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of the

## ROYAL BOTANIC GARDEN, CALCUTTA.



## Vol. VIII.

THE

## ORCHIDS OF THE SIKKIM-HIMALAYA.

By<br>Sir GEORGE KING and ROBERT PANTLING.

> Mo. Bot. Garden, 1898.

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## PART I.

LETTERPRESS.


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PARTII.<br>plates of malaxideae.

## CALOUTTA:

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## DEDICATED

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## Six \{loseply 尹altor æfooker,

G.C.S.I., C.B., F.R.S., D.C.L., OXON.; LL.D., CANTAB., EDIN., AND GLOTT.; CORRESPONDING MEMBER OF THE INSTITUTE OF FRANCE, ETC., ETC., $\quad$ BTC.,

AS A CORDIAL TOKEN OF ADMIRATION AND RESPECT.

Page 1, for "4. Didicea" read " 4. Didiciea."
" 26 , seventh line from top, omit "at" before " the sides and apex."
" 28, to the localities where Liparist tuberculata occurs add "Khasia Hills, Rita."
"
36, Liparis Assamica ; for plate " 50 " read "plate 53."
42, third line from top, for " onneate" read "cuneate."
49. In name of plate, for "Dendrobium candidum, Lindl." read "D. candidum, Wall."
56. In description of Dendrobium densiflorum, Wall., seventh line from beginning, for "revolute" read "convolute."
64, second line, add to parenthesis "(deciduous in B. polyrhizum)" and in B. triste.
64. In the diagnosis of B. Grifithii, for "striped," read " spotted."

66, sixth line from top of page, for "lanceolote" read "lanceolate."
83. In eleventh line from the bottom, omit the word "species" after Burmese.

84, ninth line from the bottom, for "Tribrachis hirta" read "Tribrachia hirta."
86, 89, and 90, for "dimediattely" read "dimidiately."
89. In the eleventh line from the top, for "narrow," read "narrowest."
93. In seventh line of description of Cirrhopetalum caudatum, for " 2 in." read " 2 in."
107. In top line for "trilobulate," read " trilobbulate."
108. In description of Phajus Wallichii, ninth line, for "many-flowered" read "rather lax-flowered," and in third line of description of $P$. Blumei for "rather lax" read "many-flowered "
110. Phajus albus, to citation "Pl. As. Rar.", prefix the words " in Wall."
111. Acanthephippium sylhetense in diagnosis for "4-lamellate" substitute " 5 -lamellate."
111. In description of Eria muscicola, seventh line, for "Petals narrower than the petals" read "Petals narrower than the sepals.'
119. In fifth line of description of Eria bambusifolia, omit the word "broad."
119. In first line of description of E. graminifolia, omit the word "and."
121. Name of Eria clausa, after "Soc." add "Beng."
123. In sixth line of description of Eria acervata, after "axils" add "of."
124. In second line of description of $\boldsymbol{E}$. coronaria for "Levaes" read "Leaves"

135, sixth line from bottom, for "Broughtonia liniaris" read "Broughtonia linearis."
140, ninth line from bottom, for " $P$. aiphylla" read " $P$. aphylla."
153, third line from top, for "Flower" read "Flowers."
155, fifth line from bottom, for "to this" read " of this."
160, twenty-third line from top, transpose the word "directly," so that the clause shall run thus-" not attached to them directly by granular elastic threads."
376. In fourth line of description of Plate of Yoania Prainii, insert the word "cap" after "anther;" thus anther-cap.
183. Remove the citation (ninth line from bottom) "North-West Himalaya; at Simla, Gamble, 7,800 ft." from Oreorchis foliosa to O. micrantha in p. 184.
192, eleventh line from top, insert the word "they" before " appear."
205. In the first line of description of Stauropsis undulata, omit the words "like the peduncle."

211, sixth line from the bottom, re-arrange these five words as follows :-Slightly bifid and more dilated.
248, twenty-second line from the top, omit the word " and."
250, name of plate, change "Corymbis veratrifolia, Blume" to C. veratrifolia, Reichb. fil.
285. In diagnosis of Z. sulcata for "lip sub-orbiculur, erose" read "lip sub-quadrate," and delete "erose."
285. In diagnosis of $Z$. Goodyersides omit the word " not."

291, twenty-second line from the top, for "the processes in this being horizontal," \&c., read "the processes of the lip in this being horizontal."
, 326, ninth line from the top, for "Don in Wall. Cat." substitute Lindl. in Wall. Cat. (not of Don).

## ERRORS IN THE INDEX TO THE PLATES IN PART II.

For "Cirrhopetalum candatum, Wall." read "C. candatum, King and Pantling."
For "Dendrobium candidum, Lindl." read "D. candidum, Wall."
Delete Microstylis ramosum, Reiehb. fil.

ERRORS IN THE INDEX TO THE PLATES IN PART III.
For "Appendiculata bifaria, Lindl.", read "Appendicula bifaria."
For "Saccolabium acuminatum, Lindl.", read "S. acuminatum, Hook. fil."

For Keegan read Kegan.

## ORCHIDEAE.

Herbs, sometimes scandent, (rarely shrubs), terrestrial with tuberous or fibrous roots, or epiphytic with aerial roots, with or without pseudo-bulbs, leafy or aphyllous. Perianth superior, irregular, in two whorls; the outer (sepals) usually sub-similar; the inner (petals) dissimilar, the odd one or lip variously shaped, often spurred. Stamens and pistils united into a column opposite the lip. Anthers solitary and perfect; or two each with one perfect and one imperfect cell or staminode (Ophrydeae) ; or both perfect (Cypripedieae); 2- to 4-celled ; pollen-grains usually cohering into one two or four pairs of oblong, globose or pyriform, sessile or caudiculate masses (pollinia), the caudicles when present free or attached to one or two glands. Perfect stigma solitary, entire or bifid; or two, approximate or distant. Apex of column usually modified into a rostellum. Ovary inferior, usually half-twisted, sometimes completely twisted. Fruit capsular, 1-celled. Seeds very numerous, minute, with lax testa and homogeneous nucleus. A widely distributed family consisting of probably about 7,500 species.

## Anther single-

Tribe I.- MALAXIDEAE. Pollinia 2 or 4, waxy, without appendages, free or rarely attached by their bases to a ball of translucent matter.

Tribe II.-EPIDENDREAE. Pollinia 4 or 8 , waxy, attached by their bases or by their backs to a single or double granular or translucent appendage, but without any gland derived from the stigma.

Tribe III.-VANDEAE. Pollinia 2, 4, or rarely 8, attached singly or in pairs or in fours by a caudicle (rarely by two caudicles) to a viscid gland derived from the stigma (in a few doubtfully from the stigma).

Tribe IV.-LISTEREAE. Anther terminal (dorsal in Epipactis', pollinia two or four, cohering by their sides, without gland or caudicle (a rudimentary caudicle in Epipogum) ; pollen powdery, granular or in small masses, never waxy.

Tribe V.-GOODYEREAE. Anther posticous, vertical but inverted ; pollinia two, or four in two pairs, attached to a single gland either by one or by two caudicles, or without a caudicle; pollen granular or sectile.

Anthers two, each with only one perfect cell-
Tribe VI.-OPHRYDEAE. Anther-cells sessile on the column, anticous or posticous, discrete or contiguous but always distinct, parallel or diverging, often with tubes from their bases, each with a staminode on its outer surface; pollinia two, rarely four, usually with caudicles and always with glands; the glands naked or enclosed in the same pouch or in two distinct pouches. Stigmas two, distinct or conjoined below the anthercells; pollen granular or sectile, not waxy.

Anthers two, each perfect-
Tribe VII.-CYPRIPEDIEAE. Perfect anthers two, one on each side of the conjoined stigmas. 'Staminode single, large, fleshy; lip large, saccate.

## PREFACE.

As regards the smaller and more obscure species of orchids indigenous to the Eastern Himalaya, the period prior to the publication of Sir Joseph Hooker's account of the family in his Flora of British India was to most people one of comparative darkness. Descriptions of a number of them indeed existed, but these were scattered in the volumes of periodicals many of which were accessible only to botanical experss. A large number of these descriptions had been brought together by Lindley in his fragmentary Orchidology of India, published in the Journal of the Linnean Society, and by Reichenbach filius in the sixth volume of Walper's Annales. But the identification of species by these means proved eminently uncertain and unsatisfactory. For many years Mr. Pantling had occupied his leisure by making drawings of the orchids found on the Government Cinchona Plantation in Sikkim, where he has lived since 1882. The appearance of the parts of the Flora of British India containing Sir Joseph Hooker's account of the family, gave an impetus to Mr. Pantling's studies; and when he showed his drawings to me, I most strongly urged him to continue the series until it should include one of each species found in the Cinchona Plantation and its immediate neighbourhood. The preparation of these drawings gradually worked itself into a project for the preparation of a complete Orchid Flora of the SikkimHimalaya; each species to be illustrated by a life-size figure of the plant, accompanied by analyses of the parts of the flower on an enlarged scale. The liberality of the Government of Bengal made it possible to publish the projected work in the Annals of the Calcutta Garden, and it now takes form in the present volume, which is the joint production of Mr. Pantling and myself.

The drawings from which the figures were lithographed were entirely the work of Mr. Pantling, my share in the production of these plates having been confined to the supervision of the lithographers who put them on the stone. For the exploration of the Alpine part of the country lying between the valley of the Great Rungeet and the higher snows, where it was believed some novelties might be found, a small party of trained Lepcha collectors was sent during the hot and rainy seasons of several successive years. These men were provided with a few swift coolies, by whom living plants of every species collected were quickly conveyed to Mr. Pantling who, while the plants were still fresh, made drawings of them. As a precaution, the collectors were provided with a stock of Formaldehyd, in a weak dilution of which they were instructed to preserve inflorescences of every species collected. These Lepcha collectors, as the following pages show, discovered a considerable number of species formerly unknown. For the letter-press Mr. Pantling and myself are jointly responsible.

Every botanist who has attempted to examine the flowers of dried specimens of orchids, and espacially those of the smaller species, knows how very difficult it is to understand the strasture of the column. For, in common with those of so many of the pataloid Monocotyledon's, the flowers of orchids, owing to the delicacy of their tissues, lose their form during the process of drying, however carefully conducted; and they do not recover it when moistened for the purposes of study. It was therefore made a rule, when the preparation of this book was undertaken, that the drawing of every species should be made from a living plant; and the only exceptions to this rule (and they are very few) which have been made, occurred in cases where the living plants sent in from the higher regions by the collectors had, in spite of the precautions taken to keep them fresh, withered prior to their arrival at Mr. Pantling's house. In such cases the drawings of the flower were male from spacimens preserved in Formaldehyd. In this excellent medium the form of flowers is exactly preserved; the colours, however, although in many cases remaining unaltered for some time, are found ultimately to fade. There may therefore be some departures from accuracy as to the exact coloration of the flowers of some of the Alpine species drawn from Formaldehyd specimens, but it is believed there are none in form. So strictly has the rule as to drawing only from living plants been observed, that neither figures nor descriptions have boan given of species recorded from Sikkim (e.g., Odontochilus Clarkei and Cymbidium macrorhizon*), of which we were unable to collect living specimens. Several species which have large handsome flowers (e.g., Dendrobium primulinum, D. crystallinum, and D. Dalhousicnum) recorded in the Flora of British India as occurring in Sikkim are believed now (probably on account of the extensive clearings for cultivation made within recent years) to be extinct. Such species have also been omitted from the book.

Three hundred copies of the book have been printed. In half the copies the lithographs have been lightly printed, and the flowers and their analyses have been coloured; in the other half the shading in the lithographs has been made darker, and they have not been coloured. The drawings have all been put on the stone by natives of Bengal educated at the Government School of Art in Calcutta. And the colouring has, under very careful supervision on Mr. Pantling's part, been done by the sons of Nepalese coolies employed on the Government Cinchona Plantationsboys who had never until Mr. Pantling took them in hand been accustomed to use any implement more delicate than a hoe. Mr. Pantling's perseverance and skill in drilling these boys into accurate colourists has been a standing marvel to everybody who has seen them at work.

In order that the species described in this volume might be represented in the great European herbaria, it was decided at the beginning of the undertaking that twelve authentically-named sets should be issued to herbaria in the different countries in Europe. These collections have just been distributed from the Calcutta Herbarium.

[^0][^1]They are by no means complete, but a list of the contents of each has been kept, and it is intended, from time to time, to fill up the blanks, so as ultimately to have every species represented in them. The specimens thus issued have been poisoned and mounted on cartridge paper, and each sheet has been examined by Mr. Pantling prior to issue; and, in token of his belief in the accuracy of its name, it bears his initials.

The herbaria to which these twelve sets have been issued are the following :-
Kew ; British Museum ; Jardin des Plantes, Paris ; Royal Herbarium, Berlin ; M. De Candolle's Herbarium, Geneva; Vienna (Hofmuseum) ; Brussels ; Florence ; St. Petersburg ; Harward (United States of America); Leiden and Upsala.

The warmest thanks of Mr. Pantling and myself are due to Sir Joseph Hooker, g.C.S.I., f.R.S., for the interest which he has taken in the progress of the work, and for much encouragement and sagacious advice ; to Mr. W. T. Thiselton Dyer, f.r.s., c.m.g., c.I.E., Director of the Royal Garden, Kew, for his courtesy in allowing comparisons of critical species to be made with the rich orchid collections of the Royal Garden by Mr. R. A. Rolfe, whose knowledge of orchids is so extensive ; and to Mr. W. Botting Hemsley, f.r.s., of the same Herbarium, for kind assistance.

From my colleague, Dr. D. Prain, I have received much willing help and excellent advice during the progress of the work, and also in the issue of the named sets of specimens.

GEORGE KING.

Royal Botanic Garden, Calcutta;
28th February 1898.

## INTRODUCTION.

The morphology and classification of orchids have been so fully treated of in modern botanical literature that it appears to me to be quite unnecessary to burden these pages with any general account of either. I propose, therefore, here to allude only to a few matters, one morphologic, the others taxonomic, in which views divergent from those commonly accepted are given effect to in the following pages. The first matter is the morphology of the stamens in the Ophrydeous genera Orchis, Habenaria, Herminium, Diplomeris and Satyrium. According to the view of Robert Brown and Lindley, as well as of the latest writers Messrs. Darwin, Bentham and Hooker, Bolus, Rolfe, Pfitzer and Kräntzlin, the stamen is single in these genera. A minute examination of the Sikkim species convinces me that this is not the case; and that, in the Sikkim species at any rate, there are two stamens. This view is not, however, taken by Mr. Pantling, who is not satisfied with the proof of the hypothesis, and it is therefore published here on my own responsibility. According to the theory which holds the field, the orchidaceous flower consists of fifteen pieces, viz., three sepals, three petals (one of which is the lip), six anthers (in two alternating rows), and three stigmas; and, in all the sub-tribes except Cypripedieae only one of the six stamens is fertile. The fertile anther is said to be the middle one of the outer whorl (i.e., the one opposite the odd sepal), the other two anthers of the outer whorl being represented by processes on the lip, and all the three of the inner whorl being merged in the column. One of the stigmas is supposed to be modified into the rostellum, and the other two to form the viscid stigmatic surfacea surface which, although usually simple, is in many cases bifid or quite divided into two segments. In the Cypripedieae, on the other hand, the fertile anthers are the lateral pair of the outer whorl, the odd one being converted into a large staminode, all the anthers of the inner whorl being infertile. The stigmas of Cypripedieae are all developed, but are confluent, none of them being modified into a rostellum.

If, however, the anther-cells of the Sikkim Ophrydeae be carefully examined, it will be found that it is difficult to explain their structure on the monantherous theory. For, although in some species the anther-cells lie close together, in many they are widely separated, the pollinia being also produced into long caudicles contained in canals, neither caudicles nor canals having any apparent attachment to a rostellum. Moreover, each of the fertile anther-cells bears on its outer surface a rugulose body which, in the descriptions in this and other works, is referred to as the staminode. Habenaria stenopetala, II. geniculata, H. pectinata, H. malleifera, H. arietina and H. Dyeriana are examples of species in which the fertile anther-cel.s are separated by a broad expanse

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of cellular tissue, and of which the prolonged caudicles are enclosed in forward-projecting tabes, there being apparently no rostellum. These structural arrangements are seen in a still more pronounced form in Diplomeris hirsuta. They are also found in very many of the South African Ophrydeae, and they are very clearly shown in the excellent drawings of Mr. Bolus.* They culminate perhaps in Habenaria Bonatea, a remarkable South African species, the structure of the flowers of which has been figured with marvellous skill and delicacy by Francis Bauer in his well-known and magnificent drawings. The incompatibility of the monantherous theory with the arrangements in this and in other species of Habenaria appears to have struck Mr. Darwin, who refers to it in his book on the Fertilization of Orchids (pagas 297 and 302, first edition), but he did not follow up the subject.

In my opinion the Sikkim species of Ophrydeae have really two anthers, one cell of each of which is fertile and the other cell infertile. Tha infertile cell invariably occupies a position on the oater surfass of the fertile one, and is the body usually described as a "staminole". $\dagger$ The two fertile anthers belong in my opinion to the inner whorl, the infertile anther being marged in the columa. In the Sikkim Opirydeae one of the three stigmas is infertile, and the two lateral are fertile. These fertile stigmas are in many species quite distinst from each other; in other species they are conjoined into a simple or bi-lobed mass. The infertile stigma in many of the spacies is obscure; in others it forms a thickened and usually carved line running batwèn the bases of the anther-cells. In Hzbenaria stenantha and H. geniculata it takes the form of a triangular concave plate occupying the lowar part of the broad space betwen the bases of the anther-cells, but on a plane anterior to the wab of cellular tissis by which these calls are connected with each other. The infertile stigma acquires its greatest development in Diplomeris hirsuta, in which (see description on page 338 and figs. 1 and 2 on plate 443) it forms a large concave hood placed well in front of the anther-cells, and (in a front view) hides the whole of the latter, except the extremities of the caadicles and their tubes. In this remarkable plant the two fertile pistils consist of two elongated parallel bodies, stigmatic at the apex, which overhang the claw of the lip and point downwards like the lip. The arrangement closely resembles that which obtains in the South African species of Habenaria of the section Bonatea.

The taxonomic matters in which there is in the following pages divergence from the current views, consist (a) in the restoration of Lindley's tribe Malaxideae, which has by most recent writers been marged in Epidendreae; (b) in the restitution to the tribe Vandeae of a few genera (hereafter mentioned in detail) which have of late bren included in Epidendreae; (c) in the breaking up of the

[^2]tribe Neotticee into two tribes, which we have named Listereae and Goodyereae. In all these changes Mr. Pantling and myself are in agreement. We are both strongly of opinion that, in limiting the larger groups, it is (as far as the Sikkim species go) the safest course to assign a supreme value to the structure and appendages of the pollen masses. In working with fresh specimens we have found that, in the genera which we have included in the old tribe Malaxideae, the pollinia have absolutely no caudicle and no gland; and that, in the majority of cases, they are perfectly free from each other; in only a very few, viz., in three species of Cirrhopetalum and in the single species of Diglyphosa, being attached by their bases to a ball of translucent substance. In the genera which we have arranged in the tribe Epidendreae the pollen masses, on the other hand, are attached, either by their backs or by their bases, to a single or double translucent appendage, but have no gland derived from the stigma. It may be that this limitation will not be found to answer in the South American Epidendreae; and it is also possible that, from the extreme delicacy of the translucent appendages, the character may be one difficult to work in the Herbarium. However, as the present work professes to be based on dissections of living, and not on those of dried specimens; and, moreover, as the polliniar differences are accompanied by certain differences in the facies of the vegetative organs, we feel bound to give full prominence to them. And in doing so we are, as already indicated, only returning to the lines followed by that great orchidologist, John Lindley. The tribe Epidendreae passes into Vandeae by a transition suite of five genera (Tipularia, Monomeria, Acrochane, Agrostophyllum, and a new one which we have named Ritaia), in all of which the polliniar appendages are attached to a gland the origin of which from the stigma is doubtful. The transfer of Cryptochilus, Calanthe and Oreorchis to Vanteae was forced upon us by the fact that the gland terminating the caudicle is, in all three, unmistakeably derived from the stigma. For this reason we have also restored to Vandeae the genus Ione which had been merged in Bulbophyllum,-a genus to which it has undoubtedly a great resemblance in its vegetative organs.

It only remains to say a few words in explanation of the re-arrangement of the genera formerly referred to Neottiece. We found that these genera may, as we believe, be arranged in two groups by following the characters afforded by the pollen. In one group the pollen is powdery (very rarely granular); in the other it is always granular or sectile. The plants with powdery pollen have a terminal anther, and their pollinia cohere by their sides, but they have neither caudicles nor glands. These we have formed into a tribe under the name Listereae. The genera with granular or sectile pollen have a posticous anther, and the pollinia are attached to a single gland by either one or two caudicles. These we have formed into our tribe Goodyereae. The location in Listereae of Epipactis and Cephalanthera appears rather anomalous; and there is no doubt that, in their vegetative organs, they resemble no other genus in the group; but their pollen is unmistakably powdery.

Our study of the Sikkim species convinces us that the fertilization of orchids by insect agency is by no means so universal as is sometimes supposed. We have found
the most unmistakable evidence of self-fertilization in genera far removed from each other in every respect. Only a few examples need be mentioned here, as they are dealt with in the text. Such examples are Eria excavata, Dendrobium crepidatum, Calanthe Mannii. Most of the species in Goodyereae, notwithstanding that the pollinar appendages in this tribe appear to be suitably formed for removal by insect agency, are also self-fertile. The subject is one which we believe would yield most interesting results in the hands of a careful and patient observer.

GEORGE KING.

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## Tribe I.-MALAXIDEAE.

Pollinia 2 or 4, waxy, without appendages, free or rarely attached by their bases to a ball of translucent matter.

## *Pollinia 4-

* Leaves equitant -

Epiphytal; leaves fleshy, sessile; inflorescence terminal; flowers minute, in racemes or spikes; column very short, without appendages

1. Oberonia.

## ** Leaves not equitant-

Terrestrial ; leaves membranous, usually sessile; inflorescence terminal; flowers small, in racemes or spikes; lip with basal (often very large) auricles; column very short, with broad arms
2. Microstylis.

Terrestrial or epiphytal; leaves 1 or 2, rarely more, mombranous, sessile; inflorescence terminal, racemose, flowers small; lip without basal or side lobes; column long, with callosities or wings or with both; rostellum sometimes double
3. Liparis.

Terrestrial ; leaf solitary, membranous, petioled; inflorescence terminal from a small pseudobulb; flowers minute, racemose; lip with a short spur, but without lobes or teeth; column without appendages
4. Didicea.

Epiphytal ; coespitose (rhizomatous in sect. Sarcopodium) ; leaves two or more (rarely one), from pseudobulbs or stems, membranous or coriaceous; inflorescence terminal or axillary, in short few-flowered peduncles or in few- or many-flowered racemes; flowers usually large, brightly coloured; column without appendages, itself short, but with a more or less elongated foot forming with the lateral sepals a mentum or sac; pollinia of equal length
5. Dendrobium.

Epiphytal with a rhizome bearing pseudobulbs or solitary leaves (rhizome sometimes absent) ; leaves solitary and coriaceous, or in pairs and membranous; inflorescence a seape from the base of the pseudobulb or from the rhizome between pseudobulbs; flowers solitary or in heads, spikes, racemes or umbels; lip fleshy, tumid, jointed to the foot of the column, mobile, usually without side lobes; column short and stout, toothed towards the apex; foot short or long; inner pair of pollinia small.

Flowers rarely umbellate; lateral sepals not much longer than the dorsal, free; pollinia always free
6. Bulbcphylium.

Flowers usually umbellate; lateral sepals much longer than the dorsal and usually connate; pollinia sometimes attached to a bali of translucent substance
7. Cirrhopetaium.

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Terrestrial; pseudobulbs with a long leafy pseudostem; leaves 3 to 5 , sessile, membranous, plicate; inflorescence lateral, raceme branched; lip without side lobes or lamellæ, convolute; column long with no foot; pollinia free
8. Anthogonium.
**Pollinia 2-
Terrestrial, pseudobulbous from a short rhizome; leaves solitary, membranous, plicate, petioled; inflorescence a racemose scape; lip lamellate; column long, with or without foot-
Column with a deep sac or spur at its base and winged, with no foot;
lip with side lobes; pollinia trapeziform; anther with a single apiculus; pollinia quite free
9. Chrysoglossum.

Column not saccate, wingless, foot long; lip without side lobes; pollinia elliptio, attached to a small translucent mass
10. Diglyphosa.

## 1. Oberonia, Lindl.

Epiphytes with usually very short, often tufted, stems. Leaves coriaceous or fleshy, usually ensiform (rarely terete), always distichous and equitant. Flowers minute, numerous, sometimes whorled, arranged in a long, erect or deflexed, spike-like or racemelike inflorescence, but expanding centrifugally. Sepals sub-equal, ovate or oblong. Petals as wide as or narrower than the sepals. Lip larger than the sepals, sessile, rarely entire, usually lobed and often erose-lobular, the hypochile more or less concave or with a nectar-secreting pit near its base. Column very short, stout, rarely winged. Anther terminal, incumbent; pollinia 4, cohering in pairs. A genus of about 60 species distributed in the Indo-Malayan region, but extending also to Australia and the islands of the Pacific.

Note.-In none of the living specimens of Oberonia which we have examined are the pairs of pollinia connected in any way with the rostellum. The rostellum has, however, at its extremity a minute globule of transparent viscid matter, and immediately above this lie the attenuated ends of the pollen masses. So closely do these approximate to each other that contact between them may be caused by the slightest movement of an insect in the neighbourhood, or even by the wind. Contact is probably also caused as the anther shrivels and the pollinia thus get displaced from their natural bed on the clinandrium. In dried specimens of Oberonia the pollinia are almost invariably attached to this rostellar viscus, and it is this circumstance which has probably given rise to the belief that they were originally connected in the living state by a viscus of their own.

> - Lip without lateral lobes or basal auricles.
> Lip coarsely erose from base to apex; rachis of inflorescence slender.
> A pex of lip not lobulate; petals spreading, erose-dentate
> Apex with two short lobules separated by a rather wide sinus; petals reflexed, entire
> Lip quite entire or very slightly erose at the apex only; petals entire, axis fleshy
> 1. O. Prainiana.
> 2. O. Dobulata.
> 3. O. pachyrachis.
> ** Lip with narrow lateral lobes; terminal lobe not elongate.
> Axis of the raceme fleshy.
> Lateral lobes of lip dentate; terminal lobe rounded, entire.

Axis of the raceme not fleshy.
Lateral lobes of lip quite entire; terminal lobe large with lobulateerose edges and a slightly bifid apex; sepals and petals spreading.
Lateral lobes sub-entire, concave; terminal lobe erose-dentate, its apex minutely mucronate; petals reflexed
5. emarginata.

Lateral lobes erose-dentate; terminal lobe with two blunt slightly incurved apical lobules separated by a sinus
6. O. micrantha.
7. O. Croftiana.
*** Lip broad, rounded or oblong in general outline; the side lobes large. Lateral lobes pectinate, glabrous.

Terminal lobe entire except for a slight erosion at the apex . .
Terminal lobe coarsely erose-dentate
8. O. Jenkinsiana.
9. O. iridifolia.

Lateral lobes entire, clothed with stiff hairs and separated from the bifid hairy apical lobe by a smooth mesochile
10. 0. ensiformis.
**** Lip with distinctly projecting lateral or basal lobes, their apices directed either outwards or forwards (towards the apex), or upwards and backwards.
Lateral lobes directed forwards.
Lateral lobes oblong, blunt.
Lateral lobes erose-dentate; terminal lobe emarginate, erose Lateral lobes entire; terminal lobe obcordate Lateral lobes sub-crenulate; terminal lobe deeply oleft into two broadly oblong blunt lobes; surface of the lip blistered or scaly

Lateral lobes falcate, their apices acute and directed forwards.
Terminal lobe with falcate parallel lobules; petals truncate .
Terminal lobe with caudate-acuminate straight parallel lobules; petals acute .
11. O. demiss_
12. O. obcordata.
13. O. myriantha.
14. O. parvula.
15. 0 . caulescens.

Lateral lobes directed horizontally outwards, small and conical; terminal lobe with rather faleate but short divergent lobules; petals blunt
16. O. falcata.

Lateral lobes long and filiform, curved upwards and backwards; terminal lobe with lanceolate elongate parallel lobules, the whole surface of the lip scaberulous

17. O. rufilabris.

*****Lip lobed only at the apex; its base broad and sometimes sub-truncate with a small auricle at each extremity; the apex with two long falcate lobules separated by a deep sinus.

Petals spreading; stems elongate.
Petals linear-oblong, truncate, entire, sepals spreading . 18. O. longilabris,
Petals oblong, erose, spreading; lateral sepals reflexed . 19. O. auriculata.
Petals reflexed; stem very short
20. O. pyrulifera.

## 1. Oberonia Prainiana, King and Pantling in Journ. As. Soc. Bengal, LXIV, pt. 2, p. 331.

Stem very short; leaves very fleshy, oblong, slightly falcate, sub-acute, .5 to $\cdot 8$ in. long and $\cdot 15$ to $\cdot 25$ in. broad. Spike slender, erect, many times longer than the leaves; the peduncle sparsely bracteate, twice as long as the uppermost leaf to wnich it is adnate; the rachis much longer than the peduncle, rather densely-
flowered in the lower two-thirds, laxly-flowered in the upper third; floral bracts equalling and sheathing the stout sessile ovary, oblong, sub-entire. Flowers warm brown, minute, $\cdot 05$ in. long, whorled. Sepais oblong, blunt, entire, revolute. Petals narrowly elliptic, sub-acute, coarsely and unequally serrate, spreading. Lip not much longer than the sepals, elliptic-lanceolate, blunt, not distinctly lobed but everywhere irregularly lobulate-erose; the base truncate and with a circular nectar-bearing pit just under the column. Pollinia orange-coloured.

At the mouth of the Teesta valley near Sivoke, elevation about 1,000 feet; Pantling No. 225; only once collected; in flower during April and May. Distrib.-Perak; Scortechini, No. 582.

A singularly beautiful little species with charming warm-brown flowers. It is evidently a straggler northwards of the Malayan Flora, only a single specimen of it having as yet been collected in British India, and that at a spot on the outer flank of the Himalaya. Father Scortechini, who collected for several years in Perak, has left an excellent pencil drawing of the Perak plant, which, as well as his manuscript description, agrees with the Sikkim plant. This is closely allied to O. Bertoldi, King and Pantling, another species of which Father Scortechini collected specimens in Perak, and of which he left a drawing now in the Calcutta Herbarium.

Plate I.-Oberonia Prainiana, King and Pantling. A plant of natural size. Fig. 1 front view of flower, 2 a flower in profile, showing the recurved sepals, 3 lip, 4 column with the reflexed lateral sepals in situ, 5 anther, 6 pollinia; all enlarged.

## 2. Oberonia lobulata, new species.

Stems very short, not tufted. Leaves oblong, acute or sub-acute, very slightly falcate, $\cdot 75$ to 3 in . long and $\cdot 25$ to $\cdot 50 \mathrm{in}$. broad. Inforescence more than twice as long as the leaves, decurved; the peduncle 1.5 in . long, winged, ebracteate; the rachis slender, sub-terete, laxly-flowered; floral bracts equalling and sheathing the sessile ovary, broadly oblong, with a blunt triangular erose apex. Flowers scattered, solitary, green, minute, (•08 in. long). Sepals ovate, acute, the petals narrower; all entire, reflexed, and resting on the ovary. Lip twice as long as the sepals, sub-quadrate, narrowed towards the apex; the base broad, truncate; the edges irregularly dentate-lobulate from base to apex; the apex with a shallow broad sinus. Stigma convex.

In a tropical valley in the Sikkim Himalaya at an elevation of 1,000 feet; only a single specimen found; Pantling, No. 199; in flower during October.

The lip of this might be described as trowel-shaped with a truncate bilobed apex, the lobes being separated by a wide shallow sinus.

Plate 2B.-Oberonia lobulata, King and Pantling. A plant; of natural sise. Fig. 1 a flower, front vien, 2 floral bract, flattened out, 3 pollinia of a young flower intact within the anther-cells; all enlarged.

> 3. Oberonia pachyrachis, Reichb. fil. in Herb. Kew ex Hook. fil. Fl. Br. Ind. V, 681.

Stems very short, tufted. Leaves ensiform, slightly falcate, tapering to the base, the apex acute, $1 \cdot 5$ to 4 in . long and 25 to 65 in . broad. Peduncle of inflorescence short, broad, compressed, adnate to a leaf to near its apex; the flower-bearing rachis very
fleshy, terete, tapering, erect, equalling or slightly longer than its leaf; florab bract ovaterotund, irregulariy but deeply serrate. Flowers minute (only '04 in. long', pale brown, sunk singly in rather distant pits in the fleshy rachis, the sepals and lip lying flat on its surface. Sepals elliptic, obtuse, glandular on the back, not reflexed. Pefals smaller than the sepals, linear-oblong, obtuse, sub-entire. Lip orbicular-elliptic, obtuse, concave, quite entire or very slightly erose at the apex, and with a deep depression at the base just under the column. Capsule short, turgid, often gibbous.

Sikkim at elevations of from 2,000 to 4,000 feet, Pantling No. 105; extending westwards along the tropical zone of the Himalaya to Gharwal and Dehra Dun-Vicary, Gamble. Khasia Hills-G. Mann. Flowering in Sikkim from November to March.

This species is very closely allied to 0 . orbicularis, Hook. fil., from which it is distinguished only by its more distant and rather smaller flowers, which have narrower petals and broader anl much more irregularly tosthed bracts. We have not found any Oberonia in Sikkim having exactly the characters of $O$. orbicularis, as they are given by Sir Joseph Hooker in his Flora of British India, or in his Century of Orchids (Ann. Bot. Gard. Calc., Volume V, 1, t. 1, where he describes and figures the species). The only loca'ity given for it in Sikkim is Dikkiling, to which we venture to think it may have been attributed by some misplacement of collectors' labels. At all events, we have failed to meet with it in Sikkim of recent years. The specimen of the plant which was the first to receive a name was collected in 1836 in the Khasia Hills by Mr. Gibson (a collector sent out by the Duke of Devonshire). It was sent to the Botanic Garden, Calcutta, to Dr. Wallich, who had a figure made of it, which still exists in the Herbarium, and on which is written, in Wallich's handwriting, "O. phyllostachys"-a name of which Sir Joseph Hooker did not know the existence when he published the species as 0 . orbicularis in the Flora of Brit. India (vol. V, 677).

The flowers of 0 . orbicularis as figured by Sir Joseph Hooker (l.c.) have larger sepals, larger and differently-shaped petals from those of the Sikkim plant here figured. Moreover the floral bract is ovate acute and regularly finely serrate in that, whereas in this it is almost rotund and irregularly erose-serrate. Sir Joseph's figure shows besides a raised fleshy margin to the nectary-a character which is wanting in this. O. orbicularis is probably confined to the Khasia Hills.

Plate 3.-Oberonia pachyrachis, Reichb. fil. A plant; of natural sise. Fig. 1 front view of a flower, 2 floral bract, 3 anther, 4 pollinia; all enlarged.

## 4. Oberonia pachyphylla, new species.

Stems very short, not tufted. Leaves very fleshy especially at the base, broadly lanceolate, acute, 5 to 1 in. long and from $\cdot 2$ to .5 in . broad at the base. Peduncle of the inflorescence short, stout, not adnate to a leaf, with one to three lanceolate hyaline bracts. Spike $1 \cdot 25 \mathrm{in}$. long, deflexed, thick, fleshy, terete, tapering towards the apex and also slightly towards the base. Flowers 04 in. long, not sunk in the rachis, covered while in bud by the broad ovate-rotund erose fleshy-based bracts. Sepals spreading, broadly-ovate, blunt, entire. Petals spreading, ovate-lanceolate, blunt, entire. Lip slightly shorter than the sepals and petals, obovate-rotund, with a deep pit at its base just under the column; the margin 3-lobed; the side lobes long, very narrow, erose-dentate; the terminal lobe rounded, quite entire.

Near the base of the Sikkim-Himalaya, at Salgurra, near Siliguri; elevation 900 feet; Pantling No. 429; only once collected; in flower in February.

The sepals and petals are of a pale reddish-brown, the lip being of a much darker shade of the same colour. In its thick fleshy terete rachis this species resembles O. pachyrachis, Reichb. fil.; and 0. orbiculuris, Hook. fil.; but it differs from both in having the inflorescence quite free from any leaf, whereas in both these the peduncle of the inflorescence is adnate to a leaf. Moreover, in both these species, the flowers are sunk in pits in the rachis; in this they are quite superficial. The leaves in this are also much shorter and more fleshy. The flowers of this are very like those of O. orbicularis as figured by $\operatorname{Sir}$ Joseph Hooker (Ann. Bot. Gard. Calc. V, t. 1); but, in that species, the lip has no side lobes and is entire; or, if in the least degree erose, it is so at the apex and not at the sides or base; whereas in this there are three lobes, and the apical one is quite entire, while the lateral lobes are very erose. From the flowers of this, those of 0 . pachyphylla differ in having much narrower petals and also somewhat narrower sepals.

Plate 4.-Oberonia pachyphylla, King and Pantling. Two plants; of natural sise. Fig. 1 flower, front ciew, 2 floral bract, 3 anther, 4 pollinia; all enlarged.

## 5. Oberonia emarginata, new species.

Stems slightly exceeding an inch in length. Leaves linear, falcate, sub-acute, length $\cdot 35$ to 1.35 in., breadth $\cdot 1$ to $\cdot 15$ in. Peduncle short, with many minute linear bracts; raceme about twice as long as the leaves, decurved, densely-flowered for five sixths of its length, but laxly-flowered in the apical sixth. Flowers very minute (less than 02 in. long), verticillate; floral bract ovate-lanceolate, with a broad base and acute apex, entire, longer than the ovary. Sepals and petals sub-equal, spreading, broadly ovate, acute, slightly narrowed to the base, the margins entire. Lip about equal in length to the sepals and petals, but broader, sub-orbicular in general outline, with a shallow depression at the base below the column, 3-lobed; the basal lobes small, rounded, entire; the terminal lobe large, with lobulate erose edges, the apex bifid, the sinus triangular. Anther transversely elliptic; pollinia ovoid.

Sikkim, at Namgah, elevation 6,000 feet; Pantling No. 423; in flower during September.

This species is allied to 0 . micrantha, King and Pantling, from which it differs in being caulescent, in having falcate leaves, and in having the floral bract entire and broader. The terminal lobe of the lip is moreover different in shape, and the sepals are smooth on the outer surface instead of being papillose as they are in 0. micrantha.

Plate 2A.-Oberonia. emarginata, King and Pantling. Three plants; of natural size. Fig. 1 a flower, seen from the front, 2 floral bract, spread out, 3 anther, 4 pollinia; all enlarged.

## 6. Oberonia micrantha, new species.

Stems very short. Leaves linear-ensiform, sub-acute, not falcate, length 35 to $1 \cdot 35$ in., breadth $\cdot 1$ to $\cdot 2 \mathrm{in}$. Inflorescence erect, longer than the leaves, slender, terete; the peduncle very short, bracteolate; the flowering-rachis four times as long as the peduncle; floral bract lanceolate, sub-acute, slightly erose, equal in length to or slightly exceeding
the ovary. Flowers very minute ( 35 in . long) whorled. Sepals broadly ovate, spreading, entire, minutely papillose externally. Petals narrower than the sepals, ovate, entire, recurved. Lip broad, sub-rotund in general outline, divided into a basal and apical part by deep lateral sinuses; the basal part concave, fleshy but with no nectary, its two lobes rounded and sub-entire; the apical part or lobe thinner than the basal, transversely elliptic, erose-dentate, its apex minutely mucronate.

Sikkim Himalaya, at Tendong, elevation 6,000 feet; Pantling No. 324; in flower in July.

A species allied to 0 . demissa, Lindl., but with different leaves, a tapering, not truncate, inflorescence, and a different lip; allied also to O. emarginata, King and Pantling, but differing in the points noted under that species.

Plate 5.-Oberonia micrantha, King and Pantling. Three plants, of natural size. Fig. 1 a flower, front viev, 2 floral bract, 3 anther, 4 pollinia; all enlarged.

## 7. Oberonia Croftiana, new species.

Stems very short, tufted. Leaves only slightly fleshy, shortly and broadly ensiform, tapering from below the middle to the acute apex, straight or sub-falcate, $\cdot 75$ to 1.5 in. long. Peduncle of inflorescence terete, stout, shorter than the leaves, bracteate; the raceme terete, usually much longer than the leaves (often twice as long), erect at first, afterwards much decurved; the rachis thick and deeply grooved when the fruit is ripe; floral bract elliptic, sub-acute, crenulate or sub-entire, equalling the shortly-stalked ovary. Fiowers reddish-brown, minute (about 05 in. long). Sepals ovate-cordate, entire, spreading. Petals oblong, blunt, sub-crenulate or entire. Lip much larger than the sepals or petals, oblong, 3-lobed, with a large depression near the base; lateral lobes narrow, erose-dentate, the terminal lobe with two long blunt slightly incurved apical lobules separated by a deep blunt sinus.

On the Sikkim-Bhotan frontier, on the banks of the Jaldakha river; elevation about 900 feet; Pantling No. 254: in flower during October.

This is allied to O. Falconeri, Hook. fil., but is a smaller plant with thinner leaves. This has moreover oblong obtuse petals which are often sub-crenulate, whereas the petals of O. Falconeri are lanceolate-acute and quite entire. The lateral lobes of the lip of this are elongate, narrow and erose-dentate, whereas those of 0 . Falconeri, as figured by Sir Joseph Hooker (Ic. Plantar., t. 1780), are short, ovate-rotund and entire. This is also allied to 0 . parvula, King and Pantling, but that has a different lip and is a smaller plant with its inflorescence always erect.

Plate 6A.-Oberonia Croftiana, King and Pantling. Three plants, of natural size. Fig. 1 front view of a flower, 2 floral bract, 3 pollinia; all enlarged.

## 8. Oberonia Jenkinstana, Griff. MSS. ex Hook. fil. Fl. Br. Ind. V, 676.

Stems about 1 or 1.5 in . long, tufted. Leaves narrowly ensiform, sub-acute, straigbt or sub-falcate, 2 to 5 in . long and $\cdot 25 \mathrm{in}$. broad. Inflorescence decurved, produced from about the middle of the uppermost leaf and about equal to the longest leaf in length; peduncle terete, bracteate; raceme three times as long as the peduncle, densely-flowered, the rachis fleshy; floral bract ovate, acuminate, erose, equalling the shortly-stalked ovary. Flowers
minute (.06 in. long), brown, verticillate. Sepals and petals sub-equal, broadly ovate, obtuse or sub-acute, entire, spreading. Lip fleshy, much larger than the sepals and petals, 3-lobed; the basal lobes large, auriculate, pectinate, with an elliptic nectar-secreting concavity between their anterior ends; the terminal lobe rather smaller, reniform, entire except for a shallow elongate sub-mucronate erosion at the apex. Clinandrium much broader than the anther; pollinia resting on the minute projecting viscid rostellum. Lindl. Fol. Orchid. Oberonia, p. 4. Maluxis Jenkinsiana, Reichb. fil. in Walp. Ann. VI, 211.

Sikkim, in the valley of the Teesta; elevation about 1,000 feet. Pantling No. 185. Distrib. Khasia Hills up to 4,000 feet; Clarke, Hooker and Thomson.

Plate 7.-Oberonia Jenkinsiana, Griff. A plant, of natural size. Fig. 1 front view of a flower, 2 floral bract, spread out, 3 anther, 4 pollinia; all enlarged.

## 9. Oberonia iridifolia, Lindl. Gen. and Spec. Orchid., 15.

Stem short. Leaves broadly ensiform, acute, 2 to 10 in . long and 25 to 1 in . broad. Inflorescence longer than the leaves, decurved; peduncle winged, ebracteate; spike twice (somet:mes three times) as long as the peduncle, its rachis rather slender, densely-flowered; floral bract minute, elliptic, obtuse, coarsely erose, convolute round the sessile ovary. Fliwers minute (.06 in. long), sub-verticillate, pale green or yellow. Sepals and petals sub-equal, ovate, reflexed and resting on the ovary, the former entire, the latter erose. Lip orbicular, indistinctly 3-lobed; the side lobes pectinate, erose; the terminal lobe broad, transversely oblong, deeply and bluntly emarginate at the apex and coarsely erose. Capsules broadly ovoid, sessile. Folia Orchid. Oberonia, p. 1. Wall. Cat. No. 1948-2 (in part oniy); Hook fil. Fl. Br. Ind. V, 675. Malaxis iridifolia, Reichb. fil. in Walp. Ann. VI, 208.

Common in the tropical valleys of the Sikkim and Bhotan Himalaya; Pantling No. 13. Also in the hill ranges of Assam and Burma, and in the Andaman Islands. In flower in Sikkim from September to December.

This is a widely-distributed and variable species; but only the typical form, as above described, occurs in Sikkim. Sir Joseph Hooker (Fl. Br. Ind. V, 676) recognises three varieties, viz., var. denticulata, found in the Nilgiri and Pulney ranges of hills; var. angustifolia, from the Khasia Hills; and var. brevifolia, from Burma and the Andamans.

Plate 8.-Oberonia iridifolia, Lindl. forma typica. A plant, of natural size. Fig. 1 a flower, front riev, 2 a flower, side viev, 3 floral bract, flattened out, 4 anther, 5 pollinia; all enlarged.

## 10. Oberonia ensiformis, Lindl. Fol. Orchid. Oberonia, p. 4.

Stem about 3 in . long. Leaves linear-ensiform, acuminate, falcate, length 3 to 18 in , breadth $\cdot j$ to $\cdot 75 \mathrm{in}$. Inflorescence erect, shorter than the leaves, its apex subtruncate, its peduncle 2 to 3 in . long and bearing numerous minute lanceolate adpressed pale bracteoles; the raceme about twice as long as the pedancle; its rachis thick, fleshy, terete; floral bract longer than the ovary, convolute, ovate-rotund, sub-acute, erose. Fluwers $\cdot 12 \mathrm{in}$. long, pale brown, not at all sunk in the rachis. Sepicls sub-equal, broadly ovate, sub-acute, entire, not ciliolate, reflexed. Petals ovate, sub-acute, stiffly pubescent, the edges entire and ciliolate. Lip twice as long as the sepals, 3 -lobed, with two large rounled entire basal lobes, a sub-quadrate smooth slightly concave mesochile whicis
bears on its edges two large projecting blister-like processes, and an ob-reniform terminal lobe with two rounded lobules separated by a broad sub-quadrate apical sinus; the whole surface and margins of the lip except the smooth mesochile clothed with stiff hairs. Hook. fil. Fl. Br. Ind. V, 679. O. acaulis, Hook. Bot. Mag., t. 5056 (not of Griff.). O. trilobata, Griff. Notul. III, 273. Maluxis ensijormis, Smith in Rees' Encycl.; Reichb. fil. in Walp. Ann. VI, 212 (excl. syn.).

Sikkim, in the valley of the Teesta, at an elevation of about 1,500 ? feet; Pantling No. 305; in flower in November. Nepal; Hamilton. Khasia Hills; Grifith. Nilgiri Hills; Proudlock.

This is the largest species of Oberonia found in Sikkim; it has the peculiarity of having all its leaves curved in the same direction. It falls into the group with o. myriantha, Lindl. and 0 . ferruginea, Parish, its nearest ally being probably the latter, from which, however, it differs conspicuously in having its petals and lip entire instead of fimbriate. The basal lobes of the lip, moreover, are broad, not narrow as in 0. ferruginea, and the apical sinus is obtuse, instead of acute as in that species. Specimens recently received from Mr. R. L. Proudlock, collected by him in the Nilgiri Hills, exactly agree with those collected in Sikkim. It had not been previously suspected that 0 . ensiformis occurred in Southern India.

Plate 9.-Oberonia ensifmmis, Lindl. A plant; of natural sise. Fig. 1 front view of a flower, 2 sepals and petals separated from the rest of the flower, 3 floral bract, flattened out, 4 pollinia; all enlarged.

## 11. Oberonia demissa, Lindl. Fol. Orchid., Oberonia, p. 4.

Stem very short. Leaves narrowly oblong, tapering to the sub-acute apex and also slightly to the base, sub-falcate, $\cdot 5$ to 3 in . long and $\cdot 25$ to $\cdot 5 \mathrm{in}$. broad. Inforescence about as long as the longest leaves, erect or decurved; the peduncle about $\cdot 25 \mathrm{in}$. long, ebracteate, axillary; the raceme five or six times as long, truncate at the apex, denselyflowered; the rachis rather stout; floral bract as long as the shortly-stalked ovary, lanceolate, sub-acute, its edges obscurely crenulate. Flowers minute, ( 05 in . long) reddish-brown, densely whorled. Sepals sub-equal, ovate, entire, all reflexed and lying on the ovary. Petals elliptic, obtuse, erose-dentate, spreading. Lip equalling the sepals in length but much broader, 3-lobed; the lateral lobes oblong, blunt, falcate, erosedentate, divergent; the terminal lobe quadrate, orbicular, with broad emarginate apex and erose-dentate edges. Hook. fil. Ic. Plantar., t. 1785 B; Fl. Br. Ind. V, 680. Malaxis demissa, Reichb. fil. in Walp. Ann. VI, 211.

Tropical valleys in the Sikkim Himulaya; Hooker, Pantling, No. 238.
Plate 10.-Oberonia demissa, Lindl. Two plants, of natural sizs. Fig. 1 front view of flower, 2 flower in profile, 3 floral bract, flattened out, 4 pollinia; all enlurged.

## 12. Oberonia obcordata, Lindl. Fol. Orchid., Oberonia, p. 7.

Caulescent; the stems short and many-leaved, or $1 \cdot 5$ to 3 inches long and fewer-leaved, fleshy, compressed. Leaves linear, falcate, acute, fleshy, 75 to 1.75 in . long. Peduncle of inflorescence short, with a few bracts or with none; raceme slender, as long as the longest leaf; floral bract larger than the flower, ovate-lanceolate, acuminate, minutely and irregularly toothed. Flowers reddish-brown, about .05 in . long, in dense whorls
densest towards the base of the raceme. Sepals sub-equal, broadly ovate, the dorsal acute, the lateral pair obtuse. Petals linear-oblong, sub-acute, spreading. Lip much longer and broader than the sepals, with an oblong narrow mesochile ridged in the middle, two oblong blunt entire divergent lateral lobes, and a large ob-reniform terminal lobe, the sinus shallow and wide making the apex broadly bilobulate, the edges entire. Hook. fil. Ic. Plantar., t. 1783; Fl. Br. Ind. V, 684. Malaxis obcordata, Reichb. fil. in Walp. Ann. VI, 216.

Sikkim-Himalaya, at elevations of from 5,000 to 9,000 feet; Griffith, Hooker, Clarke and other collectors; Pantling No. 47. Khasia Hills, alt. 5,000 feet; Griffith, No. 5087. Naga Hills, on Japhoo, elev. 9,000 feet, Colomb. In flower in Sikkim from June to October.

This species is very variable in habit. Some specimens have only a single leaf; some have short stems and five or six leaves crowded close together, while others have stems one and a half to three inches long with three or four distant leaves. The caulescent forms are occasionally viviparous, and the whole plant is usually more or less suffused with reddish-brown. We believe 0 . Trentleri, Hook. fil,, to be a form of this. The same form was recognised by Reichenbach fil. as a variety of this under the name var. latifolix. The nectary, which in most species of Oheronia is in the form of a concavity near the base of the lip, is in this a tunnelled ridge on the mesochile, with a single very minute opening at the end next the stigma. This remarkable arrangement was discovered by Mr. Pantling after the examination of numerous living flowers. The species is a very common one in Sikkim.

Plate 11.-Oberonia obcordata, Lindl. Three plants, of natural size. Fig. 1 front view of a flower, 2 floral bract opened out, 3 pollinia, complete, 4 profile of two pollinia; all enlarged.

## 13. Oberonia myriantha, Lindl. Fol. Orchid., Oberonia, p. 4.

Stcms short, slightly tufted. Leaves ensiform, acuminate, faleate, very unequal in size, from 75 to 10 in . long and $\cdot 15$ to $\cdot 5 \mathrm{in}$. broad. Inflorescence much longer than the leaves, slender, much decurved; its peduncle terete, rather thickly clothed with slightly-spreading linear bracts; the rechis of the raceme not thicker than the peduncle but several times as long; floral bract lanceolate, acuminate, coarsely erosefimbriate, equalling the long-stalked ovary. Flowers of a warm brown colour, $\cdot 1$ in. long, very numerous, more or less whorled. Sepals ovate, entire. Petals oblong, entire, truncate, spreading or reflexed on the ovary like the sepals. Lip longer than the sepals and petals; the lateral lobes broadly oblong, sub-crenulate, blunt, sub-divergent but pointing forwards; the terminal lobe large, deeply cleft into two broadly oblong blunt lobules separated from each other by a triangular blunt or acute sinus; the upper surface of the lip with a few irregularly scattered watery blisters ultimately changing into scales, and also with a small shallow depression at the base just under the column. Capsules cylindric clavate, boldly ribbed, pediceiled. Hook. fil. Fl. Br. Ind. v, 679. O. Sikkinensis, Lindl. Fol. Orch., Oberonia, 4. O. acaulis, Griff. Notul. III, 275 ; Itin. Notes 76, No. 1130; Ic. Pl. Asiat., t. 286, fig. 1. Malaxis myriantha and M. Sikkimensis, Reichb. fil. in Walp. Ann. VI, 212.

Valleys of the Sikkim-Himalaya; at elevations of 3,000 to 4,000 feet; common: Pantling No. 195; in flower in Sikkim from October to December. Khasia Hills, elevation 3,500 to 5,000 feet. Naga Hills, Clarke.

Plate 12.-Oberonia myriantha, Lindl. A plant, of natural sise. Fig. 1 front view of a flower, 2 column, 3 floral bract, 4 anther, 5 and 6 pollinia; all enlarged.
14. Oberonia parvula, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, p. 330.

Whole plant under two inches in height, not tufted, or only very slightly so. Leaves two or three, lanceolate, acute, $\cdot 5$ to nearly 1 in . long, and $\cdot 12$ to $\cdot 25 \mathrm{in}$. broad. Inflorescence erect, twice as long as the leaves; the peiuncle slender, ebracteate, about half as long as the thickened terete tapering raceme; foral bract equalling the shortly-stalked ovary, oblong-lanceolate, sub-mucronate, the edges crenulate. Flowers minute (.06 in. long), crowded but not whorled. Sepals ovate, sub-acute, the upper one entire; the lateral pair rather larger and more spreading, keeled and with wavy edges. Petals oblong, truncate, entire, spreading, pale yellow and translucent like the sepals. Lip reddish-brown, broadly obovate in general outline, with a concavity near the base, 3 -lobed; the lateral lobes small, apically-pointing, falcate-triangular, sub-acute; the terminal lobe long, deeply bifid, its sub-falcate lobules separated by a deep wide sinus mucronate at its apex. Stigma convex.

In the Teesta Valley, at Guru Bathan, elevation 1,500 feet; Pantling No. 203; in flower in February.

This, like $O$. lobulata, has a convex stigma.
Plate 6B.-Oberonia parvula, King and Fantling. Two plants, of natural size. Fig. 1 front view of a flower, 2 floral bract, flattened out, 3 anther, 4 pollinia; all enlarged.

## 15. Oberonia caulescens, Lindl. Fol. Orchid., Oberonia 7.

Siems 1 to 2 in. long. Leaves about five, linear-ensiform, acute or acuminate, rather fleshy, 5 to 1 in . long and $\cdot 15$ to $\cdot 2 \mathrm{in}$. broad. Inflorescence erect, not adnate to a leaf, twice as long as the longest leaf ; its peduncle terete, short, bracteate; the raceme slender. Flowers reddish-brown, minute ( $\cdot 05 \mathrm{in}$. long), verticillate in the lower three-fourths of the raceme, sparse and irregular in the upper fourth; floral bract equal in length to the stalked ovary, lanceolate, its apex aristate. Sopals ovate, sub-acnte, entire. Petals lanceolate, acute, entire, spreading like the sepals. Lip nearly three times as long as the sepals, 3-lobed and with a small deep elliptic depressed nectary at its base just below the column; lateral lobes triangular-falcate, their apices pointing forwards ; terminal lobe deeply cleft at its apex into two caudate-acuminate sub-parallel lobules separated by a deep narrow sinus mucronate at its apex. Lip of anther acute. Lindl. in Wall. Cat. 1950 ; Gen. and Spec. Orchid., 15 ; Hook. fil. Fl. Br. Ind. V, 683. Malaxis caulescens, Reichb. fil. in Walp. Ann. VI, 215.

Sikkim ; common at elevations of about 6,000 feet; Pantling No. 454; in flower during July and August. Nepal; Wallich. Khasia Hills; Lobb, Hooker fil., and I. Thomson.

The nearest ally of this is probably 0. caudata, King and Pantling, a species from Perak recently described in the Journal of the Asiatic Society of Bengal ; but in that species the peduncle is adnate to a leaf, the petals are very narrow and acuminate, as also are the lateral lobules of the lip; the terminal lobules of the lip are, moreover, longer than in this.
ann. Roy, Bot. Gard. Calcutta, Vol. VIII.

Plate 13B.-Oberonia caulescens, Lindl. Two plants, of natural size. Fig. 1 a flower, front vier, 2 anther, 3 pollinia; all enlarged.

> 16. Oberonia falcata, King and Pantling in Journ. As. Soc., Bengal, LXIV, pt. 2, p. 329.

Caulescent, tufted. Strms 5 in. long, flexuose. Leaves falcate, ensiform, acute, 1 to 2.5 in . long and $\cdot 2$ to $\cdot 25 \mathrm{in}$. broad. Inflorescencs erect, nearly as long as the stem and much longer than the leaves ; the peduncl? very short, terete, less than half as long as the uppermost leaf, bracteate; raceme many-flowered; floral bract equalling and sheathing the stalked ovary, ovate, sub-acute, erose. Flowers yellowishgreen, minute ( $\cdot 05 \mathrm{in}$. long), crowded, sub-verticellate. Sepuls ovate, entire, reflexed or spreading. Petuls linear-oblong, blunt, entire. Lip twice as long as the sepals, broadly oblong in general outline, flat except for a slight depression near its base and just under the column ; side lobes small, triangular, pointing outwards; the terminal lobe with two deep lanceolate slightly diverging terminal lobules separated by a wide sinus with a narrow but rounded edentate apex. Column with two fleshy wings. Anther-cap membranous. Pollinia ovate, compressed, and of a dark orange colour.

Choongthang in the Sikkim-Himalaya, at an elevation of 6,000 feet; Pantling No. 218 ; in flower during August.

This resembles 0 . longilabris, King and Pantling in having a winged column. But it is a larger plant than that, and its lip is differently lobed; the petals also are broader and their apices are not truncate as in that species. This also resembles 0 . Mannii, Hook. fil. (Ic. Plantar., t. 2003j, but has narrower petals which are quite entire.

Plate 14.-Oberonia falcata, King and Pantling. Two plants, of natural size. Fig. 1 front view of a flower, 2 floral bract, flattened out, 3 pollinia; all enlarged.

## 17. Oberonia rufilabris, Lindl. Sert. Orchid. t. 8A.

Stem very short. Leaves narrowly oblong, sub-ensiform, flaccid, 75 to 5 in. long and $\cdot 25$ to $\cdot 65$ in. broad. Inflorescence erect, longer than the leaves; its peduncle short, bearing numerous soft filiform bracts; the raceme many times longer than the petiole, with very numerous flowers in whorls. Flowers $\cdot 05 \mathrm{in}$. in diam., reddish-brown; the bracts of the flowers in the lower part of the raceme ovate with long filiform tips much longer than the stalked ovaries, those of the upper part with much shorter tips and not longer than the ovaries, the margins of all entire. Sepals ovate, acute, concave, spreading. Petals linear-oblong, sub-acute, entire, spreading. Lip fleshy, twice as long as the sepals and petals, and of a darker colour than the rest of the flower, narrow, the whole of its upper surface scaberulous, a minute elongate pit at the base just under the column; basal lobes filiform, much curved upwards and backwards ; terminal lobe narrow, deeply cleft into two lanceolate parallel lobules separated by a deep sinus with a blunt apex. Clinandrium deeply and unequally toothed; lip of anther cuspidate. Fol. Orchid., Oberonia 5; Hook. fil. Fl. Br. Ind. V, 683. Malaxis rufilabris, Reichb. fil. in Walp. Ann. VI, 213.

At the base of the Sikkim-Himalaya; Haines, l'antling No. 430. Burma; Berkeley, Kurz, No, 3278 ?; at Moulmein, Griffith.

Plate 15.-Oberonia ruflabris, Lindl. Two plants, of natural size. Fig. 1 a flower seen from the front, 2 clinandrium and part of column, 3 floral bract from the lower part of a raceme, 4 floral bract from the upper part of a raceme, 5 cap of anther, 6 pollinia; all enlarged.
18. Oberonia longilabris, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 330.

Caulescent. Stems tufted, slender, 2 to 3 in. long. Leaves linear-ensiform, acute, $\cdot 75$ to $1 \cdot 5$ in. long and $\cdot 2 \mathrm{in}$. broad. Inflorescence three times as long as the leaves, much decurved; the peduncle about as long as the uppermost leaf, terete, slender, ebracteate; the raceme tapering to the apex; floral bract lanceolate, acuminate, slightly erose, much exceeding the stalked ovary and about as long as the lip. Flowers yellow, minute ( $\cdot 06 \mathrm{in}$. long', scattered. Sepals ovate, entire. Petals linear-oblong, sub-truncate, entire, spreading like the sepals. Lip oblong in general outline, three times as long as the sepals, with two small rounded auricle-liks lobes at the very base; the apical lobes broadly lanceolate, sub-divergent, acute, separated by a sub-triangular sinus; the middle part of the lip (mesochile) with a lanceolate depression extending from near the column to near the apical sinus. Column with small stout wings. Pollinia orange.

Sikkim; at Song-chong-loo, elevation about 6,000 feet: at Namgah, elevation about 5,000 feet; Pantling No. 227; in flower in July.

The concavity on the lip is deep just under the column, becoming shallower towards its apex. The winged column is very unusual in the genus. This species approaches 0 . caulescens, Lindl.; but differs in its longer stem, ebracteate peduncle, in its flowers not being in the least whorled, and in baving truncate petals and a lip with shorter lobes.

Plate 13A.-Oberonia longilabris, King and Pantling. Two plants, of natural siz. Fig. 1 front view of a flower, 2 anther, 3 pollinia; all enlarged.

## 19. Oberonia auriculata, new species.

Stem 1 to $1 \cdot 5$ in. long. Leaves linear-equitant, acuminate, not falcate, $\check{5}$ to 1 in . long and $\cdot 15$ to $\cdot 2 \mathrm{in}$. broad. Inflorescence erect, three times as long as the leaves; peduncle less than one inch, naked or with a few bracts; raceme slender, sparselyflowered; floral bract lanceolate, erose. Sepals ovate, sub-acute, the lateral pair reflexed on the slenderly stalked ovary. Petals erect like the dorsal sepal, narrowly oblong, blunt, the margins erose. Lip longer than the sepals and petals, oblong, narrowed at the truncate base, widening upwards, the apex divided into two obtuse diverging oblong lobules by a deep triangular sinus mucronate at its apex; lateral lobes none, but at each end of the base a small rounded auricle with a triangular depression inside it.

Sikkim ; at Sureil and Rungbee at elevations of about 6,000 feet; Pantling No. 166 ; in flower in May.

Allied to 0 . cautescens, Lindl., but in that species the lip has rather large basal lobes, and the lobules of the terminal lobe are produced into tails; the petals, moreover, are entire, not erose as in this.

Plate 16A.-Oberonia auriculata, King and Pantling. Two plants, of natural size. Fig. 1 a flower seen from the front, 2 anther, 3 pollinia; all enlarged.

## 20. Oberonia pyrulifera, Lindl. Fol. Orchid., Oberonia, p. 3.

Stem very short. Leaves ensiform, obliquely acute or sub-acute, sub-falcate, 1 to 2.5 in. long and $\cdot 15$ to $\cdot 30 \mathrm{in}$. broad. Peduncle of inflorescence slender, terete, about half as long as the leaves; the bracts slender, subulate; the raceme about the same length or longer, slender, decurved ; floral bract shorter than the rather long-stalked ovary, lanceolate, acuminate, erose. Flowers minute (about -065), green, scattered, not verticillate. Sepals ovate, acute, entire. Petals oblong, blunt, reflexed like the sepals and resting on the ovary. Lip more than twice as long as the sepals, oblong, with a quadrate hypochile truncate at the base, with a small rounded shoulder-Jike auricle at each extremity and a shallow triangular depression between; the apical lobe deeply cleft into two oblong sub-falcate obtuse divergent lobules with a large triangular sinus between them. Capsules ovoid-cylindric, ribbed, $\cdot 1$ in. long. Hook. fil. Fl. Br. Ind. V, 678. O. verticillata, var. Khasiana, Lindl. Fol. Orchid., Oberonia, p, 3. Malaxis verticillata, var. Khasiana, and M. pyrulifera, Reichb. fil. in Walp. Ann. VI, 210, 211.

Valley of the Teesta in Sikkim, at an elevation of 1,000 feet; Pantling No. 191; in flower in October. Khasia Hills, elevation 4,000 to 6,000 feet; Hooker fil. and T.T. Munipore; Watt.

Plate 16B.-Oberonia pyrulifera, Lindl. Two plants, of natural sise. Fig. 1 a flower, seen from the front, 2 anther, 3 pollinia; all enlarged.

## 2. Microstylis, Nutt.

Terrestrial, sometimes epiphytic (two saprophytic), pseudo-bulbous. Leaves one or more, membranous, plicate, continuous with their sheaths (absent in two species). Flowers small, resupinate, in terminal racemes. Sepals spreading or recurved, sub-equal. Petals narrower than the sepals but of about the same length. Lip adnate to the base of the column, usually flat; the basal lobes large, sagittate, and produced upwards, or cup-shaped with small lobes, or without basal lobes; the apex emarginate, 2-3-lobed, erose or entire. Column very short (rather long in M. congesta and M. Maximowicziana), with two short spreading arms. Anther sub-terminal, bilocular; pollinia 4, ovoid or obovoid.

A genus including about sixty species, of which ten are found in Sikkim and nine in other parts of British India and in Ceylon.

Lip slightly convex; the basal auricles sagittate, projecting upwards and more or less hiding the rest of the flower.

## Leafy.

Anterior lobe of lip transversely elliptic, erose
Anterior lobe of lip rounded, notehed; the basal aurieles parallel, their tips not touching or overlapping . . Anterior lobe of lip sub-quadrate, deeply bifid; the basal lobss converging, their tips touching or overlapping. Anterior lobe of lip triangular,, its apex notched

1. M. Khasiana.
2. M. Wallichii.
3. M. Wallichii, var. biloba.
4. MI. Scottii.
Leafless and saprophytio or parasitio.
Plant 3 to 6 in . high, tuber orbicular; dorsal sepal reflexed and adpressed to the ovary; lip with a convex fold on its upper surface
5. IV. saprophyta.
Plant 7 to 9 in . high, tuber irregularly oblong; dorsal sepal erect; upper surface of lip smooth
6. M. aphylla.
Lip fleshy, concave, with two transverse calli; its anterior part 3-loved
7. M. congesta.
Lip concave, entire, its apex produced into a beak; basal auricles absent.
Plant with a single leaf . . . . . . . . . . . . . 7. M. cylindrostachya.
Plant with two leaves . . . . . . . . . . . . . . 8. M. muscifera.
Lip hooded or deeply cup-shaped; the basal lobes short, rounded. Flowers numerous, only 2 in . in diam.
8. M. Maximnxicziana.
Flowers few, 5 to 75 in. in diam.
9. M. Josephiana.

## 1. Microstylis Kihasiana, Hook. fil. Fl. Br. Ind. V, 686.

Stem about 3 in . high, growing close to the base of the cylindrical leafless pseudobulb of the previous year. Leaves three or four, ovate-elliptic, slightly oblique, 4- or 5 -nerved, the apex acute or shortly acuminate, the base narrowed into the short sheathing petiole, the edges undulate; length 3 to 5 in ., breadth 1 to 1.5 in . Raceme twice as long as the leaves; its peduncle ribbed, ebracteate. Floral bract lanceolate, reflexed, much shorter than the ovary. Flowers spreading, $\cdot 25$ in. long. Sepals broadly ovate, concave, the dorsal narrower and sub-acute; the lateral broader, more obtuse and more concave. Petals linear, truncate. Lip broad, concave, with two basal and one apical lobe; the basal lobes falcate, acute, their apices converging and overlapping; the apical lobe separated from the two basal by a constriction, its outline transversely oblong, its apex broad, erose and somewhat incurved, or sometimes slightly bifid without being erose.

Sikkim-Himalaya; abundant between elevations of 3,000 and 6,000 feet; Pantling No. 283. Jaintia Hills, alt. 4,000 to 5,000 feet; Lobb, Rita, Mann; flowering from July to October.

The leaves of this beautiful species are of a lustrous greyish-green colour flushed with purple; the inflorescence with the pedicels and bracts of the flowers are of a dull purple, and the sepals and petals are purple, the lip being yellowish. There is a slight amount of variation in the terminal lobe of the lip. In some plants the lobe is almost truncate and erose, while in others it is somewhat rounded and minutely bifid; and between these there are intermediate stages. Exactly the same variation occurs in plants growing in the Jaintia Hills, as has been recently proved by the examination by Mr. Pantling of a large number of living plants kindly sent from these Hills by Mr. S. E. Rita, Assistant Commissioner there.

Platb 17.-Microstylis Khasiana, Hook. fil. A plant, of natural size. Fig. 1 flower, front view, 2 the same, seon from the side, 3 column, 4 vertioal seotion of column and lip, 5 anther, 6 pollinia; all enlarged.
2. Microstylis Wallichi, Lindl, in Wall. Cat. No. 1938.

Stem about 3 in . long, with a few sheaths below. Leaves three or four, thinly membranous, ovate-lanceolate, acute or acuminate, narrowed to the sheathing base, the upper sessile, the lower with sheathing petioles 1.5 to 2.5 in . long; the edges much undulate; length 3 to 4.5 in., breadth 1.5 to 2 in . Inflorescence 9 to 12 in . long; the peduncle shorter than the raceme, ribbed; raceme laxly many-flowered; the foral bracts lanceolate, one-half of the length of the stalked ovaries. Flowers yellowish. green in colour, 5 in. long. Sepals oblong, the dorsal narrower, sub-acute; the laterals broader, obtuse. Petals linear, blunt, the margins, like those of the sepals, recurved. Lip slightly convex, narrowly ovate in general outline; the basal lobes (or auricles) lanceolate, their inner edges straight and parallel to each other, separated by a spacs equal to about the width of the dorsal sepal. Lip not constricted so as to form a distinct anterior lobe; its apes flat.or slightly incurved at the notch. Column with very fleshy rounded arms. Lindl. Gen. and Spec. Orchid., 20 ; Hook. fil. Fl. Br. Ind. V, 686 ; in Ann. Bot. Gard. Calc. V, pt. 1, t. 2, figures 1 and 2 (excl. syn., M. biloba). Maluxis acuminat. , Don Prod. Flor. Nep. 29.

Himalaya from Simla to Sikkim, at elevations of from 5,000 to 7,000 feet; Pantling No. 448; flowering in Sikkim from June to September; also in the Khasia Hills and Ceylon; Thwaites C. P. No. 2375.

Of his catalogue No. 1938, Wallich issued two sets, one distinguished as 1 from Nepal, and the other distinguished as 2 from Sylhet (probably really from the Khasia Hills,. The plant here figured agrees exactly as regards its lip with the sheet of Wall. Cat. 1938, 1 in the Calcutta Herbarium; but it differs from Sir Joseph Hooker's drawing (fig. C, Ann. Bot. Gard. Calc., V, pt. 1, plate 2), which represents the lip of the sheet bearing that number in the Kew Herbarium,-a circumstance which proves that (as in so many other cases) there has been some mixing amongst the Wallichian specimens. The picture of the plant itself, and both figs. A and B on plate 2 of the Calcutta Annals, are accepted by Sir Joseph Hooker as representatives of the true M. Walichii, and these agree practically with the figure here given. And an examination of one hundred living specimens shows that there is no tangible variation in the lip worthy of record. The distinctions between this species and M. biloba, Lindl., are given in our account of the latter which we treat as a variety of this. M. Wallichii is abundant at elevations between 5,000 and 6,000 feet in the Government Cinchona Plantation in Sikkim; but it does not occur at lower elevations, its place being taken from about 5,000 feet downwards to the bottoms of the valleys by the variety biloba. The form of lip depicted by Sir Joseph Hooker in fig. C. of the plate in the Calcutta Annals above-quoted, represents the lip in the Kew specimen of 1938-1, and is no doubt, as Sir Joseph suggests, a form of $M$. Wallichiii. In it the apex of the lip is obscurely 3 -lobulate, and the basal lobes or auricles are divergent; the sepals also are unusually broad.

Plate No. 18.-Microstylis Wallichii, Lindl A plant, of natural sizs. Fig. 1 flower, front view, 2 flower, back viev, 3 column and apes of ovary, 4 vertioal section of the lip and column, 5 anther, 6 pollinia; all enlarged.

Var. biloba, Hook. fil. Fl. Br. Ind. V. 686; in Ann. Bot. Gard. Calc., Vol V, 2, t. 2 , fig. D; basal lobes of lip slightly falcate, converging so that the apices either meet or overlap; apical portion of lip abruptly bent forward and forming an obovate-oblong or sul-quadrate apical lobe divided at the extremity into two rounded parallel oblong
blunt lobules; arms of the column only slightly fleshy; anther with a small sub-acute emarginate lip; leaves thicker in texture than in typical $M$. Wallichii, less acute and less undulate. M. biloba, Wall Cat. 1940; Lindl. Gen. and Spec. Orch. 20; Ridley in Journ. Linn. Soc. XXIV, 337.

In tropical Himalayan valleys at elevations below 5,000 feet. Pantling No. 37 ; flowering in Sikkim from July to September. Found also westwards along the Himalayan range to Nepal: also in the Khasia Hills.

Lindley considered this a species, and Wall. Cat. No. 1940 was issued under the name of M. biloba, Lindl. It was reduced by Sir Joseph Hooker, in his Flora of British India, to variety bilota of M. Wallichii; and the latter distinguished botanist, in an exhaustive note, illustrated by numerous figures of the lip, which he published in vol. V of the Annals of the Calcutta Garden, suggested that there are probably several species included under M. Waılichii as understood by him in the latter work. We feel satisfied, after the examination by Mr. Pantling of a hundred living plants each of M. Wallichii and of M. biloba, Lindl., that the latter ought to be kept up only as a distinct variety of the former. The chief differences between the type and the variety are to be found in the lip. In var. biloba the basal lobes of the lip are slightly falcate, and they are convergent, so that their apices either meet or overlap; the apical portion of the lip is abruptly bent forward (as is shown in fig. 2, plate 19), and forms an obovate-oblong or sub-quadrate apical lobe divided at its extremity into two rounded parallel oblong blunt lobules. In a hundred plants carefully examined by Mr. Pantling there was found to be practically no variation in these characters. Now in typical $M$. Wallichii the basal lobes of the lip are not at all falcate, their inner edges being quite straight. They therefore lie parallel to each other, the space between them being pretty wide; and their apices, which are acute, do not converge in the least. There is no constriction between the basal lobes and the anterior portion of the lip; in other words there is no distinctly marked apical lobe, the end of the lip is rounded and merely notched at the centre (it is never lobed), the notched part being slightly recurved. But there are other differences than those found in the lip. For example, the columnar arms in var. biloba are only slightly fleshy, and the anther has a small sub-acute emarginate lip; whereas, in M. Wallichii the arms of the column are very fleshy, and the lip of the anther is truncate. The leaves of the two also differthose of var. biloba being of thicker texture with a rather less acute apex. Moreover the edges are only slightly and often not at all undulate; the leaves of M. Wallichii, on the other hand, are very undulate, the apex being acute or acuminate. Finally, the flowers of var. bilobu vary from pale yellow to dull purple.

Plate 19.-Microstylis Wallichii, Lindl., var. biloba. A plant, of natural size. Fig. 1 flower, front vien, 2 flower, back vielo, 3 column and apex of ovary, 4 vertical section of column and lip, 5 anther, 6 pollinia; all eniarged.

## 3. Microstylis Scottif, Hook. fil. Fl. Br. Ind. V, 687.

Stem about 2 in. high. Leaves two to five, sessile or with short convolute angled petioles, obliquely ovate-lanceolate, acute, the base narrowed, 5 - to 7 -nerved, the edges much undulate, almost crenate; length of blade 3 to 5 in., breadth 1.25 to 1.5 in . Inflortscence longer than the leaves; the peduncle ribbed and bearing a few scattered linear reflexed bracts. Flowers ' 3 to $\cdot 4 \mathrm{in}$. long; the floral bract linear, reflexed, as
long as the shortly pedicelled ovary. Dorsal sepal narrowly oblong, sub-acute; the lateral sepals half as long, wider, blunt, all revolute. Petals linear, as long as the dorsal sepal. Lip triangular-ovate, the basal lobes obliquely lanceolate, converging, but the tips not meeting; the end (apical) lobe triangular, its apax acute and minutely emarginate. Hook. Ic. Plant. t. 2001.

Sikkim Himalaya; in the Teesta Valley, at elevations of 1,000 to 2,500 feat. Pantling No. 220; flowering from July to September. Burma, at Rangoon, J. Scott.

This charming species was dedicated by Sir J. D. Hooker to the late Mr. John Scott, for many years Curator of the Botanic Garden, Calcutta, and was originally described by its author from a spocimen, brought from Rangoon by Mr. Scott, which flowered and was figured in the Calcutta Garden. The species has of late years been found in the Teesta Valley in Sikkim at elevations between 1,000 and 2,500 feet ; and it is a Sikkim spgcimen which is here figured. A comparison of the present figure with that of the Burmese plant given by Sir Joseph, in his Icones Plantarum, t. 2001, shows that the Burmese plant has rather a diff̈rent lip, being on the whole broader, with more obtuse basal lobes which are much less distinctly separated from the apical lobe; the apical lobs itself is, moreover, rather more deeply emarginate. In all other respects the Sikkim and Burmese plants agree. The leaves of this species are beautifully coloured, being dark-gresn and purple, with a pale border suffused with purple and dotted with green. The inflorescence, bracts, sepals and petals are also purple, the lip being greenish-yellow. (Since the foregoing was written, we learn from Sir Joseph Hooker that this species is identical with M. cal phylla, Reichb. fil. in Gard. Chron. 1879, II, 718.)

Plate 20.-Microstylis Scottii, Hook. fil. A plant, of natural size. Fig. 1 a flower, front viev, 2 the same, back view; 3 column, 4 anther, 5 pollinia; all enlarged.
4. Microstylis saprophyta, King and Pantling in Journ. As. Soc. Beng. Vol. LXV (1896), pt. 2, 118.
Terrestrial, leafless, saprophytic; the whole plant 3 to 6 in . high, glabrous. Stem tuberous at the base, with a few short crowded sheaths just above the bulb and two or three scattered lanceolate bracts 35 in . long. Raceme 1 to 2 in . long, lax; floral bract lanceolate, equalling or exceeding the sub-sessile ovary. Fiovers • 12 in. long, inverted. Sepals ovate, blunt. Petals linear; the dorsal sepal reflexed and adpressed to the ovary, the lateral sepals and the petals revolute. Lip rotund-reniform, entire, with a semi-lunar convex fold in the middle of the upper surface; the basal auricles erect, rather short and broad, sub-acute.

Sikkim-Himalaya, at Choongthang, elevation 6,000 feet; also in the Lachen valley; Pantling, No. 394.

The flowers, which are greenish, open about July.
A singular plant, quite unlike any other species in the genus except the next. The bulb at the base of the stem is about 35 in . in diameter.

Pl.ats 21.-Miscrostylis saprophyta, King and Pantling. Three entire plants, of natural sise. Fig. 1 flower, front viec, 2 flower, in profle, 3 flower, seen from behind, 4 anther, 5 pollinia; all enlargad.

## 5. Microstrlis aphylla, new species.

Terrestrial, leafless, parasitic on roots, the whole plant 7 to 9 inches high. Tuber at the base of the stem irregularly oblong, sub-horizontal, smooth, 75 in . long. Stem
ribbed, clothed at the base with three or four short membranous sheaths 25 to 5 in . long, and further up with two or three herbaceous pale-green tubular sheaths 1 in . long. Raceme longer than the peduncle; floral bract lanceolate, as long as the stalked ovary, deflexed to the rachis, the bracts of the lowest flowers longest. Flowers -15 in. long, yellowish, flushed with dull purple. Sepals elliptic, sub-obtuse; the dorsal erect, its margins revolute; the lateral pair recurved, the linear petals resting upon them. Lip almost flat, ovate, the apex blunt, the margins entire, the base with two broad blunt sub-falcate erect lobes. Arms of the column stout, notched. Lip of the anther truncate.

Sikkim; in the valley of the Teesta, elevation 1,000 feet; Pantling No. 455 ; flowering in June.

The nearest ally of this is M. saprophyta, but this is in every way a larger plant; the tuber is elongated, not orbicular, the dorsal sepal is erect, not reflexed and not adpressed to the ovary; the lip in this is more pointed than in M. saprophyta, and it has no convex fold on its upper surface as in that species.

Plate 22.-Microstylis apliylla, King and Pantling. Two plants, of natural size. Fig. 1 flower, front viev, 2 flower, sids viev, showing also ovary and floral bract, 3 empty anther, 4 pollinia; all enlarged.
6. Microstylis congesta, Reichb. fil. in Walp. Ann. VI, 206.

Stem 4 to 10 in . long, thickened near the base, tufted. Leaves three to six, ellipticlanceolate, oblique, acute or acuminate, the base narrowed and sheathing, sessile or shortly petiolate, 7 -nerved, the edges undulate; length of blade 3 to 12 in., breadth $\cdot 75$ to 4.5 in. Inflorescence 6 to 14 in . long; the peduncle striate, with a few scattered subulate reflexed bracts 5 in . long; floral bract lanceolate, acuminate, nearly as long as or exceeding the undulately-winged stalked ovary. Flowers 2.2 in . long, resupinate, red or yellow, much crowded. Sepals oblong, sub-obtuse, the lateral pair falcate. Petals linear, obtuse. Lip rather fleshy, oblong, concave, scarcely exceeding the lateral sepals in length; its basal part without lobes; its anterior part 3-lubed, having two elongated, narrow, lateral lobes connected close to the column by a flat transverse callus, their free anterior extremities blunt; the apical lobe short, narrowly ovate, sub-acute. Ridley in Journ. Linn. Soc. XXIV, 334 ; Hook. fil. Fl. Br. Ind. V, 689. M. Bernaysii, F. Müll. Frag. Fl. Aust. XI, 21. M. fusca, Reichb. fil. in Walp. Ann. VI, 207. M. trilobulata, Kurz Andam. Rep. Append. B. XIX; N. E. Brown in Gard. Chron. 1883, 392. ? M. flavescens, Lindl. Gen. and Spec. Orchid, 20 ; Ridley Journ. Linn. Soc. XXIV, 337. Dienia congesta, Lindl. in Wall. Cat. No. 1936; Gen. and Spec. Orchid, 22 ; in Bot. Reg. under t. 825; Reichb. fil. in Bonplandia, III, 259. D. fusca, Lindl. Gen. and Spec. Orchid, 22. Malaxis latifolia, Smitı in Rees' Cyclop. M. plicata, Roxb. Fl. Ind. III, 456. Crepidium flavescens, Blume Bijdr., 388.

Tropical Himalaya from Nepal to Bhotan; in Sikkim from 600 up to 2,500 feet; Pantling No. 89. Parasnath; Khasia Hills; Munipore; Burma; the Andaman Islands; the Deccan and Ceylon. Also in Malaya, China and Australia.

This species has a very different lip from any other Microstylis described in the present work; the basal lobes, so prominent in the others, being in this entirely absent. There are moreover two transverse calli on the lip,-one at the base just beneath the
column, and the other connscting the tws lateral lobes of the apex; whereas none of the other species have any calli on the lip. The flowers in the Sikkim specimens of this are all red or occasionally yellow; but, in other provinces, they vary to yellowishgreen and purplish. The under-surfaces of the leaves and the rachis are in Sikkim suffused with purple.

Plate 23 -Microstylis congista, Ryichb. fil. Inflorescence and leaf, of natural size. Fig. 1 a flower, front viev, 2 stalked ovary, column and lip, in profile, 3 lip, 4 column and upper part of ovary, 5 anther, 6 pallinia; all enlarged. In the corner is a much reduced figure of an entire plant.
7. Microstylis cylindrostachya, leichb. fil. in Walp. Ann. VI, 207.

Stem proceeding from the base of the s:nall conical tuber of a former year, $1 \%$ to 6 in . long to the base of the leaf, and bearing one or two tubular wide-mouthed sheaths. Lexf solitary, elliptic, sub-acute, pasing at the base into the long tubular petiole; blade 1.5 to 4 in . long and $\cdot 75$ to 1.75 in . broad. Inflorescence 3 , to 10 in . long, the peduncle long, ebracteate, the raceme cylindric with numerous crowded small yellowish-green flowers about $\cdot 15 \mathrm{in}$. long. Floral bract lanceolate, shorter than the ovary. Sepals sub-equal, ovate, acuminate. Peta's linear-lanceolate, acute. Lip fleshy, broadly ovate, excavated, the margins thickened, angled and denticulate at the base so as to appear lobed, the apex produced into a fleshy point; the upper surface having a raised line running along its centre from apex to base, and two convexities immediately under the column. Pollinia sub-obovoid, divergent, their points exserted over the corners of the stigma. Ridley in Journ Linn. Soc. XXIV, 333 ; Hook. fil. Fl. Br. Ind. V, 659. Dienia cylindrostachya, Lindl. in Wall. Cat. 1934; Gen. and Spec. Orchid, 22; Wight Ic. 1630 .

Sikkim; the Lachen Valley, alt. about 12,000 feet; Pantling No. 379. Choombi (in Bhotan); King's Collector Nos. 409, 4709; flowering in July. Also in the NorthWest Himalaya from Simla to Nepal, but at slightly lower elevations.

Platr 24.-Microstylis oylindrostachya, Reichb. fil. A plant, of natural size. Fig. 1 flower, front vien, 2 view in profile of bract, subsessile ovary, column and lip, 3 front view of column, the pollinia being absent, 4 an empty anther, 5 pollinia, 6 a pollen mass, in profile; all enlarged.

## 8. Microstylis muscifera, Rialey in Journ. Linn. Soc. XXIV, 333.

Stem from the apex of a small ovoid pseudo-bulb, 1 to 5 in. long; and bearing at least one tubular sheath. Leaves usually two, rather close together, unequal, ovaterotund to ovate-lanceolate, sessile or petiolate, obtuse or sub-acute, sonewhat narrowed at the base to the sheathing petiole; length of blade 1 to 2.5 in ., breadth 1 to 1.5 in . Inflorescence 3 to 10 in . long; the peduncles terete, ebracteate; raceme rather lax. Flowers yellowish-green, $\cdot 15 \mathrm{in}$. long; floral bract shorter than or equal to the pedicelled ovary. Sepals sub-equal, broadly oblong-lanceolate, sub-acute, longer than the linear petals. Lip broadly ovate, fleshy and excavated at the base, the basal part with obscure thickened convex side-lobes. Column very short, fleshy. Hook. fil. Fl. Br. Ind. V, 689. Dienia muscifera, Lindl. in Wall. Cat. 1935 ; Gen. and Spec. Orchid, 23.

In the Lachen Valley in Sikkim; Panting No. 395, common. Temperate Himalaya, alt. 8000 to 11,000 feet, eastwards to Kashmir.

Plate 25.-- Nicrcstylis muscificra, Ridley. A plant, of nctural size. Fig. 1 flower, front vieir, 2 braot, stalked ovary, column and lip, in profile, 3 lip, 4 an empty anther, 5 pollinia; all enlarged.

## 9. Mic.ostylis Maximowicziana, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV (1895), pt. 2, 330.

Rhizome 2 to 4 in . long, sub-erect, bearigg scattered root-fibres and leafy pseudobulbs of varying ages 3 or 4 in . long. Leaves four or five, elliptic to ellipticlanceolate, acute, tapering to the sheathing base, slightly oblique, 7 -nerved, 5 to 6 in. long. Raceme about 6 in . long with numerous green flowers nearly ' 2 in. in diam., the peduncle of the raceme 4 to 5 in . long. Flnral bract linear-lanceolate, equal to or exceeding the stalked ovary. Sepals oblong, blunt, their margins recurved, the lateral pair broader than the dorsal. P'etals linear, blunt, all reflexed. Lip concave, hoodshaped; its apex contracted, thickened, slightly crenate, and with two minute teeth above the pit; the side lobes large, sub-falcate, blunt. Columnar arms broad, overlapping and hiding the anther; the stigma large. Lip of anther truncate.

Sikkim; on the Mungpoo Cinchona Plantation, alt. 2,000 to 4,000 feet; Pantling No. 226; flowerirg in July; King, Gamble. Jaintia Hills; Mr. Rita,

The lip of this, although the flowers are in other respects very different, resembles that of M. Josephiana in being so very concave as to resemble a hood. In this respect these two differ from the other species of Microstylis here described. The column in this species also is larger than is usual in the genus, and has broad arms which overlap and hide the anther,-an arrangement the meaning of which is that the flowers are self-fertilized. If a fresh inflorescence be examined it will be found that in every newly-opened flower the pollinia have their points slightly exserted above the stigma. If an older flower be examined fiom further down the raceme, the membranous floor of the clinandrium will be found to have been absorbed by the stigma. A still older flower taken from near the base of the raceme will show the pollinia in contact with the stigma with their grains germinating in its tissues; while at the very base of the raceme young capsules may be found. All these stages may easily be found on the same raceme, as the flowers persist for a long time. These observations, originally made on growing plants by Mr. Pantling in 1892, have since been confirmed. The curious habit of this species is no doubt accounted for by the fact that it grows amongst long grass and other herbs more powerful than itself, to contend with which, in the struggle for light and air, the peculiar semi-erect long rhizome has been developed. Mr. Pantling has recently found that an exactly similar habit is assumed by plants of M. Khasiana, and also of M. wallichii and its variety biloba, when they grow amongst longer grass than usual.

Plate 26.-Microstylis Maximowicziana, King and Pantling. Rhizome with pseudo-bulb of past anã present years and inflorescence, of natural size. Fig. 1 flower, front vien, 2 flower, in profile, 3 longitudinal section of lip, 4 column and upper part of ovary, 5 anther, 6 pollinia; all enlarged.
10. Microstylis Josephiana, Reichb. fil. in Bot. Mag. t. 6325.

Stem about 2 in. long, with several oblong acute sheaths, rising from the base of a fusiform compressed pseudo-bulb 2.5 to 3 in . long, covered with broad acuminate sheaths.

Leaves three to five, oblong or elliptic-lanceolate, plaited, acuminate, sheathing at the base, subsessile, slightly oblique, the edges undulate, often tinged with purplish-brown above, green beneath, $3 \cdot 5$ to 5 in . long, 1.5 to 2 in . broad. Inflorescence 8 to 10 in . long; the peduncle longer than the raceme, ebracteate, acutely 6 -angled; raceme 6 - to 12 -flowered, lax; floral bract lanceolate, much shorter than the angled ovary, reflexed. Flowers large for the genus, ochraceous, much shaded with brown or yellow, with red blotches near the column, 5 to .75 in. in diam. Sepals broadly ovate, recurved, connate by their bases, the dorsal saccate at the base. Petals linear-oblong, acute, recurved. Lip ventricose, gibbous, forming a deep cup with short broad rounded overlapping basal auricles; the part immediately under the column divided into a four-chambered nectary, the apex bifid. Column very stout and with thick arms. Ridley in Journ. Linn. Soc. XXIV, 336 ; Hook. fil. Fl. Br. Ind. V, 687.

Sikkim-Himalaya, at 1,500 to 3,000 feet; Pantling No. 312; Clarke, King, Gammie, Anderson and others.

A species with flowers unlike those of any other Sikkim Microstylis, and with the facies of those of Eulophia. The flowers are short-lived and they open only two or three at a time.

Plate 27.-Microstylis Josephiana, Reiohb. fil. A plant, of natural sise. Fig. 1 a flower, front viero, 2 column with seetion through the 4 -chambered nectary, 3 anther, 4 pollinia; all enlarged.

## 3. Liparis, Richard.

Terrestrial or epiphytal, pseudo-bulbous. Leaves one or more, membranous or coriaceous, continuous with the sheath, or thickened and jointed at the base. Flowers small, in terminal racemes, resupinate or not. Sepals spreading or recurved, the margins usually revolute. Petals much narrower than the sepals. Lip adnate to the base of the column, usually broad, flat, or deflexed from the middle, sometimes concave, often with calli near the base. Column elongate, often arched, usually winged near the apex, and tumid or dilated and compressed at the base. Anther terminal; pollinia 4.

[^3]Sect. I.-Mollifolie.-Leaves membranous, large, contracted at the base into and continuous with a long sheath.

[^4]
## Leaves two.

Lip more or less quadrate, obovate or orbicular, its apex broad.
Floral bracts broad, minute, erect
3. L. Cathcartii.
Floral bracts narrow, lanoeolate, deflexed
4. L. deflexa.
Lip elliptio, its apex acute
5. L. Nepalensis.
** Lip deflexed from about the middle, concave.
Leaf one; the lip ciliolate on the margin and narrowed to the mucronate apex
6. L. Glossula.

Leaves two; margin of the lip erose, not ciliolate; its apex broad, deeply emarginate, mueronate in the middle
7. L. paradoxa.

Leaves four or five
8. L. bituberouiata.

Sect. II.-Coriffolie.-Leaves coriaceous or sub-coriaceous, jointed to the sheath or pseudo-bulb.

* Lip much deflexed from about the middle.

Pseudo-bulb elongated, often cylindric and stem-like, leaves two.
Wings of column small, short.
Lip sub-orbicular with minutely erose-dentate edges, contracted near the base into a short claw
9. L. plantaginea.

Lip-broadly oblong, the basal part thickened into two triangular processes, the apex broad, mucronate-

Leaves 4 to 6 in . long . . . . . . . . . . . . 10. L. longipes.
Leaves 8 to 14 in . long . . . . . . . . . . . . 10.
10. " " var. spathulata.
Lip quadrate-oblong, the apex emarginate and minutely erose.
11. L. bistriata.

Wings of column elongated, hook-like
12. L. tootanensis.

Pseudo-bulb sinort, ovoid, not stem-like.
Leaf solitary.
Column not winged at the apex and not thickened at the base, or very slightly so; the lip without calli at its base.

Apical lobe of lip rhomboid, acute, the edges erose . . 13. L. Manniï.
Apical lobe of lip quadrate.
Lip without basal calli . . . . . . . . . 14. L. pusilla.
Lip with two small basal calli . . . . . . . 15. L. Duthiei.

Loaves two or sometimes more.
Column winged at the apex and dilated at the base; lip with two long horizontal diverging callosities near its base
16. L. perpusilla.

Coiumn not winged at the apex and very slightly dilated at the base; rostellum single; lip with a small entire callus at the hase
17. L. Griffithii.

Column shortly winged at the apex and much dilated and flattened at the base; rostellum double; lip with a large bilobed callus at its base.
18. L. pygmaea.

Column with small triangular wings near the apex, the base much dilated and flattened; rostellum single; basal half of the lip with four calli
19. L. platyrachis.

Column with large broad wings about the middle, the kase not dilated; the lip orbicular-oblong, hispidulous, its base plicate.
20. L. delicatula.

> ** Lip deflexed from near the base.

Leaves two, pseudo-bulbs disciform, column not winged
21. L. viridiflura.

Leaves two to four, pseudo-bulbs ovoid-oblong, compressed, column winged.

Wings of column short, broad, not hooked, lip with emargi-
nate apioulate apex . . . . . ......... 22. L. Assamica.
Wings of column produced into long hooked procesces; apes
of lip entire .................23. L resupinata and rar.
Ridlcyi.

1. Liparis cordifolia, Hook. fil. Ic. Plantar., t. 1811.

Terrestrial ; the whole plant of a uniform deep green colour. Pseudobuibs crowded, much compressed, ovoid, pointed, having some scattered fibres at the base, 1.5 in . long. Stem short, stout, enveloped by the leaf-sheath. Leaf large, solitary, broadly ovate, acute; the base broad, cordate, suddenly contracted into the wide sheath, shining, the nerves few and indistinct, 2 to 5 in . long and 1.5 to 4 in . broad. Inflorescence about as long as the leaf; the peduncle elongate, ebracteate; the raceme only 1 to 2 in . long; flral bract triangular, minute, the pedicelled ovary long and filiform. Flower •65 in. long. Sepals linear-lanceolate, acute; the dorsal spreading, the lateral pair lying under the lip and concealed by it except their apices. Petuls linear, spreading. Lip broadly triangular or obovate-deltoid, flat, with a slight concavity at the base, and with a minute tooth on each side, a central grooved ridge, and two lateral branching nerves; the edges minutely erose-crenulate; the apex broad, subtruncate and apiculate. Column curved, much swollen at the base, and produced into two polished knobs, the apex with two short rounded wings. Pollinia elongate, 3 -angled, each pair resting on a distinct rostellum which is tipped with a ball of transparent viscus. Hook. fil. Fl. Br. Ind. V, 692.

Sikkim-Himalaya; elevation 5,000 to 6,000 feet; Pantling No. 134. North-west Himalaya. Khasia Hills; 3,000 to 6,000 feet; Griffith, Hooker and Thomson. In flower during October and November.

Plate 28.-Liparis cordifolia, Hook. fil. A plant, of natural size. Fig. 1 a flower, front vien, 2 bract, stalked ovary, lateral sepals, lip, and column, in profile, 3 base of lip, 4 column, 5 pollinia, 6 lateral view of pollen mass ; all enlarged.
2. Liparis Gamblei, Hook. fil. Ic. Plantar. t. 1812.

Epiphytal. Pseudobulbs in clusters, sub-orbicular, flattened, green, smooth. Leaf solitary, with a long wide sheath embracing the future pseudo-bulb and the base of the peduncle, elliptic or elliptic-oblong, 7 -nerved, the margins minutelv undulate nearly to the apex, narrowed at the base to the long sheath, length 1 to 4 in., snd breadth $\cdot 5$ to 2 in . Inflorescence longer than the leaf; the peduncle rather stout, angled when dry; raceme rather laxly-flowered; the floral bract lanceolate, acute, shorter than the perlicelled ovary. Flowers 25 in . long. Sepals oblong-lanceolate, the dorsal reflexed from about the middle, the lateral pair adpressed to the under surface of the lip. Petals linear, deflexed, their margins ravolute. Lip deflexed from the base, broadly elliptic, longer than the lateral sepals, obtuse or sub-acute, green with brownish edges; its sirface and edges minutely papillose and with three strong branching brownish-purple
median nerves; the base with a small cavity bearing on its margins two minute calli under the column. Column rather stout, strongly curved about the middle, thickened at the base, the apex with two broad wings; pollinia obovoid; rostella two. Hook. fil, Fl. Br. Ind. V, 693; in Ann. Bot. Gard. Calc. Vol. V, pt. 1, 2 t. 3.

Sikkim-Himalaya at Rungbee, Clarke; on Sinchal, alt. 6,500 feet, Gamble; above Sureil, alt. 6,000 feet, Pantling, No. 150; in flower in June.

An exquisite little plant found growing on the moss-covered trunks of trees in cool damp forests. The flowers are of a dark-green, the lip having a broad margin of brownish-purple and many nerves of the same colour.

Plate 29.-Liparis Gamblei, Hook. fil. A plant, of natural size. Fig. 1 flower, front vien, 2 flower, seen from the side, 3 column and apex of ovary, 4 anther, 5 pollinia; all enlarged.

## 3. Liparis Cathcartit, Hook. fil. Ic. Plantar. t. 1808.

Terrestrial. Pseudo-bull narrowly ovoid, about $1 \cdot 25 \mathrm{in}$. long. Stem from the base of the pseudo-bulb, decumbent below, erect above, 2 or 3 in . long, bearing several sub-acute sheaths and at the apex two sub-opposite, broadly-ovate or ellipticovate sub-acute leaves, contracted into sheathing petioles at the more or less cordate bases; length of blade $1 \cdot 5$ to 4 in .; breadth 1 to 2 in .; petioles 1 to 2.5 in . long. Inflorescence much longer than the leaves, winged; the peduncle striate, ebracteate; raceme laxly-flowered; floral bract minute, broad, erect. Flower from 8 to $\cdot 9 \mathrm{in}$. long, green and purple. Sepals oblong, blunt, their edges much recurved, spreading, the lateral pair closely adpressed to the lower surface of the lip. Petals linear, curved and reflexed. Lip flat, obovate, with a clawed cordate base and a truncate erose apex cuspidate in the middle; the base with two obscure calli connected by a thickened line so as to form a nectary, with a groove proceeding from it and disappearing about half-way up the middle of the lip. Cotumn long, slender, curved, the apex sub-truncate and with two short broad wings; the base slightly thickened and with two teeth. Anther subquadrate ; pollinia clavate obsvoid. Hook. fil. Fl. Br. Ind. V, 694. L. rupestris (in part) Ridley in Journ. Linn. Soc. XXII, 145 (not of Griffith).

The flowers in this species are most beautifully and delicately coloured; the sepals, petals and upper part of the column with the anther are green; the base of the column is purple, as is also the greater part of the lip, the latter having besides veins of a deeper shade of the same colour, while its anterior edge has a broad margin of yellowish green.

Sikkim; in the Lachen valley, at an elevation of 7,000 feet; Pantling No. 369 ; at elevations of 8,000 to 10,000 feet; Hooker, Clarke.

Plate 30.-Lilaris Cathcartii, Hook. fil. A plart, of unusually large size. Fig. 1 a flower, seen from the front, 2 flower, scen from belind, 3 column, 4 anther, 5 polinia; all entarged.

## 4. Lifaris deflexa, Hook. fil. Fl. Br. Ind. V, 697.

Terrestrial. Stem cylindric, as thick as a goose-quill, about 2 or 2.5 in . sung, covered by two or three tight short sub-acute sheaths, springing from a cylindric rootbearing tuber which has beside it a nore succulent rootless tuber. Leaves two from near the top of the stem, sub-orposite, and with short unequal petioles, elliptic, tapering from the middle to the acuminate apcx and to the sheathing base, membranous, plicate,

7 -nerved; length 6 or 7 in., breadth $2 \cdot 25$ to $2 \cdot 5 \mathrm{in}$. Inflorescence longer than the leaves, erect, striate; the peduncle with a few lanceolate reflexed bracts; raceme laxly-flowered; floral bract half as long as the pedicelled ovary, reflexed. Flowers $\cdot 35 \mathrm{in}$. long, yellow. Sepals narrowly oblong, the dorsal one acute, the lateral pair obtuse. Petals narrowly oblong; obtuse, and, like the sepals, reflexed and with recurved margins. Lip flat, orbicular-reniform, contracted at its junction with the column, the margins near the base quite entire, at the sides and apex minutely erose; the apex very broad, slightly emarginate and mucronate; the upper surface with a narrowly oblong mesial glistening and nectar-exuding patch extending from the base to the middle; calli two just under the column. Column slightly curved, with narrow rounded wings near the apex; the base somewhat swollen. Hook, fil. Ic. Plantar. t. 2008.

Sikkim-Himalaya; at Goke, elevation 2,000 feet; Pantling No. 336; flowering in August. At Darjeeling; Griffith's collectors.

Plate 31.-Liparis deflexa, Lindl. A plant, of natural sise. Fig. 1 a flower seen from the front, 2 flower, back view, 3 column, 4 anther, 5 pollinia; all enlarged.

## j. Liparis Nepalensis, Lindl. in Wall. Cat., 1945.

Terrestrial. Rhizome elongate, stout, bearing rather distant ovate-acuminate compressed striate green pseudo-bulbs about 2 in . long; the stem terminating the rhizome, stout, short. Leaves two, shining, broadly ovate to sub-orbicular, abruptly acute or shortly acuminate, the bases rounded or cordate, suddenly contracted into the long stout sheath-like petiole, the upper one amplexicaul and sometimes (fide Hooker) sessile, midrib distinct; lateral nerves about five pairs, curved, ascending. Inflorescence 4 to 10 in . long; the peduncle stout, ebracteate; raceme sparsely flowered; floral bract about 5 in . long, equalling the stalked filiform ovary. Flowers 5 in . long. Sepals lanceolate-acuminate, the edges revolute, the dorsal one reflexed, the lateral pair lying parallel under the lip. Petals linear, spreading. Lip flat, elliptic, slightly cordate at the base, narrowed to the apex, with a stout smooth central ridge ending in a mucronate point and with numerous spreading branching purple veins; the edges entire, not undulate ; the base with two calli separated by a small depression. Column arched, its base thickened, grooved, and with two purple spots just above its junction with the lip; wing short, rectangular; rostella two, pollinia obovoid. Lindl. Bot. Reg. sub t. 882; Lindl. Gen. and Spec. Orchid., 28 ; Ridley in Journ. Linn. Soc. XXII, 278; Hook. fil. Fl. Br. Ind. V, 693. Malaxis cordifolia, Smith in Rees' Cyclop. Acianthus petiolatus, Don Prodr. Fl. Nep., 29.

Sikkim-Himalaya; common at elevations of from 3,500 to 5,000 feet; Pantling No. 217. Nepal; Wallich. Khasia Hills; Griffith and others; in flower in May.

The lip and petals of this species are purple, the other parts of the flower being green.

Plate 32.-Liparis Nepalensis, Lindl. A plant, of natural size. Fig. 1 flower, in profile, 2 lip, 3 column, 4 pollinia : all enlarged.

## 6. Liparis Glossula, Reichb. fil. in Linnæa, XLI, 43.

Terrestrial. Pseudo-bulbs ovoid, tufted, 1.5 to 2 in . long. Leaf solitary, oblong, sub-acute, suddenly contracted into a sheath at the base, sometimes petiolate, 2 to

4 in. long and 65 to nearly 1 in. broad. 'Inflorescence erect, longer than the leaf, slightly winged, raceme laxly-flowered; floral bract linear, obtuse, shorter than the pedicelled ovary. F'lower $\cdot 75 \mathrm{in}$. long, green, the lip purple. Sepals oblong-lanceolate, acute, the dorsal spreading, the lateral pair lying parallel under the lip, all with revolute margins. Petals linear, reflexed. Lip oblong, deflexed about the middle, concave and with a shining fluted line running from base to apex; the basal or non-deflexed part without calli, the deflexed or anterior part with a broad rounded ciliolate cuspidate apex, the whole lip veined and purple, the edges olive green. Column with two short wings near the apex, the base dilated into two large purple knob-like convexities. Anther with a beaked apex. Pollinia obovoid. Ridley in Journ. Linn. Soc. XXII, 268; Hook. fil. Ic. Plantar., t. 1809; Fl. Br. Ind. V, 693.

In the Chumbi valley, north-east of Sikkim; elevation about 11,000 feet; Pantling No. 402. Westwards along the Himalaya to Kumaon and Gharwal.

Plate 33.-Liparis Glossula, Reichb. fil. A plant, of nutural size. Fig. 1 flower, front view, 2 floral bract, pedicelled ovary, column and lip, side view, 3 column with pollinia in situ, 4 empty anther, 5 pollinia; all enlarged.

## 7. Liparis paradoxa, Reichb. fil. in Walp. Ann. VI, 218.

Terrestrial. Pseudo-bulbs narrowly ovoid. Stems tall, as thick as a pencil, about 6 in. high, slightly bulbous at the base, bearing several sheaths. Leaves two or three, alternate, narrowly elliptic-lanceolate, acute, narrowed to the amplexicaul sheath, plicate, 5 -nerved, 5 in. long and about 1 in. broad at the middle. Inflorescence longer than the leaves; the peduncle finely striate, with one or two linear spreading bracteoles $\cdot 25 \mathrm{in}$. long; raceme as long as, or longer than, its peduncle, fewflowered; floral bract ovate-lanceolate, shorter than the twisted stalked ovary. Flowers $\cdot 5$ in. long, green, the lip dull purple. Dorsal sepal linear, blunt, spreading, its margins recurved; the lateral pair broadly ovate, 5-nerved, recurved. Petucs linear, obtuse, reflexed, their margins recurved. Lip quadrate, abruptly deflexed from the middle, concave, and bearing two erect tooth-like calli; its edges entire; its apex broad, emarginate, erose, and with a short central apiculus. Column not curved, its upper half hood-like from the large rounded crenulate wings. Anther acuminate. Ridley in Journ. Linn. Soc. XXII, 261 ; Hook. fil. Fl. Br. Ind. V, 698. L. odorata, Lindl. Gen. and Spec. Orchid., 26 ; Thwaites' Enum. Pl. Ceyl., 295. Empusa paradoxa, Lindl. in Wall. Cat. 1937A (in part), Bot. Reg. sub., t. 825 ; Gen. and Spec. Orchid., 17; Miquel Prolus. Fl. Japon., 135 ; Thwaites' Enum. Pl. Ceyl., 426. Malaxis lancifolix, Smith in Rees' Encycl.

Tropical valleys up to elevations of 6,000 feet in the Sikkim-Himalaya; Pantling No. 228. Kamaon-Himalaya, Naga, Hills, Khasia Hills. Near Mymensingh in Bengal. Burma, Mysore, the Concan and Ceylon-also in Siam, China, Japan and Java. Flowering in Sikkim from July to September.

The description and figure here given of this widely-distributed plant refer to it only as it is found in the Sikkim-Himalaya. The descriptions of specimens from other regions show that they differ in some respects.

Plate 34.-Liparis paradoxa, Reichb. fil. A plant, of natural size. Fig. 1 flower, front vielv, 2 a flower, in profile, 3 lower surface of lip, 4 anther, 5 pollinia; all eniarged.

## 8. Liparis bituberculata, Lindl. Bot. Register, sub 882.

Terrestrial. Stems tall, tufted, erect, robust, fleshy, from 8 to 10 in . high and 75 in . in diameter near the base. Leaves four or five, membranous, polished, ovate to ellipticlanceolate, oblique, plicate, shortly acuminate, the base tapering into the broad sheathing petiole, 7 -nerved; length 4 to 8 in . Inforescence stout, erect, striate, much longer than the leaves; the poduncle ebracteate ; raceme about 6 in . long, rather few-flowered; floral bract cordate, acute, deflexed, minute. Flowers -65 in. long, dull, brownish-purple (the column alone pale-green); the stalked ovary ${ }^{\circ} 6 \mathrm{in}$. long. Drssal sepal linear-oblong, obtuse, sigmoidly curved backwards, 4 in . long, the lateral pair broader but of similar shape, spreading. Petals linear, spreading; their margins, like those of the dorsal sopal, recurved. Lip oblong, very concave, deflexed and revolute fron about the middle, bearing two sharp tooth-like calli at its base; the edges entire or slightly crenulate, the apex blunt with a small triangular apiculus. Column very slightly winged near the apex, not swollen at the base, slightly curved towasds the middle. Ridley in Journ. Linn. Soc. XXII, 263 ; Hook. fil. Fl. Br. Ind. V, 693 ; Enpusa paralo.xa, Wall. Cat. 1937B ; Lindl. Gen. and Spec. Orchid., 17. Cymbilium? bituberculatum; Hook. Exotic Flora, t. 116. Sturmia bituberculıta, Reichb. fil. in Bonplandia, II, 22.

Sikkim-Himalaya at Choongthang, elevation 6,000 feet, and in Lachen Valley; Pantling No. 222; Griffith, Hooker and others. Kamaon, Blinkworth; and Nepal, Wallich. Flowering in Sikkim in June and July.

Distinguished by the smill size of the floral bract. L. macrocarpa, Hook, fil., from Sikkim and Khasia, which the author describes as like a large state of L. tubercultata, ought, we think, to be reduced to this, as also might in all probability L. olontostoma, a species founded in Linnea (vol. XLI, 97) by Reichenbach on a specimen collected in Sikkim by Sir Joseph Hooker. In his Flora of British India (V. 707), Sir Joseph Hooker treats the latter as a doubtful spzcies. The two calli at the base of the lip, which gave origin to the specific names olontostma and bituberculata, are not peculiar to ihis, but occur in other species of the genus. This species closely resembles the plant figured by Lindley in the Botanical Register (t. 1175) under the name L. elata, said to have been introduced to England from Rio Janeiro. In fact Lindley (Gen. and Spec. Orchid., 27) reduces the Cymbitium? bituberculatum of Hooker's Exotic Flora (t. 116) to his Liparis elata. But the note which follows Lindley's description indicates that there was a good deal of doubt as to the real native country of the plant said to have been received in the Royal Horticultural Society's Garden from Brazil. The probability appears to be that the so-called Brazilian L. elata really came from the Himalaya, and that it is conspecific with Hooker's Cymbilium? bituberculatum, and therefore $=$ Liparis bituberculata. Plants of this species vary considerably in robustness and also in the size of the flowers. The one figured here belongs to the set with large flowers. Some plants recently received from the Khasia Hills are smaller and have smaller flowers, and these seem to be fair examples of the species as it grows in the Khasia Hills. The small form was colleeted once last year in Sikkim (at Sureil, elevation 5,500 feet), but it is uncommon in Sikkim.

Plate 35.-Liparis bituberculata, Lindl. A plant, of natural sizo. Fig. 1 a completo flower, in profile, 2 the lip viewed from behind the kase, showing the two sharp basal calli, 3 column, 4 anther, 5 pullinia; all enlarged.
9. Liparis plantaginea, Lindl. Gen. and Spec. Orch. 29.

Epiphytal. Pseudo-pulls Jarge, narrowly ovoid-oblong, compressed, smooth, palegreen, 2 to 3 in . long and 75 to 1.5 in . thick at the base. Pseudo-stem stout, short, composed of four or five large acute imbricate sheaths increasing in size upwards, and two leaves. The leaves sub-opposite, sessile or petiolate, linear-oblong or oblan-ceolate-oblong, acute, narrowed to the base, faintly 5 - to 7 -nerved, keeled, 6 to 12 in. long and 1 to 2 in . broad. Inflorescence 8 to 12 in . long, sub-erect or flexuose, about as long as the leaves; the peduncle about equal to the raceme, compressed and almost 2 -winged, with one or two linear lanceolate bracts; raceme sparsely flowered, its rachis irregularly winged ; floral bract ovate-lanceolate, convolute, not quite so long as the ovary. Flowers green, $\cdot 75$ to 1 in . long. Sepals oblong-lanceolate, sub-acute, their edges revolute, the dorsal spreading, the lateral pair lying parallel under the lip. Petals linear, decurved, revolute. Lip large, slightly concave, sub. orbicular with minutely erose-dentate edges, decurved near the base and contracted into a shortly auriculate claw bearing a didymous callus. Column with thickened base and two very small angular wings. Ridley in Journ. Linn. Soc. XXII, 286 ; Hock. fil. Fl. Br. Ind. V, 702 ; in Ann. Bot. Gard., Calcutta. Vol. V, pt. 1, p. 3, t. 4. L. selligera, Reichb. fil. in Linnæa XLI, 42. L. orbicularis, Lodd. MSS. ex Hemsl. in Gard. Chronicle, New Series, XVI (1881), 592. L. Grififthii (in part), Ridley l. c., 28 .

Sikkim-Himalaya, elevation 1,000 to 2,000 feet ; Clarke, King, Pantling No. 153. Upper Assam; Griffith No. 506y. Naga Hills; Khasia Hills; flowering from June to August.

Plate 36.-Liparis plantaginea, Lindl. A plant, of natural size. Figs. 1 and 2 front and profile views of a flower, 3 column, 4 base of the lip showing the claw and the small auricies, 5 the anther, 6 pollinia; all enlarged.
10. Liparis longipes, Lindl. in Wall. Pl. As. Rar. I, 31, t. 35.

Fpiphytal. Pseudo-bulls close together in a row, cylindric and stem-like, with a few vertical striæ and tightly-clasping sheaths, 3 to 6 in. long. Leaves two, oblanceolate-oblong, sub-acute to acuminate, sometimes aristate, 4 to 6 in. long and 75 in. broad. Inflorescence erect, slightly longer than the leaves; the peduncle slender, terete, ebracteate; the raccme twice as long as its peduncle, many-flowered; floral bract linear-lanceolate, shorter than the pedicelled ovary. Flowers 2.5 in . long, pale yellowish-green. Sepais linear-oblong, sub-acute. Petals shorter than the sepals, linear, obtuse, reflexed and, like the sepals, with the edges recurved. Lip broadly-oblong, recurved from about the middle, the inner margins at the base much thickened so as to form triangular processes; true calli none, the sides entire, the apex broad with a small central apiculus. Coiumn slightly curved, the wings very small, rounded. Wall. Cat. 1943, in part; Lindl. Gen. and Spec. Orchid., 40 ; Ridley in Journ. Linn. Soc. XXII, 293 (excl. syn. L. elegans, Lindl.) ; Hook. fil. Fl. Br. Ind. V, 703; Wight's Icones, t. 906 ; Thwaites' Enum. Pl. Ceyl., 295 ; Benth. Flora Hong-Kong, 352. L. pendula, Lindl. in Bot. Reg. 1838, Misc. 180. ?L. nesophila, Reichb. fil. OtHamb. I, 56.

Tropical Himalaya, from Kamaon to Bhotan, at elevations of 1,000 to 5,000 feet; commom in Sikkim at altitudes of 1,000 to 4,000 feet; Pantling No. 59. Khasia Hills and southwards to Perak and Penang: also in the Nilgiri Hills and in Ceylon; distributed also in China and in the Malayan and Pacific Islands; flowering in Sikkim from October to December.

Var. spathulata, Ridley. Leaves 8 to 14 in . long and about 1.25 to 1.5 in . broad; the pseudo-bulbs about 3 in . long and 1 inch in diam. at the base, quite covered by large locse ovate-lanceolate convolute sheaths. Scape sparsely bracteolate, the apex of the lip minutely 3 -lobed. L. spathulata, Lindl. in Bot. Reg. 1842, Misc. No. 189, p. 81.

At Engo, elevation 3,000 feet, Pantling No. 302; in flower in October.
Plate 37.-Liparis longipes, Lindl. A plant, of natural sise. Fig. 1 a flower, in profle, 2 lip viewed from the base, 3 upper part of column, 4 anther, 5 pollinia, 6 one of the pollinia in profile; all enlarged.

Plate 38.-Liparis longipes, Lindl., var. spathulata. A plant, of natural sise. Fig. 1 a flower, in profle, 2 the lip, 3 column, 4 anther, 5 pollinia; all enlarged.
11. Liparis bistriata, Parish and Reichb. fil. in Trans. Linn. Soc. XXX, 155.

Epiphytal. Pseudo-bulbs elongated and stem-like, 3 to 6 in. long, tufted. Leaves two, sub-coriaceous, elliptic-lanceolate or elliptic-oblong, acute or sub-acute, narrowed to the base, sessile or sub-sessile, 2 to 4 in . long and about $\cdot 5 \mathrm{in}$. broad. Inflorescence longer than the stem, erect; the peduncle short, rather stout, margined or winged, ebracteate; raceme much longer than the peduncle, lax, many-flowered. Floral bract lanceolate, shorter than the pedicelled ovary. Flowers 5 in . long, pale green. Sepals linearoblong, obtuse, spreading. Petals linear, shorter than the sepals, reflexed, their margins, like those of the sepals, revolute. Lip quadrate-oblong, recurved at a right angle below the middle, the base with two indistinct confluent calli, the sides entire; the apex truncate, emarginate and minutely erose. Column slightly curved, excavated below the stigma, with narrow rounded wings near the apex; the base very broad; the rostellum projecting and triangular. Ridley in Journ. Linn. Soc. XXII, 288; Hook. fil. Ic. Plantar., t. 1858; Hook fil. Fl. Br. Ind. V, 702.

Sikkim-Himalaya, elevation 7,000 feet; Griffith and Hooker; at Rishap, elevation 3,000 to 4,000 feet; Pantling No. 289. Khasia Hills, 5,000 feet. Tenasserim; Parish. Flowers in Sikkim during July and August.

The lip in Mr. Pantling's Sikkim specimens is as above described and as shown in the figure, and in the living plants no nerves are discernable. Sir Joseph Hooker, however, describes the lip of the dried specimens dissected by him as panduriform and 5 -nerved. He gives figures of four forms of lip in his Ic. Plantar., t. 1858.

Plate 39.-Liparis bistriata, Parish and Reiehb. fil. A plant, of natural size. Fig. 1 flower, side viev, 2 the lip seen from the base, showing the confluent calli, 3 column, stalked ovary and bract, 4 anther, 5 pollinia; all enlarged.

## 12. Liparis bootanensis, Griff. Notul. III, 278.

Epiphytal. Pseudo-bulbs narrowly oblong, tapering slightly, 2.5 in . long and $\cdot 5$ to $\cdot 75 \mathrm{in}$. in diam. at the base; the sheaths of the young growth lanceolate, acuminate.

Leaf solitary from near the apex of the pseudo-bulb, linear-oblong to oblanceolate, acute, narrowed to the sessile or shortly petiolate base, 5 to 10 in . long and 1 to $1 \cdot 3 \mathrm{in}$. broad. Inflorescence somewhat longer than the leaf, narrowly winged; the peduncle ebracteate, slightly longer than the lax few-flowered raceme; floral bract linear-lanceolate, much shorter than the filiform stalked ovary. Flowers 6 in . long, pale-brown, their ovaries usually longer. Sepals linear-lanceolate, the dorsal sub-reflexed, the lateral pair lying parallel below and projecting beyond the lip. Petals linear, blunt, much decurved, their edges, like those of the sepals, revolute. Lip cuneately oblong, deflexed from below the middle, its base bi-auriculate and with two erect troth-like calli, the sides entire; the apex broad, truncate, erose, mucronate. Column curved, its base thickened, the upper third with two long sub-pendulous elongated hook-like triangular wings. Anther with a large emarginate lip. Pollinia oblong. Griff Itin. Notes, 98; Ic. Pl. Asiat., t. 287 ; Ridley in Journ. Linn. Soc. XXII, 285 ; Hook. fil. Fl. Br. Ind. V, 700. L. lancifolia, Hook. fil. Ic. Plantar.. t. 1855 ; Fl. Br. Ind. V., 700.

Sikkim-Himalaya, below Sureil, at 4,800 feet; Pantling Nos. 33 and 343. Bhotan, near the foot of the hills; Griffith. Khasia Hills, elevation 4,000 to 6,000 feet. In Sikkim this flowers in August.

The prevailing colour in the parts of the flower of this is pale brown, but the column is whitish and the anther green, while the two tooth-like calli at the base of the lip are also green.

Plate 40.-Liparis bootanensis, Griff. A plant, of natural sise. Fig. 1 a flower, 2 lip showing the basal auricles and calli, 3 column, 4 anther, 5 pollinia; all enlarged.

## 13. Liparis Mannit, Reichb. fil. in Flora, 1872, 275.

Epiphytal. Pseudo-bulbs crowded, narrowly ovoid, compressed, 75 in . long, often enveloped in ovate-lanceolate acute scarious sheaths $\cdot 5$ to 1.25 in. long. Leaf thickly membranous, solitary, linear-oblong, acute, slightly narrowed to the convolute sessile base; length 4.5 to 7 in., breadth $\cdot 4$ to $\cdot 5 \mathrm{in}$. Inflorescence slightly longer than the leaf; the peduncle twice as long as the raceme, slender, slightly flattened, narrowly 2 -winged; the raceme about 3 in. long, decurved, many- and rather densely-flowered. Flowers yellowish, $\cdot 175$ in. long; flral bract lanceolate, equalling or exceeding the stalked ovary. Sepals subequal, oblong, reflexed, their margins recurved, the dorsal sub-acute, the lateral pair blunt. Petals linear, blunt, reflexed, shorter than the sepals. Lip 3 -lobed, without calli, its lower half parallel to the column, its apical half decurved at right angles to the lower; lateral lobes broad, erect, falcate, pointing forwards, sub-acute; apical lobe deflexed, rhomboid, acute, the edges erose. Column terete, slender, without wings, the base dilated. Lip of anther acute. Pollinia linear-clavate. Ridley in Journ. Linn. Soc. XXII, 286 ; Hook. fil. Fl. Br. Ind. V, 701.

At the base of the range east of the Jaldaka river, at an elevation of 800 feet; in flower during December; Pantling No. 466.

The flowers of this are of a uniform greenish colour. It is clusely allied to $L$. tenuifolia, Hook. fil. (Ic. Plantar., t. 2013), differing from that only in having a narrowly winged instead of a terete peduncle, and in the apical lobe of the lip having entire edges and being more acute. Of eleven plants seen in flower by Mr. Pantling, the racemes of all began to expand in the centre, and expansion proceeded towards the base and apex simultaneously.

Plate 51.-Liparis Mannii, Reichb. fil. A plant, of natural size. Fig. 1 profile view of a flower with its bract, 2 the lip showing the two erect side lobes and the depressed apical lobe, 3 apex of ovary, column and anther in situ, 4 empty anther, 5 pollinia; all enlarged.

## 14. Liparis pusilla, Ridley in Journ. Linn. Soc. XXII, 294.

Epiphytal. Pseudo-bulbs tufted, ellipsoid, about 5 in. long. Leaf solitary, linearlanceolate or linear-oblanceolate, acute, tapering to the base but not petiolate, 2 to 4 or even 6 or 7 in . long, and from 25 to $\cdot 5 \mathrm{in}$. broad. Inflorescence slightly longer than the leaf; the peduncle usually longer than the raceme, slightly winged, ebracteate; raceme rather densely-flowered. Floral bract lanceolate, equal to the slender pedicelled ovary. Flowers $\cdot 12 \mathrm{in}$. long, pale-green. Sepals oblong-elliptic, slightly oblique, obtuse, flat, reflexed. Petals linear, blunt, shorter than the sepals, reflexed. Lip broadly oblong, deeply grooved from base to apex, much decurved from the middle, the base without calli or auricles, the sides entire; the apex broad, emarginate and entire, or slightly erose. Column not curved, sub-cylindric, not winged at the apex, an 1 only slightly thickened at the base. Hook. fil. Ic. Plantar., 1856A.; Fl. Br. Ind. V., 701. L. auriculatu, Reichb. fil. in Flora for 1872, p. 277 (not of Miquel).

Sikkim-Himalaya at 4,000 to 7,000 feet. Clarke, Pantling No. 85. Khasia Hills, 4,000 to 6,000 feet, common. Distrib. Java, Sumatra. Flowering in Sikkim from August to October.

Plaie. 41.-Liparis pusilla, Ridley. A plant, of natural size. Figs. 1 and 2 front and profile views of a flower, 3 lip, 4 column, 5 auther, 6 pollinia; all enlarged.
15. Liparis Duthiet, Hook. fil, Ic. Plantar., 1857B.

Epiphytal. Pseuds-bulbs tufted, ovoid, from 35 to $\cdot 5$ in. long. Leaf linearoblanceulate, tapering to the base, petioled or sessile, 1 to 3 in . long and 2 to 3 in. broad. Inflorescence as long as the leaf; the peduncle winged, slightly longer than the raceme, ebracteate. Raceme rather laxly-flowered; floral bract linear-lanceolate, equal to or exceeding the stalked ovary. Flowers minute (only •i2 in. long), pale green. sepals elliptic-oblong, blunt, reflexed. Petals linear, recurved, longer than the sepals. Lip quadrate, slightly narrowed to the base, decurved about the middle, the edges near the base with two thickened processes, true calli none; the sides of the lip entire; its apex broad, sub-truncate, slightly emarginate, minutely erose. Coiumn slightly curved, rather long, obscurely winged, not thickened at the base. Hook. fil. Fl. Br. Ind. V, 701.

Sikkim-Himalaya, in the valley of the Teesta; elevation 1,000 feet; Pantling No. 179. Kamaon in the Gori valley; alt. 2,000 to 3,000 feet; Duthie.

This species was founded on specimens collected by Mr. J. F. Duthie, Director of the Botanical Survey of Northern India, at an elevation of from 2,000 to 3,000 feet in the Gouri Valley in the Kamaon Himalaya. In Sikkim it has been found only in the valley of the Teesta at elevations of about 1,000 feet. It closely resombles L. pusiila, Ridley, but is a smailer plant with a less decurved lip which has slight, thickened auricular processes at the base. This has also a longer column than L. pusilla. In Sikkim L. pusilla grows at elevations of from 5,000 to 7,000 feet.

Plate 42.-Liparis Duthiei, Hook. fil. A plant, of natural sise. Figs. 1 and 2 front and profile views of a flower, 3 lip, 4 column, 5 anther, 6 pollinia; all enlarged.

## 16. Liparis perpusilla, Hook. fil. Ic. Plantar., t. 1856 B.

Epiphytal. Pseudo-bulbs tufted, ovoid-oblong, from $\cdot 3$ to $\cdot 6 \mathrm{in}$. long. Leaves three or four from the upper part of a pseudo-bulb, linear or linear-oblanceolate, acute, very little narrowed to the base, sessile, the midrib stout, length $\cdot 75$ to 1 in ., breadth $\cdot 1$ to $\cdot 15$ in. Inflorescence erect, much longer than the leaves, winged; the peduncle sometimes with one or two linear bracteoles; raceme longer than the peduncle; floral bract lanceolate, shorter than the pedicelled ovary. Flower • 15 in . long, yellow. Sepals broadly elliptic-oblong, obtuse, spreading. Petals linear, obtuse, reflexed, about as long as the sepals. Lip quadrate, deflexed about the middle, deeply grooved from base to apex; the base with a small crescentic nectary and two elongated divaricating callosities proceeding from it; the anterior or deflexed half with broad rounded apex. Column short, thick, with two short sub-triangular wings in its upper part, its base broad. Hook. fil. Fl. Br. Ind. V, 706.

Sikkim, on trees at elevations of 7,000 to 8,000 feet; Hooker, Clarke, Gamble; at Choongthang, elevation 6,000 feet, Pantling No. 380.

Plate 43.--Liparis perpusilla, Hook. fil. A tuft of plants, of natural size. Fig. 1 a flower, 2 floral bract, pedieflled ovary, column and lip, seen from the side, 3 the lip showing the base with the crescentic nectary and diverging callosities, 4 column, 5 anther, 6 pollinia; all onlarged.

## 17. Liparis Griffithii, Ridley in Journ. Linn., Soc. XXII, 285 (in part).

Epiphytal. Pseudo-bulbs ovoid or oblong, compressed, 1 to 1.75 in, long. Leaves two, narrowly oblanceolate, acute, attenuated to the base, but broadened at the point of attachment; length 5 to 9 in ., breadth 75 to $1 \cdot 1 \mathrm{in}$. Inflorescence shorter than the leaves while in flower, longer in fruit, erect, produced from between the immature leaves; peduncle about equal to the raceme, flattened, winged, dilating downwards and with one or two subulate bracteoles on its margin; raceme 3 to 4 in. long. Flowers numerous, yellowish-green, $\cdot 3 \mathrm{in}$. across; floral bract linear, acuminate, shorter than the pedicelled ovary. Sepals sub-equal, oblong, blunt, their margins recurved; the dorsal reflexed; the lateral pair broader, spreading. Petals linear, blunt, spreading. Lip broadly obdeltoid, strongly recurved from near the base, with a small polished dark green callus immediately against the column; the apex broad, truncate, minutely erose, and with a short blunt apiculus. Column long, slender, wingless, the base slightly dilated. Anther depressed, its lip truncate and its upper surface partially caruncled. Rostellum large, ovate, decurved over the stigma. Liparis spec., Griff. Ic. Pl. Asiat, t. 307, fig. 1.

Sikkim; near Pemiongtchi, elevation 5,000 feet; in flower during November; Pantling No. 465.

This resembles $L$. bootanensis, Griff., but differs from that species in having 2-leaved pseudo-bulbs, a more densely-flowered raceme, and a wingless column.

Plate 52.-Liparis Griffithii, Ridley. A plant, of natural sise. Fig. 1 a flower, front vicu, 2 bract, stalked ovary, column and lip, side view, 3 lip, 4 apex of ovary, column with anther in silu, 5 anther from above, 6 pollinia; all enlarged.
18. Liparis pygmea, new species.

Terrestrial ; whole plant not exceeding 3 in . in height. Pseudo-bulbs less than 5 in, long, narrowly ovoid, loosely enveloped in two or three membranous withered sheaths. Leaves two, from the apex of the pseudo-bulb, sub-opposite, ovate, acute, sessile, sheathing at the base, $\cdot 5 \mathrm{in}$. long. Inflorescence erect, rather stout, three or four times as long as the leaves, the peduncle ebracteate, the raceme 2- to 3 -flowered ; floral bract subulate, less than half as long as the pedicelled ovary. Flowers 25 in . long, yellowish. Dorsal sepal oblong, blunt, arching over the column; the lateral pair less than half as broad as the dorsal, lying parallel under the lip and protruding beyond it. Petals linear, acute, spreading, the margins reflexed. Lip oblong-obovate, slightly deflexed from about the middle; the basal half concave and with entire edges; the apical or deflexed half obscurely erose; the base with a large bilobed callus just under the column; the apex broad, apiculate. Column with short wings near the apex; the base very wide, flattened from back to front. Anther with an acute beak. Pollinia elliptic, rostella two.

Sikkim-Himalaya, below Jongri; elevation 13,000 feet; Pantling No. 449; in flower in June.

Plate 44.-Liparis pygmea, King and Pantling. Two plants, of natural size. Fig. 1 flower, front view, 2 floral bract, stalkel ovary, column and lip, in profle, 3 lip, 4 column with anther, 5 anther, 6 pollinia in situ; all enlarged.

## 19. Liparis platyrachis, Hook. fil. Ic. Plantar., t. 1890.

Epiphytal. Pseudo-bulbs tufted, oblong, compressed, $\cdot 5 \mathrm{in}$. long, each bearing three to five linear-lanceolate thickly membranous acute leaves with sessile sheathing bases; length $\cdot 5$ to $1 \cdot 25 \mathrm{in}$. Inflorescence pendulous, much elongated; the peduncle interruptedly winged and with short linear bracteoles; raceme thicker than the peduncle and also with a winged rachis, many-flowered; floral bract subulate, much shorter than the pedicelled ovary. Flowers $2 \overline{5} \mathrm{in}$. long and about $\cdot 1 \mathrm{in}$. broad. Sepals elliptic (when flattened out), their edges much recurved, the dorsal narrower than the lateral pair. Petals linear, blunt, decurved, their edges revolute. Lip about half as long as the sepals, quadrate, deflexed about the middle; the basal half with four calli, one pair conical erect at the sides of the very minute nectary, and a second pair triangular and depressed immediately in front of the former; the decurved apical half of the lip with a broad round apes having a broad short apiculus at its centre. Column with a small triangular wing on each side of the stigma, the base dilated and compressed from back to front. Anther with broad rounded lip. Pollinia clavate-oblong. Hook. fil. Fl. Br. Ind. V, 706.

Sikkim ; Treutler, Clarke; at elevations of 4,000 to 5,000 feet. Pantling, at Choongthang; elevation 6,000 feet, No. 417. Flowering in September.

Very sparingly collected hitherto. Mr. Pantling's specimens were found growing on the branches of a bamboo. The more elongated raceme, quadri-tubercular lip, and flattened dilated base of the column distinguish this at once from its nearest ally L. delicatula. The sepals, petals, and decurved portion of the lip and anther of this are pale ochraceous; the column and straight or basal portion of the lip are green.

Plate 45.-Liparis platyrachis, Hook. fil. Two plants growing on a branch of bamboo, of natural size. Fig. 1 flower, with a part of the winged rachis, 2 column, front view, 3 lip, vieved from above and in front, 4 the anterior part of the lip, 5 an empty anther, 6 pollinia; all enlarged.

## 20. Liparis delicatula, Hook. fil. Ic. Plantar., t. 1889.

Epiphytal. Pseudo-bulbs tufted, ovoid or oblong, • 35 to $\cdot 5$ in. long. Leaves two, narrowly elliptic, tapering equally to each end, sessile or shortly petioled, rising from near the apex of the pseudo-bulb, 5 to 1.5 in . long, membranous. Inflorescence two or three times as long as the leaves, slender, bearing three or four ovate-lanceolate spreading bracteoles; raceme about as long as the peduncle, few-flowered; floral bract ovate, acute, shorter than the ovary. Flowers ' 25 in. long, ochreous, the column pale-green. Sepals ovate-lanceolate, acute, their edges recurved, the dorsal one curved backwards, the lateral pair falcate, diverging. Petals linear, obtuse, decurved. Lip orbicular-oblong, shorter than the sepals; the apex much recurved and with a blunt apiculus, hispidulous; the rest of the surface smooth, the edges entire, the base with several short lateral folds and a central small orbicular nectary with a thickened fold forming a pseudotubercle at each side of it. Column short, stout, slightiy bent forwards and with large broadly triangular wings. Hook. fil. Fl. Br. Ind. V, 705. L. decurrens, Ridley in Journ. Linn. Soc. XXII, 291 (in part).

The lip as here described would appear to differ from the same part as described by the author of the species in his Icones Plantarum and Flora of British India-a discrepancy which is entirely explained by the fact that, while the former was drawn up from a living specimen, the latter was prepared from a dried one. A careful comparison made in the Kew Herbarium shows that the plants described are identical.

Sikkim-Himalaya; on Sittong; elevation 6,000 feet; Pantling No. 155; flowering in August and September. Khasia Hills; elevation 4,000 to 5,000 feet; Hooker and Thomson, Lobb. Mishmi Hills in Assam; Griffith.

Plate 46.-Liparis delicatula, Hook. fil. A plant, of natural size. Fig. 1 a flower, 2 lip, except the apex, 3 the recurved apex of the lip, 4 anther, 5 polinia; all enlarged.
21. Liparis viridiflora, Lindl. Gen. and Spec. Orchid., 31.

Epiphytal. Pseudo-bulbs orbicular, much compressed, somewhat flattened at the apex, tufted, about 1 in . in diam. Leaves two, from the apex of a pseudo-bulb, oblonglanceolate, acute, keeled, narrowed to the base, sessile, 3 to 6 in . long and 75 to 1 in. broad. Inflorescence from the apex of the pseudo-bulb, at first erect but ultimately pendulous, longer than the leaves; the peduncle winged and bearing several subulate bracts $\cdot 2 \mathrm{in}$. long; raceme longer than the peduncle, many-flowered; floral bract linear, equal to, or longer than, the pedicelled slightly decurved ovary. Flowers $\cdot 2$ in. long, green. Sepals ovate-elliptic, sub-acute, flat. Petals linear-oblong, acute, 1-nerved. Lip slightly decurved from the base, broadly ovate in outline, narrowed to the base, without side lobes and without calli, concave especially towards the base, the apex contracted to a triangular point at the base of which are two marginal folds simulating tooth-like calli. Coluinn sub-terete, slightly curved, the base hardly at all thickened and the apex not winged. Anther sub-orbicular. Pollinia narrowly triangular. Ridley in Journ. Linn. Soc. XXII, 289; Thwaites' Enum. Pl.

Ceyl., 295; Hook. fil. Fl. Br. Ind. V, 704. L. elliptica, Wight Ic. 1735. L. Wightii, Reichb. fil. in Walp. Ann. VI, 218. L. Hookeri, Ridley l. c. 288. Maluxis viridiflora, Blume Bijdr. 392, t. 54.

Sikkim-Himalaya, in tropical valleys not ascending over 3,000 feet; Pantling No. 102; in flower in November. Also in Upper Assam and Khasia Hills, in Southern India, in the Nilgiri Hills and in Ceylon. Also in Java.

The pseudo-bulbs of this species are, in specimens from the south of India, somewhat four-angled but compressed; in other specimens they are, when fresh, almost cubical. The inflorescence is at first erect; and, in this attitude, even fruiting racemes are shown in Wight's figure (Ic. 1735). But they really become pendulous at an early stage.

Plate 47.-Liparis viridifora, Lindl. A plant, of natural size. Fig. 1 flower, front view, 2 floral bract, pedicelled ovary, and flower, side view, 3 lip, upper surface, 4 column with anther and apex of ovary, 5 empty anther, 6 pollinia, seen from the front, 7 the same, from the side; all enlarged.

## 22. Liparis Assamica, new species.

Epiphytal. Pseudo-bulbs and leaves as in L. resupina'a. Racemes thres times as long as the leaves, much deflexed. Flowers sparse, 5 in. long; floral bract usually shorter than the ovary. Sepals unequal, the dorsal erect, narrowly oblong, tapering to the sub-acute apex; the lateral pair larger, blunt, lying close together under the lip. Petals linear, obtuse, spreading, shorter than the sepals. Lip flat, about as long as the petals, broadly-oblong, with short sagittate auricles at the base; the apex broad, emarginate, with a short apiculus in the sinus; the upper surface with an elliptic nectary and two calli at the base. Column broad at the base, tapering upwards, with two shallow broad blunt wings about the middle, not hooked; and with two stout convexities on the posterior surface. Anther obtuse. Pollinia as in L. resupinata. L. resupinata, Ridl. var. Assamica, King and Pantling MSS.

Khasia Hills and Assam; Griffith (Kew Distrib. No. 5082), Wallich, G. Mann; in flower during November.

This variety has not as yet been found in Sikkim, and we include it here owing to its relationship to $L$. resupinata, Ridley, and to its var. Ridleyi. This plant has such a different column and lip from these that we have given it specific rank. On the other hand we have ventured to reduce $L$. Ridleyi as a variety of $L$. resupinata, because it differs only in size from the latter, and not at all in form. L. Assamica has the pseudo-bulbs and leaves of typical $L$. resupinata, and the larger flowers and much deflexed racemes of its variety Ridleyi. But it differs from both in its flat emarginate apiculate lip, and in having a column with no hooked wings, but with two converities on the back.

Plate 50.-Liparis Assamica, King and Pantling. A tuft of plants, of natural sise. Fig. 1 a flower, front view, 2 side view of floral bract, stalke ovary, column and lip, 3 column, showing its wings and the anther in situ, 4 empty anther, 5 pous.inia; all enlarged.
23. Liparis resupinata, Ridley in Journ. Linn. Soc. XXII, 290.

Epiphytal. Pseudo-bulbs tufted, ovoid-cylindric, sheathed, 5 to 1.5 in . long. Leaves two to four, membranous, alternate, linear-lanceolate, acute or acuminate, not narrowed to
the base, sessile, 1 to 3 in . long and 5 in . broad. Inflorescence 6 to 12 in . long, sub-pendulous, terete; the peduncle slender and with many lanceolate concave spreading bracteoles; the raceme long, laxly many-flowered; floral bract linear, shorter or longer than the ovary. Flowers golden-brownish, 25 in . long. Sepals oblong, obtuse, longer than the lip, the dorsal retroflexed, the lateral pair spreading and not concealed by the lip, the margins of all recurved. Petals linear, obtuse, spreading. Lip shorter than the sepals and petals, broadly oblong or ovate, sagittate at the base and with an elliptic nectary and two calli between the folds; the apex broad, obtuse, its edges incurved. Column 2 -winged, and with a pendent filiform process from each wing. Pollinia amber-coloured, translucent, clavate, their inner surfaces concave. Hook. fil. Ic. Plantar., t. 1888; Fl. Br. Ind. V, 705.

Sikkim-Himalaya, alt. 5,000 to 6,000 feet, not uncommon; Pautling No. 60. Khasia Hills, alt. 4,500 to 6,500 feet. Assam; Griffith, No. 5082. In flower in Sikkim from October to December.

Var. Ridleyi. Pseudo-bulbs, leaves and flowers larger than in the typical form; the raceme flowerless in its upper part. L. Ridloyi, Hook. fil. Ic. Plantar., t. 1887; Fl. Br. Ind. V, 705.

Sikkim-Himalaya, alt. 4,000 to 6,000 feet; Pantling No. 201. In flower during October, November and December.

The variety Ridleyi resembles typical $L$. resupinata in structure and colour. It also grows at the same altitudes and flowers at the same season. An examination of the flowers of both by Mr. Pantling several years in succession shows that they vary in exactly the same way. Sometimes the floral bract is longer, sometimes it is shorter than the ovary; its length decreasing towards the apex of the raceme. The lip may be ovate or broadly oblong, but it is always shortly sagittate at the base, the basal folds being prolonged upwards, and between the lobes there is an elliptic nectary. The rachises of the racemes of both are coloured' like the flowers, and the pseudo-bulbs and leaves are suffused with the same golden-brownish tint.

Plate 48.-Liparis resupinata, Ridley. A plant, of natural size. Fig. 1 a flower, seen from the front, 2 a flower, in profile, 3 upper part of the column (the anther being removed), 4 an anther, seen from above, 5 pollinia; all enlarged.

Plate 49.-Liparis resupinata, Ridley, var. Ridleyi. A plant, of natural sise. Fig. 1 a flower, front eien, 2 profile of a flower, with its stalkel ovary and bract, 3 upper part of the column (the anther removed), 4 anther, 5 pollinia, 6 innor surfaces of pollinia; all enlarged.

## 4. Didiciea, King and Prain.

Sepals free, spreading, subequal, narrow. Petals like the sepals. Lip sessile on the base of the column and parallel to it, equal in length to the sepals, fleshy, ovateoblong, concave, blunt, without lobes or teeth; spur minute. Column half as long as the sepals and lip, wingless. Anther terminal, 2-celled, convex, rather broad. Pollinia 4, free, waxy, and without appendages, unequal in size, obovoid.

As regards habit and external appearance this genus very closely resembles Tipularia. It differs, however, from that genus notably in its pollinia having no appendages. The column in this is shorter than in Tipularia, and the lip has no lobes of any kind and only
a minute straight pouch, scarcely amounting to a spur; whereas in Tipularia the spur is much longer than the ovary and much curved; the lip is also different in the two.

The genus is dedicated to its original collector, Dr. D. D. Cunningham, F.R.S., C.I.E., and the consonants in the name proposed for it are derived from his initials.

Didiciea Cunninghami, King and Prain in Journ. As. Soc. Bengal, Vol. LXV, pt. 2 (1895), p. 119.

Terrestrial, with a small pseudo-bulb bearing from its side a single leaf and from its summit an inflorescence 5 to 9 in . long, about one-third of which is spike. Leaf broadly ovate, 3 -nerved, sub-acute, the edges undulate, slightly narrowed at the base to the narrow channelled petiole; length 1.5 in., breadth 85 in.; petiole 5 in., slightly expanded at the base. Peduncle with two or three distinct blunt convolute sheaths; spike 1 to 1.5 in. long, laxly-flowered, elongating in fruit. Flowers $\cdot 1$ in. long; floral bract minute, triangular, shorter than the pedicel of the ovary. Sepals and petals sub-equal, narrowly oblong, blunt; spur of the lip very short, pointed.

Sikkim; in the Lachen Valley; the exact elevation unknown, but probably about 12,000 feet; in flower in July. Cunningham (without note of locality or elevation); Pantling No. 396.

This was originally collected by Dr. D. D. Cunningham, F.R.S., C.I.E., in the Sikkim-Himalaya in 1889. It has more recently been brought in by the collectors of the Botanic Garden, Calcutta.

Plate 50.-Didiciea Cunninghami, King and Prain. A plant, of natural size. Fig. 1 a flower front vien, 2, bract, stalked ovary, column and lip, side view, 3 lip, 4 column and anther, front view, 5 anther, 6 pollinia; all enlarged.

## 5. Dendrobium, Swartz.

Epiphytal ; pseudo-bulbs short and fleshy or elongated and stem-like, tufted except in Section Sarcopodium. Leaves never plicate, sessile (except in Sarcopodium) with sheathing bases. Flowers solitary, or in fascicles or racemes, often large. Sepals subequal, the lateral pair obliquely adnate to the foot of the column and forming with it a sac or mentum. Lip sessile or clawed at the base, adnate to and incumbent on the foot of the column; side lobes embracing the column, or spreading, or absent; the terminal lobe broad or narrow, flat, convex, concave, or saccate; the dise sometimes lamellate. Column short, its foot long or short, with usually a nectar-secreting depression or cavity at its extremity, the apex angled or 2-toothed, anther 2-celled. Pollinia 4, equal in length, sometimes in free pairs but usually all slightly coherent, the 4 never all quite free, ovoid or oblung, slightly compressed.

In the following account of this difficult genus we bave adopted the sections into which Sir Joseph Hooker divides it in the "Flora of British India," although we do not place them in the same sequence, the sections Cadetia and Sarcopodium being placed near Bulbophyllum as being forms connecting typical Dendrobium with that genus. We place Aporum at the beginning as having flowers more resembling those of Liparis than any others of the genus described in these pages. The true relationship of Stachyobium is with Eria; but, as it is impossible to place it near that genus, we have put it after sect. Virgate. Four species of Dendrobium mentioned in the "Flora of British India" as natives of Sikkim are not now found there, having probably disappeared,
like so many other species, owing to the spread of cultivation. These species are D. primulinum, Lindl., D. crystallinum, Reichb. fil.; D. palpebrae, Lindl,; and D. Dalhousiceanum, Wall. It may of course also be possible that these four species were wrongly attributed to sikkim.

Sect. I.-Aporum.-Stems compressed. Leaves shortly ensiform, equitant, fleshy or coriaceous, persistent. Flowers small, white or yellowish with pink markings shortly pedicelled, solitary, rarely in pairs; mentum stout, as long as or longer than the short broad lateral sepals.

$$
\begin{gathered}
\text { Flowers lateral } . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ 1 . ~ D . ~ a n c e p s . ~ \\
" ~ t e r m i n a l ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ . ~ 2 . ~ D . ~ t e r m i n a l e . ~
\end{gathered}
$$

Sect. II.-Brevifloues.-Stems tufted, long, terete or clavate. Leaves membranous, persistent. Flowers small, in short racemes or heads, yellow, often dingy; mentum large, saccate; lip very short, deeply concave or urceolate, truncate or with short lobes.

## 3. D. bicameratum.

Sect. III.-Virgate.-Stems tufted, elongate, slender, but hard rigid and polished, leafy. Leaves distichous, long, linear, persistent. Flowers small or medinm-sized, yellow with purple markings, produced at intervals and not at one period only, in fascicles of two from an internode; mentum usually long, stout, incurved; petals and lip often very narrow.

## 4. D. Cathcartii.

Sect. IV.-Stachyobium.-Pseudo-bulbs short, tufted, with 2 or 3 leaves, or stems elongate and leafy. Leaves narrow, membranous, deciduous or persistent. Flowers in slender terminal or lateral racemes, small or medium-sized, usually pale-green or yellow with brownish markings; mentum rather long, conical, incurved, or short and obtuse; lip often with a flat keel on the disc terminating in a truncate crenate callus on the mid lobe.
Pseudo-bulbs with 2 or 3 leaves at the apex.
Pseudo-bulbs broadly ovoid-conic, 2-leaved; terminal lobe
of lip triangular, crisped
5. D. pygmaum.
Pseudo-bulbs narrow, conical, 3 -leaved. Petals shorter than
the sepals, 3 -nerved, sub-obtuse. Lip elliptic or obovate-
oblong, flat, its margins not ciliolate, its dise thickened
and obscurely 3 -grooved
6. D. porphyrochilum.
Stems 3 to 10 in . long, with many caducous leaves.
Plant 3 to 6 in . high; lateral sepals broader than the
dorsal; side lobes of lip deeply serrate
7. D. eriaflorum.
Plant 6 to 10 in . high; sepals subequal, lanceolate, much
acuminate, side lobes of lip serrulate
8. D. denudans.

Sect. V.-Pedilonium.-Stems tufted, long, terete. Leaves oblong-lanceolate, persistent or deciduous. Flowers medium-sized, pink, in short leaf-opposed corymbose racemes, mentum very long. Lip obovate-spathiform with a long hori-zontally-toothed claw.

Sect. VI.-Formose.-Stems tufted, erect, with coarse deciduous black hairs on the sheaths. Flowers solitary or in racemes, large, white, with faintly coloured lip; mentum usually long and funnel-shaped or conical, acute, straight or incurved. Lip sessile, its middle lobe often fimbriate on the margin or disc.

> Lip fimbriate; flowers less than 1 in. across . . . . . . . 10. D. longicornu.
> Lip not fimbriate; flowers 3 to $5 \mathrm{in} .\mathrm{across} \mathrm{}. \mathrm{}. \mathrm{}. \mathrm{}. \mathrm{}. \mathrm{}. \mathrm{.11}. \mathrm{D}. \mathrm{formosum}$.

Sect. VII.-Eudendrobium.-Stems elongated, stout or slender, cylindric, elavate or nodose. Leaves membranous or coriaceous, persistent or deciduous. Flowers usually large, in lateral pairs fascicles or racemes, very rarely solitary, variously coloured, white yellow or purple.

Stems usually with many, but never with less than two leaves.
Lip not calceolar.
Lip not convolute, longer than broad.
Lip without side lobes.
Lip obovate . . . . . . . . . . . 12. D. crepidatum.
Lip elliptic, abruptly acuminate . . . . 13. D. aduncum.
Lip with short up-turned side lobes, oblong, sub-acute . . . . . . . . . . . . . 14. D. candidum,

Posterior part of the lip convolute into a tube, the anterior part expanded into a more or less orbicular open mouth.
Dise not puberulous, mentum entire.
Lip longer than broad, with broad convolute side lobes.

Mentum bulbous, bracts small, sepals obtuse . 15. D. amœenum.
Mentum conical, bracts large, sepals acute . 16. D. transparens.
Lip longer than broad, without side lobes . . 17. D. nobile.
Lip as broad as long, without side lobes . . . 18. D. Pierardi.
Disc of lip with a green-crested ridge, the anterior lobe crisped; mentum notched at the apex . . 19. D. ramosum.
Disc papillose; anterior part of lip trowel-shaped, not lobed; mentum conical . . . . . . . . 20. D. heterocarpum.
Disc tomentose; anterior part of lip orbicular-
reniform, mentum blunt . . . . . . . . . 21. D. clavatum.
Iip not convolute, the disc more or less papillose or fimbriate.

Lip papillose (shortly fimbriate in Nos. 22 and 23). Lip longer than broad.

Lip oblong or oblong-obovate, with two lateral forward-pointing lobes; mentum blunt. Flowers white; lip with no ridge, but its diso much thickened 22. D. stuposum. Flowers golden-yellow; dise of lip with a central 3 -grooved ridge . . . . 23. D. pauciflorum.
Lip broader than long or orbicular.
Lip transversely oblong or reniform, not lobed; flowers in fascicles . . 24. D. chrysanthum.

Lip orbicular or sub-orbicular ; flowers in racemes. Stems clavate.

Racemes 3 or 4 in . long, flowers dingy yellow ; lip slightly lobed . . . . . . 25. D. sulcatum.
Racemes 6 to 10 in. long; flowers brilliant yellow or white; lip not lobed.

Racemes densely crowded . . . . . 26. D. densiflorum.
Racemes lax . . . . . . . . . . 2\%. D. Farmeri.
Stems oylindric . . . . . . . . . . . 28. D. Gibsoni.
Lip deeply fimbriate.
Racemes 7- to 12 -flowered; lip with one purple blotch . . . . . . . . . . . . . . . 29. D. fimbriatum,

Racemes 2- to 4-flowered; lip with two purple blotohes
30. D. Hookerianum.

Lip calcoolar
31. D. moschatum.

Leaf solitary -
The lip with a dark blotoh . . . . . . . . . . . . . 32. D. aggregatum.
The lip without a blotoh . . . . . . . . . . . . . . 32. D. aggrogatum
var. Jenkinsii.
Scet. VIII.-Cadetia.-Stem branched, erect, the branches formed by chains of sessile or stipitate pseudo-bulbs. Leaf solitary, terminal, coriaceous, flat, persistent. F'iowers one or two from the base of the leaf, medium-sized, white or pale ; mentum short, the edge of the lip plicate,

> 33. D. Macrai.

Sect. IX.-Sarcopodium.-Pseudo-bulbs short, more or less ovoid, erect, springing singly from a stout creeping (often branching) rhizome. Leaves two, coriaceous, opposite, from the apex of the pseudo-bulb, flat, persistent. Flowers soli. tary from between the leaves, large; mentum short, rounded. Lip more or less mobile.
Flowers $1 \cdot 5$ in. in diam.
Anterior lobe of lip sab-reniform, the diso with a large triangular fleshy thickening . . . . . . . . . . . . . . . . . 34. D. rotunidatum.
Anterior lobe of lip orbicular-ovate, the disc with a broad central ridge . . . . . . . . . . . . . . . . . . . . . 35
35. D. fuscescens.

Flowers 3.5 in . in diam.
36. D. amplum.

1. Dendrobium anceps, Swartz in Act. Holm. 1800, 246.

Stems compressed, 6 to 30 in . long and from 25 to $\cdot 5 \mathrm{in}$. broad. Leaves fleshy and without apparent nerves when fresh (striate when dry), lanceolate, acuts, with sheathing equitant bases; length 1 to 1.75 in., breadth from 25 to ${ }^{\circ} 5$ in. Flcwers produced singly, $\cdot 65$ in. to $\cdot 75 \mathrm{in}$. long, yellowish-green, axillary; floral bract minute, much shorter than the short pedicelled ovary. Sepals unequal, elliptic; the lateral pair larger than the dorsal, all obtuse. Petals much shorter than the sepals, broadly elliptic, blunt. Lip cuneately oblong, concave, obscurely 3 -lobed, the edges entire in the lower part, crisped in the upper and especially at the broad 2-lobed apex; the disc occupied by a shallow thickened depression ending abruptly near the apex.

Column and its foot flat; the latter elongate and with a narrow nectar-secreting cavity at its extremity; mentum long, blunt. Anther with a truncate lip; pollinia onneate, the individual masses clavate. Willd. Spec. Plant. IV, 136; Roxb. Fl. Ind. III, 487 ; Walp. Ann. VI, 279 ; Hook. fil. Fl. Br. Ind. V, 724. Aporum anceps, Lindl. Gen. and Spec. Orchid. 71 (excl. cit. Wall); Bot. Reg. t. 1239; Bot. Mag. t. 3608 ; Lodd. Bot. Cat. t. 189j; Griff. in Calc. Journ. Nat. Hist. V, 368.

Sikkim-Himalaya, in the bottoms of tropical valleys, Hooker and others; Pantling No. 258; in flower during April and May. Assam, the Gangetic Delta, Burmah; also in the Andaman and Nicobar Islands.

Plate 54.-Dendrobium anceps, Swartz. Plant, of natural size. Fig. 1 a flower, 2 floral bract, sub-sessile ovary, column and its foot, seen from the side, 3 upper surface of lip, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.

## 2. Dendrobium terminale, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 149.

Stems terete and very slender at the base, flattened upwards, 4 to 6 in . long and $\cdot 2$ to $\cdot 25$ in. broad. Leavcs fleshy, showing no nerves when fresh, oblong-elliptic, sub-acute, the base broad and equitant; length $\cdot 4$ to $\cdot 75$ in., breadth $\cdot 2$ to 3 in. Flowers $\cdot 5$ or $\cdot 6$ in. long, terminal, solitary or in racemes of two, white or pale pink; floral bract lanceolate, much shorter than the pedicelled ovary. Sopuls unequal, the lateral pair three times as large as the dorsal, elliptic, falcate, sub-acute, 3-nerved; the dorsal ovate. Petals elliptic, blunt, about as long as the dorsal sepal but narrower, 1-nerved. Lip cuneate-triangalar (when spread out), deflexed about the middle, the sides entire, the apex broad, sub-undulate, minutely erose, slightly bifid. Column short; its foot six times as long as itself, broad, curved, and with an oblong greenish callus near the lower end. Menium broad, blunt, very long. Lip of anther truncate, erose; pollinia oblong. Capsule ovoid, 35 in. long. Hook. fil. Fl. Br , Ind. V, 72 万.

Tropical valleys in Sikkim; Pantling No. 236; in flower during September and October. Tenasserim; Parish. Malacca?

The flowers of this are either white or very pale pink, and the mentum has pink nerves. The lip has a thickened yellow line running along the middle of its upper surface from base to apex. Hitherto this species has not been recorded from Sikkim.

Plate 55.-Dendrobium terminale, Par. and Reiohb. fil. A plant, of natural size. Fig. 1 flower, front view, 2 lip, 3 floral bract, stalked ovary, column and its foot (showing the oblong callus near the apex of the latter), 4 view of inside of an empty anther, 5 pollinia; all enlarged.

## 3. Dendrobium bicameratum, Lindl. in Bot. Reg. 1839, misc. 85.

Stems clavate or fusiform, elongate, 3 to 18 in. long and $\cdot 35$ to $\cdot 5$ in. thick at the thickest part (but less when mature). Leaves elliptic-oblong to ellipticlanceolate, the apex acute and obliquely and minutely bifid, $1 \cdot 5$ to 3 in . long and $\cdot 75$ to 1 in. broad. Flowers $\cdot 4$ in. across, yellow marked with red, densely clustered on a short rachis and forming a capitate lateral or sub-terminal raceme; floral bract
sheathing the shortly-stalked ovary. Dorsal sepul broadly ovate-oblong; the lateral pair triangular, all concave and sub-acute. Petals broadly elliptic, obtuse, about as long as the sepals. Lip small, fleshy, very concave, broadly triangular (when flattened out) and 3 -lobed; the side lobes triangular, acute, erect; the terminal lobe very short, truncate; the dise fleshy, smooth. Colnmn very short, and with two large oblong nectarsecreting cells. Mentum urceolate. Anther fleshy. Saunders' Refug. Botan, t. 143; Hook. fil. Fl. Br. Ind. V, 729. D. breviflorum, Lindl. in Journ. Linn. Soc. III, 14. D. buiboflorum, Falc. MSS. ex Hook. fil. Fl. Br. Ind. V, 729 ; Ic. Plant., t. 2028.

Sikkim; common at elevations of from 4,000 to 6,000 feet; Pantling No. 40 ; in flower during August and September. N.-W. Himalaya, at Mussourie, Proudlock. Dehra Dun, Gamble. On Maheudragiri, Ganjam district, Gamble. Shan Hills, Burmah; Bot. Gard. Collectors.

In the text accompanying the figure of $B$. bulboflorum in the Icones Plantarium Sir Joseph Hooker remarks:-
"Additional specimens and drawings of this species received from Calcutta since its publication in the "Flora of British India" make me doubt whether it is sufficiently distinct from D. bicameratum. Mr. C. B. Clarke, from examination of fresh specimens in Sikkim, describes the column as very short with two produced spurs at the base. I have so described it in the "Flora of British India," but on a careful examination of the column I am disposed to think that the lateral keels of the foot of the column have been taken for spurs, or may assume the form of spurs in living specimens."

In our opinion Sir Joseph Hooker's doubt is just, and D. bulboflorum is only a young state of this.

Plate 56.-Dendrıbium bicameratum, Lindl. A plant, of natural sise. Fig. 1 a flower, 2 floral bract, ovary, column and lip, in profile, 3 lip, 4 vertical section of the lip, 5 column, 6 anther, seen from the side, 7 pollinia; all enlarged.

## 4. Dendrobium Cathcartii, Hook. fil. Fl. Br. Ind. V, 727.

Stems erect, more slender than a goose-quill, not swollen at the base, terete, many-leaved, 15 to 30 in . long. Leaves linear-lanceolate, obliquely notched at the apex, slightly narrowed at the base, sheathing, 4 or 5 in . long and $\cdot 4$ or $\cdot 5 \mathrm{in}$. broad. Flowers $\cdot 6$ in. long, in fascicles of two from an internode; the stalked ovary very slender, $\cdot 65 \mathrm{in}$. long. Sepals-the dorsal ovate-lanceolate, acute; the lateral lanceolate. Petals narrower than the sepals. Lip elliptic-oblong, acute, entire, almost flat. Column short, broad; its foot narrower, elongate; mentum stout, curved, shorter than the lateral sepals. Capsule ovoid, 6 in. long.

Sikkim; in tropical valleys ascending to 2,500 feet; Pantling No. 114 ; in flower from April to September.

The flowers are golden yellow, the lip marked with purple.
Plate 57.-Dendrobium Cathcartii, Hook. fil. A plant, of natural size. Fig. 1, front view of a flower, 2 front view of column with the anther in situ, 3 side view of apex of ovary, column and lip, 4 lip, 5 pollinia; all enlarged.
5. Dendrobium pygmetim, Lindl. in Wall. Cat. 1999.

Pseudo-bulbs globular, $\cdot 5$ to $\cdot 75$ in. long, with scarious sheaths. Leaves two, terininal, caducous, linear-oblong, sub-acute, sessile, 1.5 to $3 \cdot 5 \mathrm{in}$. long. Racemes
terminal or sub-terminal, much shorter than the leaves, solitary or two or three, erect, not more than 1 in. long. Flowers 5 in. long; floral bract equalling or exceeding the ovary. Sepats oblong-lanceolate, the lateral pair decurved, the dorsal erect. Petals oblanceolate, falcate, sub-acute. Lip obovate-deltoid (when flattened out), shortly clawed, decurved at the apex of the side lobes; the side lobes long, narrow, entire, sub-acute, almost obtuse at their apices; terminal lobe broadly triangular, crisped; the disc between the side lobes with a broad fleshy ridge emarginate at its apex. Column short, rather broad, the edges thickened; its foot long, straight, and spur-like at its extremity. Lip of anther very minutely pectinate. Lindl. Gen. and Spec. Orchid., 85 ; Bot. Reg. 1845, Misc. 62 ; Hook. fil. Fl. Br Ind. V, 717. D. peguanum, Lindl. in Journ. Linn. Soc. III, 19.

Sikkim, at the base of the hills, at elevations of about 1,000 feet. Pantling No. 23; flowering during the cold season. Burmah.

Except the lip and anther, the parts of the flower are white. The lip is pale brown, veined with a darker tint of the same colour, its anterior lube and the anther being amethyst.

Plats 58.-Dendrobium pygmaum, Lindl. A. tuft of pseudo-bulbs growing on a dead branch of a tree, of natural siso. Fig. 1 a flower, 2 lip, 3 floral bract, ovary, column and lip, in profie, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.

## 6. Dendrobium porphyrochilum, Lindl, in Journ. Linn. Soc. ILI, 18.

Pseudo-bulbs cylindric-conic, thin, ${ }^{\circ} \mathrm{j}$ to 1 in . long, narrowed into a short stem. Leaves 1 to 3 , linear-oblong, obtuse or obliquely notched at the apex, the base not narrowed; length 1 to $2 \cdot 5$ in., breadth ${ }^{\circ} 2$ to 3 in. Rucemes solitary, terminal, nodding, slightly longer than the leaves, 6- to 10 -flowered. Flowers - 3 in . long; floral bract linear, more than half as long as the stalked ovary. Scpals lancoolate, the lateral pair larger than the dorsal. Petals shorter than the sepals, oblong, sub obtuse, 3-nerved, Lip elliptic, decurved from the base, flat, not lobed, its edges entire and apex sub-acute; the upper surface with a broad central thickened band torminating near the apex, slightly grooved towards the base so as to form three obscure ridgas. Column short, broad, its foot dilated, concave. Mentum oblique, rounded. Anther sub-orbicular, the lip up-turned; pollinia elongate-clavate. Hook. fil. in Fl. Br. Ind. V, 716. D. coespitosum, King and Pantling in Joarn. As. Soc. Beng. LXIV, pt. 2, 332.

Sikkim ; at elevations of from $\tilde{5}, 000$ to 7,000 feet; Pantling No. 363 ; flowering during April and May. Khasia Hills; Hooker, Mann, Oldham.

The sepals and petals are pale green with red nerves. The lip is dull brownishpurple, edged with pale green, and the column is white spotted with purple.

Plate 59.-Dendrobium porphyrochilum, Lindl. A plant, of natural size. Fig. 1 a flower, in profile, 2 floral bract, stalked ovary, column and lip, seen from the side, 3 petals, 4 lip, 5 oolumn and its foot, 6 anther, 7 pollinia; all enlarged.

## 7. Dendrobium erieflorum, Griff. Notul. III, 316.

Stems erect, many-leaved, tapering from base to apex, 3 to 6 in. long, about $\cdot 4$ in. thick at the base. Leaves linear-lanceolate, the apex blunt; oblique, sometimes
notched; length 1.5 to 2.5 in., breadth 25 to $\cdot 35 \mathrm{in}$. Racemes numerous, leaf-opposed axillary, slightly longer than the leaves, many-flowered, nodding. Flowers 5 in . across and about $\cdot 65 \mathrm{in}$. long; floral bract lanceolate, minute, much shorter than the stalked ovary. Sepals-the dorsal lanceolate, acuminate; the lateral pair larger, falcate, with very broad bases, spreading only slightly. Petals linear, acute, lying parallel above the column. Lip shorter than the sepals, curved from the natrow base, sessile, broadly oblong-ovate when spread out, very concave, the side lobes narrow, elongate, pectinateserrate; the middle lobe shorter than the side lobes, acute, much recurved, undulate, a mesial crest running along the dise from its base to the insertion of the terminal lobe. Column long, having its foot at a right angle; nectary lanceolate, large, shallow. Lip of anther minutely pectinate. Griff. Ic. Plant. Asiat. t. 307; Lindl. in Journ. Linn. Soc. III, 19; Hook. fil. Fl. Br. Ind. V, 71乞; in Ann. Roy. Bot. Gard., Cale., Vol. V, pt. 1, p. 5, t. 7.

Sikkim; at elevations of from 3,000 to 6,000 feet, common; Pantling No. 194. Khasia Hills, common ; in flower during September and October.

Specimens from the Khasia Hills are invariably smaller than those from Sikkim. The colour of the flowers is of various tints of green, the lip and column being slightly spotted with dull purple.

Plate 61.-Dendrobium eriaflorum, Griff. A plant, of natural sise. Fig. 1 a flower, 2 side view of bract, stalked ovary, column and lip, 3 lip seen from the front, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.

## 8. Dendrobium denudans, Don Prod. Fl. Nepal. 34.

Stems terete; sub-erect, many-leaved, the lower leaves sometimes early deciduous, length 6 to 10 in . Leaves narrowly oblong, acute or sub-acute, sometimes obliquely notched, not narrowed to the sheathing base; length 2 to 4 in., breadth $\cdot 4$ to 9 in. Racemes leaf-opposed, slender, decurved, longer than the leaves, many-flowered. Flowers $\cdot 5$ to 75 in . long; floral bract minute. Sepals subequal, not wide-spreading, linear, acuminate, falcate. Pctals similar to the sepals, but smaller. Lip much shorter than the sepals, decurved from the base, the lower part sub-quadrate (when spread out) with two long narrow laciniate side lobes; the terminal lobe strongly recurved, serrate, crisped; the dise with an obscurely 3 -lined smooth surface with a triangular apex ending at the terminal lobe. Column rather long, the margin of the clinandrium denticulate; foot of the column long, curved, stout, concave, hispid near its extremity, without nectary. Anther with its lower margin ciliolate. Wall. Cat. 2014 (in part); Lindl. Gen. and Spec. Orchid., 84; in Bot. Reg. 1838, Misc. 156 and 1844, 61 ; in Journ. Linn. Soc. III, 19 ; Hook. fil. Fl. Br. Ind. V, 715.

Sikkim, at elevations of 3,000 to 5,000 feet; Pantling No. 4. A common plant, in flower during September and October. Distributed westward to Kamaon.

The flowers of this are pale green or whitish; the lip has a band of radiating red lines round its crisped or serrate edges, and the foot of the column is red.

Platr 62.-Dendrobium denudans, Don. A plant, of natural sise. Fig. 1 a flower, seen in profile, 2 floral bract, stalked ovary, column and lip, seen in profile, 3 the lip, as seen frcm aoore, 4 column and its foot, 5 an empty anther, 6 pellinia; all enlarged.
9. Dendrobium cumulatum, Lindl. in Gard. Chron. 1855, 756.

Stems erect, thin at the base, thickening upwards to 5 in .; 1 to 2 feet in length. Leaves oblong-lanceolate, acute, length 3 to 4 in., breadth $\cdot 75$ to 1 in. Flowers $1 \cdot 25$ in. long, in small corymbiform racemes; floral bract lanceolate, much shorter than the stalked ovary. Sepals-the dorsal elliptic, sub-acute; the lateral pair similar. Petals obovate, larger than the dorsal sepal. Lip as long as the petals, obovate-spathulate, with a broad erose emarginate apex, the base contracted into a long narrow claw, geniculate near its insertion to the pouched apex of the mentum, and with a horizontal retrose tooth at the bend. Column very short, broad; its foot much produced, narrow, tapering downwards, grooved in the middle and expanded at the lower extremity. Anther set at a right angle to the axis of the column, its lip acute. Bot. Mag. t. 5703 ; Reichb. fil. in Gard. Chron. 1868, 6; Veitch Man. Dendrob. 34 ; Hook. fil. Fl. Br. Ind. V, 731.

Sikkim; in tropical valleys at elevations up to 3,000 feet; in flower in June and July; Pantling No. 276. Bhotan, Lister. Assam. Khasia Hills; Rita. Also in Upper Burmah.

The flowers of this pretty species are pale purple, the lip being white with sometimes a pink patch near the apex and yellowish at the base; the mentum and apex of column are pale purple. A specimen was collected in Sikkim with the flowers pure white, the apex of the spur being pale green.

Plate 63.-Dendrobium cumulatum, Lindl. A plant, of natural sizo. Fig. 1 floral bract, stalked ovary, column and lip, seen from the side, 2 longitudinal section of the base of the lip and of the column, showing the junction of the two and the horizontal tooth on the former, 3 the lower half of the lip, showing the horizontal tooth at its flexure, 4 column and its foot, showing the curved sac at the base of the latter, 5 anther seen from behind, 6 pollinia; all enlarged.

## 10. Dendrobium longicornu, Lindl. in Wall. Cat. 1997.

Stems 6 to 12 in. long, tufted, slender (about $\cdot 2$ in. thick), erect, covered with short coarse black hairs. Leaves scattered, linear-lanceolate, slightly hairy; the apices acute, oblique, not notched; length 1.25 to 2 in ., breadth $\cdot 25$ to $\cdot 35 \mathrm{in}$. Flowers lateral and terminal, 1.75 to 2 in . long, solitary or in 2 - or 3 -flowered racemes; floral bract lanceolate, hairy, concave, much shorter than the slender pedicelled ovary. Sepals ovate-lanceolate, acuminate, keeled (in the living plant). Petals lanceolate to ovatelanceolate, acute or acuminate. Lip (when spread out) broadly triangular, 3-lobed, with a broad ridge running along its centre from the base to the apex, dividing near the apex into 3 or 4 short branches; side lobes rounded, boldly nerved, and with broad erose apices; the terminal lobe small, sub-orbicular, fimbriate. Column short, the foot broad at its base, contracted towards the apex into a funnel-shaped spur nearly as long as the stalked ovary. Lip of anther truncate, fringed; the inner pollinia very narrow. Lind. Gen. and Spec. Orchid., 80; Bot. Reg. t. 1315; vol. for 1844, Misc. 83 ; in Journ. Linn. Soc. III, 16; Walp. Ann. VI, 292; Veitch Man. Dendrob. 56 ; Hook. fil. Fl. Br. Ind. V, 720. D. flexuosum, Griff. Notul. III, 317.

Sikkim; common at elevations of from 4,000 to 8,000 feet; Pantling, No. 15 ; flowering from September to November; eastward along the Himalaya to Nepal, Khasia and Naga Hills.

A species varying somewhat as to the size of its flowers and as to the form of the middle lobe of the lip. A very hirsute form with larger leaves than above described, and with broader sepals and petals, and lip setosely fringed on the central ridge and on the nerves, was described as a distinct species by Griffith (whom Reichenbach filius followed) under the name of $D$. hirsutum (Griff. Notul. III, 318; Ic. Pl. As. t. 305; Reichb. fil. in Gard. Chron. 1884, II, 488). But Lindley reduced this species to a variety (hirsuta) of this, a course followed by Sir Joseph Hooker (Fl. Br. Ind. 1. c.). This species occasionally flowers two years in succession from the same pseudo-bulb. The colour of the sepals and petals is pure white; the lip on the upper surface is pale brown, veined with pale orange and having a central line of that colour.

Plate 64.-Dendrobium longicornu, Lindl. A plant, of natural size. Fig. 1 floral bract, stalked ovary, column, spur-shaped mentum and lip, seen from the side, 2 petals, 3 lip, spread out, 4 column and funnel-shaped mentum (spur), 5 anther, 6 pollinia. Nos, 1 and 2 of natural size, Nos. 3 to 6 enlarged.
11. Dendrobium formosum, Roxb. in Wall. Cat. 1998; Fl. Ind. III, 485.

Stems terete, 9 to 18 in . long and 5 or $\cdot 6 \mathrm{in}$. thick, erect, the sheaths pubescent. Leaves oblong, the apex obliquely sub-acute and notched; length 3 to 5 in., breadth 1 to 1.25 in. Flowers large, white, in short terminal or lateral racemes of three to five, from 3 to 5 in . across; floral bract short, ovate, sheathing. Sepals oblonglanceolate, acute, spreading, keeled. Petals much larger than the sepals, sub-orbicular, cuspidate, the edges undulate. Lip obcuneate or broadly-obovate; the side lobes small and indistinct; the terminal lobe dilated, its apex very broad, slightly emarginate, minutely mucronate, its edges undulate but not fimbriate; dise with two tubercled yellow central ridges. Column rather broad, its edges not winged, its foot short and contracted at the apex into a small sac; the mentum half as long as the dorsal sepal, conical. Anther quadrate; pollinia narrowly oblong. Lindl. Gen. and Spec. Orchid., 81 ; in Wall. Pl. As. Rar. I, 34, t. 39 ; in Bot. Regist. 1838, Misc. No. 86 ; 1839, t. 64 ; in Journ. Linn. Soc. III, 16 ; Paxt. Mag. Bot. VI, p. 49, with fig. ; Fl. des Serres, t. 226 and XVI, t. 1633-4; Williams' Orchid Alb. VII, t. 308 ; Veitch Man. Dendrob. 44, with fig.; Hook. fil. Fl. Br. Ind. V, 721. D. Infundibulum, Reichb. fil. (not of Lindl.) in Regel Garten Flora, XXXVI, t. 1253.

At the base of the Sikkim-Himalaya, common; Pantling No. 271; flowering during May. Distributed westward to Nepal and eastward to the base of the Khasia, Assam and Burmese ranges; Andaman Islands.

The lip in the Sikkim plant is yellow and the rest of the flower pure white; the column is yellowish in its lower half. This is a variable species as regards the size of its flowers, and to a slight extent also as to the coloration of the lip. In his "Flora of British India" Sir Joseph Hooker admits three varieties. The plant here figured appears, as far as we have been able to observe, to be constant in the characters above recorded.

PlatB 65.-Dendrobium formosum, Roxb. Stem in flower, with young one at its base, of natural size. Fig. 1 column with anther in situ, and foot, front riev, 2 vertical section of the preceding, seen from the side, 3 pollinia; all enlarged. 4 dehisced capsule; of natural size.

## 12. Dendrobium crepidatum, Lindl. in Paxt. Fl. Gard. I, 63, fig. 45.

Stems pendulous, striate, green and wiite, thin at the base, thickened upwards, covered when dry with the long thin scarious sheaths of fallen leaves; length 6 to 18 in . Leaves linear-lanceolate, acuminate, 2 to 4 in. long, breadth $\cdot 4$ to $\cdot 6$ in. Fiowers 75 to 1 in . in diam., solitary or two or three on very short bracteate peduncles from the very slightly swollen nodes of the leafless stems; the stalked ovaries divergent, very long, purple. Sepals broadly oblong, subequal, sub-obtuse. Petals broadly ovate, not longer than the sepals. Lip broadly obovate, pubescent, the edges undulate; the apex broad, sometimes retuse; the base narrowed to a short claw with a short transverse ridge in front of it and a small pit behind. Column very short, broad; mentum short, obtuse. Anther very convex. Capsule clavate, 1.75 in . long. Bot. Mag., t. 4993, 5011. Veitch Man. Dendrob. 33; Hook. fil. Fl. Br. Ind. V, 740. D. Lawanum, Lindl. in Journ. Linn. Soc. III, 10 ; Dalz. and Gibs. Bomb. Fl. 261. Dendrochilum ruseum, Dalz. in Hook. Kew Journ. IV (1852). 291.

Sikkim; in tropical valleys ascending to 3,500 feet; Pantling No. 308 ; in flower in April and May. Assam and Khasia Hills; also in Upper Burmah, and in the Concan and Canara in Southern India.

The flowers of this are either pink or white, the lip having a large yellow spot on it. The species as found in Assam and the Khasia Hills has rather handsome flowers, but the form found in Sikkim is unattractive in appearance. It is very interesting, however, as an example of a Dendrobium which is usually, if not invariably, self-fertile. An examination of many flowers by Mr. Pantling showed that the pollinia had left the anther, and that the pollen had begun to disappear in the tissues of the stigma before the bud had fully opened. Fig. 3 shows the condition in a bud just about to open. In a plant brought from the Khasia Hills in February of the present year, and which flowered at Mongpoo during the following April, the flowers were of the usual Assam and Khasia type. They were large, handsome, and remained fully expanded for five days, during which time no change occurred in the column of any of them; but not one of them was self-fertile. The Sikkim plant thus appears to owe its mean appearance to the fact that it is self-fertile, and to represent a stage in the transition to cleistogamy.

Plate 66. - Dendrobium crepidatum, Lindl. A plant, of natural size. Fig. 1 a flower, 2 lip, 3 column and its foot, the anther displaced and showing the absorption of the pollinia in the stigma, 4 anther, 5 pollinia; all enlarged; 6 a leaf, of natural size.

## 13. Dendrobium aduncum, Wall. in Bot. Reg. 1842, Misc. 62, 1846, t. 15.

Stems branching or viviparous, thinner than a goose-quill, pendulous, 1 to 2 feet long. Leaves narrowly lanceolate, acute or acuminate, obliquely and minutely bifid; length 2 to 3 in., breadth 3.5 to $\cdot 75$ in. Flowers 75 to 9 in . long, in short flexuose racemes from the naked stems, the rachis between the flowers zigzagged and with several minute membranous scales; floral bract sheathing, obtuse, much shorter than the stalked ovary. Dorsal sepal ovate, acute; the lateral pair larger, triangular sub-rhomboidal. Petals similar to the dorsal sepal, but broader. Lip shorter than the lateral sepals, adpressed to the column, broadly elliptic, concave, its apex abruptly acuminate, its inner surface pubescent but for a square glistering area near the short decurved claw.

Column very short, pubescent in front inside, with two large rounded crenulate and beaked shoulders pointing forward; the foot long, strongly curved, tapering. Apex of anther rich purple, papillose; its lip smooth, truncate, erose. Bot. Mag. t. 6784 ; Veitch Man. Dendrob. 14 ; Walp. Ann. VI, 295 ; Hook. fil. Fl. Br. Ind. V, 730.

Sikkim; in tropical valleys up to 2,000 feet; Pantling No. 272. Bhotan, Lister. Assam, Khasia Hills and Upper Burmah. In flower during June to August.

The prevailing colour in the flower is pale purple; the anther dark purple.
Platb 67.-Dendrobium aduncum, Wall. A plant, of natural sise. Fig. 1 floral bract, stalked ovary, column and lip, seen from the side, 2 vertical section of the foregoing, 3 lip, 4 column and its foot with the anther in situ, 5 anther, 6 pollinia; all enlarged.

## 14. Dendrobium candidum, Wall. in Lindl. Bot. Reg. 1838, 36; 1844, Misc. 32.

Stems much thinner than a goose-quill, cylindric, 6 to 12 in. long, erect. Leaves narrowly lanceolate, the apex obtuse and obliquely bifid; length 2 to 3 in., breadth 25 to 35 in . Flnwers 1 in . long, white, one to three from a short sheathed peduncle from the leafless stems; sheaths of the peduncle 25 to 35 in . long, hyaline. Sepals broadiy lanceolate, sub-acute or obtuse, subequal. Petals like the sepals, but more acute. Lip as long as the sepals, oblong-lanceolate, the apex suddenly acute; side lobes about the middle short, rounded, incurved, the disc between them with an elongated callus. Column short, the foot very broad and deeply excavated. Mentum broad, rounded, short. Anther large, sub-orbicular, papillose. Paxt. Fl. Gard. I, 63, fig. 41 ; Walp. Ann. VI, 286 ; Hook. fil. Fl. Br. Ind. V, 735 ; in Ann. Roy. Bot. Gard., Calcutta, Vol. V, pt. 1, 12, t. 19. D. spathacerm, Lindl. in Journ. Linn. Soc. III, 15; Hook. fil. Fl. Br. Ind. V, 737,

In the Lachen Valley in Sikkim at an elevation of from 6,000 to 7,000 feet; Hooker; Pantling No. 367 ; also in Western Sikkim, near Pemiongtchi; in flower during May and June. Khasia Hills.

This species closely resembles D. amœnum, Wall., but it has pure white flowers, with only a spot of yellow near the base of the lip. It is a very local and scarce plant. Judging from the descriptions of $D$. spathaceum, Lindl., that species must be identical with $D$. candidum, which as the earlier published name must be kept up. We have therefore reduced $D$. spathaceum here.

Plate 68.-Dondrobium candidum, Lindl. A plant, of natural size. Fig. 1 a bract, stalked ovary, column and lip, seen from the side, the sepals and petals having been removed, 2 lip, 3 vertical section of lip to show the outline of the callus within, 4 column with its foot, 5 anther, 6 pollinia; all enlarged.
15. Dendrobium amgenum, Wall. in Lindl. Gen. and Spec. Orchid., 78, (excl. syn. D. aphyllum).

Stems slender, slightly thickened at the nodes, pendulous, 12 to 30 in . long. Leavcs oblong-lanceolate; the apex acute, oblique; length 2.5 to 4 in ., breadth 35 to $\cdot 7$ in. Flowers 1.5 (rarely 2 in .) across, two or three from very short bracteate peduncles springing from the nodes of leafless stems. Sepals oblong-lanceolate, obtuse or acute. Petals larger, ovate, obtuse or acute. Lip as long as the sepals, oblongobovate (when spread out), clawed at the base; the side lobes broad, rounded, convolute;
the terminal lobe orbicular with undulate edges, puberulous on both surfaces, the dise sub-villous. Column broad at the apex, the foot tapering, flat in its upper part; the nectary large, its upper margin erose and its lower with two calli, the centre occupied by a thickened line. Anther minutely papillose. Lindl. in Bot. Reg. 1844, 49; in Journ. Linn. Soc. III, 12; Bot. Mag., t. 6199; Reichb. fil. in Gard. Chron. 1875, I, 305, figs. 57 , 58 ; 1881, II, 625, fig. 126 ; Veitch Man. Dendrob. 17; Hook. fil. Fl. Br. Ind. V, 738. D. mesochlorum, Lindl. in Bot. Reg. 1847, under t. 36; Paxt. Fl. Gard. Vol. I, 63, fig. 43. D. Egertonice, Lindl. 1. c.; Paxt. Mag. l. e. fig. 44.

Sikkim; in tropical valleys, up to elevations of 4,000 ftet; Pantling No. 267; a common plant; flowering during June. Westward to Gharwal and eastward to Bhotan, Sylhet and Burmah.

One of the most charming of Indian Dendrobes. The flowers smell of violets; the sepals and petals are white tipped with violet, and the lip is white with a purple spot near the apex and a flush of greenish yellow towards the middle; the upper part of the column is green, the lower part of it and the whole of the mentum are violet. Tbis species is pendulous, while D. transparens, its near ally, grows erect.

Plate 69.-Dendrobium amanum, Wall. A plant, of natural size. Fig. 1 bract, stalked ovary and lip, in profie, 2 lip, 3 column and its foot, 4 vertical section of the sac formed by the union of the lip with the produced foot of the column, 5 anther, 6 pollinia; all enlarged.

## 16 Dendrobium transparens, Wall. Cat. 2008-1.

Stems slender, erect, with a narrow thickening at the nodes, 12 to 24 in . long. Leaves linear-lanceolate, the apex acute and oblique; length 3 or 4 in., breadth $\cdot 35$ to $\cdot 5$ in. Flowers 1.5 in . across, in pairs from the leafless stems; floral bract broadly lanceolate, scarious, sometimes $\cdot 5 \mathrm{in}$. long, but always much shorter than the stalked ovary. Sepals subequal, lanceolate, acute. Petals about the length of the sepals, but ovate and with blunter apices. Lip as long as the sepals, broadly elliptic-obovate (when spread out), clawed at the base; the side lobes broad, erose and convolute; the terminal lobe sub-orbicular, undulate; the upper surface pubescent. Column with two horn-like processes at the apex, the foot narrowed and with a small nectar-secreting cavity at its apex. Mentum short, conic, obtuse. Anther puberulous; its lip truncate, entire. Lindl. Gen. and Spec. Orchid., 79 ; in Bot. Regist. 1844, Misc. 62; in Journ. Linn. Soc. III, 12; Bot. Mag. t. 4663 ; Paxt. Fl. Gard. I, 134, t. 27 ; Veitch Man. Dendrob. 81; Hook. fil. Fl. Br. Ind. V, 738. D. Henshalli, Reichb. fil. in Bonplandia, III, 226. Dendrob. Griff. Notul. 198, No. 1135, p. 198.

Sikkim; common at the base of the range, and ascending to elevations of 3,000 feet; Pantling No, 79; in flower during May. Westward to Kamaon and eastwards to Assam and the Khasia Hills; also in the Chittagong Hills.

The petals are white, occasionally suffused with pink; the lip has a large purple patch along its middle, with purple lines towards the base; the column is greenishyellow with a purple patch at its lower end, and the stigma has red lines round it. Although the expression side lobes has been used in describing the convolute part of the lip, there are no distinctly marked side lobes.

Plate 70.-Dindrobium transparens, Wall. A plant and Fig. 5 a capsule, of natural size. Fig. 1 lip, 2 column and its foot, 3 anther, 4 pollinia; all enlargod.

## 17. Dendrobium nobile, Lindl. Gen. and Spec. Orchid., 24.

Stems erect, somewhat compressed, 4 in. thick near the apex, thinner at the base, 12 to 24 in. long. Leaves coriaceous, oblong, the apex sub-obtuse and obliquely notched, slightly narrowed to the base; length 3 to $4 \cdot 5$ in., brealth 75 to $1 \cdot 1$ in. Flowers 2 to 3 in. across, solitary, or two to four in short racemes from the nodes of the leafy or leafless stems; the floral bracts 25 to 35 in. long, loose, scarious. Sepals subequal in length, the dorsal oblong-elliptic, the lateral pair oblong, all obtuse. Petals elliptic, broader than the sepals. Lip broadly ovate-oblong, pubescent, the margins of the lower half incurved, the terminal half cucullate, with recurved spreading margins, the base with a very short claw. Column short, erose just behind the anther, very broad opposite the stigma. Mentum conical, blunt, short. Anther conical, its lip truncate and erose; pollinia elongate, narrow. Lindl. Sert. Orchid., t. 3; in Bot. Reg. 1844, Misc. 48; in Journ. Linn. Soc. III, 12; Paxt. Mag. VII, t. 7; Hartm. Parad. I, t. 11 ; Reichb. fil. in Gard. Chron. XVII, 366; Williams Orch. Alb. t. 214; Veitch Man. Dendrob. 63, with fig, and var. nobilius, 64; Reichenbachia, II, t. 58 (var. Sanderiana); Hook. fil. Fl. Br. Ind. V, 740. D. coerulescens, Wall. in Lindl. Sert. Orchid., t. 18 ; Bot. Reg. 1, c. D. Lindleyana, Griff. Notul. III, 309 (excl. fig.) ; Lindl. in Journ. Linn. Soc. III, 13.

Sikkim; ascending to 5,000 feet; Hooker and many collectors, Pantling No. 362; in flower during April and May. Westward to Nepal and eastward to Bhotan, the Khasia Hills, Assam and Upper Burmah. Distrib. China.

A beautiful species, very common in Sikkim. The flowers vary both in size and shade of colour; but in Sikkim the sepals and petals are always purple, shading off into white at the base. The lip has a central blotch of very deep purple, surrounded by a broad margin of pale yellow or white; the anther is purple and the column green with vertical purple lines in front. Plants have been observed of which the stems elongated annually and produced flowers four years in succession.

Plate 71.-Dendrobium nobile, Lindl. Part of a flowering plant of natural size, and a whole plant much reduced in size. Fig. 1 base of lip to show the short claw, 2 column with its foot and the anther in situ, 3 anther, 4 pollinia; all enlarged.

## 18. Dendrobium Pierardr, Roxb. in Hooker Exotic Flora, t. 9.

Stems slender, pendulous, slightly swollen at the nodes, 2 to 4 feet long, smooth. Leaves sessile, rather thick, lanceolate to ovate-lanceolate, sub-acuminate, caducous, length 2 to 4 in ., breadth 1 to 1.5 in . Flowers 1.25 to 1.75 in . across, solitary or two or three from very short minutely bracteate peduncles springing from the slightly swollen nodes of the leafless stems. Sepals subequal, oblong-lanceolate, sub-acutePetals much broader than the sepals but not longer, elliptic, blunt. Lip sub-orbicular (when spread out), with a very short claw but without side lobes; the edges erose near the base, shortly ciliate on the anterior half, the upper surface pubescent, convolute to form a tube with a wide circular shell-like open mouth. Column and its foot about equal in length; the latter with a transversely elliptic nectary at its extremity. Anther with a curved erose lip. Capsule clavate, cylindric, 2 in . long. Roxb. Fl. Ind.

III, 483; Lindl. Gen. and Spec. Orchid., 79; in Bot. Reg. t. 17.56; Wall. Cat. 2007; Bot. Mag. t. 2584; Wight Ic. t. 908; Lodd. Bot. Cab. t. 750; Veitch Man. Dendrob. 69 ; Hook. fil. Fl. Br. Ind. V, 738.

Sikkim; in tropical valleys as high as 3,000 feet; Pantling No. 70. Assam, Bengal, and southwards to Tenasserim and the Peninsula of India; in flower during April and May.

The prevailing colour of the flower is a beautiful rose or pale purple, and the texture is translucent, the lip being pale yellow with radiating lines of purple at the base. There is some variation in the species; and one form, which is characterised by smaller flowers with shorter ovaries and a lip with a longer tube and a shorter limb, was described as a species by Robert Brown under the name D. cucullatum (Bot. Reg. t. 543). Sir Joseph Hooker (Fl. Br. Ind. V, 739) considers it as merely a variety of D. Pierardi. It is, however, a variety which does not now occur in Sikkim, being found chiefly in the western coast of Southern India.

Plate 72.-Dendrobium Pierardi, Róxb. Part of a plant in flower, of natural size. Fig. 1 a flower, 2 the claw of the lip, 3 the lip, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.

## 19. Dendrobium ramosum, Wall. Cat. 2003.

Stems slender, pendulous, often branched or viviparous, 12 to 24 in. long. Leaves lanceolate, acute or acuminate, 3 to 5 in. long and 65 to 1 in. broad. Flowers $1 \cdot 25$ to 1.5 in . long, leaf-opposed, solitary or in racemes of two; floral bract broadly lanceolate, much shorter than the stalked ovary. Dorsal sepal elliptic, narrowed towards the obtuse apex; lateral sepals much broader, their apices narrowed, blunt. Petals as long as the dorsal sepal, oblong, sub-spathulate, blunt. Lip very concave and much curved from the base, sub-trapezioidly obovate (when spread out), its base slightly auricled; the side lobes large, broad, convolute; the terminal lobe sub-orbicular, bifid, deflexed and crisped; the disc from about the middle with a villous green papillose crest. Column short, stout; the mentum broad and with a short sub-bifid pouch at its extremity. Anther with ar erose lip. D. Ruckeri, Lindl. in Bot. Reg. 1843. Misc. 8, t. 60 ; Reichb. fil. in Walp. Ann. VI, 288; Hook. fil. Fl. Br. Ind. V, 733.

Sikkim; on Sittong, elevation 4,000 to $\tilde{5}, 000$ feet; Pantling No. 117. Bhotan, Lister. Khasia Hills, Rita; in flower during April and May.

The prevailing colour in the flower is primrose yellow. The lip has numerous radiating streaks of brownish-purple, and the mentum externally is often suffused with the same colour. The villous disc on the mid lobe of the lip is green. Wallich's specimens of this are in poor condition, but a careful examination of them and a comparison with specimens of $D$. Ruckeri, Lindl., have convinced us that the two species are identical. We therefore restore the older name of Wallich.

Plate 73.-Dendrobium ramosum, Wall. A plant, of natural size. Fig. 1 a flower, with its stalked ovary and bract, 2 column, mentum and lip, seen from the side, the sepals and petals being removed, 3 posterior part of lip, seen from above, 4 transverse section of the lip, flattened out, 5 column in profile, 6 front of column showing the emarginate saccate terminal pouch, 7 anther, as seen from behind, 8 pollinia; all enlarged.

## 20. Dendrobium heterocarpum, Wall. in Lindl. Gen. and Spec. Orchid., 78.

Stoms erect, as thick as a goose-quill at the base but much thicker ( 5 in .) upwards, ribbed, sheathed, 9 to 18 in . long. Leaves narrowly elliptic-oblong, subacute; length 3 to 5 in., breadth 5 to 1 in. Flowers 2 to 2.5 in. across, solitary, or two or three on a very short peduncle from the leafless stems; floral bract broad, obtuse, convolute, much shorter than the stalked ovary. Sepals subequal, the dorsal linear-oblong, sub-acute; the lateral pair lanceolate. Petals as long as the dorsal sepal, broadly lanceolate. Lip longer than the lateral sepals, trowel-shaped, acute, decurved, the edges undulate, the sides of the base somewhat convolute, the disc papillose-pubescent. Column very short, broad above the foot, tapering, excavated and with a raised line down the centre. Mentum short, conical, obtuse. Anther convex, grooved on the upper surface, its edge erose, the inner pollinia very narrow. Wall. Pl. As. Rar. II, 84, t. 196 ; Lindl. in Bot. Reg. 1844, Misc. 49 ; Bot. Mag., t. 4708 and 4978 (var. Henshallii) ; Fl. des Serres VIII, t. 842; Gard. Chron. 1885, I, 472, fig. 84 B ; Hook. fil. Fl. Br. Ind, V, 737. D. aureum, Lindl. Gen. and Spec. Orchid, 77 ; in Bot. Reg. 1839, t. 20 (var. pallida); Wight Ic., t. 1646 ; Veitch Man. Dendrob. 19 with fig. ; Reichb. fil. in Gard. Chron. 1880, 72 (var. Philippinensis); Reichenbachia II, t. 63. D. rhombeum, Lindl. in Bot. Reg. 1843, t. 17. Dendrobium sp. Griff. Notul. III, 304; Ic. Pl. Asiat., t. 306.

Sikkim; in tropical valleys up to 3,500 feet; in flower during April; Pantling No. 200. The Himalaya westwards to Nepal ; Assam, the Khasia Hills, Upper Burmah; also in the hill ranges of Southern India and in Ceylon. Distribution; Java and the Philippine Islands.

The prevailing colour in the flower is white or pale ochraceous, often tinged with green; the lip being either yellow or white, with a yellow dise and many red or purple radiating lines. The flowers are faintly fragrant.

Plate 74.-Dendrobium heterocarpum, Wall. A plant in flower and one in fruit. Fig. 1 a floral bract flattened out and a leaf, 2 sepals and petals; all of natural size; 3 column and its foot and mentum, showing the vertical rib down the excavated centre of the latter, 4 anther, 5 pollinia, 6 an inner pollnnium; all eniarged.

## 21. Dendrobium clavatum, Wall. Cat. 2004.

Stems somewhat thicker than a swan's quill, scarcely clavate, the leafy stems smooth, the leafless vertically ridged, 18 to 30 in. long. Leaves coriaceous, narrowly oblong, the apex blunt or sub-acute, very slightly notched; length 3.5 to 5 in., breadth .8 to 1.5 in. Inflorescence from the leafless stems of the previous year; the peduncle 2 or 3 in. long, erect, bearing several tubular membranous oblong sheaths; the raceme two or three times as long as the peduncle, horizontal or decurved, bearing from four to six rather distant flowers 2 to 3 in . in diameter. Floral bract membranous, oblong, sub-acute, shorter than the slender pedicelled ovary. Sepals oblong, sub-acute or blunt. Petals broadly ovate, sub-acute. Lip narrowed and convolute in its lower part, the anterior part expanded, concave, orbicular-reniform, its margins subfimbriate near the base, undulate near the apex; the upper surface tomentose. Column and foot both short, the latter with a nectary near the base; mentum short. Lindl. in Paxt. Fl. Gard. II, 104, fig. 189; Bot. Mag., t. 6993 ; Reichb. fil. in Walp. Ann. VI, 293; Hook. fil. Fl. Br. Ind. V, 946.

Sikkim; at Tendong, elevation about 3,000 feet; Pantling; in flower during May and June. Nepal; Wallich. Kamaon; Strachey and Winterbotham. Khasia Hills, elevation 5,000 to 6,000 feet.; G. Mann. Shan Hills in Burmah; King's Collector.

The flowers of this handsome species are of rather a dark yellow, the lip having a large purple blotch near its centre, and its edges being of a paler yellow than the rest of the flower. It bas been collected only once in Sikkim; and in Assam, the Khasia Hills, and Upper Burmah, where it occurs more plentifully than in Sikkim, it is by no means abundant. Specimens were collected many years ago in Nepal by Wallich, and in Kamaon by Strachey and Winterbotham; but of late years it does not appear to have been found in the Western Himalaya.

Plate 60.-Dendrobium clavatum, Wall. A plant; of natural sise. Fig 1 part of upper surface of lip to show the papillæ, 2 column with the anther in situ, 3 anther, 4 pollinia; all enlarged.

## 22. Dendrobium stuposum, Lindl. in Bot. Reg. 1838, Misc. 52, and 1844, 52.

Stems tufted, not branched but often viviparous, about 25 in. thick near the apex, thinner near the base, sulcate, 6 to 10 in . long. Leaves narrowly oblong, subobtuse, slightly notched, $2 \cdot 25$ to 3 in . long. Flowers $\cdot 65 \mathrm{in}$. across, white, in small fewflowered short racemes from the nodes of the leafless stems; peduncles slender with scattered green sheaths ; floral bract linear-oblong, obtuse. Sepals ovate, the dorsal acute and shorter than the keeled acuminate-aristate lateral pair. Petals oblong-obovate, shortly clawed; the apex blunt, slightly apiculate, ciliolate-erose. Lip oblong-obovate, not clawed; the side lobes long, shallow, with truncate ciliate-erose apices; the terminal lobe ovate-orbicular, its upper surface covered with gland-tipped hairs and with a dirty yellow blotch in the middle. Column broad, the foot with an elongated vertical nectary contracted near the middle; the stigma with a small gland on each upper corner; mentum short, wide, obtuse. Anther with a small quadrate lip. Hook. fil. Fl. Br. Ind. VI, 186 ; in Ann. Bot. Gard. Calc., V, pt. 1, 13, t. 20. D. sphegidoglossum, Reichb. fil. in Bonplandia, II, 58 ; Hook. fil. Fl. Br. Ind. V, 737.

Sikkim ; in the valley of the Teesta at an elevation of 1,200 feet; Pantling No. 84 ; in flower in June; only once collected. Khasia Hills and Tenasserim.

The flowers are white with a blotch of dull yellow on the lip, and the mentum is suffused with green.

Plate 75.--Dendrobium stuposum, Lindl. A plant, of natural size. Fig. 1 a peduncle with its bracts, the floral bract, stalked ovary and flower, seen from the side, 2 flower, front viev, 3 lip, seen in profile, the sepals and petals removed, 4 longitudinal section of the lip, 5 column with its foot, the anther in situ, 6 anther seen from the back, 7 pollinia; all enlarged.
23. Dendrobium pauciflorum, King and Pantling in Journ. As. Soc. Beng. LXIV, pt. 2, 332.
Stems 2 to 3 feet long, as thick as a goose-quill, branching, tapering toward each extremity, pendulous, smooth when young but slightly grooved when old. Leaves linearlanceolate, obliquely and minutely emarginate at the apex, 3 to 4 in . long and 5 to $\cdot 75 \mathrm{in}$. broad. Racemes from the leafless stems, lateral, about 5 in . long, 1- to 4 -flowered, the peduncles very slender; floral bract ovate, blunt, $\cdot 1$ in. long. Flowers $\cdot 75$ in. long.

Lateral sepals ovate, not wide-spreading; the dorsal narrower, blunt. Petals ovatelanceolate, ciliolate. Lip shorter than the lateral sepals, oblong, clawed; side lobes narrow, directed forwards, fringed, the disc between them much thickened and bearing on its surface three raised lines; terminal lobe flat, hispid, with no central thickening or lines. Column short, broad; its foot longer, and with a large nectary having its upper margin deeply bifid.

Sikkim ; above Engo, at an elevation of about 4,000 feet ; Pantling No. 172 ; in flower in June ; also in the Teesta Valley at an elevation of 2,000 feet.

The flowers are of a golden yellow colour, the sepals and petals being broadly margined with purple. The apical lobe of the lip is spotted with red. Its nearest ally is probably $D$. stuposum, Lindl., which has, however, white flowers with no ridge on the disc and with a different column.

Plate 76.-Dendrobium pauciflorum, King and Pantling. Pieces of a plant, of natural size. Fig. 1 a flower, seen from the side, 2 lip, 3 section of lip beow the basal lobes, 4 floral bract, stalked ovary, column and its foot, seen from the side, 5 column with anther in situ and mentum, 6 anther, seen from the side, 7 pollinia; all enlarged.

## 24. Dendrobium chrysanthum, Wall. Cat. 2012.

Stems dark-green, except where covered by the scarious white-lined tubular sheaths, pendulous, 2 to 3 feet long, about half an inch thick near the middle, thinner at the base and apex. Leaves caducous, lanceolate, acuminate, the base rounded, sheathing; length 3 to 6.5 in., breadth 1 to 1.5 in. Flowers rather fleshy, 1.35 to 1.75 in . in diameter, in fascicles of 2 to 4 from very short bracteolate peduncles from either leafy or leafless stems. Sepals subequal, broadly ovate, fleshy, keeled, concave, obtuse, the lateral pair slightly falcate. Petals ovate-orbicular, concave, entire or minutely erose, slightly longer than the sepals. Lip transversely orbicular-oblong or reniform (when flattened out), concave, tomentose towards the sub-fimbriate margin, abruptly clawed at the base. Column broad, concave, the foot with a transverse ridge towards the lower end, and below it a large nectary; the stigma emarginate at the lower edge. Mentum short, wide, blunt. Anther 3 -ridged on the anterior surface, pollinia oblong. Capsule sub-ovoid or pyriform, grooved, 1.5 to 2 in . long. Lindl. Gen. and Spec. Orchid., 80; in Journ. Linn. Soc. III, 8; in Bot. Reg., t. 1299; Garten-flora, t. 446 ; Veitch Man. Dendrob. 28; Hook. fil. Fl. Br. Ind. V, 747. D. Paxtoni, Lindl. in Bot. Reg. 1839 (Misc. 56) ; Fl. des Serres, VII, t. 725.

Sikkim; common at elevations from 3,000 to 6,000 feet. Pantling No. 10. Westward to Nepal and eastwards to Bhotan and the Khasia Hills; also in Burmah; flowering from July to October.

The flowers are yellow, the lip having two dark sub-orbicular spots of brownishpurple.

Plate 77.-Dendrobium chrysanthum, Wall. Part of a flowering stem, of natural size. Fig. 6 capsule, of natural size; 1 lip, 2 a piece of the lip to show the villous upper surface, 3 column and its foot, with the anther in situ, 4 anther, 5 pollinia; all enlarged.
25. Dendrobium sulcatum, Lindl. in Bot. Reg. 1838, t. 65.

Stems tufted, stout, compressed-clavate, from $\cdot 4$ to 6 in . broad in the upper part, thin towards the base, sulcate, erect, 6 to 12 in . long. Leaves coriaceous, stiongly
nerved, elliptic-ovate, acute, slightly narrowed to the base, sub-terminal; length 4 to 7 in., breadth $1 \cdot 35$ to 2 in. Racemes from the upper nodes either of the leafy or leafless stems, pendulous, 8 - to 10 -flowered, crowded, 3 or 4 in . long. Flowers $\cdot 75$ to 1 in. in diameter; floral bract minute. Sepals oblong, sub-acute. Petals broader, concave, obtuse. Lip sub-orbicular (when spread out) with a cuneate base and a short claw, concave, the apex irregularly and minutely lobed or sub-entire and emarginate, its upper surface smooth in the middle, with some radiating deeply-coloured striæ near the base, the anterior part with a broad pubescent belt round the edge. Column short and broad, with a transverse concavity near its lower end. Mentum very short, blunt. Anther conical; pollinia narrow, elongate. Bot. Mag., t. 6962; Veitch Man. Dendrob. 76; Rolfe in Gard. Chron. 1887, I, 607; Hook. fil. Fl. Br. Ind. V, 749.

Sikkim; common in tropical valleys; Pantling No. 138; in flower during April and May. Khasia Hills, Assam.

The sepals and petals are of rather a dingy yellow, with lines of a darker shade. The lip is orange-yellow with two patches of brown nerves near the base. All the colours are dingy and the flowers are not attractive.

Plate 78.-Dendrobium sulcatum, Lindl. A plant, of natural size. Fig. 1 a flower, 2 lip, 3 column and its foot, the anther in situ, 4 the anther, seen from the side, 5 pollinia; all enlarged.

## 26. Dendrobium densiflorum, Wall. Cat. 2000.

Stcms clavate, terete or obscurely 4 -angled, erect, slightly swollen at the nodes, 12 to 18 in . long. Leaves coriaceous, oblong-lanceolate to ovate-lanceolate, collected near the apex of the stem, acute, slightly narrowed to the base; length 4 to 6 in., breadth 1 to 2 in . Racemes 6 to 10 in . long, pendulous, with many densely crowded flowers; the peduncle stout, short, with large sheathing bracts at its base. Flowers membranous in texture, 1 to $1 \cdot 5$ in. across ; floral bract very large, oblong, nerved, membranous, covering the bud, revolute. Sepals ovate-elliptic, obtuse, concave. Petals broader than the sepals, ovate-orbicular, the edge slightly erose. Lip orbicular-rhomboid, convolute in its basal half, the apical half spreading, the whole of the upper surface pubescent, the edges slightly revolute and shortly fimbriate, the base abruptly narrowed to a short straight claw. Column broad, with a concavity at its base. Mentum large, sub-globose. Anther conical; pollinia elongate. Capsule fusiform, 1.75 to 2.25 in. long. Lindl. in Wall. Pl. As. Rar. I, 34, t. 40 ; Gen. and Spec. Orch., 90 ; Bot. Reg. t. 1828 ; in Journ. Linn. Soc. III, 7; Paxt. Mag. Bot. V, t. 121; Bot. Mag., t. 3418; Hook. fil. Fl. Br. Ind. V, 748; Fl. des Serres, t. 1397; Veitch Mar. Dendrob., 80, with fig. D. thyrsiflorum, Reichb. fil. in Ill. Hortic. XXII, t. 207; Veitch Man. Dendrob. 80, with fig.; Gard. Chron. 1877, I, 6533, fig. 10j. Epidendrum Dumsattei, Herb. Herm. (fide Hooker).

Sikkim; common in tropical valleys, ascending to 4,000 feet; Pantling No. 119 ; in flower during April and May. Westward to Nepal and eastward to the Khasia Hills; also in the hill ranges of Burmah.

The sepals and petals of this beautiful species, as it occurs in Sikkim, are invariably of a pale yellow, the lip being of a rich orange-yellow colour, paler towards the margins. The unexpanded racomes have a curious cone-like appearance, which
occurs in no other Dendrobium. This is caused by the flower-buds being completely enveloped in and concealed by the large imbricate delicate yellow floral bracts. There is considerable variation in other provinces in the size of the flowers and in their colouring; and this has given origin to several varietal names, such as albo-lutea, Schroederi and Walkeriana. The most notable variety is the one which was separated as a species by Reichenbach under the name D. thyrsiflorum. The structure of the flowers in that form is, however, exactly that of typical $\mathcal{D}$. densiforum; but the sepals, instead of being pale yellow, are white suffused with pale lilac, the lip being yellow as usual. D. thyrsiflorum has also more slender stems, and the floral bracts are much narrower than in typical $D$. densiflorum.

Plate 79.-Dendrobium densiflorum, Wall. Flowering plant, of natural size. Fig. 1 base of the lip showing the claw, 2 column and its foot, the anther in situ, 3 a pieoe of the anterior margin of the lip, 4 anther, seen from the side, 5 pollinia; ail enlarged.

## 27. Dendrobium Farmeri, Paxt. Mag. Bot. XV (with fig.); Fl. Gard. III, p. 104 , No. 579.

Stems clavate, boldly 4-5-angled, erect; the base slender, the upper part from -75 to 1 in . in diameter; length 6 to 12 or even 18 in . Leaves two or three, sub-terminal, coriaceous, ovate-lanceolate or elliptic-lanceolate, acute, the base slightly narrowed; length 3.5 to 8 in ., breadth 1.2 to 2.2 in . Raceme sub-terminal, decurved and pendulous, much longer than the leaves, laxly many-flowered; the peduncle with imbricate bracts at the base and several scattered below the flowers. Flowers 2 in. across; floral bract broad, $\cdot 25$ to $\cdot 3 \mathrm{in}$. long, very much shorter than the stalk of the ovary. Sepals ovateoblong. Petals much broader than the sepals. Lip orbicular with lateral inflexed folds, pubescent, the margin erose, the base shortly clawed. Column short, its foot also short; mentum short, rounded. Walp. Ann. VI, 306; Flores des Serres, VII, t. 741; Jennings' Orchids, t. XXIV; Veitch Man. Dendrob. 42, with fig.; Hook. fil. Fl. Br. Ind. V, 750. D. palpebrae, Ann. Bot. Gard. Calc., Vol. V, pt. 1, t. 22. D. densiflorum, var. alöa, Regel Garten-flora, t. 595; var. Farmeri, Regel, Garten-flora, t. 785; var. albo-lutea, Bot. Mag., t. 5780. D. thyrsiforum, Regel, Garten-flora, t. 1021.

Sikkim; at elevations of from 1,000 to 3,000 feet, Pantling No. 116 ; in flower during April and May. Also along the base of the outer range, on sál trees. Westward to Nepal and eastwards to Assam and the Khasia Hills; also in Burmah.

In Sikkim the colouring of the flowers in this species is pretty constant. The sepals and petals when they first expand are of a pale mauve which gradually changes, in the course of a few days, to pure white. The lip is always of a deep rich yellow, paling towards the margins, and the actual margin is usually white. To this change of colour in the same individual flower is no doubt due much of the confusion which has occurred as regards the identity of this plant; individuals in the stage in which the sepals and petals are white having been mistaken for D. thyrsiflorum, Reichb. fil.a Burmese plant which appears to be a form of $D$. iensiflorum, of which it has the cone-shaped raceme (while in bud), and the very large convolute floral bracts, but differing in having more slender, less boldly-angled, stems, and a white perianth with a yellow lip. D. Farmeri has also been confused with the closely allied D. palpebrae, Lindl. (also a Burmese species), described in Paxt. Fl. Gard. I, 48, and in Veitch Man-

Dendrob. 67. True D. palpebrae is a smaller plant than D. Farmeri, with thinner less clavate stems. In it the lip is trowel-shaped and there is an elongated callus, 2-lobed and ciliate at the base, which runs along the centre of the lower half of the lip; the sides of the lip are also much ciliate (hence the specific name); the petals are slightly narrower and more acute than those of $D$. Farmeri. The colour of the sepals and petals of $D$. palpebrae is white, and that of the lip yellow.

There is, however, a form of D. Farmeri in Burma in which the sepals and petals, as well as the lip, are always yellow, and which was considered on its first discovery to be closely allied to $U$. chrysotoxum. To this the varietal name aureo-flava has been given. There is also in Burmah a form with smaller flowers than those of typical D. Farmeri, and to this Regel has given the varietal name parvifora. The synonymy of these stands thus:-

Var. parviflora, Regel, Garten-flora XXIII, 67; D. Farmeri, Bot. Mag., t. 4659; flowers smaller than in the type; originally sent to England by Dr. MeLelland from the Bot. Gard., Calcutta, and almost certainly a native of Burmah.

Var. aureo-flava, Hook. fil. Bot. Mag., t. 5451; whole flower yellow; from Burmah.
Plate 80.-Dendrobium Farmeri, Paxt. A flowering plant. Fig. 1 petals, of natural size, 2 lip, 3 base of lip, 4 column and foot with anther, 5 pollinia; all enlarged.
28. Dendrobium Gibsonif, Lindl. in Paxt. Mag. Bot. V, 169.

Stems as thick as a swan's quill at the base, tapering upwards, slightly thickened at the nodes, vertically ribbed, 2 to 3 feet long. Lewves ovate-lanceolate, shortly acuminate, the base rounded; length 4 to 6 in ., breadth 1 to nearly 2 in. Racemes from opposite the bases of fallen leaves, pendulous, 6 to 8 in . long, lax, 6 - to 14 -flowered, with a few tubular sheaths at the base. Flowers 1.25 to 1.5 in. across; floral bract tubular, short. Sepals subequal, broadly ovate, blunt. Petals like the sepals, but slightly broader. Lip orbicular-reniform, the apex very broad, the margins sub-fimbriate, the upper surface papillose; the base narrowed to a short claw, entire. Column short, broad, its foot about equal to it in length; nectary large, with two globose calli on its extreme margin. Walp. Ann. VI, 293; Veitch Man. Dendrob. 47; Hook, fil. Fl. Br. Ind. V, 746. D. fuscatum, Lindl. in Journ. Linn. Soc. III, 8; Bot. Mag., t. 6226; Paxt. Fl. Garden, Vol. II, 406 (fig. 204).

Sikkim; at elevations of from 2,000 to 5,000 feet; not uncommon; Hooker and other collectors; Pantling No. 334 ; flowering during July and August. Assam, Khasia Hills, Burmah.

The flowers of this are of a dull dusky yellow, the lip having two round brownishpurple spots.

Plate 81.-Dendrobium Gibsonii, Lindl. Parts of leafy and flowering stems, of natural sise. Fig. 1 base of the lip, showing the claw, 2 a piece of the edge and upper surface of the lip, 3 column and its foot, the anther in situ, 4 anther, seen from the side, 5 pollinia; all enlarged.
29. Dendrobium fimbriatum, Hook. Exot. Flora, t. 71, var. oculata, Hook. Bot. Mag., t. 4160.
Stems thickest at the base and tapering upwards, sub-erect, sulcate, slightly thickened at the nodes, $2 \cdot 5$ to 5 feet long. Leaves oblong-lanceolate, acuminate, 3.5 to 6
in. long, narrowed to the base; length 3.5 to 5 in., breadth 6 to $1 \cdot 1$ in. Racemes usually on the leafy stems, lateral, pendulous, 7 - to 12 -flowered, 6 to 8 in , long; the peduncle with several sheathing bracts at the base. Flowers 2 to 3 in. across, yellow; floral bract minute. Sepals broadly oblong, blunt, entire. Petals broader than the sepals, the apices slightly emarginate, erose. Lip orbicular, undulate, fringed, the base shortly clawed. Column and its foot short, broad, the former with a sub-orbicular nectary near its lower end. Anther obliquely and bluntly conical; poliinix compressed. Wall. Cat. 2011; Lindl. Gen. and Spec. Orchid., 83 (not 76); Paxt. Mag. II, 172 ; Paxt. Fl. Gard. III, t. 84; Veitch Man. Dendrob. 42, with fig.; Warner Select Orchids, Ser. 2, t. 19; Walp. Ann. VI, 293; Hook. fil. Fl. Br. Ind. V, 745. Dendrob. sp. Griff. Notul. III, 113.

Sikkim; in tropical valleys ascending to 4,500 feet; common; Pantling No. 360. Westward to Kamaon and eastward to Bhotan, the Assam and Khasia Hills, and to Chittagong and Upper Burmah; also in Perak. In flower from March to May.

The flowers are of a brilliant yellow colour, and in this variety (oculata) there is a large orbicular patch of rich reddish-brown on the lip. The flower in the typical form has no such spot and must be therefore much less handsome. It does not occur in Sikkim. We have never seen a specimen of it living or dead, and are inclined to doubt its occurrence in the Eastern Himalaya.

Plate 82.-Dendrobium fimbriatum, Lindl., var. oculata, Hook. A raceme and part of a stem, of natural size; an entire plant, much reduced in size. Fig. 1 base of the lip showing the short claw, 2 a portion of the edge of the lip showing the fimbriation, 3 column and its foot, the anther in situ, 4 anther, seen from the side, 5 pollinia; all enlarged.

## 30. Dendrobium Hookerianum, Lindl. in Journ. Linn. Soc. III, 8.

Stems about as thick as a quill between the nodes, but much thicker at the nodes, 6 to 8 feet. long, pendulous. Leaves oblong-lanceolate, the apex acute, slightly narrowed to the stem-clasping base; length 3 to 4 in., breadth 85 to $1 \cdot 15 \mathrm{in}$. Racemes from the leafy stem, 4 to 6 in. long and 2 - to 4 -flowered, pendulous. Flowers 3 to 4 in. in diameter ; floral bract very short. Sepals subequal, elliptic-oblong, subacute. Petals broader, denticulate. Lip orbicular, the margin deeply fringed, the base slightly cuneate. Column short and broad; the nectary at its lower end with two small calli below it. Mentum short, broad, rounded. Anther conical, 3-lobed. Bot. Mag. 6013 ; Reichb. fil. in Gard. Chron. 1857, 616 ; Veitch Man. Dendrob. 49 ; Hook. fil. Fl. Br. Ind. V, 745. D. chrysotis, Reichb. fil. in Gard. Chron. 1870, 1311 ; Ill. Hortic. 1873 , t. 155 ; Warner Sel. Orchid. Ser. 3, t. 6.

Sikkim; at elevations of from 4,000 to 6,000 feet; Pantling No. 296 ; flowering in September. Assam and Khasia Hills.

The flowers are of a rich golden-yellow, the lip having two oblique oval patches of dark purple on its disc. A variety without blotches on the lip is not uncommon.

Plate 83.-Dendrobium Hookerianum, Lindl. Part of stem with leaves and raceme, of natural size. Fig. 1 column and its foot and the anther, 2 a piece of the lip to show the fringing of its edge, 3 anther, as seen from the side, 4 pollinia; all enlarged.

## 31. Dendrobium moschatum, Wall. in Don Prod. (1825), 34.

Stems tufted, stout, terete, striate, ${ }^{5} \mathrm{in}$. thick about the middle, and 3 to 6 feet long, erect. Leaves oblong, ovate-oblong or lanceolate, acute or minutely and obliquely notched, slightly narrowed to the base ; length 3 to 6 in., breadth $1 \cdot 25$ to 2 in . Racemes one or two from a node very near the apex of a leafless or leafy stem, 9 to 15 in . long, deflexed, laxly 8- to 16 -flowered ; base of the peduncle stout and covered with many sheathing imbricate bracts. Flowers 2 to 3 in. across; floral bract lanceolate. Sepals subequal, oblong-elliptic, sheathing, often 2 in . long, obtuse. Petals larger than the sepals, broadly ovate, obtuse. Lip shorter than the petals, forming a sub-globular or pyriform open-mouthed pouch, the margins incurved, the outer surface and the edges pubescent. Column short, broad, its foot widening downwards; nectary transversely oblong. Anther with an erose lip. Capsul: fusiform, 2 in. long. Wall. Pl. As. Rar. II, 83, t. 195; Lindl. Gen. and Spec. Orehid., 82 ; in Bot. Reg. 1844, Misc. 37 ; in Journ. Linn. Soc. III, 8 ; Bot. Mag. t. 3337 ; Paxt. Mag. II, t. 241 (exel. syn. clavatum); Veitch Man. Dendrob. 61; Warner Orch. Alb., t. 165 ( (var. cuprex) ; Walp. Ann. VI, 296. D. calceoluria, Carey in Hook. Exot. Flora, t. 184; Lindl. Gen. and Spec. Orchid., 83; Hook. fil. Fl. Br. Ind. V, 744. D. cupreum, Herb. in Bot. Keg., t. 1779. Epidendrum moschatum, Ham. in Syme's Embassy to Ava, ed. 1 ( 1800 ), p. 478, with fig.; ed. 2, vol. III, 315, with fig.

Sikkim; in tropical valleys ascending to 4,000 fest; Pantling No. 370. Westward to Kamaon and eastward to Bhotan, Assam and the Khasia Hills; also in Chittagong and Tenasserim; flowering from May to July.

The coloration of the flowers of this species is variable; but as a rule, in the Sikkim specimens, the sepals and petals are ochraceous with reddish tips and with reddish or orange veins. The lip is also ochraceous, but has two large brownish-purple spots inside its cup. The column is yellow and the anther purple. The odour is sweetish with a soupcon of rhubarb or musk. In other provinces the ochraceous colour in the flowers is replaced by white or by golden yellow, and the lip is not blotched with purple. The earliest name of this is undoubtedly Epipendrum moschatum, and it was published in the year 1800 in the first edition of Syme's Embassy to Ava. The name was repeated in the much later second edition of the same work. Wallich's name, Dendrobium moschatum, dates from 1825; whereas Carey's name, D. calceolaria, was not published until 1827.

Plate 84.-Dendrobium moschatum, Wall. Raceme of flowers and leaf with part of stem, of natural sise. An entire plant, much reduced in size. Fig. 1 column with its foot and anther in situ, 2 anther, inside viev, 3 pollinia; all enlarged.

## 32. Dendrobium $\Delta$ grregatum, Ruxb. Fl. Ind. III, 477, var. Jenkinsii, K. and P.

Pseudo-bulbs fusiform or oblong-compressed, 1 to $1 \cdot 5$ or 2 in . long, angled. Leaf coriaceous, solitary from the apex of the pseudo-bulb, oblong, obtuse and notched at the apex, narrowed at the base to a short petiole; length 75 to 2.5 in., breadth 4 to $\cdot 6$ in, Flowers in a 2 -to 3 - to many-flowered drooping raceme from the axil of a small scale, from 1 to 1.25 in , across, the stalked ovaries longer than the leaves. Sepals small,
ovate, obtuse, spreading, subequal. Petals much broader than the sepals, ovate with a cuneate base. Lip much larger than the sepals and petals, tranversely oblong from a contracted shortly-clawed sub-convolute base; the apex very broad, emarginate, entire, shortly and irregularly ciliolate; the disc concave, pubescent. Column broad, Anther 4 -ridged on the summit; the nectary at the end of the foot oblong; the lower edge of the stigma emarginate and the upper with two small globose calli at its corners. Capsule fusiform, 3 or 4 in. long. Lindl. in Wall. Cat. 7411A.; in Bot. Reg., t. 1695; Bot. Mag., t. 3643 ; Paxt. Mag. Bot. VI, t. 145 ; Walp. Ann. VI, 306 ; Veitch Man. Dendrob. 15 ; Hook. fil. Fl. Br. Ind. V, 750. D. Lindleyi, Steudel Nomenc. I, 490. D. Jenkinsii, Wall. in Bot. Reg. 1839, t. 37; Warner Sel. Orch. II, t. 23; Veitch Man. Dend, l. c. 50 ; Walp. Ann. VI, 307.

Common along the base of the Sikkim-Himalaya; Pantling No. 262 ; flowering from March to May. Assam, Chittagong, Burma and Perak; at the base of hill ranges, Distrib. Southern China.

The flowers of typical D. aggregatum on first expansion are primrose yellow; but the colour deepens into orange, the lip having a dark patch near its base. The specific name $D$. Jenkinsii was given by Wallich to the form in which the pseudo-bulbs are very short and the flowers are either solitary or in a 2 -flowered raceme. This form has, however, been repeatedly found growing in the same clumps with plants having pseudobulbs of the ordinary length, and such as are found in typical D. aggregatum. We retain it as a variets, although it hardly deserves even varietal rank.

Plate 85.-Dendrobium aggregatum, Roxb., var. Jenkinsii, K. and P. A plant, of natural size. Fig. 1 a flower with its stalked ovary and basal bract, 2 the base of the lip, 3 part of the margin of the lip to show the irregular ciliæ, 4 column and its foot, the anther in situ, 5 anther, 6 pollinia; all enlarged.

## 33. Dendrobium Macraei, Lindl. Gen, and Spec. Orchid., 75 ; in Journ. Linn. Soc. III, 6.

Rhizome creeping, annulate, emitting pendulous polished stems 2 or 3 feet long and about $\cdot 25$ in. thick, bearing at irregular intervals narrowly fusiform, somewhat compressed, shining pseudo-bulbs 2 to 2.5 in . long. Leaf terminal, sessile, solitary, linear-oblong, sub-acute, 4 to 8 in . long and 75 to 1 in . in breadth. Flowers one or two from near the base of a leaf, 75 to 1 in . across; bracts at the base of the pedicel about two; floral bract proper, minute, much shorter than the stalked ovary. Sepals elliptic-oblong, subacute, spreading. Petals narrower than the sepals. Lip in general outline oblong-obovate, decurved about the middle, concave; the side lobes oblong with truncate erose apices, the dise between them with two fleshy sinuous crests; middle lobe contracted and coarsely erose-crisped at its base, its terminal part expanded and the edges much plicate. Column short, spotted, its foot short; mentum short, broad, conical; lip of anther minutely denticulate ; pollinia narrowly oblong. Thwaites' Enum. Pl. Cey. 297; Dalz. and Gibs. Fl. Bomb., 260; Hook. fil. Fl. Br. Ind. V, 714. D. fimbriatum, Lindl. Gen. and Spec. Orch., 76 (not of Hooker). D. plicatile, Lindl. in Bot. Reg. 1840, Misc. $10 . D$. nonosum, Dalz. in Hook. Journ. Bot. IV (1852), 292. D. Rabani, Lindl. in Journ. Linn. Soc. Lond. III, 7. D. pardalinum, Reichb. fil. in Gard. Chron. 1885, II, 230. D. Flabellum, Reichb. fil. in Bonplandia, 1857, 56; Xenia Orchidacea, II, t. 118. Desmotrichum fimbriatum, Blume Bijdr. 329.

Sikkim; common in tropical valleys; in flower during May; Pantling No. 266. Khasia Hills, Upper Burmah, Java; the Nilgiri Hills and Western Ghâts in Southern India; also in Ceylon.

The difficulty of understanding the structure of the lip from an examination of dried specimens no doubt in part accounts for the number of names which have been given to this species. The foregoing synonymy has, with the exception of D. plicatiie, been taken verbatim from Sir Joseph Hooker's "Flora of British India"; and for the latter synonym we are also indebted to Sir Joseph. The flowers of this are white, the side lobes of the lip and the column being pink with purple spots; the apex of the lip is pale green.

Plate 86.-Dendrobium Macraei, Lindl. Part of a plant, of natural size. Fig. 1 flower, front vien, 2 bract, stalked ovary, column and lip, seen from the side; 3 lip, upper surface, 4 column and its foot and the anther in situ, 5 anther, 6 pollinia; all enlarged.

## 34. Dendrobium rotundatum, Benth. in Benth. and Hook. fil. Gen.

 Plantar., III, 499.Rhizome pendulous, woody, ${ }^{-2}$ in. thick, sheathed, bearing narrowly ellipsoid or ovoid pseudo-bulbs 3 or 4 in . apart, 1 to 15 in . long, each partly covered by scarious sheaths. Leaves two, elliptic-oblong, sessile or shortly petioled, notehed at the apex; length 2.5 to 4 in ., breadth 1 to $1 \cdot 25 \mathrm{in}$. Flowers $1 \cdot 5 \mathrm{in}$. across ; floral bracts membranous, often nearly as long as the stalked ovary. Sepals, ovate-lanceolate, spreading; the lateral pair falcate, rather fleshy. Petals somewhat smaller than the sepals, Lip obovateoblong in general outline, sessile; the side lobes rounded, the dise between them with three unequal lamellæ; the anterior lobe sub-reniform, its edges thin and undulate, its upper surface with a large triangular fleshy thickening. Column wide at the lower end, broadly winged. Sarcopodium rotundatum, Lindl. Fol. Orchid., Sarcopodium, 2; Hook. fil. Fl. Br. Ind. V, 712. Bolbophyllum rotundatum, Reichb. fil. in Walp. Ann. VI, 244.

Sikkim; at elevations of from 6,000 to 7,000 feet ; Griffith, Hooker, Lister, Gamble and others; Pantling No. 69. Naga Hills, Prain ; in flower during April.

The flowers are of a pale chestnut brown. The rhizomes are pendent. Its nearest ally is D. fuscescens, Lindl., from which this differs in having broader leaves and much shorter pedicellate ovaries, broader petals, and a lip with a smaller anterior lobe.

Plate 87.-Dendrobium ratundatum, Benth. Terminal part of a plant, of natural size. Fig. 1 a flower with its stalked ovary and floral bract, of natural sise, 2 column and lip, seen from the side, 3 lip showing the lamellæ on its basal part and the triangular thickened area on its anterior lobe, seen from above, 4 transverse section of the lip near the base, showing the three lamellæ, 5 column showing the winged edges, 6 anther, 7 pollinia; all enlarged.

## 35. Dendrobiem fuscescens, Griff. Notul. III, 308 ; Ic. Pl. Asiat., t. 309.

Rhizome $\cdot 125 \mathrm{in}$. thick, branching, bearing several inches apart narrowly ovoid pseudobulbs 1 in . long, each clothed with several tightly-fitting sheaths. Leaves two, narrowly oblong-lanceolate, tapering to each end, sessile or sub-sessile, notched at the apex,
1.75 to 4 in . long and 5 to 75 in . broad. Flowers about 1.5 in. across, purplishbrown; bracts at the base of the long-pedicelled ovary ovate-lanceolate, scarious, imbricate, varying in size. Sepals ovate-lanceolate, acuminate. Petals much narrower than the sepals, but about equal in length. Lip obovate-oblong, sessile, the basal lobes oblong, sub-falcate, obtuse, the disc between them with three parallel lamellæ; anterior lobe orbicular-ovate, entire or slightly undulate at the apex, its upper surface with a broad central smooth slightly thickened line and branching lateral nerves. Column narrow, wingless ; the foot very long, blunt. Hook. fil. Fl. Br. Ind. V, 712. Sarcopodium fuscescens, Lindl. in Paxt. Fl. Gard. I, 155 ; Fol. Orchid., Sarcopodium 2. Bolbophyllum fuscescens, Reichb. fil. in Walp. Ann. VI, 244.

Sikkim-Himalaya; at elevations of 5,000 to 7,000 feet; Clarke, G. Gammie, Pantling No. 11 ; in flower in October. Khasia Hills; Griffith, Hooker, Clarke, Mann. Naga Hills ; Prain.

This species has smaller flowers than the last. The sepals and petals are of a dull greyish-brown colour, the lip paler and with a small central patch of yellow, the foot of the column being deep purple.

Plate 88.-Dendrobium fuscescens, Griff. Part of a plant, of natural size; Fig. 1 floral bract, stalked ovary, column and lip, seen from the side, 2 lip, 3 column and its foot, 4 view of inside of an empty anther, 5 pollinia; all enlarged.
36. Dendrobium amplum, Lindl. in Wall. Cat. 2001; Gen. and Spec. Orchid., 74.

Rhizome pendulous, $\cdot 25$ in. thick, wooly, sheathed, bearing at distances of four or five inches ellipsoidal or oblong pseudo-bulbs 1 to 2 in . long, half covered by large scarious sheaths. Leaves two, oblong or elliptic-oblong, acute, shortly petioled, 4 to 6 in . long, 1.5 to nearly 2 in, broad; petiole 5 to 1 in . Flowers 3.5 in . across; bracts at the base of the stalked ovary large, loose, scarious, often $1 \cdot 5 \mathrm{in}$. long. Sepais lanceolate with broad bases, acuminate, the lateral pair slightly falcate. Petals linear, widespreading like the sepals. Lip articulate, mobile, 3 -lobed; the side lobes short, rounded; the middle lobe rhomboid, sub-acute, entire, with three parallel mesial ridges and strong branching nerves; the space between the side lobes (the disc) with three lamellæ, the outer two having an erect tooth at their bases; the middle one shorter and toothless. Column straight; its foot at a right angle to itself, with thickened sides and a nectarsecreting depression just above the junction with the lip. Wall. Pl. As. Rar. I, 25, t. 29; Paxt. Mag. Bot., t. 121; Griff. Notul. III, 307; Ic. Pl. As., t. 304; Hook. fil. Fl. Br. Ind. V, 711. Sarcopodium amplum, Lindl. in Paxt. Fl. Gard. I, p. 155; Fol. Orchid., Sarcopodium 1. Bolbophyllum amplum, Reichb. fil. in. Walp. Ann. VI, 244.

Sikkim; at elevations of 4,000 to 6,000 feet; Clarke, King, Pantling No. 246 ; in flower during October. Nepal; Wallich. Assam and the Khasia Hills.

The sepals and petals are of a pale greenish-brown colour, profusely spotted and blotched with darker brown; the terminal lobe of the lip of a dark purple with bronze edges; the foot of the column is spotted with purple.

Plate 89.-Dendrobium amplum, Lindl. Part of a plant, of natural size. Fig. 1 longitudinal section of the basal half of the lip, showing one of the outer lamellæ and the tooth-like process at its base, 2 column and its foot, 3 anther as seen from behind, 4 pollinia; all enlarged.

## 6. Bulbophyllum, Thouars.

Epiphytal; pseudo-bulbs from a creeping rhizome (sometimes absent). Leaves solitary, thick and persistent (deciduous in B. polyrhizum); or in pairs and thin and deciduous. Scape from the rhizome near the base of the pseudo-bulb, rarely distant from it. Flowers solitary, capitate, umbellate, spicate or racemose. Sepals subequal, or the lateral pair longer than the dorsal (rarely twice as long); the lateral pair adnate to the foot of the column. Petals various, usually much smaller than the dorsal sepal. Lip jointed on the foot of the column, mobile, usually small and strongly recurved. Column very short, often 2 -aristate or toothed at the apex. Anther 2-celled; pollinia four, the two inner reduced in size. A genus of about 250 species, tropical and sub-tropical, chiefly Asiatic; a few African, Australian and American.

Flower solitary from near the base of a pseudo-bulb, minute, sessile . .
Flowers solitary or two or three from near the base of a pseudo-bulb, large ( 5 to $\cdot 75 \mathrm{in}$. long), on long pedicels.

Leaves 1.5 to 2 in . long; sepals and petals striped; pseudo-bulbs ovoid, compressed
Leaves 3 to 6 or 7 in . long.
Sepals and petals striped; pseudo-bulbs cylindric
Sepals and petals spotted; pseudo-bulbs obpyriform
m.

Flowers in racemes, umbels or heads.

* Lateral sepals broad, not acuminate.

Flowers in racemes.
Flowers yellow or ochraceous (slightly spotted and streaked
with purple in B. conchiferum).
Petals erose-dentate, lateral sepals falcate, diverging ;
pedicel of ovary long . . . . . . . . . . B. gymnopus.
Petals entire.
Lateral sepals cohering ; ovary sessile .... . . B. B. rigidum.
$\begin{gathered}\text { Lateral sepals free, spreading ; ovary shortly } \\ \text { stalked. . . . . . . . . . . . . . B. polyrhisum. }\end{gathered}$
Flowers dark-coloured, either purple or brown (green with purple streaks in B. striatum, or partly green and yellow, as in B. cornu-cervi).

Racemes decurved, densely-flowered; lateral sepals cohering; leaves and flowers contemporaneous.
Lip entire; pseudo-bulbs none
Lip with lateral lobes; pseudo-bulbs more or less ovoid
Racemes drooping, rather laxly-flowered; pseudo-bulbs turbinate ; leaves two, not contemporaneous with the flowers
Scapes pendulous from the base ; petals spurred; lateral sepals cohering, their apices aouminately beaked . . 1
Racemes erect; lateral sepals not cohering.
Columnar teeth lobed and horn-like; flowers with green and yellow markings; petals not ciliate; pseudo-bulbs minate, fusiform; rhizome none
Columnar teeth minute, triangular; flowers purple with paler markings; petals ciliate; pseudo-buibs turbinate; rhizome slender
B. secundum.
Column not toothed; flowers green with purple stripes; petals not ciliate; pseudo-bulbs broadly ovoid 14. B. striatum.
Column not toothed ; sepals and petals hyaline; pseudo- bulbs none; racemes with two or sometimes only one flower 15. B. hymenanthum.
Flowers in dense heads, minute.
Pseudo-bulbs globose; leaves linear-oblong; rhizome none B. piluliferum.Pseudo bulbs none; leaves oblanceolateB. gracilipes.

*     * Lateral sepals spreading, acuminate, the bases broad ; flowers variouslycoloured; the lip always more or less purple.
Flowers in racemes; lip without capitate hairs.
Pseudo-bulbs distant on a thin rhizome ..... 18. B. reptans.
Pseudo-bulbs crowded, cylindric, $1 \cdot 25$ to 3 in. long; rhizomenone; lip shorter than the petals, the edge shortly ciliolatenear the base19. B. eublepharum,
Pseudo-bulbs crowded, ovoid, 75 to 1 in . long; rhizome stout;
lip muoh longer than the petals, as long as the lateral sepals,bearded20. B. Penicillium.
Flowers in heads; centre of lip excavated and filled with capitate spreading hairs 21. B. odoratissimum.
** * Sepals all caudate-acuminate, the lateral pair narrow ; flowers white,greenish-white or pale yellow.
Flowers in umbels.
Pseudo-bulbs oblique ; petals elongate, acute ; teeth of columnvery long, slender.
Leaves 2 to 4 in .; pseudo-bulbs 1 to 1.75 in . long;flowers greenish22. B. caulifforum.
Leaves $1 \cdot 5$ to 2 in.; pseudo-bulbs 6 to 8 in . long;
flowers tinged with orange-yellow; floral bract very short; lip grooved to nearly the apex 23. B. protractum.
Pseudo-bulbs ereet; petals ovate or oblong, usually blunt.
Petals ovate, lip grooved; teeth of column short, triangular; floral bract as long as the ovary, acuminate ; pseudo-bulbs 1 to 125 in . long . . . 24. B. leptanthum.
Petals oblong-lanceolate; lip ridged; teeth of columnacuminate; floral bract not acuminate; pseudo-bulb$\cdot 5$ to 65 in. long25. B. Gamblei.
Petals broadly ovate, acute, 3 -nerved; lip not groovedto the apex ; teeth of column long, subulate, curved;floral bract half as long as the ovary, sub-acute;pseudo-bulbs 4 in . long26. B. Clarkeanum.
Flowers in racemes.
Raceme with its peduncle shorter than the leaf; pseudo-bulbsnone
B. ebulbum.
Raceme with its peduncle longer than the leaf.Racemes erect, glabrous; pseudo-bulbs depressed-turbi-nate, distant . . . . . . . . . . . . . . 28. B. Thomsoni.Racemes drooping, pubescent; pseudo-bulbs ovoid,crowded29, B. hirtum.

1. Bulbophylium Listeri, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 334.

Rhizome none; pseudo-bulbs narrowly ovoid, compressed, $\cdot 3$ in. long, obliquely and alternately arranged and sub-imbricate. Leaf linear-oblong, tapering to each end, sessile, fleshy, 1 to $1 \cdot 25$ in. long and $\cdot 15$ to $\cdot 2 \mathrm{in}$. broad. Flowers solitary, on very short pedicels from the bases of both old and new pseudo-bulbs, and much shorter than the latter; the stalked ovary proceeding from the short pedicel and partly enclosed in its three or four sheathing shrivelled bracts; the floral bract proper lanceolote, acuminate, longer than the ovary. Flowers about $\cdot 1 \mathrm{j}$ in. long. Sepals unequal, and with ciliolate margins; the dovsal ovate-lanceolate, blunt, spreading; the lateral pair slightly longer and with obliquely truncate apices cohering by their inner margins nearly to the tips, and forming a kind of trough in which the lip lies. Petals broadly ovate, with obtuse erose apices; the middle third of the side minutely ciliolate. Lip oblong. lanceolate, stipitate, slightly deflexed from the base, flat, not tumid; the upper surface with a central thickened line throughout its entire length; the edges ciliolate almost from the base to near the blunt apex. Column very short; its apical processes long and falcately curved upwards; the mentum very little curved. Anther galeate and with a filiform attachment to the column; pollinia unequal, the outer two elliptic, curved, the inner very small.

British Bhotan, at the Rumpti Lake, some miles from the Sikkim frontier, elevation about 1,000 feet; Pantling No. 113 ; flowering in March.

This remarkable species was discovered by Mr. J. L. Lister of the Bhotan Cinchona Association, and at one time Curator of the Botanic Garden, Calcutta, who gave it to Mr. Pantling. It is one of the most curious of the whole genus. The flowers are of a dull lake colour.

Plate 90.-Bullophyllum Listeri, King and Pantling. Two plants, of natural size. Fig. 1 a flower, 2 pedicel with its sheaths, floral bract proper, stalked ovary, column with the anther in situ, mentum and lip, seen from the side, 3 the petals, 4 column, showing its falcate apical processes and mentum, 5 lip, 6 anther, 7 pollinia; all enlarged.

## 2. Bulbophyllum Griffithit, Reichb. fil. in Walp. Ann. Vi, 247.

Pseudo-bulbs coespitose, narrowly ovoid, compressed, $\cdot 6$ to $\cdot 75$ in. long. Leaf sessile, narrowly oblong, tapering slightly to the ends, deflexed more or less at a right angle to the pseudo-bulb, the apex blunt, entire, length 1.5 to 2 in., width $\cdot 4$ to 5 in . Inflorescence, 1 -flowered; the flower about 75 in . across; floral bract cupular, much shorter than the slender curved stalked ovary. Sepals sub-equal, ovate-oblong, acute. Petals ovate, abruptly acute, the margins near the apex minutely erose. Lip oblong, sub-acute, with two forward-pointing tooth-like auricles near the base and two slender crenate ridges running from these on the upper surface, but disappearing near the apex; the base delicately jointed to the much produced foot of the column. Column short, with broad triangular wings about the middle opposite, the stigma, the apex with two small sharp teeth. Pollinia in two free pairs. Hook. fil. Fl. Br. Ind. V, 756. Surcopodium Griffithii, Lindl. Fol. Orch. 6. Bulbophyllum sp. Griff. Ic. Pl. Asiat., t. 296, fig. 2 (not of Notul. and It. Notes). ? Dendrob. bulbophylli, Griff. It. Notes, 65, No. 1019.

Sikkim; at Lachung; elevation 9,000 feet; G. A. Gammie, No. 1005 ; in flower during August. Khasia Hills; Hooker and Thomson.

The flowers of this species are yellowish with reddish-brown spots. It had previously been collected only on the Khasia Hills, where it was found by Griffith and Sir Joseph Hooker in the Myrung wood at an elevation of 5,000 feet. In Sikkim it was collected in 1892 by Mr. G. A. Gammie at Laehung, at 9,000 feet. In spite of the higher elevation at which it grows in Sikkim, the Lachung plants differ from those found in Myrung only in having broader and slightly erose petals, and leaves much more attenuated at the base.

The column of this species presents a structural arrangement of the greatest intrrest, inasmuch as the rostellum is represented by a large ball of yellowish viscid matter, similar to that found in the column in Cirrhopetalum guttulatum and C. ornatissimum. But in this plant the viscid ball and the pollinia are quite free and in no way attached to each other ; whereas, in the two species of Cirrhopetalum just referred to, they are connected and form a rudimentary appendage akin to that characteristic of Vandece.

Plate 147.-Bulbophyllum Grififthii, Reichb. fil. A plant; of natural sise. Fig. 1 a flower, 2 flowering peduncle showing the bract, stalked ovary, column and lip of its solitary flower, from the side, 3 lip, 4 column showing its apieal and lateral teeth, anther, stigma and elongated foot, 5 anther, 6 pollinia; all enlarged.
3. Bulbophyllum affine, Lindl. in Wall. Cat. 1982; Gen. and Spec. Orchid., 48.

Rhizome long, densely-rooting, about $\cdot 2$ in. thick. Pseudo-bulbs about \& in. apart, cylindric, slightly thickened at the base, $1 \cdot 5$ to 1.75 in . long and about 3 in. thick. Leaf narrowly oblong, obtuse, the base narrowed; length 3 to 7 in., breadth .65 to $1 \cdot 25$ in.; petiole 25 in . Scape very short ( 25 in .) and bracteate, producing only a single flower with a pedicelled ovary 1 to 2 in . long from the sides of the base of a pseudo-bulb, or from the rhizome between the pseudo-bulbs. Flowers 75 to nearly 1 in. long, pale green with purple nerves, smooth. Sepals subequal, lanceolate, sub-acute, 5 -nerved, not reflexed, the lateral pair falcate. Petals rather shorter than the sepals, 3 -nerved. Lip shorter than the petals, lanceolate, thickened and concave at the base, the margins of the upper surface dark purple. Column yellowish-green, rather stout, its foot short. Anther conisal, scabrid; pollinia curved. Reichb. fil. in Walp. Ann. VI, 246; Hook. fil. Fl. Br. Ind. V, 756. Sarcopodium affine, Lindl. in Paxt. Fl. Gard. I, 155; Fol. Orchid., Sarcopodium 5.

In the valley of the Teesta, at elevations of about 2,000 feet; common; Pantling No. 154 ; in flower in June and July. Nepal; Wallich. Khasia Hills, at elevations up to 4,000 feet; J. D. Hooker and T. Thomson, G. Mann. Naga Hills at Kolima; D. Prain.

Plate 91.-Bulbophyllum affine, Lind!. A plant, of natu:al size. Fig. 1 apex of ovary, column with its foot and the lip, soen from the side, 2 lip, 3 colamn and its foot with the anther in situ, 4 anther, 5 and 6 pollinia; all enlarged.
4. Bulbophyllum leopardinum, Lindl. in Wall. Cat. 1981; Gen. and Spec. Orchid., 48.

Rhizome siout, covered with numerous fibrous sheaths. Pseuldi-bulbs obpyriform, compressed, crowded, imbricate, smooth, 1 to 1.5 in. long. Leaf elliptic-oblong, the apex blunt but shortly mucronate, the base narrowed to the short petiole; blade 3
to 6 in, long and 1 to 2 in. broad; petiole about 25 in . long. Flowers 1 in. in diameter, solitary or two or three from the base of a pseudo-bulb; pedicel and ovary about as long as the pseudo-bulb; floral bract broad, sub-spathaceous, pale, ochraceous, spotted with purple. Sepals ovate-lanceolate, sub-acute, 9 -nerved. Petals smaller than the sepals, 7 -nerved. Lip shorter than the petals, thick, decurved from below the middle, lanceolate, the base with small toothed auricles near its attachment to the apex of the much-curved foot of the column; the apex obtuse, the upper surface concave and with an elongated nectar-secreting groove expanding at its base into a triangular pit. Anther conical. Walp. Ann. VI, 2土7; Hook. fil. Fl. Br. Ind. V, 756. Dendrobium leopardinum, Wall. Tent. Fl. Nep., t. 28. Sarcopodium leopardinum, Lindl. Fol. Orch., Sarcopodium 5.

Sikkim; at elevations of 6,000 feet; not uncommon. Pantling No. 281; in flower in October and November. Nepal; Wallich. Khasia Hills; Hook. fil. and T. Thompson, G. Mann.

A handsome species not previously collected in Sikkim. The sepals and petals are whitish or pale-ochraceous, spotted with crimson; the lip is deep crimson or purple, indistinctly spotted, and the column yellow, which colour passes into purple in the mentum. The nectar, plentifully secreted by the lip, is of a pinkish colour and possesses an odour suggestive of decaying fruit, which is very attractive to flies of all kinds. Mr. Pantling has recorded the following incident, which throws some light on the fertilization of the genus generally:-"One of the many visitors to the plant on my table while I was making a drawing of it was an insect rather longer than the common housefly, but brownish in colour and clothed with stiff hairs. One of these alighted on a flower and depressed the mobile lip to its utmost. As the fly absorbed the nectar on the anterior part of the lip it gradually approached nearer and nearer the base, seeking for more. As it got to the part of the lip which bends down to join the column, the lip began to rise, and as the latter suddenly assumed its normal position, the fly was pressed between it and the column and was for some time held a prisoner. After some struggles, it managed to escape, carrying off one of the pollinia glued to its thorax. This incident may assist to throw some light on the use of the mobility of the lip so characteristic of this genus and of Cirrhopetalum."

Plate 92.-Bulbophyllum leopardinum, Lindl. A plant, of natural sizs. Fig. 1 seape with its bracts, pedicel and ovary, column and lip, seen from the side, 2 and 3 lip, front and back vievos, 4 column showing its much-curved foot, 5 anther, 6 pollinia; all enlarged.

## 5. Bulbophyllum gymnopus, Hook. fil. Ic. Plantar., t. 2040,

Rhizome about $\cdot 2$ in. thick, very long, the apical (growing) part with spotted sheaths 5 in . long. Pseudo-bulbs about 6 or 7 in. apart, ovoid, smooth, with scarious sheaths at their bases. Leaf narrowly oblong, the apex blunt but slightly notched, the base narrowed to the short petiole; length 5 to $7 \cdot 5 \mathrm{in}$., breadth 1 to $1 \cdot 25 \mathrm{in}$.; petiole 5 to 1 in. Scape slender, sheathed at the base, erect, shorter than the leaf; the peduncle only about 1 in . long; the raceme five or six times as long, laxly-flowered; floral bract minute, lanceolate, much shorter than the long-stalked ovary. Flowers $\cdot 3 \mathrm{in}$. long, white and yellow. Lateral sepals inserted on the produced foot of the column and widely separated at their bases from the dorsal, falcate, acute, spreading downwards, their edges incurved; the dorsal shorter, lanceolate, aeute, concave, erect. Petals about half
as long as the lateral sepals, linear-lanceolate, serrulate, spreading. Lip rather shorter than the petals, lanceolate, with a broad base, the apex acute. Column broad, its apical teeth short, acute, their bases broad; the foot as long as the column, sharply curved upwards at the apex. Anther papillose. Pollinia unequal, the inner two smaller. Hook. fil. Fl. Br, Ind. V, 764. Bulbophyllum, Griff. Notul. III, 294; Ic. Pl. Asiat., t. 297 ; Itin. Notes II, 104, No. 65.

Sikkim; at Rishap; Pantling No. 357. Engo; elevation 3,000 feet; in flower in November and December. Bhotan, Griffith (Kew Distrib. No. 5133). Khasia Hills; Griffith (Kew Distrib. No, 5134) ; at Jowai, 3,500 feet, Clarke, King's Collectors.

The insertion of the lateral sepals is at the extremity of the foot of the column, and is separated from that of the dorsal by a wide space. The same arrangement occurs in $B$, Wrayi, Hook. fil. The sepals of this are white with spots of red externally; the petals are white; the column pale-ochraceous, spotted with red in front, and the lip and anther are yellow.

Plate 93.-Bulbophyllum gymnopus, Hook. fil. Part of a plant, of natural sizo. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, seen from the side, 3 lip, 4 column with its foot and anther in situ, 5 anther, 6 pollinia; all enlarged.

## 6. Bulbophyllum rigidum, new species.

Rhizome about • 2 in. thick, clothed with brown fibres; pseudo-bulbs none. Leaves rising direct from the rhizome about $\cdot 5$ in. apart, each with a whorl of fibres at the base of the petiole; the young leaf at flowering-time invested by a tubular sheath 2 in . long; blade oblong, blunt, narrowed at the base into the short petiole; length 6 to 10 in., breadth 1.75 to 2 in. ; petiole 1 to 1.5 in. Scape slender, equal to or shorter than the leaf; the peduncle longer than the somewhat decurved spike, with one or two tubular short sheaths at intervals. Flowers somewhat distant, yellowish, tinged with green and streaked with red, $\cdot 3$ in. long; floral bract triangular, acute, longer than the short sessile ovary. Sepals 3 -nerved; the dorsal spreading, lanceolate with a broad base, sub-acuminate; the lateral pair longer, oblong, obtuse, connate below, free at the apex. Petals shorter than the dorsal sepal, oblong with an angularly acute erose apex, 1 -nerved. Lip as long as the dorsal sepal, elliptic-oblong, blunt, the margins deflexed, glabrous, the base with a narrow nectar-secreting groove. Column broad, its apical processes broad and 3-toothed, its foot very short. Anther much depressed.

Sikkim ; at elevations about 6,000 feet, Griffith (Kew Distrib. No. 5291) ; Pantling No. 42 ; in flower in May and June.

The spikes of this curious species open from the apex downwards, and are often bent at a. right angle to the peduncle. The sepals and petals are brownish-yellow flushed with green and have purplish nerves; the lip is of the same ground colour, but towards the base has many minute purple spots ; the column is greenish, spotted in front like the lip. Hitherto it. has been found nowhere but in Sikkim. To this belongs the Griffithian specimen No. 5291 (Kew Distrib.), which has been inadvertently referred in the "Flora of British India" to B. conchiferum, Reichb. fil., a closely allied but pseudo-bulbous species inhabiting the Khasia Hills.

Plate 94-Bu!lophyllum rigidum, King and Pantling. Part of a plant, of notural size. Fig. 1 flower, side riew, 2 ovary, column with its foot, anther in situ, and lip, 3 lateral sepals, 4 petals, 5 lip, 6 column showing the tridentate processes and short foot, 7 anther, 8 pollinia; all enlarged.

## 7. Bulbophyllum polyrhizum, Lindl. Gen. and Spec. Orchid., 53.

Rhizome branching, thread-like, naked; pseudo-bulbs globular or ovoid, with a broad base, about 1 in . apart, smooth. Leaf narrowly oblong, sub-acute, slightly narrowed to the sessile base, deciduous before the scapes flower, 2.5 in . long and $\cdot 35 \mathrm{in}$. broad. Scape filiform, about 4 in . long, its peduncle sub-erect, longer than the raceme, with one or two minute bracteoles; raceme inclined, with about six secund distant paleyellowish flowers $\cdot 25 \mathrm{in}$. long; floral bract minute, oblong, about as long as the short stalk of the ovary. Sepals spreading, sub-acute ; the dorsal ovate, concave; the lateral pair longer, oblong-lanceolate, sub-acute, 3-nerved. Petals much shorter than the sepals, broadly ovate, acute, 1-nerved. Lip stipitate, deflexed from the base, oblong, obtuse, scaberulous, the basal half grooved. Column with very short sharp teeth; its foot short, slightly curved. Anther papillose, its lip acute. Hook. fil. Fl. Br. Ind. V, 767 : in Ann. Bot. Gard. Calc., V, Pt. I, 15, t. 23.

Sikkim; in the valley of the Teesta; elevation about 1,500 feet; Lister, Pantling No. 260. Nepal; Wallich. Dehra-Dun; Gamble ; in flower in April.

In the Dehra Dun specimens the pseudo-bulbs are crowded on the rhizome, and they are so depicted in Wallich's drawing of the Nepal plant. But in Sikkim they are, in the few specimens hitherto collected by Mr. Pantling, as here described and figured, about one inch distant from each other. The flowers, however, agree with those of the Dehra Dun specimens and with Sir Joseph Hooker's description. The plant is quite leafless when flowering; its flowers are of a uniform pale yellow; it is rare in Sikkim. In his Century of Indian Orchids, published in the fifth volume of these Annals, Sir Joseph Hooker has described and figured what he considers may either be a variety of this species or a distinct one, for which, in either case, he proposes the trivial name zonale. This plant was once found by Mr. Lister in Sikkim; he sent it to the Botanic Garden, Calcutta, where it flowered and was figured in April 1877. It has oblong-ovate pseudo-bulbs, twice (rarely thrice) constricted transversely, as if formed of three internodes; and these internodes are vertically traversed by many deep grooves with tumid interspaces; the whole pseudo-bulb having (as depicted) somewhat the appearance of three superposed rows of green oblong beads; the pseudo-bulbs, moreover, emit surculi from their bases. We have unfortunately not been able to rediscover this plant in Sikkim. In a small living specimen of it received from Mr. J. S. Gamble, Director of the Forest School at Dehra Dun, and grown on the Cinchona Plantation in Nikkim, the pseudo-bulbs were distant from each other very much as represented in the figure of the Sikkim plant. There were also two or three horizontal lines on them, but so inconspicuous as not to be noticed without examination.

Plate 95.-Bulbophyllum polyrhizum, Lindl. Leafing and flowering plants, of natural size. Fig. 1 flower, 2 bract, stalked ovary, column, foot and lip, seen from the side, 3 lip, 4 column with its minute apical teeth and foot, 5 anther, 6 pollinia; all enlargid.

## 8. Bulbophyllum cylindraceum, Lindl. Gen. and Spec. Orchid., 53.

Rhizome stout, $\cdot 25$ in thick; pseud)-bulbs none. Leaf oblong-elliptic, acute, the base tapering to the long petiole; length of blade 5 to 12 in .; petioles nearly as long, channelled. Scape 12 to 18 in . long, blackish-purple, the pedicel with a few acute sheathing bracts and a pair at the base; spike cylindric, 2 to 3 in . long, nolding. Flowers densely crowded and imbricate, dorsally compressed, 3 or $\cdot 3.5 \mathrm{in}$. long, blackishpurple (almost black); floral bract of a pa'er colour, ovate-acuminate, longer than the
sessile ovary. Sepals sub-connivent, unequal; the dorsal ovate, acuminate; the lateral pair broadly oblong, unequal-sided; their inner edges straight, parallel and cohering, the outer rounded; the apices acute, entire. Petals falcate-lanceolate, truncate at the base, the apex acuminate and denticulate. Lip thick, ovate, deflexed about the middle, the apex obtuse, papillose, the posterior half deeply grooved. Column with large fleshy unequally tridentate apical processes; the foot rather straight, swollen in the middle. Anther quadrate, flattened, and with a fleshy oval centre. Wall. Pl. As. Rar. I, t. 69 ; Hook. fil. Fl. Br. Ind. V, 765.

Sikkim; at elevations of 6,000 to 7,000 feet; Clarke, King, Thompson, Pantling No. 2.39. Nepal; Wallich. Assam and Khasia Hills; Griffith No. 5128 (Kew Distrib.); J. D. Hooker and T. Thomson; Mann (at 4,000 feet); in flower from October to January.

The column is of a paler purple than the rest of the flower, and the floral bract is of the same tint. The colour of other parts of the flower makes the nearest possible approach to black. The plant which we here figure and describe is that which is found in Sikkim. But, according to Sir Joseph Hooker, there is considerable variation in specimens from different localities. He describes a sheath rising from near the apex of the peduncle and embracing the base of the spike, but this sheath is not usually found in the Sikkim plant. The colour of the flower also is described by him as white or pink; and in a form collected by Wallich in Nepal (but of which no specimen is extant) it is said to be yellow. Sir Joseph admits two varieties, (a) cylindraceum proper, with the upper sheath of the peduncle embracing the base of the spike, and (b) var. Khasiana, with the sheath smaller and distant from the spike. The Sikkim plant rarely has this sheath.

The synonymy of these varieties is given by Sir Joseph Hooker as follows:cylindraceum proper $=$ B. imbricatum, Griff. Notul. III, 289.
var. Khasiana $=$ B, Khasianum, Griff. Notul. III, 284; Reichb. fil. in Gard. Chron. 1878, II, 716.
Plate 96.-Bulbophyllum cylindraceum, Lindl. A plant, of natural sizo. Fig. 1 dorsal sepal, 2 flower, ovary and bract, 3 ovary, column with its foot, and the lip, seen from the side, 4 lip, 5 the petals, 6 column showing its tridentate apical processes, the foot with its anterior dilatation, and the pollinia in situ, 7 anther, 8 pollinia; all enlarged.
9. Bulbophyllum Careyanum, Spreng. Syst. Veg. III, 732.

Rhizome stout, woody, $\cdot 2 \mathrm{in}$. thick; pseudo-bulbs erect, ovoid, ribbed, about 3 in . apart, 1.5 in . long and about 1.2 in . in diameter. Leaf oblong, sub-sessile, tapering to each end; the apex sub-acute, notched; length 5 to 10 in .; breadth 8 to 1.65 in . Scape about the length of the pseudo-bulb, stout, brown, and clothed with many lanceolate bracts of the same colour, bearing at its apex a densely-flowered decurved raceme 2 to 3 in . long; floral bract lanceolate, longer than the stalked ovary. Flowers $\cdot 25$ to $\cdot 3$ in. long, imbricate, dark brown, shining. Sepals unequal; the lateral pair oblong-ovate, acute, cohering by their tips but free at the base; the dorsal smaller, oblong, acute, quite free from the laterals from its base. Petals only about one-third of the size of the sepals, fleshy, narrowly triangular, with caudate-acuminate apices and with a few projecting bristle-like teeth on the edges. Lip longer than the petals, oblong, with a broad base and two short falcate side lobes or auricles obscurely erose at the apices, the edges minutely ciliolate. Column rather stout, with two short broad apical teeth and a short curved foot. Lip of anther erose; pollinia obovoid. Wall. Cat. 1990-1; Lindl. Gen, and Spec. Orchid., 51 ; Reichb. fil. in Walp. Ann. VI, 256 ;

Hook. fil. Fl. Rr. Ind. V, 760. Anisopetalum Careyanum, Hook. Fl. Exot. t. 149. Pleurothallis purpurea, Don Prod. 33. Tribrachia purpurea, Lindl. Coll. Bot. 41.

Sikkim; in warm valleys, common; Pantling, No. 23; in flower in October, November and December; distributed westwards to Nepal and eastwards to the Khasia Hills and Burma.

The flowers of the Sikkim plant are of a uniform coppery brown, the column alone being yellow and the petals largely blotched with that colour. In colouration they thus differ from the Nepal plant as figured by Sir William Hooker (under the name Anisopetalum Careyanum) in his Exotic Flora, t. 149. In that figure the sepals and petals are depicted as dusky yellow, spotted with brown; the column and petals as yellow; and the lip as purple. The basal lobes of the lip are of the same shape as in the Sikkim plant; the petals, however, are narrower, unspotted, and with no appendages on their margins. In spite, however, of these differences, we believe Sir William Hooker's figure and that here given, to refer to the same species. Sir Joseph Hooker reduces (Fl. Br. Ind. 1. c.) to a variety of this, under the varietal name ochracea, the plant named B. cupreum by Lindley in the Bot. Register, XXIV (1838), Misc. yj, and figured under that name in Bot. Mag. t. 5316. This form, which is found in Burma, has ochraceous sepals and petals and a reddish-brown lip. In all other respects, except colour, its flowers agree with those of the Sikkim plant as here figured. Closely allied to this are B. sicyobulbon, Reichb. fil., and B. crassipes, Hook, fil. The latter species is described and figured in the Bot. Magazine (t. 4166) as B. Careyanum, from which, however, it differs in having a longer column with shorter apical teeth, in having the side lobes of the lip shorter and blunter, and in having (according to the figure 4166) shorter racaraes. We have not been able to find B. crassipes in Sikkim, and indeed its author attributes it only to the Khasia Hills, although in the Flora of British India Sir Joseph Hooker gives it as a native of Sikkim. B. sicyobulbon was described from Burma by Reichenbach filius, who distinguishes it from this by its orange-yellow flowers with narrower floral bracts, sub-serrulate petals, and by its larger pseudo-bulbs. Another species to which B. Careyanum is closely allied is B. Pechei, Cat Bull.. This, which has been described and figured by Sir Joseph Hooker (Bot. Mag. t. 7236), agrees with B. Careyanum in its pseudo-bulbs and leaves, in the length of its densely-flowered raceme, and in its bracts and sepals. Its flowers are of the same dull colour as those of the Sikkim form of B. Careyanum here figured, and it is probably the same species. A plant (probably belonging to an undescribed species) which recently flowered in the Botanic Garden in Calcutta, and which is believed to have been received from Burma, closely resembles B. Careyanum, but has yellow flowers with triangular floral bracts not half so long as the ovaries, a much longer and rather more lax and more slender inflorescence than B. Careyanum, smaller petals, and a lip otherwise like that of $B$. Careyanum, but with blunt, not acute, side lobes. It has also smaller pseudo-bulbs than $B$. Careyanum, and in this character disagrees with the description of $B$. sicyobulbon. The flowers of this Burmese plant, like those of B. Careyanum, have a disagreeable odour. The plants mentioned in this paragraph belong to a group of Bulbophyllum, the lips of which have basal lobes, an unusual character in the genus. The members of the group differ within very narrow limits, and the whole of them want careful study in the field.

Plate 97.-Bulbophyllum Careyanum, Spreng. A plant; of natural sise. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, seen from the side, 3 lip, 4 column and its foot, 5 petals, 6 anther, 7 pollinia; all enlarged.
10. Bulbophyllum triste, Reichb, fil, in Walp. Ann. VI, 253.

Rhizome about $\cdot 15$ in. thick, naked. Pseudo-bulbs turbinate with umbonate apices, close together or $\cdot 5$ to 1 in . apart, leafless at flowering time, 7 to $\cdot 9 \mathrm{in}$. in diam. Leaves two from each pseudo-bulb, sub-membranous, flaccid, narrowly oblong, gradually tapering to the acute apex and to the sub-sessile base, 3 to 5 in . long and 6 to $\cdot 9 \mathrm{in}$. broad. Scape 3 to 5 in . long; the peduncle slender, erect, with a few filiform bracteoles, twice as long as the drooping rather densely flowered raceme. Flowers ' 25 in . long, purple; floral bract lanceolate, acute, as long as the sessile ovary. Dorsal sepal oblongovate, blunt, concave; the lateral pair longer, cohering to the tips, gibbous near the base, their margins incurved. Petals triangular, 1-nerved, shorter than the dorsal sepal. Lip stipitate, oblong-lanceolate, the anterior half narrowed to the obtuse apex; the upper surface convex and with a divided protuberance. Column with subulate apical processes; the foot short, much curved. Anther conical, papillose, with a small inflexed lip ; pollnia globose, the inner two rudimentary. Hook. fil. Fl. Br. Ind. V, 768.

Sikkim; at an elevation of about 1,500 feet, in the valley of the Teesta; Pantling, No. 129; in flower in March. Tenasserim, on the Toungoo range; Lobb, Parish and Berkeley.

A species now recorded for the first time from this province; hitherto supposed to be confined to Burma. The flowers, except for a line of yellow on the edges of the lip and on the ovary, are of a dull purple throughout; the column is greenish passing into white and the foot is minutely spotted with purple. The flowers have a powerful and fœetid odour. The Burmese B. micranthum, Hook. fil. ([c. Plant., t, 2048), must come very near to this.

Plate 98.-Bulbophyllum triste, Reichb. fil. Part of a plant growing on the branch of a tree, the leafy pseudo-bulb in outline behind, of natural size. Fig. 1 a flower, side view, 2 front view of a flower, 3 ovary, column with its foot, and the lip, seen from the side, 4 lip, 5 column with its apical processes and the curved spotted foot, 6 an empty anther, 7 pollinia; all en'arged.

## 11. Bulbophyllum bisetum, Lindl. in Ann. Nat. Hist. X, 186.

Rhizome branching, wiry, about $\cdot 1$ in thick. Pseudo-bulbs about 1.5 in, apart, ovoidconic, smooth, with a fibrous sheath at the base, about 8 in . long and 65 to 75 in . in diam. at the base. Leaf narrowly oblong-lanceolate, the apex acuminate and obliquely bifid, the base narrowed to the short petiole; length 3 to 4.5 in., breadth $\cdot 6$ to $\cdot 8$ in.; petiole $\cdot 25$ to $\cdot 5 \mathrm{in}$. Scape pendent, filiform, somewhat shorter than the leaf; the peduncle twice as long as the raceme, bearing a few subulate bracteoles. Raceme with a much thickened rachis, bearing 12 to 15 crowded broad purplish flowers about $\cdot 25$ in. long; floral bract lanceolate, shoiter than the curved stalked ovary. Sepals sub-connivent and with undulate keels; the dorsal ovate-lanceolate; the lateral pair unequal-sided, their inner edges straight and coherent; their outer edges rounded and undulate; the apices fiee, acuminate and curved upwards. Petals shorter than the dorsal sepal, spathulate, entire, and with a pair of linear spurs inserted behind and lying parallel to them and extending beyond their apices. Lip stipitate, ovate-lanceolate, deflexed about the middle, the basal portion with two crenate ridgos on its apper surface, the apical portion nariowed and pubescent, sub-acute, not ridged. Column with two long subulate
apical processes, and with a large callus below the stigma; the foot short, curved. Anther apiculate, glandular-pubescent; the lip oblong and ciliate, pollinia broadly elliptic. Hook. fil. Fl. Br. Ind. V, 767. B. cirrhopetaloides, Griff. Notul. III, 290. Bulbophyllum sp., Ic. Pl. Asiat., t. 296, fig. 1. B. cariniferum, Reichb. fil. in Walp. Ann. VI, 253.

Sikkim; at Rungbee, elevation 5,000 to 6,000 feet; Pantling, No, 192 ; in flower in September. Khasia Hills; Griffith (Kew Distrib. No. 5140), Hooker fil. and Thomson (Bolb. 23).

A species not hitherto recorded from Sikkim. The flower is remarkable for the spurs which run parallel to the dorsal sepal and to the petals, and which are homologous with the spurs of the Burmese B. xylophyllum. The sepals are dull purple with green on the edges and keels; the lip is purple with a yellowish apex; the petals pale purple with dark purple apices; the column and the spurs lying parallel to the dorsal sepals and to the petals are greenish. Although more closely associated with the dorsal than with the lateral sepals, the two spurs really originate from the apex of the ovary, and not from either the sepals or petals. Griffith suggests that they may be appendages of two of the costæ of the ovary.

Plate 99.-Bulbophyllum bisetum, Lindl. A plant, of natural sise. Fig. 1 a flower, side viev, 2 the same, front view, 3 the back of the column with the spurs of the lateral sepals, the spathulate petals, and the apex of the lip, 4 part of ovary, column and its foot, and the lip, seen from the side, 5 lip, 6 column with its subulate apical processes and anterior callosity, the anther in situ, and the curved foot, 7 anther, 8 pollinia; all enlarged.

## 12. Bulbophyllum cornu-cervi, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, Pt. 2, 332.

Rhizome none; pseudo-bulbs minute, crowded, globular, $\cdot 1$ to $\cdot 15$ in. in diam. Leaf coriaceous, sessile, or shortly petiolate, obovate-elliptic, the apex rounded and entire, tapering slightly to the base, 1 to $1 \cdot 5 \mathrm{in}$. long and 6 to 8 in . broad; petiole 0 to $\cdot 35 \mathrm{in}$. Scape slender, erect, twice as long as the leaves or longer; the peduncle about as long as the raceme, with one or two small remote bracts; raceme slightly decurved, laxly-flowered; floral bract ovate, acute, shorter than the stalked ovary, Flowers - 25 in . long, green and yellow. Dorsal sepal oblong, blunt, resting on the column, the lateral pair broader, flat and slightly spreading, their margins upturned. Petals half as long as the sepals, lanceolate, slightly falcate, acute, 1-nerved. Lip fleshy, obovate-oblong, much deflexed from about the middle, stipitate; the basal portion fleshy, grooved in the centre; the anterior portion broader and thinner, convex, entire, blunt. Column very short, with stout $2-3$-fid broad apical processes varying somewhat in size and shape; the foot flat, very slightly curved, with a short raised mesial line which begins as a hook at the lower margin of the stigma and extends to nearly the apex. Anther compressed, its lip truncate.

Sikkim; near the base of the Engo ridge, at an elevation of probably about 2,500 feet; Pantling, No. 264; in flower in July.

The sepals of this are green with reddish-brown margins, the petals are green, the lip yellow in its anterior and reddish-brown in its posterior half. The column and its processes are white, and the foot reddish-brown. The species is named from its columnar processes which resemble in shape the horns of an elk. Its nearest ally is probably the Burmese B. alcicorne, Par. and Reichb. fil., which has a short drooping densely-flowered raceme and compressed fleshy flowers.

Plate 100.-Bulbophyllum cornu-cervi, King and Pantling. A plant; of natural size, Fig. 1 a flower, 2 floral bract, stalked ovary, column with its foot, and the lip, 3 the petals, 4 lip, 5 column showing the horn-like apical processes and the foot, 6 anther, 7 pollinia; all enlarged.

## 13. Bulbophyllum secundum, Hook. fil. Ic. Plantar., t. 2042.

Rhizome slender; pseudo-bulbs crowded, turbinate, about 35 in . in diam, smooth. Leaf narrowly oblong, sub-acute, narrowed at the base to the short petiole; length 1 to 2.5 in ., breadth $\cdot 25$ to $\cdot 4 \mathrm{in}$.; petiole $\cdot 2$ to 35 in . Seape erect, longer than the leaves, slender; the peduncle with one or two sheathing brown bracts; the raceme shorter than the peduncle, laxly-flowered, secund; floral bract minute, ovate, much shortar than the stalked ovary. Flowers $\cdot 2$ to $\cdot 25$ in. across, purple. Sepals broadly triangular, sub-acute, spreading, the dorsal slightly narrower than the lateral pair, 1-nerved; all with ciliolate edges. Petals much smaller than the sepals, spathulateoblong, obtuse, 1 -nerved, the anterior half with strongly ciliate edges. Lip longer than the petals, oblong, slightly dilated towards the middle, the apex obtuse, the base truncate and with a blackish gland; the edges ciliolate. Cupsule sub-cylindric, truncate, $\cdot 15$ in. long. Column with two short triangular apical teeth; the foot short, curved, Lip. of anther erose, pollinia broad. Hook. fil. Fl. Br. Ind. V, 764.

Sikkim; at Choong-thang and Tendong; elevation 6,000 to 7,000 feet; Pantling, No. 214. Kohima in the Naga Hills, Assam; Prain; in flower in June and July.

The sepals and petals of this species are pale purple with darker nerves; the petals have a large dark purple blotch near the tip; the lip is dark purple with four longitudinal pale lines, the column green and its foot purple. It is remarkable for its secund habit. Originally discovered in the Naga Hills by Dr. D. Prain of the Calcutta Herbarium, and now recorded from Sikkim for the first time.

Plate 101.-Bulbophyllum seoundum, Hook. fil. A plant; of natural size. Fig. 1 a flower, side view, 2 floral bract, stalked ovary, column, foot and lip, 3 lip, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.
14. Bulbophyllum striatum, Reichb. fil. in Walp. Ann. VI, 257.

Rhizome woody, $\cdot 1 \mathrm{in}$. thick; pseudo-bulbs obpyriform, $\cdot 5$ to 75 in . long., about 2 inches apart, their surfaces cinereous, the flesh dark purple. Leaf coriaceous, elliptic, the apex slightly retuse, the blade 1 to 2.5 in . long and $\cdot 75$ to 1.5 in . broad, the petiole .5 to nearly 1 inch long, mottled. Scape 2 to 2.5 in . long, slender, erect, purplish, with 2 or 3 sheathing bracteoles. Flowers 2 to 4, sub-umbellate or shortly racemose, about 4 or $\cdot 5 \mathrm{in}$. across; floral bract linear, $\cdot 15 \mathrm{in}$. long, ahout one-third as long as the slender stalked ovary. Sepals sub-equal, broadly lanceolate, sub-acute, 5-nerved, spreading. Petals much smaller, 3-nerved. Lip about as long as the petals, ovate-lanceolate, bent on itself near the base, and with two small erect oblong basal lobes at the bend, the surface of the anterior horizontal part with bold purple nerves, those in the middle straight, those towards the edges reticulate. Column long, slender, not toothed. Anther conical ; pollinia ovoid, in two free pairs. Hook. fil. Fl. Br. Ind. V, 755. Sarcopodium striatum, Lindl. Fol. Orchid., Sarcopodium 5. Dendrobium striatum, Griff. Notul. III, 318.

Sikkim; on Sinchal, at an elevation of about 7,000 feet; Pantling, No. 298; in flower during October. Khasia Hills, elevat, 4,000 feet; Griffith (Kew Distrib. No. 5156), Lobb, Hooker and others.

Khasia specimens have larger flowers than those from Sikkim, but in other respects they agree. This species had not hitherto been collected in Sikkim.

Plate 102.-Bulbophyllum striatum, Reiohb. fil. A plant, of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, seen in profile, 3 lip, detached and showing the small basal lobes, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.

## 15. Bulbophyllum hymenanthum, Hook. fil. Ic. Plantar., Ic. 2046 .

Rhizome slender and thread-like, naked; pseudo-bulbs none. Leaves rising direct from the rhizome nearly 1 inch apart, sessile, fleshy, ovate or elliptic, blunt, $\cdot 5$ to 65 in. long and $\cdot 25$ to $\cdot 4$ in. broad. Scape erect, rising from the rhizome between the leaves and slightly longer than them, with several minute sub-tubular sheaths, and at the apex one or two flowers 4 or 5 in . across; floral bract ovate, half as long as the stalked ovary. Sepals sub-equal, ovate, acute, 3 -nerved, spreading. Petals about half the size of the sepals, elliptic-lanceolate, sub-acute, 1-nerved. Lip longer than the petals, ovate-lanceolate, sharply deflexed near the base, the apex narrowed but blunt, the upper surface with a deep groove from the base nearly to the apex. Column short and without apical processes; its foot long and much curved. Anther with a rounded lip; pollinia only two, the inner ones being suppressed. Hook. fil. Fl. Br. Ind. V, 767.

Sikkim; in the Lachung Valley, elevation 8,000 feet; Pantling, No. 368 ; in flower in May. Khasia Hills; at Myrung, elevation 5,000 feet; Hooker and Thomson.

The sepals and petals in this species are yellowish, streaked with purple, the lip being wholly purple.

Plate 103.-Bulbophyllim bymenanthum, Hook. fil. A plant, of natural siz. 1 a flower, 2 bract, stalked ovary, column with its foot and the lip, side view, 3 the petals, 4 lip, 5 column with anther in situ and foot, 6 anther, 7 pollinia; all enlarged.

## 16. Bulbophyllum piluliferum, new species.

Pseudo-bulbs coespitose, globose or depressed-globose, 25 to $\cdot 3$ in. diam. Leaf fleshy, linear-oblong, obtuse, entire, the base narrowed to the very short petiole; length 4 in., breadth $\cdot 5$ in, petiole $\cdot 15$ in. Scape slender, erect, about two-thirds as long as the leares, the pedicel with one or two bracts at the base and one or two at intervals above, bearing at its apex a densely crowded semi-globose capitulum of flowers about 5 in. in diam. Flowers 12 in. across, reddish-brown; floral bract lanceolate, acute, half as long as the sub-sessile ovary. Sepals sub-equal, their tips spreading, acute, the dorsal lanceolate, the laterals ovate and parallel. Petals shorter than the sepals, narrowly lanceolate, acute. Lip longer than the petals but shorter than the sepals, elliptic, tumid, papillose, much deflexed from the base; the posterior portion deeply grooved; the anterior convez with entire edges and broad rounded apex. Column very short; the apical processes broadly triangular, their apices slightly erose; the foot longer than the column. Anther truncate, the margin of its lip erose; pollinia pyriform, the inner pair much reduced.

Sikkim; at an elevation of 1,000 feet; Pantling, No. 141 ; in flower in May; only one plant found.

The sepals and petals are of a pale reddisht-brown, with streaks of a darker shade of the same colour. The lip is dark reddish-brown.

Plate 104.-Bulbophyllum piluliferum, King and Pantling. A plant; of natural size. Fig. 1 a flower, seen from the side, 2 a flower, front view, 3 lip, 4 ovary, column and its foot, and the lip, from the side, 5 column showing its apical processes and foot, 6 anthor, 7 pollinia; all enlarged.

## 17. Bulbophyllum gracilipes, King and Pantling in Journ. As. Soe Bengal, Vol. LXV, pt. 2, 118.

Rhizome $\cdot 15$ in. thick, bearing the remains of sheaths and also leaves at intervals of 8 to $1 \cdot 25$ in., pseudo-bulbs none. Leaf solitary, subcoriaceous, oblanceolate or elliptic-oblanceolate, obtuse and minutely bifid at the apox (sometimes obliquely so), much narrowed to the sessile or sub-sessile base; length 1 to 2.25 in . Scape erect, filiform, longer than the leaves and rising either at the base of a leaf or from an interspace, with one sheathing bract at the base and another at the middle; the flowers crowded in a capitulum about 35 in . in diam.; floral bract ovate, half as long as the shortly stalked ovary. Flowers $\cdot 1 \mathrm{in}$. across, fleshy and of a dull purple colour, dorsally compressed. Sepals sub-equal, 3 -nerved; the dorsal triangular, lying close to the column, its apex acute, revolute; the lateral pair ovate, acute, spreading but slightly. Petals shorter than the sepals, oblong, falcately acute, 1 -nerved. Lip obovate, tumid, decurved from the middle, the whole of its surface papillose, the posterior portion deeply grooved, the anterior convex, dilated, the edges entire and the apex broad. Apical processes of the column broad, abruptly pointed. Anther depressed, its lip truncate; pollinia pyriform, all four uniform.

Sikkim; in the valley of the Teesta and elsewhere at elevations of about 1,500 feet; Pantiing, No. 242; in flower during September and October; rather plentiful in the localities where it occurs.

The flowers of this are of a dull purple throughout. It resembles B. pilulifcrum, King and Pantling, in its capitate inflorescence, and to some extent in its flowers; but differs in having no pseudo-bulbs, and in having oblanceolate and not linear-oblong leaves widely distant on a rhizome. This is still more closely allied to $B$. xylophyllum, Reichb. fil., but that species has spurs at the base of the dorsal sepals which are quite absent in this; it has, besides, blunt lateral sepals. Moreover the leaves of $B$. xylophyllum are very much thicker in texture and their broad apices are emarginate; its flowers, moreover, are yellowish-green and are larger than the flowers of this.

Plate 105.-Bulbophyllum gracilipes, King and Pantling. A plant, of natural size. Fig. 1 a flower, sten from the front, 2 floral bract, stalked ovary, column with its foot, and the lip, sien from the side, 3 the petals, 4 lip, 5 column and its foot, 6 anther, 7 pollinia; all enlarged.
18. Bulbophyllum reptans, Lindl. in Wall. Cat. 1988; Gen. and Spec. Orchid. 51.

Rhizme thin, wiry, naked, branching, $\cdot 1 \mathrm{in}$. in diam.; pseudo-bulbs 2.5 in . apart, obpyriform, smooth, '6 to 75 in: long. Leaf linear-oblong, sub-acute, obliquely notched at the apex, slightly narrowed at the base to the very short petiole; length 3.5 to 6 in., breadth $\cdot 25$ to -35 in ; petiole $\cdot 2 \mathrm{in}$. Scapes shorter or longer than the leaves, often in pairs, slender, more or less decurved; the peduncle sheathed at base, bracteate, varying in length, sometimes longer, sometimes shorter than the laxly-flowered raceme;
floral bract largest in the lower flowers of the spike, half as long as the upper, oblonglanceolate, usually longer than the shortly-stalked ovary. Flowers ' 25 to 35 in . long, yellowish with purple spots. Sepals sub-equal, lanceolate, 3 -nerved, spreading, the lateral pair with dilated bases. Petals much shorter than the sepals, oblong, blunt, 1-nerved, spreading. Lip about as long as the petals, stipitate, oblong, expanded and grooved at the base, the apex narrowed and sub-acute, the margins more or less winged, deflexed from the middle. Column with filiform apical processes and short lateral wings; the foot short, tumid near the stigma, slightly curved; pollinia sub-globose, the two inner small. Hook. fil. Fl. Br. Ind. V, 768. B. Clarkei, Reichb. fil. in dourn. Linn. Soc. XXV, 72. Tribrachia reptans, Lindl. Coll. Bot. t. 41A.

Sikkim; common at altitudes between 5,000 and 7,000 feet, Griffith (Kew Distrib. 5129); Pantling, No. 7; in flower from October to December. Distributed westwards to Nepal and eastwards to the Naga and Khasia Hills; a common plant; Griffith (No. 1573, Kew Distribution).

Var. sub-racemosa, Hook. fil. Fl. Br. Ind. V, 769. Bracts oblong, obtuse, much shorter than the longer pedicelled ovary. B. grandiflorum, Griff. It. Notes, 146, No. 705 ; Notul. III, 293; Ic. Pl. Asiat., t. 294, fig. 1.

Sikkim, Bhotan and Khasia Hills, Griffith (Kew Distrib., 5130); Clarke, No. 14814.
The sepals of this are buff-coloured, flushed with brown and speckled slightly with red; the petals are buff, the lip buff at the base and yellow at the tip, the column green and white, the ovary green with red spots.

Plate 106.-Bulbophyllum reptans, Lindl. A plant, of natural size. Fig. 1 a flower, 2 floral bract, shortly stalked ovary, column with its foot and the lip, seen from the side, 3 lip, 4 the petals, 5 column to show the apical processes and tumid foot, 6 anther, 7 pollinia; all enlarged.

## 19. Bulbophyllum eublepharum, Reichb. fil. in Walp. Ann. VI, $2 \overline{2} 2$.

Rhizome none; pseudo-bulbs close together, cylindric, slightly thickened at the base, dark brown in colour, 25 to 3 in. long. Leaf oblong, acute, much narrowed to the sessile base; length 4 to 7 in ., breadth 75 to 1.5 in . Scape 10 to 18 in . long, decurved; the pedicel much longer than the raceme, spotted with brown and bearing two or three sheathing bracts about 1 in. long at intervals, and several shorter spreading near the apex. Raceme only 3 to 4 in. long, laxly-flowered; floral bract oblong-lanceolate, concave, acute, as long as the ovary. Flowsrs 6 in. long, green. Lateral sepals ovate-lanceolate, acuminate; the dorsal slightly shorter, less acuminate and more concave. Petals half as long as the sepals, broadly elliptic, blunt, obscurely 5 -nerved, the edges shortly ciliolate. Liip thick, oblong-lanceolate, the apex blunt and emarginate, the upper surface deeply grooved in the lower half, the edges towards the base glandular-ciliolate. Column broad, with subulate apical teeth, much swollen below the stigma; its foot short, much curved. Anther hooded; polimia oblong with oblique ends, the inner two much reduced. Hook. fil. Fl. Br. Ind. V, 764 ; in Ann. Bot. Gard. Calc. V, 16, t. 24.

Sikkim; Griffith (Kew Distrib. No. 5296); at Sureil, elevation about 6,000 feet; Pantling, No. 46. On Tongloo, at 7,000 feet; T. Anderson, King; in flower in August.

Plate 107.-Bulbophyllum eublepharum, Reichb. fil. Part of a plant, of natural size. Fig. 1 flower with its ovary and bract, 2 column and lip, seen from the side, 3 lip, 4 apex of lip, showing the minute emargination, 5 column and its foot and anther, 6 anther, 7 and 8 pollinia, seen from above and from belor; all enlarged. Fig. 9 capsule, of natural size.
20. Bulbopiyllum Penicillium, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 151.

Rhizome stout, wiry, ${ }^{2}$ in. thick; pseudo-bulbs close together or $\cdot 5$ in. apart, broadly ovoid, $\cdot 75$ to 1 in . long, and about $\cdot 6$ to 7 in . in diam. at the base. Leaf 4.5 to 6.5 in. long, oblong-lanceolate, acute, narrowed at the base into a channelled petiole 1.5 to 2 in . long. Scape longer than the leaf; the peduncle with 3 or 4 sheathing lanceolate bracts; the raceme longer than the peduncle, inclined or decurved, and with a stouter rachis, laxly-flowered; floral bract large, ovate, acute, as long as the shortly stalked ovary. Flowers 5 in. across, opening 3 or 4 at a time, brown. Sepals sub-equal, narrowly lanceolate, with broad concave 5 -nerved bases and caudateacuminate apices, about $\cdot 4 \mathrm{in}$. long. Petals much smaller than the sepals, orbicular, fleshy, the anterior half with the margins and apex softly bearded. Lip slightly longer than the sepals, very mobile, lanceolate with a truncate auricled base, broadly fimbriate-fringed except at the base. Column stout, with two elongate minutely capitate erect teeth at the apex, and a protuberance under the stigma; its foot short and much curved. Anther conical with a fimbriate crest; pollinia unequal, Hook fil. Fl. Br. Ind. V, 764.

Bhutan; at Song-chong-loo, elevation 6,000 feet; Pantling No. 251; flowering in August and September.

The colour of the sepals and petals is of a uniform brown, the lip being of a paler tint; the rachis is also dark brown. The lower part of the raceme is occupied by empty bracts. Except in the colour of the flowers, this Bhutan plant agrees exactly with the type specimens of $B$. Penicillium which were collecive in Burma. We have no doubt whatever, after careful comparison of specimens of both at Kew, that the Bhutan and Burma plants are conspecific. Although not strictly speaking a native of Sikkim, this was found so near the frontier, and is such a remarkable plant, that we have included it in this work. The lip is so extremely mobile that it responds to the faintest movement of the air. The nature of the motion, which is spasmodic rather than oscillatory, is described in the following note by Mr. Pantling: "I have recently carefully observed the behaviour of the lip of this species, and I find that the lip does not oscillate, but has a jerky movement. In its normal position it is pressed to the face of the column as shown in figure 1. The only other position which I have ever seen it occupy is that of extreme depression, as depicted in fig. 4; there is no intermediate position whatever. The movement from the one position to the other is sudden and spasmodic; and so extremely delicate is the balance that, even when the air appears to be quite still, a lip here and there may be observed suddenly to drop, and as suddenly to resume its normal position."

Plate 108.-Bulbophyllum Penieillium, Par, and Reiohb. fil. A plant; of natural size. Fig. 1 a flower, 2 the petals, 3 lip, from the base, 4 bract, ovary, column with its foot, and the lip, 5 column, to show the processes at its spex and the protuberance in its front, and also the short much-curved foot, 6 anther, 7 under-surface of the pollinia; all enlarged.

## 21. Bulbophyllum odoratissimum, Lindl. in Wall. Cat. 1987.

Rhizome woody, thin, branching, naked, $\cdot 1 \mathrm{in}$. thick; pseudo-bulbs sub-cylindric, slightly thickened in the lower half, smooth, $\cdot 75$ to 1 in. long. Leaf oblong-lanceolate, slightly notched at the apex, and somewhat narrowed at the sessile base; 1 to

3 in . long and $\cdot 25$ to $\cdot 75 \mathrm{in}$. broad. Scape from near the base of a pseudo-bulb, nearly as long as the leaf, clothed with pale lanceolate sheathing bracts, and with several large brown scarious sheaths at its base; bearing many flowers in a compact umbel or capitulum $\cdot 5$ to $\cdot 75 \mathrm{in}$. in diam.; floral bract lanceolate, concave, entire, exceeding the stalked ovary. Flower ' 2 to 3 in . long, white. Sepals sub-equal, lanceolate, acuminate, falcate, spreading, the tips terete. Petals about one-sixth of the size of the sepals, ovate. Lip slightly longer than the petals, fleshy, oblong-lanceolate, convex, but with a central groove covered with capitate hairs, the margin fringed with similar hairs. Column stout, its foot very short, its apical teeth small, slightly winged below; stigma prominent. Anther with a thickened papillose crest. Pollinia divergent, the inner two very small. Hook. fil. Fl. Br. Ind. V, 758. Stelis odoratissima, Smith in Rees' Cyclop. XXXIV; S. caudata, Don Prodr., 32. I'ribrachia odoratissima, Lindl. Coll. Bot. 41.

Sikkim; alt. 3,000 to 7,000 feet; Hooker and others; common; Pantling, No. 16; in flower from May to September. Chumbi Valley. Nepal; Wallich. Khasia Hills. Tenasscrim; Helfer (Kew Distrib., Nos. 5167, 5168). Moulmein; R. Scott. Also found in China.

The flowers are in the main white, but the sepals and back of the column and its foot are tinged with yellow. The flowers are sweet-smelling. Some specimens in the Calcutta herbarium are noted as having been found at so low an elevation as 1,000 feet in the Teesta valley. The elevation at which the specimens from the Khasia Hills and Burma were collected is not known. No, nerves are visible in the sepals or petals when fresh. Plants from high elevations have longer flowers than those from lower levels.

Plate 109.-Bulbophyllum odoratissimum, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, seen from the side, 3 lip, 4 capitate hairs from the central groove on the lip, 5 column and its foot, 6 anther, 7 pollinia; all enlurged.
22. Bulbophyllum cauliflorum, Hook. fil., Ic. Plantar., t. 2036.

Rhizome woody, branching, naked, $\cdot 15$ in. thick. Pseudo-bulbs cylindric-elliptic, about 3 in. apart, $\cdot 1$ to 1.75 in . long, obliquely attached to the rhizome. Leaf oblong, obtuse, suddenly narrowed at the base into the short petiole; length 2 to 4 in ., breadth 75 to $1 \cdot 25 \mathrm{in}$, petiole $\cdot 25$ in, Scape about as long as the pseudo-bulb, slender, sub-umbellately 4-to 5 -flowered, bracteate at the base; floral bracts equalling or exceeding the stalked ovaries, lanceolate, acute, entire. Flowers $\cdot 5$ or $\cdot 6$ in. long, green, flushed with brown. Sepals linear-lanceolate, caudate-acuminate, rather longer than the lancoolate petals, their apices curved or hooked, all entire and spreading slightly. Lip shorter than the petals, lanceolate, deflexed below the middle, excavated along the middle of the upper surface, the apex sub-acute, the base truncate and jointed on to the apex of the rather short curved foot. Column broad, with two long decurved filiform spurs at the apex, stigmatic cavity very large. Anther with a small acute upturned lip; inner pair of pollinia much reduced. Hook. fil. Fl. Br. Ind. V, 758.

Sikkim; Griffith (Kew Distrib. No. 5165), Hooker; on Sittong, in the Government Cinchona Plantation, elevation 5,000 to 6,000 feet, Pantling, No. 221; in flower in July. Khasia Hills; Griffith (Kew Distrib. No. 5139).

Allied to B. odoratissimum, Lindl., but a larger plant with shorter fewer-flowered scapes. The flowers of this are inodorous. The tips of the sepals are tinged with yellow.

Piate 110.-Rulbophyllum cauliflorum, Hook. fil. A plant; of natural sise. Fig. 1 sepals and petals, separated, 2 a flower, lateral view, 3 bract, column with its foot, and the lip, sien from the side, 4 lip, 5 column and its foot, showing the large stigma, 6 anther, 7 pollinia; all enlarged.

## 23. Bulbophyllum protractum, Hook. fil., Ic. Plantar. 2037.

Rhizome slender, woody, branching, naked below, bracteate towards the apex, $\cdot 1$ in. in diam.; pseudo-bulbs sub-erect, cylindric, about 1 inch apart, 6 to 8 in. long. Leaf oblong, acute, narrowed to the sessile base, thinly coriaceous, 1.5 to 2 in . long and from $\cdot 3$ to $\cdot 5$ in. broad. Scapes filiform, slightly longer than the pseudo-bulbs, rising from the rhizome at the bases of and also between the pseudo-bulbs, minutely bracteate, umbellately 2 - to 3 -flowered; floral bract not half the length of the slender stalked ovary, lanceolate. Flowers ' 25 in . long, yellowish and orange. Sepals linear-lanceolate, acuminate, the dorsal rather shorter than the lateral pair, entire, slightly spreading. Petals narrowly elliptic-oblong, acute, shorter than the sepals. Lip shorter than the petals, lanceolate, sub-acute, entire, the upper surface concave and with two parallel ridges meeting near its apex; the base joined by a fine point to the apex of the short stout curved foot of the column. Column stout, with two long slender linear horizontal spurs from its apex. Lip of anther large, its margin crenulate. Pollinia broad, compressed, the inner pair small. Hook. fil. Fl. Br. Ind. V, 758.

Sikkim; in tropical valleys, at elevations of 1,500 to 2,000 feet; Pantling, No. 230; in flower in July. Tenasserim, Helfer (Kew Distrib. No. 5164). Pegu; Brandis, No. 1045.

Even in fresh flowers the sepals are seen to have three and the petals one nerve. The flowers are pale yellow, the sepals being orange in their upper half, and the concavity of the lip being also orange. The species has not previously been recorded from Sikkim.

Plats 111.-Bulbophyllum protractum, Hook. fil. A plant; of natural size. Fig. 1 a flower with its stalked ovary and bract, seen from the side, 2 column and lip, 3 lip, 4 column and its foot, 5 anther, inside viev, 6 pollinia; all enlarged.

## 24. Bulbophyllum leptanthum, Hook. fil. Ic. Plantar., t. 2039 A.

Rhizome about $\cdot 15 \mathrm{in}$. thick, naked except at the growing point; pseudo-bulbs 1 to 1.25 in . long, cylindric, 1.5 in . apart, with several short sheaths at the base. Leaf narrowly oblong, the apex blunt and slightly notched, slightly narrowed to the sessile or sub-sessile base; length $2 \cdot 25$ to 2.75 in ., breadth 5 to 6 in . Scapcs from the rhizome near the base of the pseudo-bulbs and also from the spaces between them, varying in length, sometimes shorter, sometimes longer than the pseudo-bulbs, always erect, slender, and with one or two small tubular sheaths and bearing at their apices an umbel of three to five flowers ' 3 to $\cdot 35 \mathrm{in}$. long; floral bract lanceolate, acuminate, as long as the stalked ovary. Sepals lanceolate, caudate-acuminate, spreading, the dorsal slightly shorter than the lateral pair. Petals about one-fourth of the length of the sepa's, ovate, acute, 1-nerved. Lip slightly longer than the petals, ovate-oblong, blunt, decurved from the thickened stipitate and slightly grooved base, the margins revoluts. Column stout, with smell triangular apical processes, and narrow lateral wings; the foot short. curved, tapering to
the apex. Anther with a fleshy convex belt in the middle, its lip truncate; the pairs of pollinia diverging. Hook. fil. Fl. Br. Ind. V, 759. B. cylindricum, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 333.

Sikkim ; at Mungpoo, elevation about 3,000 feet; King; Pantling, No. 322; in flower in July. Khasia Hills; elevation 4,000 to 5,000 feet; Griffith, Hooker and Thomson (Bolb. No. 18).

This comes very near B. protractum, Hook. fil., but has shorter petals, a slightly different column and lip, a longer and more slenderly stalked ovary, and a much longer floral bract. B. protractum has besides smaller pseudo-bulbs. This is also closely allied to B. Gamblei, but differs in the points noted under that species. The flowers of this are of a pale yellowish green, with a blotch of orange on the foot of the column.

Plate 112.-Bulbophyllum leptanthum, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with its foot, and the lip, seen from the side, 3 lip, 4 column and its foot, showing the apical processes and wings, 5 the petals, 6 anther, 7 pollinia; all enlarged.
25. Bulbophyllum Gamblet, Hook. fil. Ic. Plantar., 2058B ; Fl. Br. Ind. VI, 190.

Rhizome very slender, thread-like, naked; pseudo-bulb narrowly obpyriform or sub-cylindric, 1.5 to 4 in. apart, erect, 5 to 6.5 in long. Leaf oblong-lanceolate, notched at the apex, narrowed at the base, sub-sessile, 1 to 1.25 in . long and about 25. in. broad. Ncape filiform, 75 in . to 2 in , long, with two sheathing bracts. Fluwers in umbels of three to six, about $\cdot 3 \mathrm{in}$. long; floral bract large, ovate, acute, nearly as long at the stalked ovary. Depals lanceolate, caudate-acuminate, sub-equal, spreading, twice as long as the oblong-lanceolate, acute, 1-nerved petals. Lip oblong-lanceolate, sub-acute, the anterior part with a central groove deepening towards the concave base. Column broad with triangular acuminate apical teeth, narrowing downwards into the short, much curved slender foot. Lip of anther everted; pollinia unequal, the inner two very small; the external large, elliptic-rotund, compressed. B. leptanthum, var. Gamblei, Hook. fil. Fl. Br. Ind. V. 759.

Sikkim ; on Engo, elevation from 5,000 to 7,000 feet; Pantling, No. 219 ; in flower during July and August; forms large tangled masses on trees in damp forests.

This species closely resembles B. leptanthum, Hook. fil. But this has broader floral bracts, which are not acuminate, l-nerved oblong petals, and longer columnar teeth. It has also a much more slender rhizome, shorter pseudo-bulbs, longer and more slender scapes; and it is altngether a smaller plant in every respect except its flowers, and they are longer than those of $B$. leptanthum.

Plate 113.-Bulbophyllum Gamblei, Hook. fil. A plant; of natural size. Fig. 1 sepals and petals; of natural size, 2 a flower, 3 floral bract, stalked ovary, column and lip, in profle, 4 lip, 5 column with its foot and anther in situ, 6 anther, 7 pollinia; all enlarged.
26. Bulbophyllum Clarkeanum, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, p. 333.
Rhizome about the thickness of a crow-quili, branching, naked; pseudo-bulbs cylindric or cylindric-ovoid, 1 to $1 \cdot 25 \mathrm{in}$. apart, 4 to $\cdot 6 \mathrm{in}$. long, smooth. Leaf narrowly elliptic-oblong, the apex blunt and notched, the base narrowed, sessile; length 1 to $1 \cdot 25 \mathrm{in}$,, breadth $\cdot 3$ to $\cdot 4 \mathrm{in}$. Scape filiform, 5 to 1 in . long, with 1 or 2 sheathing bracts, umbellately 2-to-3-flowered. Fiowers whitish, 35 in. long; floral
bract lanceulate, sub-acute, half as long as the stalked ovary. Sepals sub-equal, spreading, lanceolate, with broad bases and caudate-acuminate fleshy tips. Petals broadly ovate, acute, 3 -nerved. Lip ovate-oblong, decurved from the thickened grooved basal portion, the anterior portion narrowed, thin and slightly erose at the sides, the apex sub-acute and recurved. Column with rather long straight subulate spurs, its foot short and much curved. Anther with a small quadrate lip; outer pollinia broad, sub-orbicular, the inner two minute.

Western Dooar of Bhutan; in the Kumai forest near the Jallacca river, elevation about 1,500 feet; Pantling, No. 319 ; in flower in June.

The nearest ally of this species is probably the Burmese B. stenobulbon, Par, and Reichb. fil., but that has different pseudo-bulbs and leaves. The sepals and petals of this are white tinged with orange-red at the tips; the lip and column are yellow or yellowish-white. It is also allied to B. Gamblei and to B. leptanthum.

Plate 114.-Buibophyllum Clarkeanum, King and Pantling. A plant; of natural size. Fig. 1 a flower, front view, 2 floral bract, stalked ovary, column with its foot and lip, seen from the side, 3 lip, 4 column and its foot, showing the apical spurs, 5 anther, 6 pollinia; all enlarged.
27. Bulbophyllum ebulbum, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 334.
Rhizome - 15 in. thick, naked except at the growing point; pseudo-bulbs none. Leaves solitary, rising 8 inches apart, rather thin, oblong-lanceolate, acute, tapering slightly at the base to the long channelled petiole; length 6 or 7 in., breadth about 1.2 in .; petiole 15 to 1.75 in . Scape rising immediately in front of a leaf, erect, shorter than the leaf; the peduncle sheathed at the base, less than half as long as the many-flowered raceme. Flowers $\cdot 3 \mathrm{in}$. long, not crowded, vale green; floral bract, large, lanceolate, as long as the curved stalked ovary. Sepals lanceolate, acuminate, the dorsal somewhat shorter than the lateral. Petals half as long as the lateral sepals, linear-lanceolate, 1-nerved. Lip longer than the petals, oblong, stipitate, deflexed from the middle, the basal portion grooved, the anterior flat, the edges entire and the apex sub-obtuse. Column stout with small quadrate wings surmounted by minute teeth, tumid below the stigma; the foot long. Anther thickened vertically in the middle; pollinia elliptic.

Sikkim ; at Sivoke, elevation about 1,500 feet; Pantling, No. 323 ; in flower in June; only once gathered.

A species near the Burmese species B. apodum, Hook. fil., from which, however, it is distinguished by the shape and thinner texture of its leaves, by the more slender inflorescence and larger flowers. B. apodum, Hook. fil., has moreover rudimentary pseudo-bulbs, while this species has no trace of such.

Plate 115.-Bulbophyllum ebulbum, King and Pantling. A plant; of natural size. Fig. 1 a flower, side viev, 2 floral bract, stalked ovary, column with its foot, lip, side view, 3 lip, 4 column, showing the short apical processes and tumid base, 5 petals, 6 anther, 7 pollinia; all enlurged.

## 28. Bulbophyllum Thomsoni, Hook. fil. Ic. Plantar., t. 2041.

Rhizome about $\cdot 12$ in. thick, branching, naked; pseudo-bulbs about 2.5 in. apart, depressed-turbinate, almost discoid, 8 to 1 in. in diam. and only 25 in. from base to apex, smooth. Leaf narrowly oblong, acute, slightly narrowed to the
petiole, 4 to 6 in . long and about 8 in . broad; the petiole $\cdot 5$ to $\cdot 75 \mathrm{in}$. Scape erect, slender, usually slightly longer than the leaf; the peduncle about equal to the raceme, with a few small scattered bracteoles; raceme many-flowered; floral bract minute, half as long as the shortly-stalked ovary, lanceolate. Flowers about 25 in. long, yellowish-white. Sepals sub-equal, lanceo'ate, with broad bases and acuminate apices; the lateral rather broader at the base than the dorsal; all sub-connivent. Petals half as lorg as the sepals, oblong, sub-acute, the edges ciliolate. Lip thick, oblong, slightly wider at the broad obtuse smooth apex, shortly clawed at the base; the upper surface with an elongate depression near the base, the edges ciliolate especially towards the base. Column short, its apical teeth minute, narrow, the foot short and almost straight. Anther with a papilluse crest. Hook. fil. Fl. Br. Ind. V, 764.

Sikkim; in tropical valleys ascending to 4,000 feet; Thomson, King, Pantling No. 245 ; in flower in September.

In habit this somewhat resembles B. gymnopus; the inflorescence is like that of B. hirtum, but the raceme is quite erect, not drooping as in B. hirtum. Moreover that species has 2-leaved pseudo-bulbs.

Plate 116.-Bulbophyllum Thomsoni, Hook. fil. A plant; of natural size. Fig. 1 a flower with staiked ovary and bract, 2 part of ovary, column and its foot, and the lip, seen from the side, 3 the petals, 4 lip, 5 column and its foot, seen from the front, 6 anther, 7 pollinia; all enlarged.
29. Bulbophyllum hirtum, Lindl. in Wall. Cat. 1989 ; Gen. and Spec. Orchid., 51.

Rhizome about $\cdot 2$ in. thick; pseudo-bulbs close together, ovoid-oblong, terete, with a scarious terminal collar, 1 to $1 \cdot 5 \mathrm{in}$. long. Leaves in pairs, flaccid, absent at flowering time, oblong-lanceolate or oblong-oblanceolate, sub-acute, narrowed towards the equitant base; length 4 to 9 in., breadth 75 to $1.7 j$ in. Scape longer than the leaves, stout, erect, with one or two small remote bracts. Spikc about from one-third to one-half of the length of the erect peduncle, densely-flowered, pendulous; floral bract ovate, acute, entire, shorter than the sessile pubescent ovary. Flowers 20 to -3 in. long, imbricate, green. Sepals unequal; the lateral pair falcate-lanceolate, caudate-acuminate, converging; the dorsal smaller, not acuminate, not spreading; all green and pubescent on the outer surface, white on the inner. Petals only a third of the length of the sepals, ovate, with acute apices and ciliolate edges. Lip oblong, decurved from the base; the apex broader, emarginate and decurved, its upper surface with broad papillose margins and an elongate central glabrous groove. Column short, its apical spurs minute; the foot much curved. Anther conical, compressed at the apex, and with a broad vertical papillose green band down the centre; pollinia obovoid, minute. Hook. fil. Fl. Br. Ind. V, 762. B. suave, Griff. Notul. III, 292. Stelis hirta, smith in Rees' Cyclop. XXXIV. Tribrachis lirla, Lindl. Coll. Bot. 41.

Sikkim; at elevations of 3,000 to 6,000 feet; common. Pantling, No. 9 ; in flower from October to January. Distributed westwards to Nepal and eastwards to the Khasia Hills, and also to the Burmese hill ranges.

The sepals are of the palest yellow-green outside and white inside, and the lip is yellow. The whole plant smells of A ithoxanthum odoratum, and is much prized on account of its fragrance by the Lepcha aborigines, whose name for it is "Sur-voo-reep." Allied to this are the Burmese species B. comosum, Collett and Hemsley, and B. auricomum, Lindl.

Plate 117.--Bulbophyllum hirtum, Lindl. A plant; of natural size. Fig. 1 the petals, 2 flower, ovary and bract, 3 lip, 4 ovary, column and its foot and the lip, 5 anther, 6 , pollinia; all enlarged.

## 7. Cirrhopetalum, Lindl.

Epiphytal; usually with a creeping rhizome, but sometimes coespitose; pseudo-bulbs 1-rarely-2 leaved. Leaves usually solitary from each pseudo-bulb, coriaceous and persistent; rarely in pairs, membranous and deciduous. Scape rising from the base of a pseudo-bulb. Flowers usually in whorled umbels, sometimes capitate, rarely racemose, cften dorsally compressed. Dorsal sepal concave, short, rarely half as long as the lateral pair, and usually much shorter; lateral sepals usually much elongate and acuminate, oblique, often cohering by their inner edges, the bases adnate to the sides of the column or of its foot. Petals shorter than the dorsal sepal. Lip smail, tumid, usually entire, always shorter than the dorsal sepal, jointed to the end of the foot of the column and more or less mobile. Column short ; its apex with two (rarely four) toothlike apperdages ; the foot more or less produced. Anther bilocular ; pollinia 4, cohering in a single mass and sometimes attached by their lower ends to a mass of viscid tissue; the inner two usually small and lamelliform.

A genus of about forty species, ohiefly Indo-Malayan; very closely allied to Bulbophyllum, and not separated from that genus by any really good oharacter, but artificially distinguished by the shortness of the dorsal and the great length of the lateral sepals, and by the flowers being usually in whorled umbels, rarely in racemes or heads.
Pollinia without any viscus.

- Lateral sepals cohering to their apices, or almost to their apices, to form a flattened blade.
Leaves in pairs from coespitose pseudo-bulbs, caducous; flowers in drooping racemes.
Dorsal sepal more than half as long as the lateral pair
Dorsal sepal only about one-tenth of the length of the lateral pair

1. C. viridifiorum.
2. C. refractum.

Leaf solitary ; pseudo-bulbs borne on an elongated ereeping rhizome.
The blade formed by the lateral sepals narrow and tapering near the apex.

Scape half as long as the leaf; flowers 1.5 in . long; pseudo-bulbs 1.75 to 2 in . long
3. C. cornutum.

Scape equal to or exceeding the leaf; flowers 75 to 1 in . long; pseudo-bulbs ' 65 to $1 \cdot 2 \mathrm{in}$. long
4. C. Wallichii.

Scape not much longer than the pseudo-bulb
5. C. brevipes.

The blade formed by the lateral sepals broader at the apex than the base.

Soape and umbel only twice as long as the pseudo-bulbs and much shorter than the leaf
6. C. bootanense.

Scape much longer than the pseudo-bulbs, longer than or nearly as long as the leaf.

Dorsal sepal and petals not ciliate; the petals awned at the apex and with erose margins; the apex of the lip emarginate
7. C. Andersoni.

Dorsal sepal and petals with ciliate edges, the apex of tle lip entire
8. C. Sikkimense.

> ** Lateral sepals partially cohering.
> P'seudo-bulbs small, discoid, distant, borne on a long rhizome . . 9. C. strcophyllum.
> Pseudo-bulbs ovoid, crowded, rhizome none . . . . . 10. C. coespitosum.
*** Lateral sepals not at all coherent.
Pseudo-bulbs on a rhizome.

$$
\text { Flowers umbellate, } \cdot 6 \text { in. long . . . . . . . 11. C. parrulum. }
$$

Flowers capitate, 8 to 1.35 in . long; the lateral sepals with
very long filiform tails . . . . . . . . 12. C. caudatum.
Pseudo-bulbs crowded, rhizome none . . . . . . . 13. C. elatum.
Pollinia attached to a viscus.
Lateral sepals divergent, their margins involute ; flowers $\cdot 75 \mathrm{in}$. long, in racemes
14. C. guttulatum.

Lateral sepals divergent, free but converging; the upper margin upturned ; flowers $\cdot 4 \mathrm{in}$. long, in umbels
15. C. maculosum.

Lateral sepals with filiform tails many inches long, free at the base and apex, otherwise coherent; dorsal sepal with elongated apex bearing coloured paleae ; flower solitary . . . . . . . . 16. C. ornatissimum.

## 1. Cirrhopetalum viridiflorum, Hook. fil. Ic. Plantar., t. 2061.

Coespitose; pseudo-bulbs ovoid, often much tapered to the apex, 1 to $1 \cdot 25 \mathrm{in}$. long. Leaves thin, in pairs on the young pseudo-bulbs, deciduous after flowering time, narrowly oblong or oblong-lanceolate, the apex acute, the base narrowed, sessile; length 3.5 to 5 in., breadth 1 to 1.4 in . Scape with an erect peduncle, 3 to 5 in . long, sheathed at the base, and with two or three distant sheathing bracts; raceme drooping, from 2 to 4 in. long, many-flowered. Flowers about 75 in . long, drooping, imbricate; floral bract ovate, acuminate, 3 nerved, longer than the shortly stalked thick ovary. Dorsal sepal ovate-oblong, sub-acute, depressed; the lateral pair less than twice as long as the dorsal, dimeliately ovate-lanceolate, cohering from base to apex. Petals sub-orbicular, the edges with a dense belt of short purple gland-like hairs. Lip longer than the petals but shorter than the dorsal sepal, fleshy, entire, oblong, blunt; the edges of the grooved lower half up-turned. Column with large broadly falcate hooked (inverted hatchet-shaped) apical processes, the foot short. Anther helmet-shaped, papillose ; pollinia very unequal, the outer two narrowly reniform. Hook. fil. Fl. Br. Ind. V, 779.

Sikkim, at elevations of 5,000 to 7,000 feet; common; Pantling, No. 99 ; in flower during October and Novembor. Khasia Hills, at Shillong; alt. 5,500 feet; C. B. Clarke.

The sepals of this are of a duil yellowish green colour, changing to pale warm brown at maturity; the floral bract is straw-coloured, and the rest of the flower more or less purple with white blotches. In general appearance and coespitose habit it resembles C. refractum, having like it leaves in pairs, drooping racemes and dull greenishyellow sepals. But the long upper sepal (more than half as long as the lateral pair) suggests Bulb,phyllum, from which genus Cirrhopetalum is separated by only arbitrary and not very constant characters.

Plate 118. Cirrhopetalum viridiflorum, Hook. fil. A plant, of natural size. 1 Flower with its bract, front riew, 2 stalked ovary, column and lip, seen from the side, 3 floral bract, opened out, 4 the petals, 5 lip, 6 anther, 7 column showing its large hooked processes, papillose anther in situ, and short foot, 8 pollinia; all enlarged.

## 2. Cirrhopltalum refractum, Zollinger in Flora, 1847, 456.

Coespitose; pseudo-bulbs conical with broad bases, short, wrinkled at flowering-time, crowded. Leaves two from the apex of a pseudo-bulb, deciduous at flowering-time, narrowly oblong, acute, contracted at the base, sessile, 3 to 5 in. long and 7 to 85 in . broad. Scapes 4 to 6 in . long; the peduncle erect or slightly decurved, slender, sheathed at the base and with two ovate-acuminate bracts; the raceme drooping, 1.5 to 3.5 in . long, 4- to 12 -flowered; floral bract ovate-acuminate, several times longer than the short subsessile ovary. Flowers 1.75 to 2.5 in . long, decurved. Dorsal sepal free at the base from the lateral pair, lanceolate, the apex awned; the margins ciliate, depressed; the lateral pair about five or six times as long as the dorsal, linear, sub acute, sparsely ciliate, cohering except at the base. Petals rather fleshy, triangular, more densely ciliate than the dorsal sepal and only about half as long. Lip shorter than the dorsal sepal, very fleshy, oblong, obtuse; the lower surface convex, the upper smooth, deflexed from below the middle, the basal half with its edges upturned, the anterior half with tufts of purple glandular hairs, and also with long solitary hairs. Column short, with decurved slender apical teeth, the foot short and little curved, abruptly contracted about the middle. Anther papillose ; pollinia obovoid, subequal. Walp. Ann. I, 776; Hook. fil. Fl. Br. Ind. V, 779; Ann. Bot. Gard. Calc. V, 19, t. 28. C. Wallichii, Lindl. in Wall. Cat. 1980, and in Bot. Reg. 1839, Misc. 72; and 1843 sub. t. 49 (not of Wall. Pl. As. Rar. I, 53, t. 67); C. tripudiuns, Par. and Reichb. fil. in Gard. Chron. 1876 (I) 816. Bulbophyllum refractum, Reichb. fil. in Walp. Ann. VI, 259. B. tripudians, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 1 ̌4.

Sikkim ; at altitudes of 4,000 to 6,000 feet; common; Pantling, No. 24 ; in flower during October and November. Westward to Kamaon; also in Burma and Java.

A curious plant with a very wide geographical distribution. The lateral sepals, which form by far the largest part of the flower, are pale green when young, but change to a pale warm brown with age. The dorsal sepal, petals and lip are pale yellow, much spotted with purple, and with thick purple hairs. The flowers have a pleasant but faint smell of hay.

Plate 119. Cirrhopetalum refractum, Zoll. A plant, of natural size. Fig. 1 a flower, seen from the front, 2 ovary, column with anther in situ, foot and lip, seen from the side, 3 floral bract, 4 the petals, 5 lip, 6 column, with anther in situ, apical teeth and foot, 7 anther, 8 pollinia; all enlarged.
3. Cirrhopetalum cornutum, Lindl. in Bot. Reg. 1838, Misc. 75; 1843, under t. 49.

Rhizome naked, $\cdot 25$ to $\cdot 3$ in. thick; pseudo-bulbs narrowly ovoid, compressed, 1 to 1.5 in . apart, 1.75 to 2 in . long. Leaf narrowly oblong, blunt, slightly and obliquely notched, narrowed at the base into the short channelled petiole; length 6 to 9 in., breadth 1.25 to 1.5 in.; petiole about 75 in . Scape 4 to 6 in . long, rather slender, sheathed at the base and with several ovate bracts, sub-erect, the apex bearing a lax radiate umbel of 6 to 9 puberulous flowers about $1 \cdot 5 \mathrm{in}$. long; floral bract lanceolate, much shorter than the stalked ovary. Dorsal sepal very convex, vaulted over the column, ovate, scabrid, sub-acute, $\cdot 25 \mathrm{in}$. long; lateral sepals narrowly lanceolate, falcate, acuminate, cohering except at the scabrid base and at the apex, 1.5 in. long, minutely ciliolate. Petals ovate, acute, 3-nerved, ciliolate. Lip

## 7. Cirrhopetalum Andersoni, Hook. fil. Ic. Plantar. t. 2055. (not of Kurz).

Rhizome naked, $\cdot 2$ in. thick; pseudo-bulb elliptic or ovoid, smooth, with many slightly spreading fibres at the base, 1 to 1.25 in . long and 1.5 to 2 in , apart. Leuf oblong, tapering slightly to the sab-acute apex, the base rather suddenly narrowed, sessile or sub-sessile; length 3.5 to 5 in., breadth .85 to 1.35 in . Scape somewhat shorter than the leaves, slender, the peduncle speckled with brownish-purple and bearing two lanceolate-oblong sheaths 5 in . long. Flowers dorsally compressed, $\cdot 65 \mathrm{in}$. long, five or six in a radiate umbel; floral bract minute, oblong, acute, much shorter than the rather long-stalked ovary. Dorsal sepal oblong-ovate, shortly awned at the apex; the lateral pair three or four times as long as the dorsal, dimediate-oblong-obovate, falcate, the inner edges coherent, the apices blunt. Petals slightly longer than the dorsal sepals, broadly oblong, 3 -nerved, the apices acute and awned, the edges slightly erose. Lip narrowly oblong, with blunt emarginate apex and entire edges, decurved from the middle. Column stout, thick, winged, apical teeth very short, the foot much curved. Lip of anther pectinate, pollinia elongate. Hook. fil. Fl. Br. Ind. V, 777.

Sikkim; Anderson; in the valley of the Teesta, at an altitude of about 1,500 feet; Pantling, No. 300 ; in flower in October.

The flowers are of a delicate pink, with minute spots of a darker tint. Collected only twice-once by the late Dr. T. Anderson, after whom it is named, and once by Mr. Pantling. In shape the flowers are very like those of C. bootanense, but the scapes are very much longer. This species also very closely resembles C. gamosepalum, Griff., which has, however, a scape decurved from its base.

Plate 124 -Cirrhopetalum Andersoni, Hook. fil. A plant; of natural sise. Fig. 1 flower, 2 bract, stalked ovary, column, foot and lip of a flower which has probably been fertilised, seen from the side, 3 petals, 4 a complete lip and the emarginate apex of another, 5 column with anther in situ and foot, 6 anther, 7 pollinia; all enlarged.

## 8. Ciribhopetalum Sikkimense, King and Pantling, n. species.

Rhizome naked, about 15 in. thick; pseudo-bulbs ovoid-globose, about $\cdot 5$ in. apart and $\cdot 3$ or $\cdot 4$ in. long. Leaf very fleshy, oblanceolate, obtuse, obliquely notched, narrowed to the base, sessile or sub-sessile, $1 \cdot 5$ to 2 in . long. Scape shorter or very little longer than the leaves (about 2 in . long), sub-erect, with two sheathing bracts, and at the apex a radiating umbel of ten to twelve flowers about 5 in . long; floral bract lanceolate, acuminate, shorter than the stalked ovary. Dorsal sepal about $\cdot 15$ or $\cdot 2 \mathrm{in}$. long, free from the lateral pair at its base, concave, lying over the column, ovate-acute, the tip upturned and with several soft hairs on its edges; lateral sepals three or four times as long as the dorsal, narrowly oblong, very blunt, sub-falcate, coherent except at the bases; their apices obtuse, entire. Petals ovate, sub-acute, with very oblique bases, 3 -nerved, the edges ciliate-aristate and with one strong long apical awn. Lip broadly ovate at the base, much narrowed in the anterior half, the apex obtuse, the edges entire; the upper surface smooth, slightly concave, having a slonder raised line down its centre. Coiumn broad, with short bidentate shoulders; the foot long, much curved. Poilinia very unequal, the inner two very small.

Sikkim; at the foot of the hills; common; Pantling, No. 148 ; in flower in May.
The dorsal sepal of this is greenish with a few brownish-red markings; the lateral sepals are ochraceous, minutely spotted with reddish-brown and with a few lines of the same colour near the base. The petals are ochraceous with three broad reddishbrown nerves and purplish marginal ciliæ. The upper surface of the lip is of the same colour as the lateral sepals, but darker. The anther is yellow and the column is white with a pink patch in front, marked with elongate brown dots. The ovary is greenish-yellow with brown spots. The nearest ally of this species is C. Roxburghiu, Lindl., a species hitherto collected only in the Sunderbuns. It is also allied to C. gamosepalum, Griff, a plant common from Burma southwards to Malacca and not infrequent in the Andaman Islands. From C. Roxburghii this differs in its petals having only three nerves, much coarser marginal ciliæ, and a more obtuse apex terminated by a shorter awn; and in its lateral sepals being more obtuse, connate almost to the apex, and ochraceous with dots, instead of pure yellow. The scape of this is moreover shorter and the leaves not only shorter but also broader than is the case in C. Roxburghii.

Plate 125.-Cirrhopetalum Sikkimense, King and Pantling. A plant; of nutural size. Fig. 1 a flower, 2 bract, stalked ovary, column and its foot, and the lip, 3 the petals, 4 lip, 5 column, its bidentate shoulders with anther in situ, and its foot, 6 anther, 7 pollinia; all enlarged.
9. Cirrhopetalum sarcophyllum, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, pt. 2, 335.

Rhizome $\cdot 1$ in. thick, naked, remotely annular ; pseudo bulbs discoid, about $\cdot 15$ or $\cdot 2 \mathrm{in}$. thick, 3 or $\cdot 4 \mathrm{in}$. broad, and from 2 to 3 in. apart, each with a fringe of long fibres at its base. Leaf pendulous, very fleshy, oblong, sub-falcate, tapering to the acute apex and at the base to the thick terete petiole; length 5 to 9 in., breadth 1.25 to 1.5 in .; petiole 75 to 1 in . Scape about half as long as the leaf; the peduncle sheathed at the base and bearing at intervals two lanceolate bracts. Umbel 3- to 7 -flowered. Flowers 75 in . long; floral bract ovate, acute, shorter than the stalked ovary. Dorsal sepal free at its base from the lateral pair, ovate, acuminate, concave, 35 in . long, depressed; the lateral pair rather more than twice as long, falcate-lanceolate, sub-acuminate, cohering just under the apex for about one-third of their length, glandular-puberulous like the dorsal. Petals oblong, falcate, subacute, much shorter than the dorsal sepal. Lip oblong, deeply grooved in the basal half; the anterior half smooth, the apex sub-acute. Column stout, with two long erect subulate sub-divergent apical teeth; the foot short, very slightly curved, with two raised lines down its centre. Pollinia narrowly pyriform, the inner two less than half as large as the outer.

Sikkim; at elevations of from 3,000 to 5,000 feet; Pantling, No. 95 ; in flower from June to September according to elevation.

The sepals and petals are reddish-brown, much mottled; the lip is purple with deeper blotches. A species with a considerable vertical distribution. At low elevations it appears as a dwarf, and to this dwarf we have given the following varietal name.

Var. minor. Leaves 2 to 3 in . long; scape $\cdot 75$ to 1 in ., flower $\cdot 45 \mathrm{in}$. long.

Smaller in all its parts than the typical form, and found close to the plains at elevations of 1,000 feet; not connected with the type by transition forms.

Plate 126.-Cirrhopetalum sarcophyllum, King and Pantling. A plant, of natural sise. Fig. 1 a flower, seen from the side, 2 the same, from the front, 3, front of ovary, column with anther in situ, foot and lip, side view, 4 lip, 5 column with its apical processes, anther in situ and foot, 6 anther, seen from below, 7 pollinia; all enlarged; 8 transverse section of leaf, of natural size.
10. Cirrhopetaltm coespitosum, Wall. in Bot. Reg. 1838, Misc. 35.

Coespitose, pseudo-bulbs much crowded, ovoid, 35 to $\cdot 5$ in. long. Leaf linearlanceolate, acute, the base narrowed to the petiole; length 2 to 4 in., petiole 25 to .75 in. Scape much shorter than the leaves, slender, erect, minutely bracteate, bearing at the apex an umbel of three to five flowers 5 to 7 in . long; floral bract lanceolate, much shorter than the long-stalked ovary. Dorsal sepal free at its base from the lateral pair, very concave, vaulted over the column, ovate, shortly acuninate; lateral sepals much longer than the dorsal (.75 in. or more), linear-lanceolate, obtusely acuminate, partly coherent, the bases and apices free, the edges erose. Petals broadly ovate, acute, the edges erose-dentate. Lip oblong, sub-acute, entire, fleshy, very concave near the base. Column thick, with minute sharp triangular apical processes; the foot rather long, much curved; pollinia laterally compressed, unequal, the inner two minute. Lindl. in Bot. Reg. 1843, under t. 49; Hook. fil. Fl. Br. Ind. V, 775 ; in Ann. Bot. Gard. Calc., Vol. V, pt. 18, t. 27. B. confertum, Hook. fil. Ic. Plant., t. 2035; Fl. Br. Ind. V, 757. Bulbophyllum scabraium, Reicbh. fil. in Walp. Ann. VI. 259.

Sikkim; at elevations of about 4,000 feet; Pantling, No. 110; in flower during April. Khasia Hills; Gibson, Griffith, G. Gammie.

The flowers are of a pale ochreous yellow; the nerves of the sepals and petals being coloured and flexuous.

Plate 127._Cirrhopetalum coespitosum, Wall. A plant; of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ, the foot and the lip, 3 lip, 4 column and its foot, 5 anther, 6 pollinia; all enlarged.

## 11. Cirrhopetalum parvulum, Hook. fil. Ic. Plantar., t. 2060 A.

Rhizome slender, annulated, $\cdot 1$ in. thick; pseudo-bulbs ovoid, $\cdot 35$ to $\cdot 75$ in. long, sometimes touching, sometimes $\cdot 25$ to $\cdot 5$ in. apart. Leaf narrowly elliptic, sub-acute, narrowed at the base, sessile, 1 to 1.25 in . long. Scape as long as the leaf or longer, erect, slender, sheathed only at the base, bearing at the apex three or four flowers in a short raceme. Flowers • 6 in . long, drooping; floral bract lanceolate, acuminate, equalling the stalked ovary. Dorsal sepal oblong-ovate, acute, free at its base; the lateral pair two and a half times as long as the dorsal, linear-oblong, somewhat falcate, acuminate, diverging. Petals ovate, acute, obscurely erose. Lip oblong, tapering to the sub-acute apex, decurved from below the middle, the upper surface with a deep mesial groove from the base to near the apex. Column with short triangular erect teeth; the foot much curved, elongate. Anther minutely papillose; the pollinia elliptic, the inner two small. Capsule nearly 5 in. long, fusiform, ellipsoid, smooth, stalked. Hook. fil. Fl. Br. Ind. V, 778. C. Dyerianum, King and Pantling in Juurn. As. Soc. Bengal, Vol. LXIV, pt. 2, 335.

Sikkim ; Griffith, G. Gammie; Pantling, No. 342 ; at elevations of 7,000 to 9,000 feet; in flower in August.

Plate 128.-Cirrhopetalum parvulum, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column, foot and lip, seen from the side, 3 petals, 4 lip, 5 column with anther in situ and the curved foot, 6 anther, 7 pollinia; all enlarged.

## 12. Cirrhopetalum caudatum, King and Pantling (not of Wight).

Rhizome filiform, naked, less than $\cdot 1$ in. in diam. Pseudo-bulbs ovoid, compressed, furrowed, $\cdot 4$ or 5 in . long and an inch or more apart. Leaf coriaceous, ovatelanceolate, acute, 75 to 1 in . long and $\cdot 3$ to $\cdot 4 \mathrm{in}$. broad, sessile or sub-sessile. Scape stout, its peduncle equalling or slightly exceeding the pseudo-bulb, bearing several sheaths near its base. Flowers dorsally depressed, umbellately capitate, 8 to 1.35 in . long (to the tips of the lateral sepals), radiating; floral bract lanceolate, as long as the stalked ovary, Dorsal sepal $\cdot 15$ to 2 in . long, oblong-ovate, acuminate, vaulted over the column ; the lateral pair five to seven times as long, lanceolate, with elongated filiform tips, parallel or divergent, nowhere cohering. Petals oblong-obovate, blunt, Lip about as long as the petals, oblong, stipitate, with erect rounded side lobes connected at the base by a transverse bar, the anterior half with its edge decurved all round. Column short, broad, with two pairs of short apical teeth, the upper pair slender, the lower pair broader and incurved. Anther papillose. Bulbophyllum caudatum, Lindl. in Wall. Cat. 1983 ; Gen. and Spec. Orchid., $\check{5} 6$; Hook. fil. Fl. Br. Ind. V, 769.

Sikkim; at elevations from 1,500 to 6,000 feet; Pantling, No. 50 ; in flower during June and July.

The flowers are white, the sepals and petals being semi-transparent when fresh. This species has the umbellate inflorescence, the comparatively short dorsal sepal, and the elongated lateral sepals which are the only tangible characters by which Cirrhopetalum is distinguished from Bulbophyllum. We have therefore removed it from the latter to the former genus. In the Lindley Orchid Herbarium preserved at Kew, there is a coloured drawing (No. 1132 without specimen) named in Lindley's own handwriting "Bulbophyllum caudatum." This has much shorter lateral sepals than the plant here figured, but in other respects it agrees well with it. The shortness of the sepals depicted in Lindley's drawing may be accounted for by the points, which are extremely thin and fragile, having been broken off. It is possible, however, that they never were longer; for there is considerable variation as to the length of the lateral sepals in the species of Cirrhopetalum (e.g. C. ornatissimum in which they are prolonged into hair-points). The plant named C. caudatum by Wight is really C. vaginatum, Lindl., and is a Malayan species.

Plate 129.-Cirrhopetaluin caudatum, King and Pantling. A plant; of nutural size. Fig. 1 a flower, 2 stalked ovary, column, anther in situ, foot and lip, 3 the petals, 4 lip, half profile view, 5 column with the anther in situ and foot, 6 anther, 7 pollinia; all enlarged.
13. Cirrhopetalum elatum, Hook. fil. Ic. Plantar., t. 2052.

Coespitose; pseudo-bulbs cylindric, tapering to the apex, 2 to 3 in . long, usually of a dull copper colour. Leaf narrowly oblong, obtuse, slightly notched, tapering to the
base, sessile or sub-sessile, 8 to 10 in . long and 1 to $1 \cdot 25 \mathrm{in}$. broad. Scape as long as the leaves, slightly decurved, slender, speckled with purple, and with two or three small bracts; umbels many-flowered. Flowers about 75 in . long, radiating; floral bract much shorter than the stalked ovary. Dorsal sepal free at its base from the lateral pair, broadly ovate, sub-acute, depressed, the lateral pair three or four times as long as the dorsal, narrowly oblong, falcate, sub-acute, not cohering. Petals falcately triangular, with oblique bases. Lip oblong, tapering to the sub-acute apex, entire, the base slightly dilated, the upper surface with a shallow mesial groove on its basal half. Column slightly winged; the apical teeth minute, decurved; the foot slender, much curved. Hook. fil. Fl. Br. Ind. V, 775.

Sikkim; at elevations of 5,000 to 6,000 feet; Clarke, Gamble; Jaldacea valley, 6,000 feet; Pantling, No. 160; in flower in May.

The flowers are of a dirty yellow, spotted with purple. This is closely allied to C. picturatum; G. Lodd,-a Burmese species which, however, has awned dorsal sepals, erose petals, and a column with long subulate apical teeth.

Plate 130.-Cirrhopetahom elatum, Hook. fil. A plant; of natural siso. Fig. 1 a flower, 2 petalz, 3 bract, long-stalked ovary, column with the anther in situ, foot and lip, seen from the side, 4 lip, 5 column, showing its narrowly winged sides and small apical teeth, the anther and the slender curved foot, 6 anther, 7 pollinia; all enlarged.

## 14. Cirriopetalum guttulatum, Hook. fil. Fl. Br. Ind. V, 776.

Pseudo-bulbs coespitose, crowded, ovoid, tapering much to the apex, 1 to 2 in. long. Leaf elliptic-oblong, sub-acute, tapering much to the channelled petiole; length 3 to 6 in ., breadth 8 to $1 \cdot 25 \mathrm{in}$.; petiole 5 to $\cdot 75 \mathrm{in}$. Scape equalling or exceeding the leaf, decurved, spotted with purple, with two sheathing bracts at the base and several scattered along the peduncle. Flowers about 75 in . long, in umbels of 6 to 9 on long pedicels; floral bract ovate, acuminate, much shorter than the long pedicel of the ovary. Dorsal sepal free at its base from the lateral pair, broadly ovate, apiculate, very concave, vaulted over the column; lateral sepals free, about twice as long as the dorsal, ovatelanceolate from a broad base, sub-falcate, sub-acute, their upper margins incurved, cohering only at the base, the apices divergent. Petals broadly elliptic, shortly apiculate, shorter than the dorsal sepal, spreading. Lip deflexed from the middle, oblong with a very broad base, the apox minutely emarginate; the under surface with a grooved keel. Column stout, with broad rectangular wings, the apical teeth long, filiform, decurved; the foot rather long, its apex upturned. Pollinia ellipsoid, attached to a ball of viscid cheesy matter, the inner two very small. Bulbophyllum umbellatum, Lindl. in Wall. Cat. 1984 ; in Bot. Reg. 1845, t. 44 ; Bot. Mag. t. 4267 ; Reichb. fil. in Walp. Ann. VI, 264. B. guttulatum, Wall. MSS.

Sikkim ; at altitudes of from 2,000 to 5,000 feet ; not uncommon; Griffith (No. 5180, Kew Distrib.); Pantling, No. 53. Nepal; Wallich. Khasia and Assam Hill Ranges; in flower from July to September.

The flowers of this are of a pale yellow, beautifully spotted with purple, the lip being almost entirely purple. What is probably this species has been recently collected in the Shan States in Burma, but the specimens are not in flower. This much resembles C. maculosum, Lindl., but has longer scapes and much longer columnar processes.

Plate 131.-Cirrhopetalum guttulatum, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 bract, the long-pedicelled ovary, the column and lip seen from the side, 3 lip, 4 column with the anther in situ and the foot, 5 anther, under surface, 6 pollinia; all enlarged.

## 15. Cirriopetalum maculosum, Lindl. in Bot. Regist. 1841, Misc. 81 ; 1843, under t. 49.

Rhizome with fibrous sheaths and many roots, about $\cdot 2$ in. thick; pseudo-bulbs touching or as much as $\cdot 5 \mathrm{in}$. apart, ovoid, shrivelled, $\cdot 75$ to 1 in . long. Leaf thick, narrowly oblong, the apex obtuse and notched, narrowed at the base, sessile, 4.5 to 6 in . long and 65 to 1.25 in . broad. Scape about twice as long as the pseudo-bulbs, with a sheath at the base, the umbel two- to four-flowered; floral bract lanceolate, shorter than the stalked ovary. Flowers about 4 in . long. Dorsal sepal free at its base from the lateral pair, broadly ovate, acute, sub-depressed; lateral sepals about twice as long as the dorsal, free, ovate-lanceolate from a broad base, sub-acute, falcate, their upper margins curved inwards. Petuis broadly ovate, very obtuse. Lip oblong with a broad base, tapering to the sub-acute apex, the upper surface with a groove and a line in the middle of it. Column broadly winged, short; the apical teeth short, curved, blunt; the foot narrowed, rectangularly curved below the apex, otherwise rather straight. Pollinia unequal, the outer two much the larger, all cohering to a mass of viscid tissue. Hook. fil. Fl. Br. Ind. V, 776. C. bootanense, Griff. Notul, III, 297; Ic. Pl. t. 299. Bulbophyllopsis maculosa, Reichb. fil. in Walp. Ann. VI, 243. B. morphologorum, Reichb. fil. in Bot. Zeit. 1852, 933.

Sikkim; at Tendong; elevation 5,000 feet; Pantling, No. 208; in flower in May. Distributed westward to Nepal, Kumaon and Gharwal; Falconer, Strachey and Winterbottam and other collectors. Khasia Hills; Mrs. Prain.

The sepals and petals are cream-coloured, profusely spotted; the lip is green, and the foot of the column blotched with red. This is allied to C. guttulatum, Hook. fil. As in the case of $C$. ornatissimum, the pollinia adhere to a viscus. The Sikkim plant has been made a variety by Sir Joseph Hooker under the name of var. fusceseens.

Plate 132.-Cirrhopetalum masulosum, Lindi. A plant; of natural size. Fig. 1 a flower with its stalked ovary and bract, side vien, 2 front of ovary, column with its foot and the lip, seen from the side, 3 lip, 4 column, half front view to show the wings and apical processes, the anther in situ, and the foot, 5 anther, 6 pollinia; all enlarged.

> 16. Cirrhopetalum ornatissimum, Reichb. fil. in Gardn. Chron. 1882, II, 424 .

Rhizome naked, about $\cdot 15 \mathrm{in}$. thick; pseudo-bulbs narrowly ellipsoid, about 1 in . apart and 1 in . in length. Leaf oblong, the apex obtuse and slightly notched, the base slightly narrowed, sessile, 2.25 to 4 in . long. Scape about 3 in . long, rather stout, bearing one sheathing bract at the base and one free lanceolate one about the middle, and a solitary flower at the apex; floral bract lanceolate, shorter than the sub-sessile ovary. Flower (to the ends of the lateral sepals) 7 or 8 inches in length. Dorsal sepal (including its tail) about $\cdot 7$ in. long, erect, ovate, 3 -nerved, the apex prolonged into a long drooping filiform appendage bearing hairs on its edges
in its lower half, and irregular sub-cuneate deeply erose red paleæ in its upper; the lateral pair widely separated at their bases from the dorsal, lanceolate, from 4 to 7 inches long, the filiform tips twisted into a tail, their apices free. Petals subulatelanceolate, falcate, 1 -nerved, with filiform pale-bearing apices like the dorsal sepal and of about the same length. Lip oblong, obtuse, decurved from the very concave base; the area between the upturned edges flat and with three raised lines, the outer two sinuous, the central one straight. Column broad with hooked decurved apical teeth, dentate at their bases; the foot curved, tapering. Anther pubescent in front; pollinia oblong, compressed, attached to a ball of viscid matter. Warner Orchid. Alb. t. 369 ; Hook, fil. Fl. Br. Ind. V, 773.

Sikkim, in warm valleys; Pantling, No. 197; in flower during October and November.

The colour of the flowers is yellowish-green with purple markings; the paleæ and lip are dark purple. The lateral sepals in the plant from which the drawing was made measured 7 inches in length. The flowers have a very unpleasant odour. The nearest allies of this are the Burmese C. Collettii, Hemsl., and the Malayan C. vaginatum, Lindl.

Plate 133.-Cirrhopetalum ornatissimum, Reiehb. fil. A plant; of natural size. Fig. 1 dorsal sepal, 2 petals, 3 paleæ from the petals, 4 bract, ovary, column with the anther in situ and lip, 5 lip, 6 column, showing its decurved apical processes, foot, and the lip, 7 anther, 8 pollinia and viseus; all enlarged.

## 8. Anthogonium, Lindl.

Terrestrial, slender; pseudo-bulb small, partly buried in the soil, bearing at the apex a short 2 - to 5 -leaved stem. Leaves membranous, linear, plicate, sessile, sheathing. Scape from the side of the pseudo-bulb, exceeding the leaves, bearing a simple or slightly branched terminal lax raceme of resupinate flowers rather more than 5 in . long, gibbous at the base. Sepals connate in their lower half into a narrow cylindric tube; the upper halves free, oblanceolate, spreading. Petals elongatespathulate, their narrow bases included in the seplline tube. Lip adnate to the base of the column, convolute, embracing the column; the basal part narrow, the anterior part slightly expanded, and the mouth obscurely 3 -lobed. Column long, slender, its apex dilated and abruptly bent, not winged and with no foot. Anther 4-celled; pollinia 4 , in one row, unequal, without membrane or viscus. A single species.

Anthogonium gracile, Lindl. in Wall., Cat 7398; Gen. and Spec. Orchid., 426.
Pseudo-butb ovoid. Stcm 4 in . long, sheathed at the base, bearing 2 to 5 membranous, many-nerved, acuminate leaves, not petiolate, but sheathing at the base, 6 to 12 in . long and $\cdot 4$ to 7 in . broad. Scape longer than the leaves, rising from the side of the pseudo-bulb, slender, erect, bearing several short tubular sheaths $\cdot 5$ in. long. Raceme 3 to 6 in . long, sometimes with a branch, sparsely flowered. Flowers - 6 to $\cdot 75 \mathrm{in}$. long, often at a wide angle with the long-stalked ovary; the bract lanceolate, minute. Tube of the perianth longer than the free parts; anterior part of the lip cuneate, the apex tri-lobulate. Pollinia four in a single row, unequal,
without either membrane or gland. Capsule 1 in . long, fusiform. Lindl. in Journ. Linn. Soc, III, 22. A. Griffithii, Reichb. fil. in Bonplandia, II, 90 ; in Allg. Gartenzeit, for 1856, 218 ; in Walp. Ann. VI, 471 ; Hook. fil. Fl., Br. Ind, V. 823. Anthogonium, Griff. Notul. III, 383 ; Ic. Pl. Asiat. t. 345.

Sikkim ; at elevations of from 4,000 to 7,000 feet, common; Pantling, No. 54 : flowering during August and September. Distributed westward along the Himalaya to Nepal and in the Khasia and Naga Hills; also in Burma.

The flowers are rose-coloured, the lip being white towards the apex, with dark purple spots, and the anther a brilliant yellow, A white-flowered variety is not uncommon.

Plite 134.-Anthogonium gracile, Lindl. A plant; of natural size. Fig. 1 flower, 2 bract, ovary and lip, in profile, the sepals and petals having been removed, 3 lip, spread out, 4 upper part of column with anther in situ, 5 under surface of anther, 6 pollinia; all enlarged.

## 9. Chrysoglossum, Blume.

Terrestrial with creeping rhizome, pseudo-bulbs narrow. Leaf solitary, plicate, membranous, elliptic-lanceolate. Scape from the rhizome near the pseudo-bulb, erect the raceme lax. Sepals sub-equal, spreading, the lateral pair connate into a mentum with the base of the lip. Petals slightly broader than the sepals. Lip usually auricled near the base, adpressed to the column and adnate to its foot, deflexed below the middle, 3-lobed, 3-lamellate. Column slender, with a very small spur, its sides auriculate about the middle, sometimes lamellate in front. Anther triangular, 2-celled; pollinia 2, free, sub-globose or unequally four-sided.

A genus for a long time supposed to be confined to the Malayan region, but, as discovered by Sir Joseph Hooker, quite as much Indian as Malayan, there being two species now known from India, and one from Ceylon, besides the two Malayan originally described by Blume. This genus resembles Tainia and Plocoglottis in habit, and to some extent Eulophia also. It is characterised by its bi-auriculate column, small mentum (formed by the union of the bases of the column, lip and lateral sepals); 3 -lobed lip with a large auriculated base adnate to the column (not jointed); and perfectly free, sub-globular or angled pollinia, and membranous plicate leaves.

Cerysoglossum erraticum, Hook. fil. Ic., Plantar., t. 2062.
Pseudo-bulb narrowly ovoid, tapering much to the apex, about 3 in. long. Leaf tapering to each end, about 12 in . long and 4 in . broad; petiole 4 in . Scape about as long as the leaf, with three or four sheathing bracts about 75 in . long. Flowers few, about $\cdot 8$ in. across; floral braet lanceolate, shorter than the long-stalked ovary. Sepals linear-oblong, sub-acnte, the lateral pair falcate. Petals oblong, obtuse, very falcate. Lip with a broad base hastately 3 -lobed, the lateral lobes rounded, the apical lobe sub-acute with upturned margins. Disc with three lamellæ, the central one shorter, the two lateral diverging at their apices. Column with two projecting rounded, lobes on its margins below the middle, and a short spur at its base; the face grooved and with two lamellæ near the base and above the entrance to the spur. Anther apiculate.

Sikkim; at Rishap; C. B. Clarke. Bhotan, in the valley of the Gheet, at an elevation of from 3,000 to 5,000 feet; Pantling, No. 83; in flower during June,

The sepals and petals are green, minutely spotted with brown; the lip is white with a yellow spot at its base and reddish spots on the edges of the side and apical lobes; the column is yellow with a white blotch.

Plate 135 -Chrysoglossum erraticum, Hook. fil. A plant; of natural size. Fig. 1 the sepals and petals, detached, 2 ovary and column, showing its short spur and the lip, side viow, 3 lip, 4 the base of the lip, showing the yellow auricles, 5 column with the anther in situ, 6 anther, 7 pollinia; all enlurged.

## 10. Diglyphosa, Blume.

Terrestrial with creeping rhizome and long narrow pseudo-bulbs, each bearing a solitary, membranous, elliptic, plicate, petiolate leaf. Scape lateral near the base of the pseudo-bulb, erect; the raceme many- and densely-flowered, with a thick rachis. Sepals broadly lanceslate, the lateral pair and the petals falcate. Lip jointed to the foot of the column, mobile, oblong, bilamellate from base to apex, with obscure basal but no lateral lobes; the apical lobe narrow. Column with a foot half as long as itsclf, but without lateral wings or auricles. Anther with two projecting triangular wings ; pollinia 2, elliptic, slightly obovate, sometimes attached to a small mass of adhesive matter. Distrib. two species, one Malayan and one British Indian.

A genus closely allied to Chrysoglossum, but differing from it in the column having rather a long foot, but neither wings nor auricles; in the polliuia being elliptie and slightly clavate (instead of sub-globular or unequally 4 -sided) ; in the petals and sepals being much broader; in the lip being without basal or side lobes; and in the raceme being many- and densely-flowered, and having a thick rachis and large persistent coloured bracts. The genus was first founded by Blume in his Bijdragen (p. 336 t. 60). The same author again described and figured in his Flora Javæ (Orchid. 138, t. 60) the only species known to him ( $D$. latifolia). In the text of the Flora Javæ, Blume changed the name of the genus to Diglyphis, retaining that of Diglyphosa in his figure. The older name must of course stand.

## Diglyphosa macrophylla, King and Pantling.

Pseudo-bulb sub-cylindric, broadly elliptic, thin, 6 in. long. Leaf plaited, slightly narrowed at base and apex, 15 in . long and 7 in. broad; its petiole 8 in . long. Raceme about 6 in. long, many-flowered, its stalk about 12 in . long, sparsely bracteolate. Flower $\cdot 5$ in. across; the ovaries $\cdot 5$ in. long; bract lanceolate, reflexed, shorter than the stalked ovary. Sepals sub-equal, the dorsal lanceolate, the laterals falcate. Petals slightly broader than the sepals, falcate. Lip contracted into a claw at the base, mobile, oblong, abruptly decurved from the obscure rounded basal lobes, the apex minutely emarginate and decurved; upper surface with two bold longitudinal minutely hispid lamellæ running from the base to nearly the apex where they unite. Mentum none. Anther with two projecting triangular wings. Pollinia 2, attached to a small viscus. Chrysoglossum macrophyllum, King and Pantling, in Journ. As. Soc. Bengal, Vol. XLIV, pt. 2, 335.

Sikkim; in the Chel valley, at an elevation of 4,000 feet; in flower in May; Pantling, No. 315.

The colour of the flowers is golden-brown throughout, that of the scape and rachis is purple. The flowers have an unpleasant smell. The only other species of the
genus is D. latifolia, B1., of which the flowers are yellowish, tinged with purple, the floral bracts being of a dull brownish-grey colour.

Plate 136.—Diglyphosa maorophylla, King and Pantling. Pseudo-bulb, part of a stem and of a peduncle and an entire raceme; of natural size. Fig. 1 sketch of an entire plant, much reductd in size, 2, flower, 3 floral bract, stalked ovary, column and lip, side view, 4 lip, 5 column with its foot and anther in silu, 6 anther, side and front view, 7 pollinia; all enlarged.

## Tribe II.-EPIDENDREAE.

Pollinia 4 or 8 , waxy, attached by their bases or by their backs to a single or double granular or translucent appendage, but without any gland derived from the stigma.

Terrestrial, with or without pseudo-bulbs, leaves membranous, plicate; inflorescence axillary or soapiform; lip lamellate, 3 -lobed, column long, pollinia 8.

Leaves linear from a slender psoudo-stem; inflorescence racemose, the peduncle long and slender, column without a foot, lip never spurred (saccate in Pachystoma).

Lip sessile, with horizontal lamellæ, not sacoate; column hooded, nearly straight, leaves and flowers contemporaneous
11. Spathoglottis.

Lip sessile, saccate at the base, lamellw ridge-like and carunculate ; column dilated towards the apex, but not hooded, leaves not contemporaneous with the flowers.

12. Pachystoma.

Leaves elliptic, ovate or cordate, solitary from a pseudo-bulb or lateral from a stem, petiolate or sub-sessile; inflorescence scapiform or terminal from a stem; column with or without a foot, sometimes spurred.

Sepals and petals sub-equal, all free.
Lateral sepals inserted on the short foot of the column; lip not convolute, rarely spurred; pseudo-bulbs 1-leaved; leaves elongate, long-petioled
13. Tainia.

Lateral sepals inserted on the long foot of the column and forming with it a mentum, or column without foot and lip spurred; pseudo-bulbs when present, 1-leaved; leaves ovate or cordate, sub-sessile . . .
Lateral sepals inserted on the base of the footless column; lip spurred, convolute above the column, the mouth large and with undulate edges ; pseudobulb with a many-leaved short pseudo-stem; leaves sub-sessile
Sepals cohering into a ventricose tube, their apices only free. Petals free, included except their apices; foot of column very long and bent at a right angle; the lip mobile
14. Nephelaphyllum.
15. Phajus.
16. Acanthephippium.

Terrestrial, with tall reed-like many-leaved stems and no pseudo-bulbs; infloressence terminal, panicled; lip sessile, not spurred, its base convolute and embracing the column; pollinia 8, unequal
17. Arundina.

Epiphytal, either with or without pseudo-bulbs; leaves membranous or fleshy; inflorescence lateral or terminal; lip usually lamellate, column with a long foot, flowers with a mentum; pollinia 8, sub equal, all cohering, or cohering by fours to a common membrane.

Column straight, short; lip oblong, not mobile.
Sepals connate, petals included except their apices; pseudobulbs small, discoid, reticulate; flowers one or two, terminal.
Sepals and petals free, spreading; pseudo-bulbs when present not discoid; inflorescence lateral or terminal, racemose or capitate
18. Porpax.
19. Eria.

Column long; curved, arohing so that its apex is brought opposite the middle of the lip; its foot much thickened, coloured; lip orbicular, mobile; racemes lateral
20. Tylostylis.

Epiphytal, with pseudo-bulbs or jointed stems, ccespitose or with a rhizome; leaves in pairs, membranous; inflorescence terminal or scapiform, racemose; column usually long (short in some species of Pholidota) with no foot; pollinia 4, in free pairs, or all cohering to a common membrane.

Pseudo-bulbous.
Lip not clawed and not sigmoidly bent at the base; disc of lip lamellate
21. Coelogyne.

Lip clawed and boldly sigmoid at the base; dise of lip
not lamellate . . . . . . . . . . . 22. Panisea.
Stems composed of elongate pseudo-bulb-like joints strung end to end on a woody core.

Sepals narrow; lip narrow and deflexed, saccate at the base; floral bracts caducous
23. Otochilus.

Sepals broad, lip broad and erect, not saccate at the base; floral bracts persistent
24. Pholidota.

## 11. Spathoglottis, Blume.

Terrestrial ; pseudo-bulbs broadly ovoid. Leaves on short stems, long, narrow, manynerved. Scape lateral, bearing a few rather large flowers in a raceme. Sepals and petals sub-equal, free, spreading. Lip sessile on the base of the column, erect, usually saccate at the base; lateral lobes divergent, the disc between them ridged or tubercled; terminal lobe large. Column long, erect, winged toward the apex, with no foot. Anther 2 -celled. Pollinia 8, cohering to a small membrane. Species about ten, in the tropics of Asia, in tropical Australia and the islands of the Pacific.

Spathoglottis ixioides, Lindl. in. Wall. Cat. 3745 ; Gen, and Spec. Orch., 120.
Pseudo-bulbs globular, ovoid, $\cdot 6$ to $\cdot 75 \mathrm{in}$. long, with numerous loose sheath-like fibres at their bases. Leaves two or three on a short sheathed stem from the apes of the pseudobulb, linear, acuminate, with several nerves, 4 to 8 in. long and about 2 or 25 in . broad. Scape from the side of the pseudo-bulb, erect, slender, longer or shorter than the leaves, with a long sheath at the base and bearing three or four flowers in a lax raceme at the apex, Flowers yellow, 1.5 in . in vertical expanse, puberulous; floral bract lanceolate,
shorter thian the puberulous long-stalked ovary. Sepals and petals subequal, spreading, elliptic, oblong, sub-acute. Lip sessile on the column, erect, oblong, sub-saccate or concave at the base, 3 -lobed; the side lobes conical, bifid, diverging; the terminal lohe obcordate, the disc between the side lobes with two elongate dimidiate calli separated by a mesial ridge passing forwards to the terminal lobe. Column elongate, dilated into wings towards the apex. Anther 2-celled. Pollinia 8, narrowly clavate, cohering in fours to a small membrane. Lindl. in Journ. Linn. Soc. III, 22; Hook. fil. Fl. Br. Ind. V, 814. Pachystoma Josephi, Reichb. fil. in Walp. Ann. VI, 464. Cymbidium ixioides, Don Prod. 36.

Sikkim, in the Lachoong valley, elevation 10,000 feet, Hooker, Elwes; Pantling 'No. 405; in flower during July and August. Nepal; Wallich, Scully.

The flowers are of a bright pule yellow, the lower half of the lip having numerous minute red spots.

Plate 139.-Spathoglottis ixioides, Lindl. A group of plants; of natural size. Fig. 1 lip, 2 column with anther in situ, 3 empty anther, lower surface, 4 pollinia; all enlarged.

## 12. Pachystoma, Blume.

Terrestrial, with rather thick rhizomes. Leaves solitary or in pairs, following the flowers, long, narrow, many-nerved. Scapes pale, leafless but with many sheaths; flowers white or pale purple, puberulous, rather small, in crowded racemes. Lip sessile on the footless column, erect, with oblong acute side lobes and small terminal lobe. Column short, dilated at the apex. Anther dorsal. Pollinia 8, pyriform, adhering to a single membrane. About six or eight species, Asiatic or African.

Pachystoma senile, Reichb. fil. in Bonplandia, III, 251.
Terrestrial, leafless at flowering time. Rhizome rather stout, producing seapes at intervals of 2 inches. Leaf succeeding the flowers, solitary, membranous, linear, 4- or 5 -nerved, longer than the scape. Scapes about a foot high, very pale, clothed with numerous membranous clasping striate sheaths each 1 to 2 inches long; the raceme occupying the upper fourth, many-flowered. Flowers about 5 in. across, glandularpuberulous; floral bract lanceolate, acuminate, erect, longer than the curved stalked pubescent ovary. Sepals unequal; the dorsal oblong, elliptic, blunt; the lateral pair oblong-lanceolate, sub-acute, all spreading. Petals narrowly spathulate, recurved, puberulous like the sepals. Lip sessile on the base of the column, erect, broadly oblong, 3 -lobed, the base gibbous and pubescent, the side lobes with acute falcate apices; the terminal lobe orbicular, short, recurved, the dise of the whole lip from base to apex occupied by five stoutly crested ridges. Column dilated at the apex, puberulous. Anther on the back of the column, indistinctly 8 -celled. Pollinia 8 , sub-clavate, cohering to a single cylindric appendage. Reichb. fil. in Walp. Ann. VI, 463; Hook. fil. Fl. Br. Ind. V, 812. P. Smithianum, P. montanum and P. Lindleyanum, Reichb. fil. 1, e.; and in Walp. Ann. VI, 462-463. P. Edgeworthii, Reichb. fil. Walp. Ann. VI, 463. Apaturia senilis, A. Smithiuna and A. montana, Lindl. in Wall. Cat. 3739, 3737, 3738; Gen. and Spec. Orchid., 130, 131. A. Lindleyana, Wight Ic. Plant. t. 1662.

At the base of the Sikkim-Himalaya; Pantling No. 432; in flower during March. Extending along the base of the Himalaya westward to Gharwal. In the Khasia Hills, the base of the ranges of Peninsular India and of Ceylon, the Malay Archipelago and S. China.

The flowers are greenish-white, often flushed with pink; the terminal lobe of the lip being purplish. There is some variation in the size of the bracts which sheath the scape, but the variations are not constant.

Plate 140.-Pachystoma senile, Reíchb. fil. Rhizome, flowering scape and leaf; of naturai size. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther and lip, seen from the side, 3 lip, 4 part of ovary, column showing the stigma and the end of the dorsal anther, 5 lower surface of anther, 6 pollinia; all enlarged.

## 13. Tainia, Blume.

Terrestrial, g'abrous, pseudo-bulbous. Leaf solitary, petiolate, membranous, manynerved. Scape tall, erect, originating from the base of the pseudo-bulb. Flowers racemose, rather small and of a dull colour. Scpals and petals sub-equal, narrow; the lateral sepals falcate, forming with the short foot of the column a small blunt mentum. Lip more or less hastately 3 -lobed, the lateral lobes small, the terminal broad, the dise with several lamellæ. Column slightly winged towards the apex. Anther short, broad, with two blunt often highly coloured bosses. Pollinia 8, unequal, united in fours to a granular membrane. Species eighteen or twenty, Indo-Malayan and Chinese.

> Pseudo-bulbs narrowly fusiform. Scape as long as or slightly longer than the narrowly elliptic leaves . . 1. T. minor. Scape at least twice as long as the broadly elliptio leaves . . . . . . 2. T. latifolia. Pseudo-bulbs ovoid. Leaves narrowed at the base . . . . . . . . . . . . . . . . . . T. Hookeriana.

1. Tainia minor, Hook. fil. Ic. Plantar., t. 2091.

Rhizome stout, with woolly roots. Pseudo-bulbs narrowly fusiform, inclined, about 1.5 in . apart, oblique, slightly curved, 1.5 to 1.75 in . long, often covered with a fibrous sheath. Leaf plicate, membranous, narrowly elliptic, tapering to each end, 5 or 6 in . long, and 1.5 to 2.25 in . broad; petiole channelled, 2 to 2.5 in . long. Seape from the base of the pseudo-bulb, erect, slender, as long as or longer than the leaf, tuberous at the base and enveloped in several unequal tubular sheaths; the raceme occupying the upper half and bearing seven or eight distant flowers $\cdot 6 \mathrm{in}$. long; floral bract linear-lanceolate, slightly shorter than the stalked ovary. Sepals free, spreading, narrowly oblong, blunt, the lateral pair sub-falcate. Petals like the lateral sepals, all 3 -nerved. Iip narrowly cuneate-elliptic, 3 -lobed, the lateral lobes far forward, small, sub-acute ; the terminal lobe broad, short, erose, obtuse, its upper surface with five narrow unequal ridges; the disc between the side lobes with three broad lamellæ. Mentum short, blunt. Column slightly winged towaràs the apex, the foot very short. Anther short, broad, with two obtuse bosses. Pollinia unequal, cohering in fours to a granular mombrane. Hook. fil. Fl. Br. Ind. V, 821.

Sikkim, on Mahalderam peak, elevation 6,000 feet; King, Clarke; Pantling No. 210; also at Choonthang; in flower during July. Bhutan; Biermann.

The sepals, petals, ovary and rachis of the raceme are of a purplish-brown, the two former being streaked with a darker shade; the lower half of the lip is white, speckled towards the sides with brownish-purple, the anterior part being yellow. The column and anther are green. Specimens of this are mixed with the species issued by Wallich as No. 7346 of his Catalogue under the name Culanthe plantaginea.

Plate 141.-Tainia minor, Hook. fil. A plant; of natural sise. Fig. 1 sepals and petals separated, 2 part of rachis, bract, stalked ovary, column and lip seen from the side, 3 lip, 4 column and anther, 5 anther, 6 polinia; all enlarged.
2. Tainia latifolia, Benth. ex Hook. fil. Fl. Br. Ind. V, 820.

Rhizone stout, with woolly roots. Pseudo-bulbs narrowly fusiform, about 1 in . apart, often enveloped in membranous sheaths, oblique, 3 to 4 in . long, not more than 5 to $\cdot 75$ in. thick. Leaf plicate, elliptic, acute, petiolate; length 9 to i2 in., breadth $2 \cdot 25$ to 4 in.; petiole $3 \cdot 5$ to 5 in., channelled, Scape 18 to 36 in . long, bearing several long tubular sheaths in the lower part and at the apex a lax many-flowered raceme 6 to 9 in. long. Flowers $\cdot 6$ or $\cdot 7$ in. long; floral bract small, linear-lanceolate, much shorter than the stalked ovary. Sepals and petals sub-equal, erecto-patent or spreading, linearoblong, acute. Lip narrowly oblong-panduriform, 3 -lobed, not spurred; the lateral lobes small, tooth-like, divergent; the terminal lobe large, bluntly triangular, the upper surface with a narrow central and two broad lateral lamellæ running from the base nearly to the apex. Mentum very short, blunt. Column narrow, curved, with a very short foot. Anther short, broad, with two crimson bosses. Pollinia in fours, broad, unequal, compressed, each united to a granular membrane. Hook, fil, Fl. Br. Ind. V, 820. Tuinia hastata, Hook. fil. Ic. Plant., 2094. Ania latifolia, Lindl. in Wall Cat., 3741 ; Gen. and Spec. Orch., 130. Eria Ania, Reichb. fil. in Walp. Ann. VI, 270. T. cordifolia, Hook. fil. Fl. Br. Ind. VI, 193; in Ann. Bot. Gard. Calc., V, 24, t. 36.

Sikkim, in tropical valleys, ascending to elevations of 2,500 feet; many collectors, Pantling No. 106. Sylhet, Cachar and Khasia Hills; Wallich and others. Burma; Griffith.

The sepals and petals, the pedicels of the ovaries and the rachis of the inflorescence are of a uniform dark brown, the lip and column are yellow, and the pseudo-bulbs olive green.

Plate 142.-Tainia latifolia, Benth. Leaf, pseudo-bulb and scape with its raceme; of natural sise. Fig. 1 a flower, 2 bract, stalked ovary, column with the anther in situ and lip, side vicu, 3 lip, 4 column and anther, front vies, 5 anther, 6 and 7 pollinia; all enlarged.

## 3. Tainia Hookeriana, King and Pantling in Journ. As. Soc., Bengal, LXIV, pt. II, 336.

Pseudu-bulbs ovoid, tapering upwards, 2 to 3 in . long, rising close together from a stout rhizome, and enveloped in a bract which sheaths also the petiole nearly to its apex. Leaf plicate, oblong-lanceolate, tapering much to each end, the blade 12 to 18 in . long and about 3 in . broad, its petiole somewhat shorter. Raceme about 10 in . long; its stalk about twice as long, glaucous, bearing two or three sheathing bracts near the
base. Flower about 1 in. long; the bract linear, about one-third of the length of the stalked ovary. Sepals and petals sub-equal, lanceolate, acuminate. Lip oblong, with a short, blunt, curved spur, rather large blunt incurved side lobes, and a dilated sub-reniform apex apiculate in the centre; upper surface of the middle of the lip with three ridges which, beginning at the base as lines, pass into converging lamellæ towards the apex; spur blunt, incurved, exceeding the sepals by 12 in . Column narrowly winged from base to apex. Anther with two purple bosses.

Sikkim, in tropical valleys, ascending to elevations of 2,500 feet, in flower in March; Pantling No. 204.

The colour of the sepals and petals is greenish with brown lines; the lip is white, and its lamellæ are yellow, spotted with pink. The anther is pink and its bosses are dark red. The species is near to T. viridifusca. We lave dedicated it to Sir Joseph Hooker.

Plate 143. Tainia Hookeriana, King and Puntling. Pseudo-bulbs, flowering-seape and leaf. Fig. 1 sepals and petals separated, of natural size, 2 apes of ovary, column, anther and lip, seen from the side, 3 lip, 4 column and anther, 5 front of an'her, 6 pollinia, 7 the same, side view; all enlarged.

## 14. Nephelaphyllum, Blume.

Terrestrial creeping herbs with succulent stems or pseudo-bulbs, and a few subcoriaceous, petiolate, often coloured, ovate or cordate leaves. Scapes sheathed, flowers in racemes. Sepals free, narrow, spreading or recurved. Petals narrow. Lip sessile on the base of the column (attached to its foot in N. grandiforum), usually shortly spurred. Column with winged edges, Anther 2-celled. Pollinia 8, unequal, adnate to a linear membrane. Species seven; Indian, Malayan and Chinese.

Column with a long foot, flowers with a mentum.

1. N. grandiflorum.

Column without a foot; flowers with no mentum, but with a short stout spur.

Lip broadly oblong, without lobes.
Lip elongate-cuneate, 3 -lobed.
2. N. pulchrum, var.

Sikkimensis.
3. N. cordifolium.

1. Nephelaphyllum grandiflorum, Hook. fil. Fl. Br. Ind. VI, 192; in Ann. Bot. Gard. Calc. V, pt. 1, 23, t. 34.
Pseudo-bulbs about 3 in. long, narrowly fusiform, touching by their bases, half covered by a membranous sheath and bearing at the apex a rather thick ovate-elliptic, acute, 7- to 9 -nerved leaf, cordate at the base, 4 or 5 in . long, and 2.5 to 3 in , broad, the petiole undistinguishable from the pseudo-bulb. Scape with raceme much longer than the leaves, erect, slender; its peduncle with two sheaths 1 to 1.5 in . in length, cne at the base and one about the middle; the raceme sparsely 6 - to 10 -flowered. Flowers 1 in. long; the bract linear-lanceolate, much shorter than the stalked ovary. Dorsal sepal lanceolate; the lateral pair larger, falcate and with broad bases. Petals as long as, but broader than, the dorsal sepal, acute, 5 -nerved like the sepals. Lip sub-panduriform when flattened out; the side lobes large, rounded, erect; the terminal lobe triangular, arute, deflexed; the upper surface with a thickened mesial line and two lateral undulate lamellæ running from the base nearly to the apes, Mentum conical. Column and its foot
sub-equal. Anthsr dilated, compressed and 2 -lobed at the apex, latoral margins of the clinandrium erose. Pollinia 8, unequal, one set of four much longer than the other set, all attached to a single membrane.

Sikkim, in the valley of the Teesta, at elevations of 1,000 to 1,500 feet; Pantling No. 206; in flower during March. Distrib. Perak.

The sepals and petals are of a pale greenish-brown colour, with dark brown nerves, the lip is white with small pink spots and a large bloteh of pink at the apex. The lip has also a yellow blotch at the base, the mentum and column are yellow. The pseudo-bulbs and leaves are of a uniform green colour.

Plate 144.-Nephelaphyllum grandiforum, Hook. fil. A plant; of natural size. Fig. 1 sepals and petals separated from each other, 2 floral bract, stalked ovary, column with its foot, and the lip seen from the side, 3 lip, 4 upper part of the column with the anther in situ, 5 the same with the anther removed so as to show the erose edges of the clinandrium, 6 pollinia; all enlarged.

## 2. Nephelaphyllum pulchrum, Blume (Bijdr. 372, t. 32) var, Silkimensis, Hook. fil., Fl. Br. Ind,, V, 819.

Pseudo-bulbs 1 to 1.5 in . long, arranged in a chain, ovoid-cylindric, with large membranous sheaths when young, each bearing at the apex a broadly ovate-lanceolate, 5 - or 6 -nerved, rather thick blade deeply cordate at the base; length 3 to 4 in., breadth 1.75 to 2.5 in., petiole $\cdot 5$ to 1 in . Scape from the base of the pseudo-bulb, sheathed, 3 or 4 in. long, bearing at its apex a few-flowered short raceme. Flowers 65 to 75 in. long; floral bract ovate-lanceolate, shorter than the shortly stalked ovary. Sepals and petals sub-equal, linear-oblong, acute, reflexed on the ovary. Lip almost flat, adpressed to the column, broadly oblong, without lobes, the apex broad and emarginate, the edges minutely crenulate; the upper surface with a broad thickened pubescent mesial band passing near the apex into 3 toothed ridges, the entrance to the bilobed spur at the base clothed with long hairs. Column without a foot, its sides narrowly winged from base to apex, the wings crenulate opposite the stigma. Anther short, broad and with two short horns. Pollinia 8, very unequal, the four smaller only one third of the size of the four larger.

Bhutan; Griffith (Kew Distrib. No. 5.370); at Guru Bathan, elevation 1,500 feet; in flower during June; Pantling No. 216.

The pseudo-bulbs and under surfaces of the leaves are purple, while the upper surfaces have a metallic lustre and are green, flushed and mottled with purple; the sepals, petals, ovary and (in part also) the base of the lip are red, the anterior portion of the lip and its spur being yellow. The typical form of this is found in the Malayan countries. As described and figured by Blume (Orch. Archipel. Ind. 171, t. 61; p. 1), its pseudo-bulbs are quite cylindric, not having bulbous bases as in the variety Sikkimensis. The flowers are also paler in colour and slightly larger in size. The synonymy of the typical form is as follows:-N. pulchrum, Blume Bijdr. 372, t. 32; Orch. Archipel. Ind. 171, t. 61, p. 1; Lindl. Gen. and Spec. Orch. 24 ; Reichb. fil. Xen. Orchid. 1, 216, t. 88, p. 1; Bot. Mag. t. 5332.

Plate 145.-Nephelaphyllum pulchrum, Blume, var. Sikkimensis, Hook. fil. A plant; of natural size. Fig. 1 a flower seen from the front, showing the reflexed sepals and petals and the lip partly hidden by the column, 2 lip, 3 bract, stalked ovary, winged column and sacoate spur of lip, with the anther in situ, 4 anther, 5 pollinia; all enlarged.

## 3. Nephelaphyllum cordifolum, Blume Orchid. Archipel. Ind. 145 ; t. 61 ; Fig. 3, A to D (1858).

Stem succulent, brownish-purple, ascending from the creeping rhizome and producing at each joint a short pseudo-bulbous growth surmounted by a leaf, 8 to 12 in . high and bearing several membranous hyaline sheaths 1 to 3 in. long. Leaves thickly membranous, ovate-cordate, acute, boldly 5 -nerved from the base, 2.5 to 4 in . long and 1.5 to 2 in. broad; the petiole dull purple, .5 to 1 in . long, with a large sheath. Raceme 3- to 6 -flowered. Flowers nodding, inverted, $\cdot 75$ in. long; floral bract linear, about as long as the shortly stalked ovary, withered at flowering time. Sepals free, sub-equal; narrowly oblong, spreading or recurved, the lateral pair apiculate. Petals like the sepals but smaller, gibbous at the widest part. Lip parallel with and sessile on the base of the footless column, elongate-cuneate, 3-lobed, with a short knob-like 2-lobed spur at the base; the lateral lobes narrow, diverging, the edges erose; the terminal lobe broad, retuse, its upper snrface with 3 stout spine-like calli. Column long. Anther short, broad, with two short crimson horns. Pollinia unequal, cohering in fours by a granular substance. Lind. in Journ. Linn. Soc. III (1859); Hook. fil. Fl. Br. Ind. V, 818. Citheris cordifolia, Lindl. in Wall. Cat., 3750 ; Gen. and Spec. Orchid., 129.

Sikkim; at Labba, elevation 5,000 feet; Pantling No. 275; in flower during June. Khasia Hills; Wallich, Griffith (Kew Distrib. No. 5371), Hooker, Oldham, \&c.

The flowers are green striped with purple, the lip and column being pale yellow. The leaves are green, suffused with pale and mottled with dull purple, they have also a broad streak of the same colour down the centre.

Plate 146.-Nephelaphyllum cordifolium, Blume. A plant; of natural sise. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, seen from the side, 3 section of the foregoing, 4 lip, 5 column with the horned anther in situ, and (at the base) the bilobed saccate spur of the lip, 6 anther, front view, 7 pollinia; all enlarged.

## 15. Phajus, Lour.

Terrestrial or epiphytal, with or without pseudo-bulbs, usually of large size. Leaves membranous, usually plicate. Flowers handsome, in a raceme from a scape rising from the base of the stem or pseudo-bulb, or from the axil of a leaf or at the apex of the stem. Sepals and petals sub-equal, erecto-patent, rarely spreading. Lip adnate to the base of the long footless column, erect, gibbous or spurred. Anther incompletely 4 -celled, Pollinia 8, attached by fours to a granular membrane. Species about thirty, natives of the tropics of Asia and of the Pacific.

> Flowering scape from the base of the stem or side of the pseudo-balb.
> Stem 2 or 3 in . long
> 1. $P$. nanus.

> Stem 18 to 48 in . long.

Flowers yellow, sepals and petals erecto-patent, column hairy . 2. P. maculatus,
Flowers buff and purple, or rarely yellowish; sepals and petals widely spreading, column glabrous.

Spur 5 to 75 in . long; anterior portion of lip ovate-rotund,

# Spur only 25 in. long, anterior portion of lip contracted, triilobulate <br> 4. P. Blumei. <br> Raceme from the axil of a leaf half way up the stem, flowers rosecoloured . . . . . . . . . . . . . . . . . . . . . . . 5. P. mishmensis. <br> Raceme on the apex of the stem, flowers white . . . . . . . . . 6. P. albis. 

## 1. Phajus nanus, Hook. fil. in Hook. Ic. Plant. t. 2088.

Rhizome stout, pseudo bulbs none. Stems only an inch or two long. Leaves narrowly elliptic or oblong, lanceolate, acuminate, narrowed to the long petiole, the lower one often sheath-like; length 12 to 15 in ., breadth 1.5 to 3 in .; petiole winged, 2 to 5 in. long. Scape from the base of the stem, erect, 6 to 9 in. long, bearing several wide scattered sheaths about 1 in . in length, and at its apex a 2 - to 3 -flowered raceme. Flowers 2.5 in. long; the bract large, lanceolate, cymbiform, about as long as the stalked ovary. Sepals and petals sub-equal, narrowly oblong, acuminate, spreading, Lip nearly orbicular when spread out, obscurely 3 -lobed, the base with a slender spur only about - 25 in. long; the side lobes small, rounded; the middle lobe plicate, its terminal lobule broad and emarginate, its upper surface faintly nerved, puberulous. Column short, puberulous. Anther short, broad. Pollinia 8.

In the Western Duars of Bhutan, east of the Jaldacca river, at an elevation of 500 feet; Pantling No. 433; in flower in February.

A species at once recognised by its dwarf habit.
Plate 148.-Phajus nanus, Hook. fil. A plant; of natural size. Fig. 1 floral bract, ovary and lip with its spur, side view, 2 lip, 3 front view of the column showing the anther in situ, the spur, and the apex of the ovary, 4 lower surface of empty anther, 5 pollinia; all enlarged.
2. Phajus maculatus, Lindl. in Wall. Cat., 3748.

Pseudo-bulbs ovoid-cylindric, naked, 4 to 5 in . long, and 2 to 2.75 in . in diam. near the base. Stem 16 to 24 in . high. Leaves four to six, stoutly membranous, ellipticlanceolate, acuminate, many-nerved, plicate, tapering to the petiole, 14 to 20 in . long and 3 to 4 in . broad, often spotted with yellowish-white. Scape from the base of the pseudo-bulb, 12 to 18 in . long, bearing several sub-tubular broadly lanceolate sheaths; the raceme many-flowered, rather crowded. Flowers 2.25 in. long; bract rather large, broadly lanceolate, longer than the shortly pedicelled ovary. Sepals sub-equal, oblong, obtuse, concave. Petals oblong-oblanceolate. Lip erect, oblong, concave, with a sharp spur at the base, side lobes narrow; terminal lobe deflexed, conchiform, its edges corrugated. Column without a foot, sparsely hairy in front. Pollinia 8, broad, compressed, attached in groups of four to two membranes, Capsule globose-ovoid, ribbed, 1.25 in. long, Lodd. Bot. Cab., t. 1803; Bot. Mag., t. 3960 ; Blume Mus. Bot. Lugd. Bat. II, 180; Orchid. Archip. Ind., 9; Hook. fil. Fl. Br. Ind. V, 817. Bletia flava, Wall. MSS. B. Woolfordii, Hook. in Bot. Mag., t. 2719; Reichb. fil. Fl. Exot., t. 63.

Sikkim, in tropical valleys; Hooker, Pantling No. 207; in flower during April. Nepal ; Wallich. Khasia Hills; Griffith. Distrib., China, Japan.

In Sikkim the flowers are of a dull yellow with faint stripes of a darker shade, the terminal lobe of the lip being brown. Figure 3960 in the Botanical Magazine, however, shows the flowers as of a bright yellow, the sepals and petals tipped with green and
the lip blotched with red rather than with brown. In fig. 2719 of the same work, the prevailing colour of the sepals and petals is shawn as green rather than red. Loddiges' figure shows the sepals and petals as of a pale primrose, the lip of bright yellow.

Plate 149.-Phajus maculatus, Lindl. Pseudo-bulbs, leaf and part of scaps; of natural siss. Fig. 1 lip and ovary, 2 upper part of the column showing the stigma and the anther in situ, 3 empty anther seen from below, 4 pollinia, 5 side view of the pollinia; all enlarged, 6 oapsule; of natural sise.

## 3. Phajus Wallichit, Lindl. in Wall. Pl. As. Rar. II, 46, t. 158.

Pseudo-bulbs conical, bearing three or four annular cicatrices and sometimes also one or two sheaths. Stem stout, 2 to 3.5 feet high, and from 5 to $\cdot 75$ in. thick. Leaves thickly membranous, elliptic-lanceolate, acute, tapering to the petiole, 12 to 24 in . long and $2 \cdot 5$ to 8 in . broad. Scapes from the side of the pseudo-bulb, 2 to 4 feet long, with several tubular sheaths $1 \cdot 5$ to 2 in . long; the raceme from 8 to 24 in., many-flowered. Flowers 4 to 6 in, across; bract large, cymbiform, slightly longer than the stalked ovary, caducous, Sepals and petals sub-equal, linear-lanceolate, acuminate, spreading. Lip shorter than the sepals and petals, its lower part tubular and ending in a narrow curved spur 5 to .75 in . in length; its anterior part deflexed, conchiform, more or less ovate, dilated, acute or acuminate, sometimes apiculate, the margins erose-undulate, the upper surface corrugated. Column erect, glabrous. Pollinia 8, dimidiately ovate, somewhat compressed, united by fours to two membranes. Capsule narrowly obovoid, stoutly ribbed, 3 in. long and 1.5 in, in diam, Lindl. Gen. and Spec. Orch. 126.; Lindl. in Bot. Reg. Mise., 44 ; Reichb. fil. in Walp. Ann. VI, 459 ; Paxt. Mag. Bot., t. 193; Bot. Mag., 7023 ; Hook. fil. Fl. Br. Ind. V, 816 (in part). P. bicolor, Lindl. Gen, and Spec. Orch. 128; Sertum Orch., t. 23 ; in Bot. Reg., 1839, Misc. 61 ; Bot. Mag., t. 4078 . Wight Ic. t. 1659-60; Thwaites Enum. Pl. Ceyl., 300; Blume Mus. Bot. Ludg. Bat. II, 178; Walp. Ann. VI, 458. P. grandifolius, Lindl. in Wall. Cat., 3747 (not of Loureiro).

Sikkim, in tropical valleys and at the base of the range ; many collectors; Pantling No. 120. Assam, Sylhet, Khasia Hills, Burma, Ceylon, also in the Malay Archipelago.

In Wallich's original figure of this species the sepals and petals are buff, and the lip is white tinged with yellow on the dise and externally, and also with slight touches of pink. The Sikkim plant here figured has darker sepals and petals, warm brown on the inner and white on the outer surface, while the lip is pale purple passing into white on the edges and into yellow in the tube.

Plate 150.-Phajus Wallichii, Lindl. Pseudo bulbs, part of a raceme and capsule, of natural size. Fig. 1 section through upper part of column, anther and spur, 2 empty anther, lower surface, 3 and 4 pollinia; all enlarged.

## 4. Phajus Blumer, Lindl. Gen. and Spec. Orch., 127, var. pulchra.

The characters of $P$. Wallichii, but the spur not exceeding $\cdot 25 \mathrm{in}$. in length, the mouth of the lip contracted and trilobulate, and the capsule ellipsoid and only $2 \cdot 5 \mathrm{in}$. in length; inflorescence rather lax. Blume Orch. Archip. Ind. 2, t. 1; De Vriese Jllustr. Orch. Archip. Ind., t. 8; Regel Garten-flora, XIV, t. 464. P. Blumei, var. Berneysii, Hook, fil, in Bot, Mag., t. 6032; var. Assamica, Reichb. fil, in Gard. Chron, for

## PHAJUS.

1882, I, p. 558. P. Wallichii, Hook, fil. Fl. Br. Ind. V, 816 (in part). ? Limodorum Tankervillice, Roxb. Fl. Ind. III, 466 (not of Aiton).

Sikkin, in similar situations to $P$. Wallichii; in flower during March and April; Pantling No. 189. Kamroop and Luckimpur in Assam; Clarke, Mann, Watt. Khasia Hills; Gallatly. Burma; Griffith (Kew Distrib.), No. 5292.

There has been some confusion and uncertainty about the limits of the two closely allied species $P$. Wallichii and $P$. Blumei, much of which has doubtless arisen from reliance being placed on the colour of the flower as a means of separating the species. The tendency has been to refer individuals with pale-coloured flowers to $P$. Blumei, and those with dark-coloured flowers to P. Wallichii. Mr. Pantling has had for some time a number of plants of both, of local origin, in cultivation at the Government Cinchona Plantation, and the conduct of one of these during the present year has completely broken down our faith in colour as a means of separating the two. The plant referred to used to produce flowers with the long spur and dilated ovate-rotund acuminate lip which we have above given as characteristic of $P$. Wallichii. Hitherto the colouration of these has been as follows; sepals and petals warm brown on the inner surface, white or nearly so on the outer; lip with a pale purple mouth becoming paler towards the white margin, the tube being yellow. The shade of purple on the lip has in former years been observed to vary in intensity, and the palest coloured lips have usually been the widest; the very dark coloured lips being smaller in every way. This has hitherto been the limit of variation. But during the present year there appeared on the clump in question two racemes, the flowers on which had dull yellow sepals and petals and a pale yellow lip, the yellow shading into white at the margins. But these pale flowers had spur and lip of exactly the same shape as those on the other racemes which produced flowers of the normal colour. No change in structure accompanied the change in colour. We have on the strength of this experience, as well as from the examination of large suites of specimens, both living and dried, been driven to the conclusion that the form of the spur and lip are the only reliable characters to separate the two. Both species appear to have the same distribution. The Sikkim plant, which we have here figured as $P$. Blumeei, has a more condensed raceme, larger flowers and smaller capsules than typical P. Blumei, and may be separated as a variety under the name pulchra. Two varieties of $P$. Blumei have been founded on the colour of their flowers. One from North Australia, which has been named variety Berneysii, has flowers of a sulphur yellow colour, the outer surface of sepals and petals being pure white; and closely allied to that is another described by Reichenbach filius (in Gardener's Chron. for 1882, I, p. 558), as P. Blumei, var. Assamica, which has "yellowish flowers with a light yellow lip bordered with white."

Plate 151.-Phajus Blumei, Lindl. var. pulchra, King and Pantling. Pseudo-bulb, base of stem and raceme; of natural size. Fig. 1 lip, 2 lip seen from above, 3 column and spur, 4 empty anther, 5 pollinia, 6 side view of a group of four pollinia, 7 a fruit; Nos. 1, 2 and 7 are of natural size, the others are enlarged. An entire plant, much reduced in size.

## 5. Piajus mishmessis, Reicbh. fil. in Bonplandia V, 43 ,

Stems 3 to 4 feet high and 5 to 75 in . thick, swollen at the very base but hardly pseudo-bulbous, naked below or bearing at the nodes the fibres of decayed sheaths; above with six to eight stoutly membranous, many-nerved, plicate, elliptic-lanceolate, acute leaves, narrowed at the base to a sheathing petiole; length 7 to 12 in., breadth 3
to 4 in. Raceme axillary, few- and sparsely-flowered; its peduncle long, slender, decurved, bearing one or two lanceolate sheaths. Flowers (measured to the end of the spur) about 1.75 in . long; bract lanceolate, 75 to 1 in . long, deciduous. Sepals sub-equal, narrowly oblong, sub-acute; the lateral pair sub-undulate, slightly broader than the dorsal. Petals narrowly spathulate, obtuse. Lip with a rather long sharp spur, when spread out sub-reniform, as long as the sepals, 3 -lobed, puberulous, upper surface with a pubescent mesial ridge from base to apex ; the lateral lobes large, broad, convolute into a tube, the apical lobe deflexed, sub-quadrate, emarginate both at the edges and at the broad apex; spur unequally and minutely bifid at the apex, pubescent internally. Column long, without a foot, the edges slightly winged towards the apex. Anther rounded, puberulous. Pollinia 8, narrowly oblong, slightly compressed, attached by fours to an elongated membrane. Reichb. fil. in Walp. Ann. VI, 922, 928; Hook. fil. Fl. Br. Ind. V, 817. Limatudes mishmensis, Lindl. and Paxt. Fl. Gard. III, 36.

Sikkim, at elevations of 4,000 to 6,000 feet, common; Pantling No. 18 ; in flower during September and October. Collected also by Clarke in Assam and in the Mishmi Hills by Griffith.

The flowers are rose-coloured, the petals being of rather a paler tint than the sepals, and the spur being a bright yellow. A form is occasionally met with having pure white flowers but, except that it is more slender in its habit, it differs from the type in no other respect.

Plate 152-Phajus mishmensis, Reichb. fil. Laaf and raceme ; of natural size. Fig. 1 floral bract, 2 sepals and petals, 3 side view of ovary, column and lip, 4 lip, 5 column with anther in situ and the spur of the lip, 6 anther, upper surface, 7 pollinia; all enlarged.

## 6. Phajus albus, Lindl. in Wall. Cat., 3749 ; Pl. As. Rar. II, t. 198.

Pseudo-bulb none. Stems stout, erect, tufted, 1 to 3 feet long, bearing many tubular sheaths at the base and numerous leaves. Leavcs membranous, glaucous beneath, dis. tichous, narrowly elliptic-lanceolate or oblong-lanceolate, acuminate, sessile, 6 to 12 in. long and 1 to 2.25 in . broad. Raceme terminal, drooping, 4 - to 6 -flowered, 4 to 6 in . long, on a short peduncle with a single elongate sheath. Flowers 2 to 2.5 in . long and 4 in . wide when forcibly expanded; the bract nearly white, large, oblong, cymbiform, acute, equalling or exceeding the long-stalked ovary. Sepals free, sub-equal, narrowly oblong, acute; the petals slightly narrower, acute. Lip broadly oblong-pandurate when spread out, the base with a short slightly bifid horizontal spur; the lower half convolute into a tube; the anterior cucullate, forming a rounded sheil-like mouth slightly acuminate and with sharply and unequally dentate undulate edges, the upper surface with seven to nine dentate crested ridges. Column slightly winged near the apex, with a very short foot. Pollinia 8, unequal, elongate. Capsule narrowly elliptic, 1.25 in. long. Lindl. Bot. Reg., 1838, t. 33 ; Paxt. Mag. V, t. 125; Bot. Mag., t. 3991. Grah. Cat. Bomb. Plants, 205 ; Blume Mus. Bot. Lugd. Bat. II, 181; Hook. fil. Fl. Br. Ind. V, 818. P. Marshalliana, Reichb. fil. in Linnæa XLI, 65; Regel Garten-flora, t. 1098. Thunia alba, Reichb. fil. in Bot. Zeit., 1852, 764. T. pulchra, Reichb. fil. in Gard. Chron., 1881, II, 166. Limodorum bracteatum, Roxb. FI. Ind. III, 466.

Sikkim, at elevations of 2,000 to 4,000 feet; Pantling No. 81 ; in flower during May. Distributed westwards along the Himalayan chain to Gharwal. In the Khasia Hills, Burma and also on the Western Ghâts.

The sepals and petals are pure white; the lip is also white, or yellow with purple or orange veins, the crested laminæ being orange. In Burma is found a form (which has been named var. Bensonice) with rose-purple sepals and petals, and a deep purple lip white at the base. In Sikkim there is a form rather smaller in all its parts than the type, and with a shorter congested raceme, but not differing in form. This smaller form is epiphytal and does not ascend above an elevation of 3,000 feet. It is No. 171 of Mr. Pantling's gathering.

Plate 153.-Phajus albus, Lindl. Part of a plant, of natural size; an entire plant; much reduced in size. Fig. 1 profile view of the stalked ovary, lip and spar, the column being hidden within the lip, 2 lip and spur from above, the latter flattened out, of natural size, 3 summit of the column, the anther in situ, 4 empty anther, 5 pollinia; enlarged.

## 16. Acanthephippium, Blume.

Terrestrial with large pseudo-bulbs bearing short stems and three to eight thickly membranous, plicate, petiolate leaves. Flowers few, large, fleshy, in a short lateral sheathed raceme. Sepals cohering, the lateral pair adnate to the long foot of the column to form a large pouched mentum, Petals erect, narrowed, included in the tube formed by the sepals. Lip mobile, small, stipitate, with broad incurved lateral lobes and a small triangular terminal lobe. Column short, stout, with a long foot. Pollinia 8, cohering by a granular mass. Species three or four, Indian or Malayan.

> Pseudo-bulbs ovoid; flowers 1.5 to 1.75 in. long; petals narrowly rhomboid, spotted and protruding beyond the tube of the sepals disc of lip 4-lamellate
> 1. A. sylhetense.

> Pseudo-bulbs elongate, obpyriform; flowers 1.25 in . long ; petals, dimidiate, oblong, included, striped, dise of lip with a single central ridge
> 2. A. striatum.

1. Acanthephippiom sylhetense, Lindl. Gen. and Spec. Orchid., 177.

Pseudo-bulbs large, ovoid, about 5 in . long and 2.5 in . in diam., tapering above into a stout leafy stem, the sides marked by the annular transverse cicatrices of two or three fallen leaves. Stem 4 to. 12 in . high, about 5 in . thick, bearing a sheath at the base and several leaves higher up. Leaves thickly membranous, plicate, many-nerved, elliptic, tapering to each end, acuminate, petiolate; length 12 to 15 in., breadth 2.75 to 4 in ., petiole 2 or 3 in . Scape from the side of the base of the pseudo-bulb, 3 to 6 in . long, clothed with numerous broad acute imbricate sheaths and bearing a short fewflowered raceme. Flowers 1.5 to 1.75 in . long and $\cdot 8 \mathrm{in}$, across, fleshy; floral bract membranous, ovate, acute, concave, shorter than the long-stalked ovary. Sepals broadly oblong, cohering into a ventricose tube; the lateral pair adnate to the column to form a large saccate mentum, the tips of all free and recurved. Petals narrowly sub-rhomboid, sub-acute, included. Lip small, mobile, attached to the foot of the column, 3 -lobed; the lateral lobes broad and boldly emarginate; the terminal lobe bluntly triangular, entire, recurved, its upper surface smooth, the disc between the lateral lobes with five narrow deep ridges. Column short, stout, with a foot longer than itself and bent at a right angle. Anther 2-celled, transversely oblong, its lip with a sharp point in the centre. Pollinia 8, oval, attached in fours to a granular mass. Capsule oblong, sub-clavate, boldly ribbed, glabrous, 2.5 in. long. Lindl. in Journ. Linn. Soc. III, 21 ; Hook. fil. Fl. Br. Ind. V, 815. A. ringiflorum, Griff. Notul. III, 347; Ie. Pl. Asiat., t. 325.

Sikkim, at elevations of 2,000 to 4,000 feet; Wallich Hooker filius and T. Thomson; Pantling No. 121 ; in flower during April and May. Khasia Hills; Hooker filius.

The flowers are of a dull white suffused and blotched with yellow; the apices of the sepals are purple and the upper halves of the petals are spotted with purple and yellow. The apex of the lip and the ridges on the disc are yellow. The ripe capsule is of a fine purple colour.

Plate 154.-Acanthephippium sylhetense, Lindl. A plant; of natural size. Fig. 1 the petals, 2 part of ovary, column with its foot and the lip, seen from the side, 3 lip, 4 column and foot, anther in situ and base of lip, 5 empty anther, 6 pollinia; all enlarged.

## 2. Acanthephippium striatum, Lindl. in Bot. Reg. 1838, Misc., 45.

Pseudo-bulbs elongate-obpyriform, 3 or 4 in . long, and 1.5 in . in diam. at the base, clothed near the top with long brown fimbriate membranous sheaths and tapering into cylindric stems 4 or 5 in . long. Leaves elliptic, shortly acuminate or acute, tapering at the base into the short petiole; length 8 to 12 in., breadth 2.5 to 4.5 in. Raceme fewflowered, on a stout peduncle 3 or 4 in . long enveloped in long imbricate green sheaths often tipped and striped with red. Flowers 1.25 in. long and about 6 o in. in diam.; fioral bract large, cymbiform, membranous, shorter than the stalked ovary. Sep els broadly oblong, cohering; the lateral pair broad, cohering to form an elongate conical mentum. Petals quite concealed by the sepals, dimidiate-oblong, their tips not protruding. Lip a little longer than the column, concealed by the sepals, oblong, with large lateral entire much incurved lobes and a small triangular terminal lobe with undulate edges; the upper surface without any calli or lamellæ, but with a single thickened ridge down the middle. Column short, with a long straight foot suddenly pouched and curved at the extremity. Anther 2-celled, its apex conical. Pollinia 8. Hook. fil. Fl. Br. Ind. V, 816 ; in Ann. Bot. Gard. Calc. V, pt. I, 22, t. 33; Reichb. fil. in Walp. Ann. VI, 460.

Sikkim, at elevations of 1,800 to 3,000 feet. Griffith (Kew Distrib. No. 5298); Pantling No. 269; in flower during July and August. Nepal. Khasia Hills ; C. B. Clarke.

The flowers are pale pink with bold red lines, the mentum and lip being tinged with yellow.

Plate 155.-Acanthephippium striatum, Lindl. A plant; of natural size. Fig. 1 the petals, 2 apex of ovary, column with its foot, anther in situ and lip, seen from the side, 3 lip, 4 column, foot, anther in situ, apes of mentum and base of lip, from the side, 5 empty anther, lower surface, 6 pollinia; all enlarged.

## 17. Arundina, Blume.

Terrestrial, with tall reed-like stems. Leaves numerous, membranous, distichous, narrow. Flowers large, rose-coloured, in erect terminal panicles or racemes. Sepals free, sub-equal, spreading. Petals broader and shorter. spreading. Lip large, cucullate, convolute at the base and embracing the column; the mouth large, 2-lobed at the apex. Column long, slender, narrowly winged, foot none. Anther-cells 4 ; pollinia 8, in two superposed unequal rows attached by fours to one membrane. Species eight or ten; Indian, Malayan and Chinese.

## Arundina bambusifolia, Lindl. in Wall. Cat. 3751 ; Gen. and Spec. Orch., 125.

Stem stout, woody, erect, reed-like, often about 1 in . in diameter at the base, 4 to 7 feet high. Leaves membranous, narrowly oblong-lanceolate, acuminate, not tapering at the sheathing base, 8 to 12 in . long, and $\cdot 75$ to 1 in . broad. Panicle few-branched, lax, with broad acute stout keeled persistent bracts; the flowers few and at the terminations of the branchlets, 3 in . across vertically. Sepals free, spreading, sub-equal; the dorsal erect, oblong, acute; the lateral pair lying parallel behind the lip, lanceolate, 3 -nerved. Petals rhomboid-elliptic, acute, spreading, shorter and broader than the sepals. Lip cucullate, its base convolute round the column; the mouth large, expanded, subquadrate, the basal lobes with recurved edges, the anterior corrugated; the apex broad and irregularly toothed, deeply bifid and with a very narrow sinus between the lobules, the dise with three lamellæ. Column long, slender, narrowly winged. Anther-cells 4: Pollinia 8, very unequal, in two rows, those of the upper row much longer than those of the lower, cohering in fours to one membrane. Lindl, in Bot. Reg. XXVII, Misc. 2; in Journ. Linn. Soc. III; 22; Wight Ic. 1661; Griff. Notul. III, 329, 331; Ic. Pl. Asiat., t. 314 ; Walp. Anv. VI, 457 ; Hook. fil. Fl. Br. Ind. V, 857. Cymbidium bambusifolium, Roxb. Hort. Beng., 63 ; Roxb. Fl. Ind. III, 460. Bletia graminifolia, Don Prodr. 29. Limodorum gruminifolium, Ham. MSS.

Sikkim, from the base of the range to 3,000 feet, rather common; flowering from April to S ptember. Pantling No. 17. Distributed westwards to Nepal and eastwards to Assam, the Khasia Hills, Manipur, Chittagong, and Upper Burma; also in the Nilgiri and Anamali Ranges in Southern India.

The sepals and petals are of a pale pinkish-purple; the lip of a most brilliant rosy-purple, which we have failed to imitate in our figure. The lamellæ of the disc are composed of two long lateral ones reaching to the sinus on the terminal lobe and having two crimson hooks at their bases, and of a short mesial one.

Plate 156.-Arundina bambusifolia Lindl. Part of a panicle and of a leafy stem. Fig. 1 the base of the lip, the convolute sides having been cut away so as to show the lamelle of the disc, 2 column with the anther in situ, 3 inner surface of anther, 4 pollinia; all enlarged.

## 18. Porpax, Lindl.

Small epiphytes with much depressed sub-discoid pseudo-bulbs clothed with reticulate sheaths. Leaves two, membranous, caducous. Flowers one to three, sub-sessile on the apex of the pseudo-bulb. Sepals connate into a tube; the lateral pair oblique at the base and adnate to the long-produced foot of the column. Petals small, free, included (except the tips in one species) in the sepaline tube. Column short, wingless, its foot longer than itself. Pollinia 8, unequal, attached by fours to a very short granular membrane. Distrib.; six species all Indian.

A small but very natural genus allied to Eria, but distinguished from that by its connate sepals which form a tube in which the petals are most entirely included; distinguished also by its small size and by its curicus flattened reticulate pseudo-bulbs. It was founded by Lindley in 1845.

[^5]1. Porpax fibulfformis, King and Pantling.

Pseudo.bulbs crowded and often óverlapping, much depressed, reticulate, 5 in. in diam. Leaves membranous, in pairs, oblanceolate, sub-acute, sessile, the edges minutely ciliolate, 1.25 to 175 in. long. Flowers in pairs, 25 in . long; their ovaries short, sigmoid. Sepals united to form a 2-lipped beaked sac, gibbous at the base. Petals oblong-lanceolate, sub-acute, falcate, not quite so long as the calyx, their apices connivent above the very small lip (1-nerved?). Lip half as long as the petals, oblong, clawed at the base, its uppor surface concave, the side lobes broad and rounded, the part beyond them contracted and with laciniate edges, the apex carunculate, a small retrose callus in front of the basal claw. The foot twice as long as the column, tapering downwards. Rostellum large. Anther crested and tuberculate, its lip erose. Pollinia barely cohering by their minute membranes. Eria fibuliformis, King and Pantling in Jour. Asiat. Soc. Beng., Vol. XLIV, pt. 2, page 336.

Sikkim, in tropical valleys at the base of the hills, at Sivoke, \&c.; in flower in October; Pantling, No. 278.

This resembles Eria Lichenora, Lindl. and E. ustulata, Par. \& Reichb. fil. Its sepals are, however, united to form a curious 2-lipped sac sparsely hispid externally. All parts of the flower are of a uniform dull red colour.

Plate 157.-Porpax fibuliformis, King and Pantling. A plant; of natural size. Fig. 1 flower, 2 the petals, 3 floral bract, ovary, column and its foot, anther in situ and lip seen from the side, 4 lip, 5 column and its foot and anther in situ, rostallum and stigma, 6 pollinia; all, enlarged.

## 2. Porpax Meirax, King and Pantling.

Pseudo-bulbs clustered, depressed-turbinate, almost discoid, • 35 in . in diam., leafless at flowering time, covered by a set of thin fibres which radiate from the centre (apex) and are connected by a membrane, not reticulated when fresh but minutely so when dry. Leaves two, elliptic-oblong, mucronate, 1 in. in length, shortly petiolate. Flower about $\cdot 5$ in. long, solitary, from the centre of a pseudo-bulb; floral bract large, erect, concave, acuminate, twice as long as the shortly-stalked ovary. Sepals connate into a 3 -toothed bilabiate tube $\cdot 3 \mathrm{in}$. long; the teeth ovate, shortly awned, the upper one re-curved. Petals shorter than the sepaline tube, oblong.lanceolate, blunt. Lip ovateorbicular at the base, the apex obtusely acuminate, the base with a triangular notch; the side lobes rounded, their edges upturned; the terminal lobe oblong, tapering to the blunt apex, the margins entire. Column short, its foot twice as long as the column, curved, convex in front. Rostellum large, quadrate, overlapping the upper part of the stigma. Pollinia 8, unequal, broadly clavate, their bases granular and slightly cohering in groups of four to a small membrane. Eria Meirax, N. E. Brown in Gard. Chron., 1880, I, 603; Hook. fil. Fl. Br. Ind. V, 186. E. Elwesiz, Reichb. fil. in Gard. Chron, 1883, 1, 402. Cryptochilus Meirax, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 148.

Sikkim, at elevations of from 1,500 to 2,500 feet; Elwes, Pantling, No. 249 ; in flower during October? Tenasserim, near Moulmein, Parish.

The colour of the flowers is dull brown throughout.
In the Burmese specimens, described under the name of Cryptochilus Meirax by Parish and Reichenbach filius, the edges of the petals are ciliolate and their surfaces slightly hairy, while the edges of the lip are serrulate. In the Sikkim plant the petals are glabrous and the lip is entire. The flowers of the Burmese plant also appear
to be slightly larger. In other respects the two are alike. The minuter reticulations on the hyaline membrane which covers the pseudo-bulbs are not visible while the plant is fresh; they become so only after the pseudu-bulbs have become dry. There are, however, sometimes a few radiating and some reticulate nerves which are visible even on fresh pseudo-bulbs.

Plate 158.- Porpax Meirax, King and Pantling. Plants in flower and in leaf; of natural size. Fig. 1 a single plant, showing the disooid pseudo-bulb, large floral bract and the flower, 2 part of ovary, column with its foot, anther in situ and lip, seen from the side, 3 the petals, 4 the lip, 5 column with its foot and the anther in situ, 6 under surface of anther, 7 pollinia; all enlarged.

## 19. Eria, Lindl.

Epiphytal; usually pseudo-bulbous, the pseudo-bulbs often elongated and stem-like. Flowers never large, rarely brightly coloured, often pubescent or tomentose, in racemes spikes or heads, or on 1- to 2-flowered pedicels. Sepals free, adnate to the elongate foot of the column and with it forming a short or long and spur-like or saccate mentum. Lip sessile on the foot of the column and incumbent. Column short and straight, or long and little curved. Anther imperfectly 4 - or 8 -celled. Pollinia 8, pyriform or broadly obovoid, attached in fours by their bases to a granular membrane, or the whole occasionally attached to a single viscus,

A polymorphous genus comprising about 160 species, all tropical Asiatic. It is separated from Dendrobium really by the single character of having 8 pollinia instead of 4 . We have maintained most of the sections adopted by Sir Joseph Hooker in his Flora of British India, but we have not arranged them in the same sequence. Sir Joseph's section Porpax we have restored to generic rank; and for Eria discolor we have restored, as suggested by Sir Joseph himself, the Blumean genus Tylostylis. We have reduced the genus Trichosma, Lindl. to Eria, as had at one time been suggested by Lindley himself

## * Ovary and its pedicel not vinged; peduncle not equitantly bracteate.

## Flowers glabrous or pubescent; never woolly-

I.-Bryobium. Small plants with depressed-globular pseudo-bulbs bearing two to four membranous leaves. Raceme from between the leaves, with small glabrous flowers

1. E. muscioula.
II.-Hymeneria. Plants with short or long pseudo-bulbs having one or several nodes, or with a leafy stem. Flowers usually about 5 to .75 in. long (some smaller), glabrous or pubescent, never woolly or tomentose, usually in racemes, rarely in heads or spikes.
Flowers $\cdot 2$ in. long, in 1 - to 2 -flowered peduncles .......
Flowers $\cdot 25$ in long, sub-globose, in dense many-flowered spikes . .
Flowers minute, in dense heads $\cdot 35$ to 5 in . in diam . . . . . .
Flowers $\cdot 5$ to 75 in . long, in many-flowered racemes ( 1 in . aeross in $E$ fragrans and only 35 in . long in E. excacata.)
Stems 2 or 3 feet long with numerous leaves; flowers brown, streaked, externally rusty-pubescent
2. E. biflora.
3. E. convallarioides,
4. E. pumila.

Pseudo-bulbs with a single node, bearing leaves at the apex only.
Pseudo-bulbs narrowly oylindric, 4 to 6 in . long, flowers white with yellow lip.
6. E. graminifoila.

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Pseudo-bulbs stoutly cylindric, tapering to the apex, 2 to 4 in . long.

Flowers green with brown stripes; raceme single, manyflowered, shorter than the leaves, much decurved; lip without side lobes
7. E. vittata.

Flowers pale yellow; racemes few-flowered, shorter than the leaves, spreading, not decurved; lip with large side lobes. Pseudo-bulbs ovoid-elliptic, $1 \cdot 25$ to 1.5 in . long; flowers pale greenish, usually elosed, the lip alone streaked with brown. Pseudo-bulbs ellipsoid, 2 to 3 in . long; raceme longer than the leaves; flowers white, the apex of the column and side lobes of the lip alone pink
8. E. bractescens.
9. E. clausa.

Pseudo-bulbs with more than one node, bearing sheaths or leaves along their sides.

Pseudo-bulbs clavate, furrowed, 4 to 5 in . long, bearing several pubescent racemes on their sides; flowers pubescent, the ovaries long-stalked . 11. E. confusa.
Pseudo-bulbs narrowly ellipsoid, 1.5 to 2.5 in . long, much compressed vertically, furrowed and with several transverse cicatrices of fallen leaves; racemes from the axils of leaves, few-flowered, glabrous; sepals and petals spreading . . .
Pseudo-bulbs oblong, tapered to each end, curved, shrunken, about 1.5 in . long; racemes solitary, the rachis pubescent; sepals and petals not spreading
13. E. excavata.

> III.- Trichosma. Pseudo-bulb long ( 5 or 6 in. ), thin, cylindric, bearing at its apex two membranous sessile leaves, Raceme terminal, bearing a few large white flowers . . . . . . . . . . . I4. E. coronaria.

Flowers woolly externally-

VI.-Dendrolirium. Pseudo-bulbs short, bearing several flat or terete terminal or sub-terminal leaves. Flowers tomentose externally; raceme on a tomentose rachis; sepals broadly triangular, spreading.

Leaves flat; pseudo-bulbs large, much compressed, 3 to 4 in . long . 1\%. E. flava.
Leaves terete; pseudo-bulbs none
18. E. pannea.
VII.-Trichotosia. Stems long, pubescent-tomentose like the leaves and esterior of the sepals, leaves numerous; flowers solitary or in short leaf-opposed racemes; the lip without lateral lobes or with very narrow ones.

Flowers solitary, stems procumbent . . . . . : . . . 19. E. dasyphy li.
Flowers in very short racemes, stems pendulous . . . . . 20. E. rufinula.

## ** Ovary and its pedicel winged; peduncle equitantly sheathed.

YIII.-Xiphcsium. Pseudo-bulb 1-leaved; peduncle of the solitary raceme enveloped in the conduplicate young leaf sheathed by numerous large equitant bracts. Flowers large ( 1 in. long); sepals keeled and (like the petals) polished, ovary and pedicel 3 -winged . . . 21. E. carinata.

## 1. Eria muscicola, Lindl. in Journ. Linn. Soc. III, 47.

Height of the whole plant not exceeding two inches. Pseudo-bulbs coespitose, depressedglobular, reticulate, $\cdot 25$ in. broad. Stem short, slender. Leaves two to four, oblanceolate; apiculate, sessile, .5 to 1.25 in . long and about $\cdot 25 \mathrm{in}$. broad. Scape terminal, slightly longer than the leaves, erect; the peduncle with one or two bracts; the raceme 3 - to 6 -flowered, secund. Flowers - 25 in. across, pale green; floral bract lanceolate, acuminate; longer than the curved sessile ovary. Sepals sub-equal, lanceolate, acuminate, spreading; the lateral pair falcate. Petals narrower than the petals, spreading. Lip shorter than the sepals, lanceolate, concave, slight dilated and deflexed at the middle, without side lobes, erose towards the minutely tri-lobulate apex, the dise with two calli at the very base. Column short with a long curved foot. Lip of the anther emarginate. Pollinia oblong, laterally compressed. Hook. fil. Fl. Br. Ind. V, 759. Dendrobium muscicola, Lindl. in Wall. Cat., 2017 ; Gen. and Spec. Orchid., 75.

Sikkim, at Namtse, elevation 4,000 to 5,000 feet, Pantling, No. 163 ; in flower during August. Nepal; Wallich. Khasia, altitude 3,000 to 4,000 feet; Griffith. Tenasserim; Parish.

This species is said also to occur in Ceylon, and Thwaites' C. P. No. 2355 is referred to it; but an examination of the Ceylon plant shows its lip to be without calli at the base, and its ulterior margins to be entire, not serrate. The Sikkim plant is closely allied to E. Dalzelli.

Plate 159.-Eria muscicola, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, sessile ovary, the column and its foot, the anther in situ and the lip seen from the side, 3 lip, 4 column and foot with anther in situ, 5 anther, 6 pollinia; all enlarged.

## 2. Eria biflora, Griff. Notul. III, 302 (not of Lindl.)

Pseudo-bulbs tufted, stem-like, clavate, compressed, $2 \cdot 5$ to 4 in. long, bearing the remains of several scattered sheaths. Leaves three to five, narrowly elliptic, acute, slightly narrowed to the base, 2 to 2.5 in . long and $\cdot 5$ to 65 in . broad. Peduncles $\cdot 25$ to $\cdot 35$ in. long, 1- or 2-flowered. Flowers $\cdot 2$ in. long, glabrous; floral bract large, petaloid, as long as the flower, elliptic, recurved, ovary shortly stalked. Sepals connivent, the dorsal narrowly elliptic; the lateral pair with broad bases, falcate. Petals nearly as long as the dorsal sepal, oblong, obtuse. Lip oblong, with very narrow incurved side lcbes; the apex blunt, emarginate, with papillose margins and a central oblong callus, the dise with two bold erect parallel laminæ from the base to near the apex. Mentum triangular. Anther with an orbicular fleshy top and membranous edges. Pollinia obovate, cohering by a delicate granular membrane. Hook. fil. Fl. Br. Ind. V, 800. Trichotosia biflora, Griff. Notul. III, 331 ; Ic. Pl. Asiat., t. 315.

Sikkim, in tropical valleys, Pantling, No. 244; in flower during September? Tenasserim, at Mergui; Griffith.

The flowers are of a nearly uniform pale yellow, the large floral bract being of a deeper shade of the same colour.

Platb 160,-Eria biflora, Griff. A plant; of natural size. Fig. 1 floral braot, stalked ovary and flower, side view, 2 ovary, column with its foot, anther in situ and lip, side view, 3 lip, 4 front view of column, foot and anther, 5 anther seen from above, 6 pollinia; all enlarged.
3. Eria convallarioides, Lindl. in Wall. Cat., 1975.

Pseudo-kulbs tufted, flattened, 3 to 7 in. long, covered when young with large loose sheathing bracts $\cdot 75$ to 1.25 in . wide. Leaves four to six, elliptic-lanceolate or oblanceolate, acute, subcoriaceous, many-nerved but not plicate, 4 to 7 in . long, and 1.25 to 1.6 in . broad. Spikes cylindric, produced on the young growths and proceeding from the axils of the bracts and leaves, decurved; their peduncles short, naked. Flowers sub-globose, about ' 25 in. in diam., numerous, densely crowded; floral bract ovate-lanceolate, concave, equalling the sessile pubescent ovary, the bracts at the base of the spike largest. Sepals broadly ovate, obtuse, the lateral pair very concave. Petals oblanceolate-oblong, spreading, nearly as long as the sepals but much narrower. Lip cuneate, obscurely 3 -lobed, concave, the apex sub-acute, the dise without lamellæ. Column rather slender, with a long muchcurved foot. Pollinia clavate, attached to a large translucent sub-globular viscus. Capsuls oblong, oltuse, not winged. Lindl. Gen. and Spec. Orchid., 70; in Bot. Reg., 1841, t. 62, Misc. 58 ; in Journ. Linn. Soc. III, 53 ; Reichb. fil. in Walp. Ann. VI, 276 ; Hook. fil. Fl. Br. Ind. V, 791. Octomeria spicata, Don Prod. 31. O. conrallarioides, Wall. MSS. Pinalia alba, Herb. Ham.

Sikkim, at elevations of 2,000 to 6,000 feet, common, Pantling, No. 41 ; in flower during July and August. Gharwal, Kumaon, Nepal, Khasia and Naga Hills, also in Tenasserim.

The flowers are white or of a pale straw-colour, the column being tinged with red and the lip with yellow. They are quite inodorous. Specimens grown at low elevations have often more slender pseudo-bulbs and narrower leaves than those from cooler places, the spikes also are longer and not so densely flowered.

Plate 161.-Eria convallarioides, Lindl. A plant; of natural size. Fig. 1 a flower, 2 ovary, column with its foot, anther in situ and lip, 3 lip, 4 column showing the pollinia from which the anther has been drawn back, 5 anther from below, 6 pollinia; all enlarged.
4. Eria pumila, Lindl. in Wall. Cat., 1972; Gen. and Spec. Orchid., 68.

Rhizome stout, densely covered with fibrous sheaths. Pseudo-bulbs rather crowded, sub-cylindric or slightly clavate, compressed, 3 to 4 in , long and about ${ }^{\circ} \mathrm{j}$ in. thick when fresh. Leaves three or four, linear-lanceolate, tapering to each end, 2.5 to 3.5 in . long and 3 to 5 in. broad. Flowers minnte, in dense capitula ' 35 to 5 in . in diam, and borne on short axillary peduncles; floral bract oblong, sub-acute, glabrous, as long as the tomentose ovary. Sepals broadly oblong, obtuse. Petals much narrower, but of the same length, blunt, spreading. Lip broadly oblong, 3-lobed, with two calii near the base which are produced into faint ridges on the disc; the lateral lobes short, tonth-like, acute, erect; the anterior lobe broad, hispid-pubescent, deeply bilobulate at the apex, the lobules separated by a wide sinus. Column rather long, the foot short, flat, pubescent. Pollinia stoutly c'avate, attached to a small depressed-globular viscus. Stigma with 2 minute processes on its lower margin. Lindl. in Bot. Reg., 1838, Misc. 79; Walp. Ann. VI, 278 ; Hook. fil. Fl. Br. Ind. V, 791.

Sikkim, in tropical valleys, in flower during August? Pantling, No. 291; Khasia Hills; Wallich. Tenasserim, near Moulmein; Parish.

The flowers are white flushed with pink, the upper part of the column and the lateral lobes of the lip being red.

Plate 162.-Eria pumila, Lindl. A plant; of natural size. Fig. 1 flower, 2 floral braot, column and its foot, anther in situ and lip, 3 lip, 4 column, the pollinia in situ being shown by the dehiscence of the anther, 5 anther, 6 pollinia; all enlarged.

## 5. Eria bambusifolia, Lindl. in Journ. Linn. Soc. III, 61.

Stem 2 to 3 feet long and about 35 in . thick, enveloped in large blunt tubular sheaths. Leaves numerous, thickly membranous, many-nerved, narrowly elliptic-oblong, acuminate, tapering slightly to the base, 4 to 8 in . long and 1 to 1.75 in . broad. Racemes about as long as the leaves, few-flowered, the rachises rusty-pubescent; the peduncles with scattered broad short broadly ovoid pubescent bracts. Flowers $\cdot 5$ or $\cdot 6 \mathrm{in}$. long, distant; floral bract broad, sub-orbicular, apiculate, much shorter than the long-stalked rusty-pubescent ovary. Sepals rusty-pubescent externally, 5 -nerved, spreading; the dorsal broadly elliptic, blunt; the lateral pair similar but falcate. Petals narrower than the sepals, elliptic-oblong, 3 -nerved, blunt, spreading. Lip ovate-oblong, deflexed from below the middle, obtuse, with small side lobes; the upper surface with three bold pubescent ridges from base to apex and two short additional ones near the apex. Mentum short. Column long, curved; the foot straight, shorter than the column. Pollinia obovoid-elliptic, compressed, attached to a short granular membrane. Capsules cylindric, slender, 1 to 1.5 in. long. Hook. fil. Fl. Br. Ind. V, 805.

Sikkim, at Rissisoom, altitude 6,000 feet; in flower from October to December; Pantling, No. 355. Khasia Hills; Griffith (Kew Distrib. 5112), Simons, Mann. On Mohendragiri, in the Ganjom Hill Tracts, altitude 4,500 feet; Gamble.

The flowers are pale brown with darker lines; the three ridges on the lip being pale green and the column yellow behind and pink in front. The unexpected discovery of specimens of this on the hill ranges of the eastern coast of Peninsular India, shows that it must not as heretofore be regarded as a species peculiar to the Eastern Himalaya and Khasia Hills, and is an illustration of the scantiness of our knowledge of the minuter details of the distribution of Indian Orchids. E. crassicaulis, Hook, fil., from the Khasia range, is a close ally of this, but the flowers have a different lip.

Plate 163.-Eria bambusifolia, Lindl. A plant; of natural size. Fig. 1 a flower, front view, 2 floral bract, stalked ovary, column, foot, anther and lip, side view, 3 lip, 4 front view of column and its foot with the anther dehisciug, 5 under surface of anther, 6 pollinia; all enlarged.

## 6. Eria graminifolia, Lindl. in Journ. Linn. Soc. III, 54.

Pseudu-bulbs narrowly cylindric, 4 to 6 in . long, coherent and rooting below, and bearing when young several long tubular sheaths. Leaves two to six, thickly membranous, manynerved, linear-lanceolate, acuminate, narrowed towards the base; length 4 to 6 in., breadth $\cdot 35$ to $\cdot 75 \mathrm{in}$. Racemes solitary or several produced from among the young leaves, somewhat shorter than the leaves, erect, the rachis glandular-pubescent, the pedunele short. Flowers 15 to 20 , about $\cdot 5 \mathrm{in}$. across; floral bract ovate, acuminate, shorter than the glandularpubescent ovary. Sepals spreading, elliptic-lanceolate, the lateral pair broader than the dorsal, sub-falcate. Petals oblong, sub-acute, sub-falcate, about as long as the sepals. Lip fleshy, shorter than the petals, broadly oblong in general outline, 3-lobed, the side lobes oblong, blunt, erect, incurved; the terminal lobe transversely oblong, its apex emarginate and with a large oblong callus in the middle; the dise with three parallel stout ridges, the middle one of which ends in the apical callus and the side ones in two smaller calli.

Column with a short broad puberulous foot. Pollinia clavate, united in two sets to a small globose viscus. Hook. fil. Ic. Plantar., t. 1847 ; Fl. Br. Ind. V, 794. E. alba, Lindl. in Journ. Linn. Soc. III, 53, var. b.

Sikkim, at elevations of 5,000 to 7,000 feet; Griffith (Kew Distrib. No. 5115), Gamble, Gammie and others, rather common; Pantling, No. 371 ; in flower during July and August.

The sepals and petals are pure white. The dise of the lip is also white, but its ridges and the anterior lobe are yellowish-white; the side lobes are red.

Plate 164.-Eria graminifolia, Lindl. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, seen from the side, 3 lip, 4 column and its foot, the anther in situ, 5 lower surface of anther, 6 pollinia; all enlarged.

## 7. Eria vittata, Lindl. in Journ, Linn. Soc. III, 51.

Rhizome stout; pseudo-bulbs about one inch apart, cylindric, tapering upward, 2 to 4 in. long and about $\cdot 5$ to 65 in , in diam. near the rhizome, bearing several large unequal sheathing bracts especially near the base. Leaves two, membranous, many-nerved, ellipticlanceolate, acute, tapering to the base, 6 to 8 in . long and 1.5 to 2 in . broad. Raceme from the summit of the pseudo-bulb outside the leaves, decurved, many-flowered, about half as long as the leaves; its peduncle about 1 in . long, sheathed at the base. Flowers .75 in. long; the floral bract reduced to a thickened ring. Dorsal sepal oblong, subacute; the lateral pair triangular-oblong, falcate, spreading, forming with the column a wide short mentum. Petals narrowly oblong, slightly falcate, obtuse. Lip oblong, without lobes, decurved and crenulate in its terminal third, the apex broad; the upper surface with five crenulate ridges from base to apex. Column slender, shorter than its purple foot. Rostellum elongate, cylindric, coloured red. Pollinix ovoid, attached in fours at their backs by a granular membrane. Reichb. fil. in Gard. Chron., 1882, I, 330 ; Hook. fil. Fl. Br. Ind. V, 794.

Sikkim, at elevations of 5,000 to 6,000 feet; in flower during March and April; Pantling, No. 62. Munipur ; Watt, No. 7451.

The flowers, which are very fragrant, are pale green, the sepals and petals being striped and the lip as well as its lamellæ being spotted and striped with purplish-brown.

Plate 165.-Eria vittata, Lindl. A plant; of natural size. Fig. 1 a flower, 2 the abortive floral bract, ovary, column and its foot, anther and lip, seen from the side, 3 lip, 4 column and foot showing the pollinia in sith, 5 olinandrium, rostellum and stigma, 6 anther, 7 pollinia; all enlurged.

## 8. Eria bractiscens, Lindl. in Bot. Reg. 1841, Misc. 18, 1844, t. 49.

Pseudo-bulbs narrowly cylindric, tapering towards the apex, slightly curved, somewhat wrinkled at flowering time, 2 to 4 in . long and $\cdot 7 \mathrm{in}$. in diam. Leaves three to six (rarely only two), sub-coriaceous, elliptic-oblong, sub-acute, tapering to the base, 5 or 6 in. long and 1.25 to 1.75 in . broad. Raremes several, axillary, lax, their peduncles sheathed at the base. Flowers ${ }^{6} \mathbf{i n}$. long and 75 in . across, quite glabrous; floral bract ellipticovate, reflexed, the margins sometimes involute, shorter than the long-stalked ovary. Sepals spreading, sub-acute; the dorsal narrowly elliptic, the lateral pair broader. Petals narrowly oblong, shorter than the sepals, their apices blunt and revolute. Lip oblong, expanded towards the apex, 3 -lobed; the lateral lobes erect, large, rounded; the terminal lobe entire, blunt, deflexed at the apex ; the upper surface with three lamelle running
along nearly its entire length, the two lateral being dilated in the basal half and having glandular margins, the middle one minutely papillose in its basal half. Column stout, its foot short. Anther with a truncate incurved lip. Polliniu in fours, compressed, attached by their backs to a granular membrane. Reichb. fil. in Walp. Ann. VI, 277; Hook. fil. Fl. Br. Ind. V, 796.

Sikkim, at elevations of from 1,000 to 3,000 feet; flowering in April; Pantling, No. 137. Chittagong; Lister. Tenasserim ; Parish. Singapore; Lobb.

The flowers are of a uniform pale yellow colour, the lamelle on the lip being red. They are short-lived, not surviving more than two days. The species is allied to E. confusa, Hook. fil., but differs in being quite glabrous and in having pseudo-bulbs without nodes. It has not hitherto been recorded from Sikkim; but there are in the Calcutta Herbarium two drawings made by the late Dr. Simons from specimens collected by him in Assam. There is also a specimen obtained by Mr. J. L. Lister near Chitta gong. The larger form of this, which has been separated as var. Kurzii, extends through Burma to the Andaman and Nicobar Islands.

Plate 166.-Eria bractescens, Lindl. A plant; of natural sizo. Fig. 1 a flower, front view, 2 floral bract, stalked ovary and flower, side view, 3 part of ovary, column and lip, side view, 4 lip showing the lamellæ, 5 transverse section of the basal half of the lip, showing the glandulose lamellæ, 6 front of eolumn showing the anther in situ and the stigma, 7 lower surface of anther, 8 pollinia; all enlarged,

## 9. Eria clausa, King and Pantling in Journ. As. Soc. Vol. LXV, pt. 2, p. 121.

Rhizome $\cdot 15$ in. thick, jointed, smooth, with a few short membranous sheaths. Pseudo-bulbs 1.5 to 2 in . apart, 1.25 to 1.5 long and .75 in . in diam., ovoid-ellipsoid, blunt at the apex, the bases clothed with the fibrous remains of sheaths. Learcs two or three, membranous, narrowly lanceolate, tapering to each end, sessile, 4 to 6 in. long and 8 to 1 in. broad. Scapes rather shorter than the leaves, one or two from the summit of the pseudo-bulb, each enveloped for more than half its length by a narrow convolute sheath; raceme stout, erect; floral bract nearly obsolete, and represented by a slightly thickened ring at the base of the stalked ovary. Flowers from 15 to 20, about $\cdot 3$ in. long, slightly shorter than the ovaries, the buds often not expanding. Sepals and pelals oblong, blunt. Lip oblong, with two rounded oblique lateral lobes near the apex, the short caruncled rounded mid lobe with five to seven vertical lines, the edges entire, the disc between the side lobes with three parallel raised slightly sinuous vertical lines. Column long, rostellum flattened against the back of the clinandrium. Stigma small, with two sub-globular convexities inside its lower margin.

Sikkim, not uncommon at elevations of 3,000 to 5,000 feet; flowering during February and March; Pantling, No. 359.

This species in many respects resembles E. vittata, Lindl. (of which it may possibly be a cleistogamic form), but is a much smaller plant, with smaller pseudo-bulbs and a shorter and erect raceme. The flowers of both are similar in form, with the exception that the lip of this has lateral lobes, while in E. vittata the lip is entire; and that the disc of this has three elevated vertical lines on its surface, whereas the lip in E. vittata has five crenulate wavy ridges. The colour of the flowers of the two also differs, those of this species being pale greenish with brown streaks on the lip only; whereas the flowers of $E$. rittata are green with prominent brown streaks on all their parts. The
time of flowering of the two species is the same, and they are found in similar situations. In many cases the flowers of this do not open; nevertheless the ovaries set seeds, and capsules form and ripen, self-fertilization being effected by the rostellum disappearing from its normal position and being pressed against the back of the clinandrium, thus permitting the pollinia to come into direct contact with the stigma.

Plate 167.-Eria clausa, King and Pantling. A plant; of natural size. Fig. 1 stalked ovary and fully developed flower-bud, 2 part of ovary, column with its foot, and the lip, seen from the side, 3 lip, 4 summit of column taken from a mature but unopened bud showing the anther and stigma, 5 the same with the anther removed, showing the rostellum $(r)$ flattened against the baek of the clinandrium, 6 the same as No. 4 but from an older bud, showing the pollinia in process of absorption by the stigma; all enlarged.

## 10. Eria fragrans, Reichb. fil. in Bot. Zeit. XXII, 415.

Rhizome woody, covered with sheaths; pseudo-bulbs about an inch apart, 2 to 3 in. long, ellipsoid, bearing several large membranous sheaths. Leaves in pairs, thickly membranous, many-nerved, elliptic-oblong, the apex acuminate, tapering at the base into a short petiole; length 8 to 12 in., breadth 1.25 to 1.75 in . Raceme longer than the leaves, decurved, rather lax, the rachis more or less pubescent, the peduncle with a few lanceolate bracts. Flowers numerous, about 1 in . across; floral bract lanceolate, pubescent, longer than the stalked pubescent ovary. Sepals sub-equal, lanceolate, acuminate, pubescent externally, spreading, their apices reflexed. Petals like the sepals but smaller, falcate, glabrous, spreading but not reflexed. Lip narrowly oblong, 3-lobed, deflexed about the middle; the lateral lobes short, broad, sub-falcate, obtuse; the terminal lobe narrowly oblong, acute, its upper surface with five crisped narrow ridges. Column short, rather broad, shorter than its curved foot. Pollinia reniform, attached in fours to two small membranes. Hook. fil. Fl. Br. Ind. V, 794.

Sikkim, in the bottoms of warm valleys; Pantling, No. 91 ; in flower during July and August. Tenasserim ; at Moulmein, Falconer, Parish.

The flowers are white throughout except for some red spots on the apex of the column and on the side lobes of the lip; they are very fragrant. The species has not hitherto been recorded from Sikkim; its nearest allies are E. barbata, Reichb. fil. and the Philippine E. stellata.

Plate 168.- Eria fragrans, Reichb. fil. A plant; of natural size. Fig. 1 front view of a flower, 2 floral bract, apex of ovary, column and lip, seen from the side, 3 lip, 4 column with its foot, the anther in situ, 5 lower surface of empty anther, 6 pollinia, side and front views; all enlarged.
11. Eria confusa, Hook. fil. Ic. Plant., t. 1850 ; Fl. Br. Inḑ. V, 796.
$P_{\text {seudo-bulbs elongate-clavate, furrowed, imbricately sheathed at the base and with }}$ two or three large sheaths 4 to 6 in. long scattered along their surfaces. Leaves three or more, thickly membranous, oblong-lanceolate, tapering to the base; length 4 to 5 in., breadth 6 to 8 in . Racemes from the axils of the sheaths below the leaves, 2 to 3 in . long, their rachises puberulous. Flowers $\cdot 4$ in. across; floral bract large, ovate, glabrous, longer than the puberulous long-stalked ovary, deflexed. Dorsal sepal elliptic, blunt; the lateral pair broadly ovate, blunt, spreading, all 5 -nerved. Petals narrower than the dorsal sepal, 5-nerved. Lip 3-lobed; the lateral lobes broad, rounded; the apical lobe reniform, decurved; the dise with three ridges, the lateral ones short and
ending with the side lobes, the central one long, extending to the apical lobe. Mentum conical. Column rather short, its foot about the same length, slightly curved. Pollinia compressed, attached to two vertical elongated membranes. Eria Andersoni, Hook. fil. Ic. Plantar, t. 2069 ; Fl. Br. Ind. V, 795 (in part). E. excavata (in part), Lindl., Gen. and Spec. Orch., 67 ; Wall. Cat., 1974.

Sikkim, at elevations of about 1,500 feet in the valley of the Teesta; Pantling, No. 257 ; in flower during April.

The sepals and petals are dull yellow with reddish-brown nerves. The lip has similar colouration, except that the apical lobe is bright yellow with brown margins.

After most careful examination of all the available material both in the field and in the Herbarium, we have been forced to the conclusion that E. confusa, Hook. fil., covers for the most part the E. Andersoni of the same author. The colour of the sepals and petals of this species is ochraceous with brown stripes, the posterior part of the lip being purplish-brown and the anterior lube yellow flushed with brown.

Plate 169.-Eria confusa, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, 3 lip, 4 column and its foot with anther in situ, 5 interior of anther, 6 pollinia; all entarged.
12. Eria acervata, Lindl, in Journ. Hort. Soc., 1851, 57, with fig.

Rhizome stout, clothed with fibrous sheaths. Pseudo-bulbs crowded, narrowly ellipsoid, more or less compressed, furrowed, sheathed when young and with several transverse cicatrices when adult, 1.5 to 2.5 in . long and 6 or $\cdot 7 \mathrm{in}$. broad. Leaves three to five, thickly membranous, narrowly-oblong or oblanceolate-oblong, sub-acute, minutely emarginate, narrowed towards the base; length 3 to 6 in., breadth $\cdot 5$ to 1 in, Racemes one to three, few-flowered, glabrous, from the axils and more than half as long as the leaves; the peduncle puberulous, bearing four or five lanceolate, more or less reflexed bracts. Flowers glabrous, about $\cdot 65 \mathrm{in}$. long ; floral bract lanceolate, acuminate, only half as long as the long-stalked ovary. Sepals sub-equal, lanceolate, acuminate, the lateral pair falcate. Petals similar to the sepals, but slightly narrower. Lip obovate in general outline, narrowed at the base, 3-lobed; the lateral lobes oblong, blunt, slightly narrowed; the terminal sub-orbicular or ovate, with thickened entire edges; the upper surface with three parallel ridges from the base, almost to the apex. Column and foot about equal in length. Mentum short, obtuse. Lindl. in Paxt. Flow. Gard. I, 170 ; Hook. fil. Ic. Plantar, t. 1849 ; Fl. Br. Ind. V, 796 ; Reichb. fil. in Walp. Ann. VI, 269 ; in Gard. Chron., 1878, 106. Denảrobium seriutum, Wall. MSS.

Sikkim, at elevations of about 1,500 to 2,000 feet ; in flower during June and July ; Pantling, No. 170. Khasia Hills; Hooker, Mann.

The flowers are white, only the terminal lobe of the lip being tinged with yellow. There is considerable variation in the size of specimens. Parish's Tenasserim specimens attributed to this species have shorter broader leaves, and probably belong to another.

Platr 170.-Eria acervata, Lindl. A plant; of natural size. Fig. 1 front view of a flower 2 floral bract, stalked ovary, column with its foot, anther, in situ, and the lip, seen from the side, 3 lip, 4 front view of column and its foot with the anther in situ, 5 lower surface of empty anther, 6 pollinia; all enlarged.
13. Eria excavata, Lindl. in Wall. Cat., 1974 (in part).

Pscudj-bulbs oblong, tapering to each end, compressed, about 1.5 in . long, somewhat shrivelled at flowering-time. Leaves four to six, membranous in texture, many-nerved, elliptic-lanceolate or elliptic-oblanceolate, acute, 3 to 6 in . long and $\cdot 6$ to $\cdot 75 \mathrm{in}$. broad, Raceme solitary, terminal, about as long as the leaves, few-flowered, the rachis more or less rufous-puipescent; peduncle long, ebracteate. Flowers $\cdot 35 \mathrm{in}$. long; floral bract slightly shorter than the tomentose stalked ovary, lanceolate, glabrescent. Sepals cunnivent, the dorsal broadly elliptic; the lateral pair longer, falcate, all rusty-pubescent externally and 3 -nerved. Petals narrower, 3-nerved, conniving over the anther. Lip obovate in general outline, 3 -lobed; the lateral lobes erect, rounded and with two elongate calli between them; the terminal lobe decurved, transversely oblong, its apex bilobulate, the disc rugulose. Mentum none. Column and its foot very short. Pollinia clavate-elliptic, attached to a single small viscus. Capsules 8 in . long, oblong, ribbed. Hook. fil. Ie. Plantar. t. 1846; Fl. Br. Ind. V, 795. E. exeavata (in part) Lindl., Gen. and Spec. Orchid., 67 ; Journ. Linn. Soc. III, 53. E. sphecrochila and E. flava, var. rubida, Lindl. in Journ. Linn. Soc. III, 54, 49; Hook. fil. Ic. Plant, t. 1845 ; Fl. Br. Ind. V, 795. Octomeria excavata, Wall. MSS.

Sikkim, at elevations of about 6,000 to 9,000 feet; Gamble, King, Thomson; Pantling, No. 273 ; in flower during June. Khasia Hillis, elevation 6,000 feet; G. Mann.

The flowers are of a dirty white colour, the end lobe of the lip being yellow with some red markings about its base. Wallich's specimens numbered 1974, and named E. excavata, consist of a mixture of this and of $E$. confusa, Hook. fil. The specific name excavata was given on account of the supposed concavity on the anterior surface of the column and its foot. These organs are, however, not concave in fresh specimens of the plant as it occurs in Sikkim. Sir Joseph Hooker's figures of this (Ic. Plantar, t. 1846) and of E. alba Lindl. (I. e. t. 1845) show that the two are closely allied. All the specimens gathered in Sikkim are, however, self-fertile. Their flowers hardly open, and the colour is poorer than in specimens collected in the Khasia Hills, the flowers of which expand freely and are not self-fertile. It is possible therefore that E. excavata is but a cleistogamic form of $E$. . alba, and, if so, the latter name (in spite of its juniority and of the mechanical law of priority) ought to be kept up, and E. excavata to be mude a variety of it.

Plate. 171.-Eria excarata, Lindl. A plant; of natural size. Fig. 1 a flower seen from above, 2 floral bract, ovary, column with its foot, anther in situ, and lip in profile, 3 upper surface of lip, 4 column and its foot, the anther having been removed, 5 under surface of anther, 6 pollinia; all enlarged.
14. Eria coronaria, Reichb. fil. in Walp. Ann. VI, 272.

Pseudo-bulbs tufted, thin, cylindric, 5 or 6 in . long and -25 to -35 in . in diam when young, with a large tubular sheath at the base. Levaes two, terminal, subopposite, sub-sessile, thickly membranous, narrowly elliptic to ovate-lanceolate, 5 or 6 in. long, and 1.25 to 1.5 in. broad. Raceme terminal, usually sub-horizontal, fewflowered, its peduncle short and sheathed at the base. Flowers four to six, 1.5 in . across; floral bract narrowly lanceolate, much shorter than the long-stalked slender
ovary. Sepals sub-equal in length, spreading; the dorsal elliptic-oblong, sub-acute; the lateral pair with broad bases attached to the sides of the column. Petals like the dorsal sepals, but shorter. Lip oblong, 3 -lobed; the side lobes large, rounded; the terminal lobe small, oblong, revolute, with undulate edges and six or seven crenate ridges on its upper surface; the dise between the sids lobes with two broad dilated crenulate ridges. Column short, stout, longer than its tapering foot. Anther much vaulted, 2 -celled. Polinia unequal, the upper four being about half as large as the lower four, broad, compressed, united in fours by granular vertical membranes. Reichb. fil. in Gard. Chron., 1876, I, 234. Eria suavis, Lindl. in Journ. Linn. Soc. III, 52. Eria cylindropoda, Griff. Notul. 1II, 299. Trichosma suavis, Lindl. in But. Reg., 1842, t. 21 ; Hook. fil. Fl. Br. Ind. V, 827. Coelogyne coronaria, Lindl. in Bot. Reg., 1841, Misc., 83.

Sikkim, at elevations of 5,000 to 6,000 feet; many collectors; Pantling, No. 27; in flower during November and Dccember. Khasia Hills; Griffith (Kew Distrib. No. 5117) and many other collectors.

The flowers of the Sikkim plant are in the main white, the lip being flushed with purple externally and having some dark streaks of purple on the side lobes; the terminal lobe, however, is yellow. In the Khasia Hills the flowers are said to be more purple than white. They are always very sweetly scented. This plant was first (1841) referred by Lindley to Ceelogyne, then (1842) to Trichosma (a genus which he formed for its reception); but was finally (1859) removed by him to Eria, of which geuus he formed for it the section Trichosma. Griffith also regarded the plant as an Eria and named it E. cylindropodx. There is therefore good authority in favour of treating this plant as an Eria rather than as the solitary member of a distinct genus. When Lindley changed the generic name from Ccelogyne to Trichosma he ought to have kept up the specific name coronaria. In consequence of his not having done so, the authorship of the species as an Eria falls to Reichenbach filius.

Plate 172.-Eria coronaria, Reielib. fil. A plant; of natural size. Fig. 1 side view of a flower from which the sepals and petals have been removed, 2 lip, 3 column with its foot and anther in situ, 4 lower surface of anther, 5 pollinia; all enlarged.
15. Eria stricta, Lindl. Coll. Bot. t. 41 B; in Journ. Linn. Soc. III, 52.

Pseudo-bulbs crowded, without a rhizome, often cohering, cylindric, 3.5 to 5 in . long and about 3 in . in diam., with loose fibrous sheaths at the base, and at the apex two oblong elliptic sub-coriaceous sessile leaves tapering to each end, $2 \cdot 5$ to 4 in . long and 5 to 9 in . broad. Spike solitary, erect, rising from between the leaves and exceeding them in length, the peduncle naked, the raceme many-flowered. Flowers $\cdot 1$ to $\cdot 15$ in. long, secund, crowded; the floral bract ovate, acute, glabrous, much shorter than the woolly ovary. Sepals densely woolly outside, sub-equal, ovate. Petals ovate-rotund, blunt, as long as the sepals. Lip sub-orbicular, concave, obscurely 3 -lobed; the apical lobe very short, broad, truncate; the side lobes shallow, rounded, the disc between them with a smooth depressed callus; the base gibbous and nectar-secreting, divided into two chambers by a short rib continued upwards on the foot of the column. Column short, broad, the foot short. Anther without true cells, but with depressions for the elliptic pollinia. Pollinia in two masses of four each, each mass attached separately to the quadrate gland by a granular elastic thread. Roichb. fil. in Walp. Ann. VI, 271;

Lindl. in Journ. Linn. Soc. III, 52; Hook. fil. Fl. Br. Ind V, 791. E. secundiflora, Griff. Notul. III, 302 ; Ic. Pl. Asiat., $\ddagger$ 301. Mycaranthes stricta, Lindl. in Wall. Cat., 1970; Gen. and Spec. Orchid., 63; Wight Ic. 1733. Octomeria secunda, Wall. MSS.

Sikkim, common at elevations of 1,000 to 4,000 feet; in flower from November to February; Pantling, No. 65. Nepal; Wallich. Assam; in the Naga and Khasia Hills.

The flowers, are white flushed with pink, the column being yellow and the sides of the lip inside being streaked with the same tint.

This is quite an anomalous species of Eria, the attachment of the pollinia by elastic threads to a gland being suggestive of Vandeae, to which tribe it ought probably to be removed to form the type of a new genus allied to Cryptochilus.

Plate 173.-Eria stricta, Lindl. A plant; of natural size. Fig. 1 a flower, 2 part of ovary, column and lip, 3 lip, 4 column showing the anther in situ and stigma, 5 anther, 6 pollinia; all enlarged.

## 16. Eria paniculata, Lindl. in Wall. Pl. As. Rar. I, 32, t. 36.

Stems coespitose, pendulous, one to two feet long and about as thick as a gooss-quill. Leaves numerous, fleshy, linear, acuminate, sessile, $\cdot 2$ to $\cdot 5 \mathrm{in}$. broad. Racemes in terminal fascicles of two or three, about as long as the leaves, with long lanceolate bracts at their lases, woolly, many-flowered. Flowers 25 to 3 in. across; floral bract lanceolate, acuminate, curved, glabrous, nearly as long as the pubescent stalked ovary. Dorsal sepal ovate; the lateral pair triangular, sub-falcate, spreading, all softly and sparsely pubescent outside. Petals about as long as the dorsal sepal, elliptic-obovate, the edges slightly erose. Lip in general outline sub-orbicular, 3-lobed, the base with a large mealy callus in front of the column; lateral lobas oblong, sub-falcate, their apices sub-acute and directed forwards; apical lobe broad, coarsely erose, much decurved, bearing on its upper surface a callus like that at the base but larger. Column stout, with a narrow straight foot about as long as itself. Anther imperfectly 8 -celled, much shrunken when the flowers expand and only partly covering the eight clavate pollinia. Pollinia attached to a broad viscid mass. Wall. Cat., 1971 ; Lindl., Gen, and Spec. Orch., 65 ; Bot. Reg. XXVIII (1842), Misc. 38 ; in Journ. Linn. Soc. III, 55 ; Reichb. fil. in Walp. Ann. VI, 274 ; Hook. fil. Fl. Br. Ind. V, 789.

Sikkim, at elevations of from 2,000 to 4,000 feet; Hooker, Thomson and others, Pantling, No. 103 ; in flower from January to April. Khasia Hills; Griffith (Kew Distrib. No. 5111), Prain, Simons. Sylhet; Wallich. Naga Hills; Prain.

The sepals are of a pale yellowish-green colour; the petals, lip and column are pale lavender with brownish blotches. The callus on the lip is white and has a mealy appearance. In Sikkim the flowers are in racemes which arise in fascicles. Wallich's figure of the Nepal plant shows them as forming a short panicle.

Platr 174.--Eria paniculata, Lindl. A plant; of natural size. Fig. 1 a flower, front view, 2 floral braet, stalked ovary, column with its foot, anther in situ and lip, side view, 3 lip, 4 summit of colunin with the anther carled up and showing the pollinia in situ, and stigma, 5 pollinia; all enlarged.

> 17. Eria flava, Lindl. in Wall. Cat., 1973, (in part); Gen. and Spec. Orch. 65 .

Rhisome stout, clothed with imbricating tubular sheaths. Pseudo-bulbs vertically furrowed, sheathed at the base, much compressed, 3 to 4 in . long and $1 \cdot 25 \mathrm{in}$. in diam.

Leares three to five, sub-coriaceous, more or less narrowly oblong, acuminate, tapering to the base ; length 6 to 9 in., breadth 75 to 15 in . Race:ne from the base of the pseudobulb, erect, stout, covered with dense pale soft tomentum, about as long as the leaves and with several sheaths at the base. Flowers distant, $\cdot 6$ in, long; floral bract lanceolate, much shorter than the tomentose stalked ovary, shrivelled when the flowers open, Sepals tomentose externally, the dorsal small, lanceolate; the lateral pair much larger, triangular, spreading. Petuls lying parallel over the column, narrowly oblong, narrowed at base and apex, smaller than the dorsal sepal, . Lip oblong, 3 -lobed; the side lobes narrow with truncate apices, puberulous and with two long tapering ridges at their junction with the dise; the terminal lobe oblong, acute, deflexed, slightly 2 -ridged, glabrous. Coiumn erect, its foot at right angles to and longer than itself. Lip of anther with a small quadrate appendage. Pollinia small, compressed, attached to two granular membranes. Capsule narrowly cylindric, $1 \cdot 5$ to $1 \cdot 75 \mathrm{in}$. long. Lindl. in Journ. Linn. Soc. III, 49 (excl. var. B.); Hook. fil. Fll Br. Ind. V, 801. E. laniceps, Reichb. fil. in Hamb. Gartenzeit, XIX, 10. Dendrobium pubescens, Hook. Exot. Flora, t. 124. Octonaria fava, Wall. MSS. O. pubescens, Spreng. Syst., t. IV. 310.

Sikkim, in low warm valleys and at the base of the range, common; Pantling, No. 130; in flower curing April. Westwards as far as Kumaon and eastwards to Bhutan. A variety named lanata, with smaller flowers and darker coloured lip, is found in Tenasserim; it was regarded as a species by Lindley.

The sepals and petals of the Sikkim plant are green, and the basal half of the lip is purple on both surfaces; the foot of the column has a blotch of the same colour. In specimens from Nepal and Kumaon the flowers are yellow. The leaves when dry have often numerous small concretions on their surfaces.

Plate 175.-Eria fara, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column and its foot and the lip, seen from the side, 3 lip, 4 column, 5 lower surface of anther, 6 pollinia; all enlarged.

## 18. Eria pannea, Lindl. in Bot. Reg., 1842, Misc. 64; in Journ. Linn. Soc. III, 50.

Rhizome as thick as a crow-quill, woolly; stems very short, 1- to 4-leaved, Lcaves fleshy, cylindric, pointed at the apex, 3 to 7 in . long, and $\cdot 2$ to $\cdot 25 \mathrm{in}$. in diam. Peduncle terminal, 1 to 2 in. long, woolly, 1- to 4 -flowered. Flowers about 5 in, long; floral bract large, ovate; the ovary pubescent, sessile. Sepals spreading, densely covered with white wool externally like the ovary and bract; the dorsal broadly elliptic, sub-acute; the lateral pair ovate-triangular, sub-acute, sub-falcate. Petals elliptic, sub-acute, slightly pubescent, spreading. Lip fleshy, cblong, obtuse, not lobed, concave, downy, with oblong granular calli near the base and apex, the edges sub-undulate. Mentum rati:er long, obtuse. Column short, pubescent outside; the foot long, curved, concave, glabrous, Pollinia clavate, in two groups, each group united to a very small granular appendage. Walp. Ann. VI, 273; Hook. fil. Fl. Br. Ind, V, 804. E.? teretifotia, Griff. III, 298; Ic. Pl. Asiat., t. 300,

Sikkim, in tropical valleys and along the base of the range; in flower-during May; Pantling, Nu. 144. Tenasserim; Parish. Perak; Scortechini, Ridley. Malacca; Lolb. Distrib. Borneo.

The outer surfaces of the sepals and petals are covered with white wool ; the inner surfaces which are smooth are of different shades of golden brown, the lip is dark brown, the edges being paler; the column is green, and the foot tinged with orange.

Platb 176.-Eria pannea, Lindl. A plant; of natural size. Fig. 1 a flower, 2 part of ovary, column and its foot, anther in situ and lip, 3 lip, 4 front view of column and its lip and the anther, 5 anther seen from below, 6 pollinia; all enlarged.
19. Erta daspphylla, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 147,

Stems creeping on trees, much branched, about 1 in . thisk, the older with long brown hispid pubescence, the younger branches with shorter paler hairs. Leaves small, fleshy, sessile, elliptic-ovate or obovate, covered with short whitish wool mixed with long hispid hairs, length $\cdot 35$ to $\cdot 7$ in, breadth from $\cdot 15$ to $\cdot 35$ in. Flowers $\cdot 4$ or $\cdot 5$ in. long, solitary, on short pubsscent sheathed peduncles; floral bract lanceolate, shorter than the stalked ovary. Sepals pubescent externally, unequal; the dorsal small, erect, elliptic; the lateral pair large, broadly triangular, concave. Petals oblong, blunt. Lip large, cuneately oblong, ciliolate, the base narrowed, the side lobes very shallow; the terminal half deflexed its apex broad, slightly emarginate and minutely erose. Mentum broad. Column short, the foot long, slightly curved. Anther conical, its lip broad and truncate. Pollinia sub-cuneiform. Hook. fil. Fl. Br. Ind. V, 808.

Sikkim, in tropical valleys up to elevations of 3,000 feet; in flower during May and June; Pantling, No. 90; Griffith (Kew Distrib.) No. 5131. Khasia Hills, alt. 1,000 to 2,000 feet; Hooker and Thomson. Pegu; Kurz, Helfer.

The flowers are green slightly flushed with yellow, and at the base of the lip there is a large patch of browrish-purple.

Plats 177.-Eria daryphylla, Par. and Reiehb. fil. Pieoo of a young stem of a plant with leaves and flowers; of natural size. Fig. 1 a flower, 2 scape and bracts, ovary, oolumn with its foot, anther and lip, seen from the side, 3 lip, 4 column with its foot, anther in situ, 5 anther, 6 pollinia; all enlarged.
20. Eria rufinula, Reichb. fil. in Hamb. Gartenzeit XIX, 13.

Stem cylindric, 10 to 12 in . long, leafy, pendulous, rufous-hispid. Lexves numerous, coriaceous, narrowly lanceolate, acuminate, sparsoly rusty-pubescent, 2.5 to 4 in . long, and about 5 in . broad, often with superficial concretions when dry. Rasemes leaf-opposed, about 75 in . long, bearing three to six flowers about 3 in . in length; floral bract large, cordate, acute, hispid, exceeding the sessile ovary. Sepals sub-equal, ovate-lanceolate, subacute, spreading, hispid externally. Petals narrower than the sepals, spreading, sparsely hispid. Lip spathulate, not lobed, the edges slightly upturned, the posterior half scabrid, the anterior half thickened, smooth except for a small elongate callus near the apex. Column rather long, narrowed towards the short sigmoidly curved foot. Anther with lobulate lip. Pollinia oblong, cohering by two granular membranes. Hook. fil. Fil. Br. Ind. V, 808. E. annulata, Lindl. (not of Blume) in Journ. Linn. Soc. III, 57.

Sikkim, in tropical valleys up to elevations of 2,500 feet; in flower during May? Pantling, No. 287. Khasia Hills, at an elevation of 4,000 feet, G. Mann? Tenasserim; Helfer. Cachar; Keenan.

The flowers are whitish flushed with pink, the lip being blotched with red at the base and the anther deep crimson. The bract and ovary are green.

Plate 178.-Eria rufinula, Reichb. fil. A plant; of natural sizs. Fig. 1 a flower, front view, 2 floral bract, ovary, column, foot, anther and lip, 3 lip, 4 anther, 6 pollinia; all enlarged.

## 21. Eria carinata, Gibs. in Calc. Journ. Nat. Hist. V, 365.

Rhizome very short, woody, covered with dark scarious sheaths. Pseudo-bulbs oblongovoid, furrowed when mature, 2 to 3 in . long and about 1 in . in diam. Leaf thickly coriaceous, elliptic-oblong, acute, tapering at the base into the long channelled petiole; length of blade 7 to 12 in., of petiole 1.5 to 3.5 in ., breadth of blade 1.5 to 2 in . Inflorescence borne on an undeveloped pseudo-bulb, 6 to 12 in . long;' the peduncle enveloped in the conduplicate young leaf, sheathed by numerous large equitant bracts 1 to 3 in . long. Raceme about 3 in . long, bearing three drooping polished flowers 1 in . long; floral bract narrowly lanceolate, 1 to 1.5 in . long and longer than the threewinged stalked ovary. Sepals lanceolate, shortly keeled, slightly spreading, the dorsal rather shorter; the lateral pair gibbous at the base, their keels denticulate near the apex. Petals oblong-rhomboid, 9-nerved. Lip oblong, decurved from the middle, the side lobes narrow; the terminal lobe oblong, apiculate, much recurved, the upper surface with a ridge along the middle from base to apex and two shorter lines between the side lobes. Mentum short, rounded. Column much curved, its foot shorter than itself but broader. Anther with a thickened crest and a bilobed lip. Pollinia elliptic, attached to a broad granular membrane. Lindl. in Journ. Linn. Soc. III, 50; Hook. fil. Fl. Br. Ind. V, 808. E. rosea, Wall. Cat. 7409 (not of Lindl.); Reichb. fil. in Walp. Ann. VI, 269 (in part). E. Fordii, Rolfe in Gard. Chron. 1886, II, 584. Xiphosium acuminatum, Griff. Notul. III, 332; Itin. Notes II, 78, No. 1153; Ic. Plant. Asiat., t. 316.

Sikkim, at elevations of 500 to 3,000 feet; Elwes and others; Pantling, No. 1; in flower from November to January. Nepal; Wallich. Khasia Hills; Griffith (Kew Distrib. 5121), Mann, Rita.

The sepals are yellowish-green, the petals yellowish, the lip a pale faded purple, and the column pale yellow and white. The flowers smell of paregoric.

Plate 179.-Eria carinata, Gibs. A plant; of natural sise. Fig. 1 the petals, 2 part of ovary, column and its foot, anther in situ and lip seen from the side, 3 lip, 4 column and its foot and anther, 5 outside of anther; 6 pollinia; all onlarged.

## 20. Tylostylis, Blume.

Stem thick, fleshy, furrowed, constricted and leaf-bearing at the nodes. Leaves several, coriaceous, sessile. Flowers small, in extra-axillary or axillary racemes. Sepals oblong-elliptic, pubescent, spreading. Petals smaller than the sepals. Lip articulated to the very short foot of the column, mobile, broad, not lobsd, much deflexed, pubescent. Column very long, much curved forwards and downwards, so that its apex is brought opposite the middle of the lip, bearing a large callus at its base and on the very short foot. Pollinia 8, sub-equal, sub-orbicular, compressed, attached to four elongated membranes. Distrib. Two species, one Indian and the other Malayan.

This genus was first published (1825) by Blume in his Bijdragen (p. 340, t. 74) as Callostylis. But, on the ground that the name is Græco-Latin, he changed it (1828) in his Flora Javæ, praef. VI, to Tylostylis. The genus contains two species, the original Malayan one of Blume ( $T$, rigida)
and the Indian one here described. The genus was maintained by the late Mr. Bentham (Gen. Plantar. III, 318), but was reduced by Sir J. D. Hooker in his Flora of British India to Eria, where it was placed in the section Dendrolirion. The latter author, in describing the Indian species as an Eria in the Annals of the Calcutta Garden ( $\mathrm{V}, 22$ ), suggested the probability of its having to be removed from that genus; and,' in his Flora of British India $\nabla, 785$, he stated that, should an examination of living flowers prove the lip to be mobile, Tylostylis ought to be reinstated as a genus. Having satisfied ourselves that the lip is mobile, we accordingly adopt for the plant the name suggested for it by him (Ann. Bot. Gard. Calc. V, 22).

## Tylostylis discolor, Mook. fil. in Ann. Bot. Gard. Cale. V, 22.

Rhizome thick, woody, bearing short distant tubular sheaths. Stem thick, furrowed, constricted and leaf-bearing at the nodes, 3 to 10 in . long and 1 to 1.25 in . in diam. near the base. Leaves five or six, coriaceous, many-nerved, narrowly oblong, blunt or subacute and emarginate, not contracted at the base, 4 to 6 in . long and 9 to $1 \cdot 2 \mathrm{in}$. broad. Racemes from beneath the leaves and shorter than them, erect, few-flowered, with a stout tomentose rachis, the peduncle longer than the raceme and with distant broad sheathing sub-glabrous bracts. Flowers few, $\cdot 4$ in. long; floral bract thick, broadly elliptic, glabrous, much shorter than the pubescent stalked ovary. Sepals shortly pubescent on the outer and slightly so in the inner surface, thick, sub-equal, spreading, oblongelliptic, obtuse. Petals narrowly obovate, obtuse, smaller than the sepals, sub-glabrous, spreading. Lip mobile, broadly cordate, articulated to the foot of the column by a claw, not lobed, the dise near its base with a square shining patch on the foot above the claw, the rest of the upper surface pubescent, the edges upturned. Mentum none. Column long, much curved downwards and forwards, the foot very short and with a large darkcoloured callus. Anther depressed. Poblinia attached to four elongated membranes. Eria discolor, Lindl. in Journ. Linn. Soc. III, 51; Hook. fil. Fl. Br. Ind. VI, 190; in Ann. Roy. Bot. Gard. Calc. V, 22, t. 32. E. pulchella, (in part) Hook. fil. Fl. Br. Ind. V, 802.

Sikkim, at elevations of from 500 to 3,500 feet; Pantling, No. 127; in flower during February. Khasia Hills; Simons.

The colour of the inner surfaces of the sepals, petals and of the column is ochraceousyellow, their outer surfaces being dull white. The foot of the column is of a dark leaden colour and the lip has a dark purplish-brown patch near its base.

Plate 180.-Tylostylis discolor, Hook. fil. A plant; of natural sise. Fig. 1 a flower, front view 2 lip, 3 bract, stalked ovary, column with its foot, anther in situ and lip, seen from the side 4 column with pollinia and stigma, front view, 5 empty anther, showing the septa, 6 and 7 pollinia; all enlarged.

## 21. Cœlogyne, Lindl.

Epiphytes; pseudo-bulbs coespitose or attached to a rhizome, 2-(or rarely 1-) leaved. Leaves coriaceous, or membranous and plicate. Inflorescence racemose, from the apex or base of the adult pseudo-bulb. Flowers without mentum or spur ; floral bract large, deciduous. Sepals sub-equal, spreading, more or less lanceolate or oblong. Petals narrower, sometimes linear. Lip sessile on the base of the column, or very shortly clawed (in C. uniflora), sometimes saccate at the base, oblong and 3 -lobed or sub-orbicular and without lateral lobes. Column long, erect, straight or curved, winged and often hooded
in its upper part, foot none. Anther more or less 2-celled. Pollinia 4, cohering in pairs to a single two-lobed granular appendage. Species about 90 ; Indian and Malayan.
I.-Eu-Cglogyne. Lip oblong, 3-lobed; flowers and leaves contemporaneous, the latter persistent; flowers in racemes (solitary in C. uniflora).
Inflorescence racemose from the base of the pseudo-bulb; leaves in pairs, petals lanceolate or oblong.

Leaves elliptic, 2 to 4 in . broad; flowers pale brown . . . .
Leares narrowly elliptic or narrowly oblong, less than 2 in. broad; flowers usually white.
Pseudo-bulbs 2 to 4 in . long; racemes with seven to nine flowers.
Lip with two smooth ridges; raceme erect, lengthening when in fruit

1. C. fuscescens.

Lip with three flexuose ridges, not fimbriate, raceme drooping
2. C. ochracea.

Lip with four long-fimbriate lamellæ, raceme drooping .
Pseudo-bulbs 1 to 1.5 in . long; racemes erect with only two to four flowers.

Peduncle of raceme 3 in . long, lengthening when in fruit, enveloped in sheathing bracts; racemes curved, 3- or 4 -flowered
5. C. corymbosz.

Peduncle of raceme 4 in . long, lengthening when in fruit, completely enveloped in large wide sheathing bracts.
6. C. occultata.

Inflorescence racemose from between the pair of leaves on the apex of a fully developed pseudo-bulb; petals linear.

Flowering axis bracteate at its base; lip fimbriate
7. C. ocalis.

Flowering axis naked below, but with numerous imbricate distichous small sheaths below the 6 . to 12 -flowered raceme, proliferous (i.e., flowering in successive years from a prolongation of the same axis).

Lip with two lacerate lamellæ, the terminal lobe with
erose edges . . . . . . . . . . . . .
Lamellæ of lip not lacerate-fimbriate, the terminal lobe with undulate not erose edges; flowers yellow.

Pseudo-bulbs cylindric, tapering to each end, thin, much elongate; flowers greenish . Pseudo-bulbs ovoid.

Leaves sessile or sub-sessile; base of lip only slightly concave.
8. C. elata.

Leaves with long petioles; base of lip very concave
Flowers solitary on a short peduncle from the base of and not longer than the pseudo-bulb
12. C. uniflora.
II.-Pletone. Lip more or less orbicular or reniform, without side
lobes; pedancles from the base of the adult pseudo-bulb and
bearing only one or at most two flowers; leaves solitary or in pairs.

Flowers and leaves not contemporaneous, the latter deciduous.

Pseudo-bulbs elongated, ovoid, leaf usually solitary . 14. C. humilis.
Pseudo-bulbs more or less turbinate, umbonate, leaves in pairs.

Flowers 2 to 3 in. across, white . . . . . 15. C. macuata.
Flowers 3 to 4 in. across, rose-coloured . . . 16. C. pracox.

## 1. Celogyne fuscescens, Lindl. in Wall. Cat., 1962; Gen. and Spec. Orch., 41.

Pseudo-bulbs long, cylindric, furrowed, shortly sheathed at the base, about 1 in . apart on a stout rhizome 3 or 4 in . long, and about 75 in . in diam. Leaves in pairs, elliptic, plicate, acute, narrowed to the shortly petioled base, 6 to 9 in. long and 2 to 4 in. broad. Raceme rather shorter than the leaves (longer in fruit), drooping, 4 - to 10 -flowered; the peduncle stout, rising from the rhizome, enveloped for more than half its length in imbricate sheaths. Flowers about 1.5 in. long, pale brown; floral bract broadly ovate, acute, longer than the stalked ovary, caducous. Sepals sub-equal, erecto-patent, oblong-lanceolate, acute, rather concave. Petals linear, acute, reflexed, about as long as the sepals. Lip oblong; the basal half concave, with two broad rounded recurved side lobes; the anterior part wider than the basal and not separated from it by any constriction, broadly ovate, elliptic, obtuse, the edges undulate; the disc between the side lobes with three bold smooth ridges. Column long, curved, erosely winged at the apex. Pollinia dimidiately obovoid. Capsule pyriform, 125 in. long. Lindl. Fol. Orchid., 11; Bot. Mag., t. 5494 (var. brunnea); Walp. Ann. VI, 231 ; Hook. fil. Fl. Br. Ind. V, 833. C. brunnea, Lindl. in Gard. Chron., 1848, 71, with fig. C. assamica, Lindl. ex Reichb. fil. in Koch Allgem. Gartenzeit, 1857, 503; Xen. Orchid. II, t. 134.

Sikkim, at elevations of 3,000 to 5,000 feet; flowering from October to December; Pantling, No. 22. Nepal; Wallich, Maries. Bhutan; Griffith, No. 5198 (Kew Distrib.), Clarke; Khasia Hills, Simons. Burma; Parish.

In the Sikkim plant the flowers are of a pale brown colour, the ridges on the dise of the lip being of a darker shade. There are also two spots of a still darker brown on the side lobes and two on the anterior lobe, besides some dark dots; the floral bract also is brown. In other provinces the colour varies to brownish-green or yellowish, the lip being spotted with brown.

Plate 181.-Calogyne fuscescens, Lindl. A plant; fig. 2 bract, 6 capsule, 7 transverse section of the same; of natural size. 1 lip, 3 column with the anther in situ, 4 anther, 5 pollinia; all enlarged.

## 2. Celogine ochracea, Lindl. in Bot. Reg., 1846, t. 69.

Pseudo-bulbs on a stout rhizome, ovate-oblong to cylindric, furrowed, 3 to 4 in. long and $\cdot 75 \mathrm{in}$. in diam. Leaves narrowly oblong, acute, narrowed to the channelled petiole, 6 to 8 in . long and " 8 to 1.25 in . broad; petiole 1.5 to 2.25 in . long. Raceme from the base of the old pseudo-bulb, erect, shorter than the leaves (longer in fruit), 6-to 8 -flowered; its peduncle stout and with several large imbricating sheaths, Flowers white, 1.0 in . in diam.; the lract oblong, convolute, sheathing, longer than the slender stalked ovary, caducous. Sepals sub-equal, oblong-lanceolate to ovatelanceolate, obtuse, spreading, the petals narrower. Lip oblong, constricted about the
middle; lateral lobes large, rounded, incurved, the edges serrulate; terminal lobe rotund to oblong, blunt, entire or very slightly notched at the apex, the dise with two ridges. Column broadly winged towards the apex. Pollinia broadly oblong, compressed: Capsule narrowly clavate, 1.75 in. long. Lindl. Fol. Orch. 5 ; Bot. Mag., t. 4661 ; Walp. Ann. VI, 226; Hook. fil. Fl. Br. Ind. V, 831.

Sikkim, at elevations of from 4,000 to 7,000 feet; common; in flower during May and June; Pantling, No. 76. Westward to Kumaon and eastward to Bhutan and the Assam hill ranges.

The sepals and petals are pure white, the upper surface of the lip has two elongated blotches of yellow margined with red on its side lobes and two united orbicular spots at the base of the terminal lobe, with reddish oblique lines on the outer surface of the side lobes; the column is white with a vertical yellowish-brown band in front. The flowers are fragrant.

Plate 182.-Celogyne ochracea, Lindl. Fig. 1 floral bract; of natural size, 2 lip, 3 column with anther in situ, 4 empty anther, 5 pollinia; all enlarged.

## 3. Celogyne flaccida, Lindl. in Wall. Cat., 1961; Gen. and Spec. Orch., 39.

Pseudo-bulbs ovoid-cylindric, with large fibrous brown sheaths at the base, 2 to 6 in . long and 8 to 1 in . in diam. Lcaves thinly coriaceous, in pairs, narrowly oblong, acuminate, narrowed into a long channelled petiole, length 4 to 6 in., breadth 75 to $1 \cdot 25 \mathrm{in}$., the petiole 1.5 to 2 in . Raceme from the base of the pseudo-bulb, decurved, many-flowered, lax, as long as the leaves; its peduncle short and with large lax sheaths at the base. Flowers $1^{\circ} 5 \mathrm{in}$. across (vertically); bracts obovate-cymbiform, acute, 75 to 1 in . long, caducous. Sepals sub-equal, oblong-lanceolate, acute, spreading. Petals narrower and shorter than the sepals, acute. Lip oblong, 3 -lobed; the side lobes long, with acute apices; the terminal lobe oblong, reflexed; the disc with three yellow flexuose ridges between the side lobas. Column long, broadly and erosely hooded at the apex. Pollinia oblong. Capsule ellipsoid, tapering to both ends but especially to the lower, winged, 1.5 to 1.75 in. long. Lindl. in Bot. Reg., 1841, t. 31; Fol. Orchid. 2; Bot. Mag., 3318; Walp. Ann. VI, 223; Hook. fil. Fl. Br. Ind. V, 829.

Sikkim, at elevations of 3,000 to 5,500 feet; common; Pantling, No. 136; in flower from March to May. Nepal; Wallich. Khasia Hills and Burma.

The sepals and petals are of a pale brown colour; the lip is of a darker brown, the terminal lobe however being white with a yellow patch near its base; the lamellæ are yellow. The column is white with a broad yellow streak in front and the anther is buff-coloured. The flowers have a disagreeable smell.

Plate 183-Calogyne flacida, Lindl. A plant; of natural size. Fig. 1 flower, 2 lip, 3 floral bract, 4 column with anther in situ, 5 auther, 6 pollinia, all enlarged, 7 capsule; of natural size.

## 4. Celogyne cristata, Lindl. Coll. Bot. t. 33.

Pendulous; pseudo-bulbs rising from a long stout rhizome, rather distant, ovoidcylindric, polished, sheathed at the base, 2 to 3 in . long and about 85 in . in diam. Leaves in pairs, linear-oblong, acute, narrowed to the sessile base, 6 to 10 in . long and about 8 in . broad. Racemes from the base of the pseude-bulbs, pendulous, about as long
as the leaves, few-flowered, their bases sheathed with numerous small bracts. Flowers large, white, 2 to 3.5 in. across; bract oblong, acute, concave, as long as or longer than the long-stalked ovary. Sepals and petals sub-equal, erecto-patent, oblong, obtuse or sub-acute, with entire undulate edges. Lip oblong, with large rounded lateral lobes; the terminal lobe separated by an isthmus from the lateral, broad, short, crenate, with two broad, square, yellow lamellæ on its upper surface; disc between the side lobes with four yellow fimbriate lamellæ. Column long, the apex hooded and crenate. Anther with a sub-acute lip. Pollinia 4, narrowly oblong, compressed. Capsule narrowly clavate, 2 in. long. Lindl. in Bot. Reg., 1841, t. 57; Fol. Orchid. 8; Walp. Ann. VI, 229 ; Paxt. Fl. Gard. III, 171, f. 312; Fl. des Serres, t. 1807 ; Pescatoria I, t. 25 ; Warner's Sel. Orch. I, t. 35 ; Orch. Alb., t. 54 ; Jennings' Orch., t. 7 ; Gartenfl. VIII, t. $24 \hat{b}$; Hook. fil Fl. Br. Ind. V, 829.

Sikkim, at elevations of 5,000 to 8,000 feet; common; in flower during March and April; Pantling, No. 104. Westward along the range to Kumaon, and eastward to Bhutan. Khasia Hills.

The flower is pure white throughout, with the exception of the lamellæ of the lip which are yellow. The depth of the yellow varies, and a variety has been founded for the form in which it is very pale.

Plate 184.-Celogyne cristata, Lindl. A plant. Fig. 1 a capsule; both of natural size, 2 apex of ovary column and lip seen from the side, 3 lip, front view, 4 column with the anther in situ, 5 empty anther, 6 pollinia; all enlarged.

## 5. Celogyne corymbosa, Lindl. Fol. Orchid., 7.

Pseudo-bulbs rather crowded on a stout rhizome, ovoid or obovoid, slightly sheathed at the base, 1 to 1.5 in . long. Leaves narrowly elliptic-oblong, acute, narrowed to the sessile base, 4 to 7 in . long, and 8 to 1.25 in. broad. Raceme shorter or longer than the leaves, decurved, its peduncle enclosed in large sheaths. Flowers three or four, large, lax, white, 2.25 in . across; floral bract lanceolate, as long as the stalked ovary. Sepals and petals sub-equal, lanceolate; the petals rather narrower. Lip oblong, much contracted about the middle, the lateral lobes broad and blunt; the terminal lobe ovate, the apex acuminate and recurved, crenulate towards the base and the disc with three lamellæ. Column curved, slightly winged towards the apex. Pollinia falcate-elliptic, compressed. Capsule clavate, 1.5 in. long. Bot. Mag., t. 6955 ; Walp. Ann. VI, 228 ; Hook. fil. Fl. Br. Ind. V, 831 ; Reichb. fil. in Gard. Chron., 1876, II, 8; Rolfe l.c. 1887, II, 73. f. 15.

Sikkim, at elevations of from 6,000 to 8,500 feet; in flower during April and May, common; Pantling, No. 77. Bhutan, Khasia Hills.

The sepals and petals are pure white; the posterior part of the lip is brown, the middle part has four yellow blotches and the terminal part is white. The side lobes of the lip are sometimes erose at the margin as is (in other specimens) the base of the middie lobe. This species is often confounded with $C$. occultata and $C$. nitida. The flowers are sweet-scented.

Platr 185.-Calogyne corymbosa, Lindl. A plant; of nalural size. Fig. 1 lip, 2 column with the auther in situ, 3 empty anther, 4 pollinia; all enlarged.
6. Celogyne occultata, Hook. fil. Ic. Plant. t. 2104.

Pseudo-bulbs obliquely attached to a rhizome $\cdot 25$ in. thick, obovoid or ellipsoid, polished, 1 to 1.5 in. long. Leaves in pairs, narrowly elliptic, acute, narrowed to the variable petiole, length 2.25 to 3.5 in ., breadth 75 to 1 in., petiole 35 to $\cdot 75$ in. Raceme from the base of the pseudo-bulb, longer than the leaves, erect, short, 2. or 3 -flowered; the peduncle much longer than the pseudo-bulbs, enveloped almost to the top in wide spathaceous bracts which enclose at the summit the two young leaves. Flowers 2 in. in diam., white; floral bract oblong, cymbiform, acute, longer than the stalked ovary. Sepals and petals sub-equal in length; the petals narrower, oblong-lanceolate, acute, spreading. Lip oblong; the lateral lobes large, rounded, crenulate in front, separated by a constriction from the oblong, acute, recurved entire terminal lobe; disc between the side lobes with two large thick crenate ridges and a short small one between them at the anterior end. Column with a broad hoodlike winged apex. Pollinia obovate. Hook. fil. Fl. Br. Ind. V, 832.

Sikkim, at elevations of from 6,000 to 7,500 feet; in flower during July; Pantling, No. 213; Griffith, No. 5195 (Kew Distrib.)

The flower is white with the exception of some streaks and a large blotch of yellow on the lip. This is closely allied to C. corymbosa, Lindl., but differs in having shorter peduncles which are more completely enveloped in sheathing bracts larger and wider than those of that species. The racemes are also more erect and have fewer flowers, and the latter are inodorous.

Plate 186.-Calogyne occullata, Hook, fil. A plant; of natural size. Fig. 1 lip, 2 column with anther in situ, 3 empty anther, 4 pollinia, all enlarged, 5 capsule, 6 transverse section of the same; both eniarged.

## 7. Celogyne ovalis, Lindl. in Bot. Reg., 1838, Misc. 91.

Pseudo-bulbs long, cylindric, slightly thickened towards the sheathed base, polished, 1.5 to 3.5 in . long, rising at distances of 2 to 4 in . from a rather stout imbricately sheathed rhizome. Leaves in pairs, thinly coriaceous, elliptic-oblong, acute, tapering at the base into the short petiole; length 4 to 5 in., breadth 1 to 1.5 in . Inflorescence terminal, bearing three flowers which expand singly. Flowers about 2 in. across; floral bract coriaceous, 1.25 in . long, ovate-lanceolate, convolute, caducous. Sepals subequal, ovate-lanceolate, acute, spreading. Petals linear, blunt, spreading or reflexed. Lip oblong; the lateral lobes narrow, recurved; the terminal lobe broadly oblong, its edges and upper surface with stiff black hairs; the disc with two crisped lamellæ from base to apex. Column curved, broadly winged in its upper half. Pollinia dimidiately obovate. Lindl., Fol. Orch. 12; Walp. Ann. VI, 232; Hook. fil. Fl. Br. Ind. V, 836 ; Ann. Bot. Gard Calc. V, 28, t. 41. C. fimbriata, Lindl. in Wall. Cat., 1957. C. fimbriata? Lindl., Griff. Notul. III, 281; Ic. Plant. Asiat., 291, fig. 1 ? C. pilosissima, Planch. Hort. Donat, 104. Broughtonia liniaris, Wall. MSS.

Sikkim, at elevations of 2,000 to 6,000 feet; in flower from October to December; Pantling, No. 19. Westward to Nepal and Dehra Dun; Wallich, Gamble. Khasia Hills, at 4,000 feet.

The flowers are pale brown, the lip having blackish-brown markings and hairs; the column is of a warmer tint than the rest of the flower. The inflorescence is
pseudo-proliferous, one flower appearing at a time and being accompanied by an axillary bud which ultimately developes into a second flower.

Plate 187.-Cologyne ovalis, Lindl. A plant; Fig. 1 floral braot, of natural size; 2 lip, 3 upper part of column with the anther, 4 empty anther, 5 pollinia; all enlarged.

## 8. Celogyne elata, Lindl. in Wall. Cat., 1959.

Pseudo-bulbs oblong-cylindric, polished, sheathed at the base, 3 to 5 in . long and 1 to 2 in . in diam., rising at distances of about 2 in . from a very stout sheathed rhizome. Leaves in pairs, thinly coriaceous, narrowly elliptic-oblong, acute, narrowed at the base to the long petiole; length of blade 7 to 14 in., breadth 1.5 to 2.75 in ., of petiole 1.25 to 3 in . Pednncle from the apex of the adult pseudo-bulb between the leaves and rather shorter than them, naked below, bearing many short imbricate sheaths just under the raceme. Raceme 4 to 6 in . long, distichous, laxly manyflowered. Flowers 1.25 in . across ; floral bract sub-rhomboid, acute, conduplicate, slightlylonger than the stalked ovary, caducous. Sepals sub-equal, oblong, sub-acute, spreading, Petals as long as the sepals but much narrower, sub-acute. Lip elongate, the lower part oblong and with narrow entire side lobes, separated from the sub-orbicular anterior lobe by an erose-edged sinus; anterior lobe irregularly erose, undulate, obtuse; the dise with two erose-crenulate lamellæ from the base to near the apex. Column winged in its upper half, the wing erose at the apex ; pollinia dimidiately ovate. Capsule clavate, 1.5 in. long. Lindl., Gen. and Spec. Urch., 40 ; in Wall. Pl. As. Rar. III, 12, t. 218; in Bot. Reg., 1839, Misc. 92; Fol. Orchid. 9; Bot. Mag., t. 5001 ; Walp. Ann. VI, 230; Hook. fil. Fl. Br. Ind. V, 838. Coelogyne sp. Grif. Ic. Pl. Asiat., t. 290.'

Sikkim, at elevations of 4,000 to 6,000 feet; Lister, Gammie ; in flower during May and June; Pantling, No. 123. Westward along the range to Nepal and Gharwal. Bhutan and upper Burma; Griffith.

The flowers are in colour ochraceous white, the lip having a broad spot of yellow and pink on the lamellæ on its anterior lobe, the lower part of the lamellæ being yellow; the column is white and the ovary pinkish-brown. The flowers have rather an unpleasant smell.

Plate 188.-Celogyne elata, Lindl. A raceme and part of its peduncle, fig. 5 braet; of natural size. Outline of a plant ; reduced in sise. Fig. 1 a flower, 2 apex of ovary, column and lip in profile, 3 lip, 4 apex of ovary and column with anther in situ, 6 empty anther, 7 pollinia; all enlarged.

## 9. Celogyne longipes, Lindl. Fol. Orch., 10.

Pseudo-bulbs slender, cylindric, tapering to each end, slightly sheathed at the base, 2.5 to 4 in . long and $\cdot 4$ or $\cdot 5 \mathrm{in}$. in diam., obliquely attached at distances of 2 to 3 inches to a rather slender rhizome clothed with imbricate sheaths. Leaves narrowly elliptic, acute, narrowed to the petiole, 3 to 6 in . long and 1 to 1.5 in . broad. Peduncle erect, terminal, as long as or longer than the leaves, naked below, but clothed near the flowers with numerous small distichous imbricate bracts. Raceme about 2 in . long, its rachis slightly sinuous. Flowers $\cdot 75$ to 1 in. across; floral bract leathery, oblong, acute, convolute, almost as long as the flower, caducous. Sepals sub-equal, spreading, oblong-lanceolate, sub-acute. Petals linear, twisted, reflexed. Lip oblong,
concave at the base and with narrow entire lateral lobes; the anterior lobe sub-quadrate, emarginate, its edges undulate-crenulate; upper surface with two slender lamellæ proceeding from the base and becoming much enlarged in the terminal lobe. Column straight, very slightly winged, broader opposite the stigma than at the minutely crenulate apex. Pollinia obovoid, the caudicle-like membrane very small. Capsule ellipsoid, obtusely angled, 75 to 1 in. long. Walp. Ann. VI, 230; Hook. fil. Fl. Br. Ind. V, 839.

Sikkim, at elevations of 6,000 to 7,000 feet; in flower during May and June; Pantling, No. 128. Naga Hills, at Kohima, elevation 4,500 feet; Prain. Khasia Hills, at elevations of 4,000 to 5,0100 feet; Griffith, Hook, fil.

The flowers are pale greenish flushed with yellow, the side lobes and lamellæ of the lip having reddish markings. The inflorescence of this species is proliferous, exactly in the same manner as that of C. flavida, Wall.

Plate 189.-Cologyne longipes, Lindl. A plant; fig. 3 floral bract, of natural size. Fig. 1 a flower, 2 lip, 4 column with anther in situ, 5 empty auther, 6 pollinia; 7 two pollinia in profile; all enlarged.

## 10. Celogyne prolifera, Lindl. in Wa!l. Cat., 1956.

Pseudo-bulbs narrowly ovoid, compressed, shrunken at flowering time, with short sheaths at the base, $1 \cdot 2 \mathrm{j}$ in. long, rising at distances of 1.5 to 2 in . from a rhizome 25 in. thick, clothed with imbricate scale-like sheaths. Leaves narrowly elliptic, acute, tapering to the shoztly petiolate bass, sometimes sessile; length 2.5 to 4 in., breadth 5 to 75 in . Peduncle terminal, shorter than the leaves, naked below, but bearing numerous imbricate distichous sheaths under the flowers. Raceme 2 in . long, lax, 3- to 6 -flowered, the rachis zig-zagged. Flowers 8 in. across; floral bract oblong, acute, convolute, longer than the stalked ovary, caducous. Sepals sub-equal, broadly lanceolate, sub-acute, erecto-patent. Peta's as long as the sepals, filiform, reflexed. Lip oblong; the lateral lobes erect, broadly sub-triangular, obtuse; the terminal lobe sub-quadrate, with boldly undulate margins and with two converging lamellæ on its upper surface; the apex broad, minutely apicuiate. Column long, rather straight, very slightly winged towards the apex. Pollinia broadly oblong. Capsule pyriform, obtusely angled, $\cdot 75$ to 1 in. long. Lindl. Gen. and Spec. Orch., 40 ; Fol. Orchid, 10; Walp. Ann. VI, 230 ; Hook. fil. Fl. Br. Ind. V, 838.

Sikkim, in the Lachen Valley at elevations of about 6,000 or 7,000 feet; in flower during June; Pantling, No. 366. Nepal; Wallich. Khasia Hills, at elevations of 3,000 to 5,000 feet; Simons, Oldham, Mann.

The sepals and petals of the Sikkim plant are of a pale yellowish-brown, the tips of the side lobes and the whole of the anterior lobe being orange-brown and the column greenish-yellow. In Sikkim we have found this only at comparatively high elevations ( 6,000 to 7,000 feet). But, in the Khasia Hills, the species occurs at much lower elevations ( 3,000 to 4,000 feet) and in a much larger form, the blade of the leaf attaining a length of 6 or 7 in . and the peduncle and its raceme measuring as much as 10 inches.

Plate 190.-Coelogyne prolifera, Lindl. A plant; of natural size. Fig. 1 a flower, 2 stalked ovary, column and lip, seen in profile, 3 lip, 4 column and anther, 5 empty anther, 6 po'linia; all enlarged.
11. Celogyne flavida, Wall. MSS. ex Hook. fil. Fl. Br. Ind. V, 839.

Pseudo-bulbs elongated-ovoid, shrunken when in flower, sheathed at the base, 1.5 to 2 in. long, standing from 1 to 1.5 in . apart on a scaly rhizome 25 in . thick. Leares in pairs, narrowly elliptic-oblong, acute, contracted at the base into the petiole; length 4 to 7 in. long, breadth $\cdot 75$ to $1 \cdot 25$ in. Peduncle terminal, naked below, but with many small imbricate scaly sheaths just under the flowers, of en proliferous from the production of flowers several years in succession on the, annually lengthening axis. Raceme 1.5 to 2.5 in. long, laxly few-flowered. Flowers $\cdot 5$ in. across; floral bract large, scarious, broadly ovate, acute, convolute, longer than the slender stalked ovary. Sepals sub-equal, spreading, ovate, bluntly acuminate. Petals lincar, spreading, as long as the sepals, obtuse. Lip oblong, 3-lobed, the basal half concave; the side lobes small, oblong, obtuse; the terminal lobe decurved, cuneately obcordate, separated from the lateral lobes by two broad sinuses, its disc faintly 2-ridged. Column long, straight, very slightly winged near the apex; pollinia dimidiately clavate. Hook. fil. ex Lindl. Fol. Orchid, 10; Walp. Ann. V, 2z3; Hook. fil. Fl. Br. Ind. V, 839 ; in Ann. Bot. Gard. Calc., V, 28, t. 42.

Sikkim, asconding to elevations of 5,000 feet; very common, in flower from May to July and even later; Pantling, No. 29. Naga Hills ; at Kohima, Prain. Khasia Hills ; G. Mann.

The flowers are of a pretty uniform pale yellow.
Plate 191.-Coelogyas flacila, Wall. A plant; 4 a floral bract; of natural size. Fig. 1 a flower, 2 stalked ovary, column and lip in profile, 3 oolumn and anther, 5 transverse section of lip through the side lobes, 6 empty anther, 7 pollinia; all enlarged.

## 12. Celogine uniflord, Lindl. in Wall. Cat., 1966.

Pssudo-bulbs coespitose, broadly ovoid, mammillate, with some loose fibrous sheaths at the base, $\cdot 6$ to 1.2 in . long. Leaves in pairs, narrowly oblong, acuminate, slightly narrowed at the base, sessile, 2 to $3 \cdot 5 \mathrm{in}$. long and $: 35$ to $\cdot 45 \mathrm{in}$. broad. Flower solitary on a short peduncle from the base of the pseudo-bulb and usually shorter than it ; the peduncle up to its junction with the ovary sheathed in lanceolate acuminate imbricate bracts. Sepals oblong-lanceolate, sub-acute, spreading. Petals broadly lanceolate, sub-acute, shorter than the sopals. Lip oblong, with a very short claw at the base; the side lobes erect, narrow, with their acute apices pointing forwards, the isthmus between the lateral and side lobes with undulate edges; the anterior lobe ovate, blunt, entire, the disc between the lamellæ with two slight ridges. Column winged, with two broad, erose, marginal lobes below the stigma, the apex above the anther with a central broad shallow lobe and two teeth at each end of it. Pollinia broadly oblong, oblique. Capsule ellipsoid, winged, ${ }^{\circ} 6$ in. long. Lindl, Gen. and Spec. Oreh., 42 ; Hook. fil. Fl. Br. Ind., 842 ; in Ann. Bot. Gard., Calc., Vol. V, 29, t. 43. Panisea uniflora, Lindl. Fol. Orch., 2; Walp. Ann. VI, 240. Epidendrum, Griff. 1c. Pl. Asiat., t. 313, fig. 1.

Sikkim, at elevations from 500 to 4,000 feet; in flower during April and May; Pantling, No. 71. Nepal; Wallich, Khasia Hills; Griffith. Tenasserim; Parish.

The sepals and petals are pale ochraccous, and the lip is of a pale brown with four elongated spots of dark brown, the column being white. Lindley, after first describing this as a Coelogyne, finally regarded it as a Panisea. His earlier opinion appears to us to be the correct one; for the flowers of this in no way differ from those of a typical Coelogyne; whereas the curious sigmoidly bent narrow claw at the base of the lip, so characteristic of Panisea, is here quite unrepresented. The lip of this has moreover conspicuous sharp side lobes, whereas that of Panisea has no lobes whatever and no lamellæ.

Plate 192.-Cologyne unifora, Lindl. A plant; of natural size. Fig. 1 a flower, 2 peduncie with ts bracts, ovary, column and lip, $3 \mathrm{lip}, 4$ column with anther in situ, 5 pollinia; all enlarged.

## 13. Celogyne Hooreriana, Lindl. Fol. Orchid., 14.

Pseudo-bulbs coespitose, oval, with a few lax sheaths, smooth, not mottled, $\cdot 75$ to 1 in. long. Leof solitary, proceeding from the base of the adult pseudo-bulb, narrowly elliptic, acute, tapering to the petiole; the blade 2 to 2.5 in . long and $\cdot 5$ to 8 in . broad; petiole 75 to 12.5 in . long, enclosed in tubular imbricate sheaths. Peduncle enveloped in the same sheaths as the base of the undeveloped leaf and longer than the latter, (often several times longer,) bearing a solitary white flower 2 in. across; floral bract about as long as the stalked ovary, broadly obovate-elliptic, very obtuse, convolute, persistent. Sepals spreading, sub-equal in length, elliptic-oblong, blunt, the dorsal narrower than the lateral pair. Petals spreading, as long as the sepals, oblanceolate, obtuse. Lip sub-reniform, cordate at the base, broad and entire in its posterior half, narrowed, lobulate and minutely erose in its anterior, the apex retuse, the dise with five to seven slender ciliate ridges from the base nearly to the apex. Column long, curved, broadly winged in its upper half, the wings widening to the truncate erose apex. Pullinia obliquely elliptic. Bot. Mag., t. 6388; Hook. fil. Fl. Br. Ind. V, 842.

Sikkim, at elevations from 7,000 to 11,000 feet; in flower during May and June; Thomson, Watt, Gammie, Gamble ; Pantling, No. 313. Kumaon; Collett, No. 160.

In the Sikkim plant the sepals and petals are white flushed with violet, the lip is also white with a large spot of yellow with dull reddish-mottlings. The sepals are, however, figured in the Botanical Magazine ( t . 6388) as pale violet tipped with dark violet. In this, as also in all the members of this section (except C. Hookeriana), the leaves are deciduous and are absent at flowering time.

Plate 193.-Cologyne Hookeriana, Lindl. A plant; of natural size. Fig. 1 lip flattened out, 2 column and anther, 3 a floral bract, 4 anther, 5 pollinia; all enlarged.

## 14. Celogyne humilis, Lindl. Coll. Bot. 37.

Pseudo-bulbs coespitose, narrowly ovoid, tapering to the apex, partly enveloped by fibrous sheaths; length 1.25 to 1.75 in. Leaves membranous, elliptic, acute, tapering to the base, sessile; length 3 to 4 in ., breadth $1 \cdot 15$ to 1.4 in . Peduncle from the base of the pseudo bulb and about the same length, enveloped to the apex in tubular pale sheaths with pink striae, 1- rarely 2 -flowered. Flowers 2 to 2.5 in. in diam., white ; bract obovoid-elliptic, obtuse, convolute, pale purple, longer than the stalked ovary, persistent. Sepals sub-equal, spreading, oblong, acute; the petals narrower, obtuse.

Lip shortly clawed, sub-orbicular, without side lobes, concave in the lower part but expanding into a wide mouth with emarginate apex; the edges entire in the posterior sharply and somewhat irregularly dentate in the anterior half, the upper surface with numerous fringed lamellæ. Column very long, the apex expanded into a broad hood with a truncate erose apex; pollinia elliptic. Lindl. Gen. and Spec. Orch., 43; in Wall. Cat., 1963 (in part) ; Fol. Oreh., 16; Bot. Mag., t. 5674 ; Hook. fil. Fl. Br. Ind. V, 810. Pleione humilis, Don Prod. Fl. Nep., 37; Paxt. Fl. Gard., t. 51. Epidendrum humile, Sm. Exot. Bot., t. 98. Cymbiaium humile, Smith in Rees' Cyclop.

Sikkim, at elevations of 7,000 to 8,500 feet; in flower during February and March ; Pantling, No. 64. Distributed westward to Nepal.

The lip is speckled with purple towards the edges (on the upper surface), the dise being yellow with brown spots, and the lamellæ being brown. In some specimens the brown on the lip is supplanted by purple or crimson. The column is spockled in front with purple. All other parts of the flower are white. The lip is sometimes adnate to the sides of the column for one quarter of the length of the latter; in other specimens it adheres to the column by its base only. To the European residents of Darjeeling the plant is known as the "Himalayan Crocus."

Platk 194.-Celogyne humilis, Lindl. A plant; Fig. 1 lip flattened out, 2 a bract flattened out; of natural size; 3 column with anther in situ, 4 anther, 5 pollinia; all enlarged.

## 15. Celogyne maculita, Lindl., Gen, and Spec. Orch. 43.

Pscudo-bulbs as in C. precox, but rather smaller, sometimes constricted at the middle, enclosed in a net-work of fibres (old bracts). Leaves two, narrowly elliptic-oblong, acute, narrowed to the petiole, their bases sheathed with bracts baving nodular inflations; length 4.5 to 8 in ., breadth 1 to 1.75 in . Flowers 2 to 3 in . across, rising singly from the base of the pseudo-bulb by a very short peduncle enveloped in a large spathaceous flower bract with broad emarginate apex, convolutg, longer than ovary. Sepals sub-equal, spreading, oblong, lanceolate, sub-acute. Petals about equal in length to, but narrower than, the sepals, oblanceolate-oblong, spreading. Lip broadly elliptic, 3 -lobed, the basal part convolute round the column; the lateral lobes narrow, entire; the terminal lobe broader than long, its edges sub-entire, its apex broad and emarginate; the upper surface with five to seven pectinate lines disappearing in the disc between the side lobes. Column long, slightly curved; the apex winged, irregularly erose. Anther with a small bilobed lip. Pollinia elliptic. Capsule ellipsoid, 8 in . long, its peduncle elongating after flowering. Lindl. in Wall. Pl. As. Rarior. I, 45, t. 53; Fol. Orehid., 15; Bot. Mag., t. 4691 ; Fl. des Serres, t. 1470; Griff. Notul. III, 281 ; Hook. fil. Fl. Br. Ind. V, 841. C. candidu, Liudl. in Wall. Cat., 1964. Pleione maculata, Lindl. in Paxt. Fl. Gard., t. 39, fig. 1. P. aiphylla, Lindl. in Paxt. Fl. Gard. under t. 51; Fol. Oreh., 15; Walp. Ann. VI, 234. Caelogyne, Griff. Itin. Notes, 44, 684. Gomphostylis candida, Wall. MSS,

Sikkim, at elevations of from 1,600 to 3,000 feet; in flower during October and November; Pantling, No. 21. Nepal; Wallich. Bhutan ; Clarke. Khasia Hills, at elevations of from 4,000 to 5,000 feet.

The sepals and petals are white with occasional pink lines. The lip is much marked with purple and yellow and the column is green. The flowers are fragrant. This species is usually leafless at flowering time.

Plate 195.-Cologyne maculata, Lindl. A plant; of natural size. Fig. 1 lip, 2 column with anther in situ, 3 bract, 4 anther, 5 pollinia; all enlarged.
16. Celogyne precox, Lindl. Coll. Bot. 37 ; in Wall. 'Cat. 1965.
$P_{\text {seudo-bulbs coespitose, varying in shape at different stages of growth from ampullate }}$ to turbinate, finally often shortly cylindric, usually umbonate in all stages, the surface mottled with brown or purple and imperfectly sheathed by loose brown fibres. Leaves in pairs, membranous, elliptic or elliptic-oblong, many-nerved, occasionally somewhat oblanceolate, sub-acute, narrowed at the base to the petiole, 4 to 8 in . long and 1.75 to 2.5 in . broad, petiole 1 to 2 in . Peduncle from the base of and about as long as the mature pseudo-bulb, its lower half enveloped in tight tubular mottled sheaths, its apex 1- or 2 -flowered. Flowers large, rose-coloured, 3 or 4 in. across; florul bract obovoid, very obtuse, convolute, as long as the stalked ovary or longer. Sepals sub-equal, spreading, oblanceolate or lanceolate. Petals as long as but narrower than the sepals, spreading. Lip ovate-orbicular, without side lobes, the basal part convolute round the column, the anterior part concave, having an open wide repand mouth with deeply and irregular lobulate-dentate edges, the apex slightly bifid, the disc with five laciniate lamellæ. Column very long, with a short sac at the base, the apex expanded into a wide undulate irregularly lobulate hood. Pollinia clavate. Lindl. Fol. Orchid, 16; Bot. Mag., t. 4496; Paxt. Mag. XIV. t. 7; Hook., fil. Fl. Br. Ind. V, 840. C. Wallichiana, Lindl. Gen. and Spec. Orch., 43 ; in Wall. Pl. As. Rarior. I, 46, t. 54; Bot. Reg. XXIV, Misc. 85 ; Paxt. Mag. VI, t. 25; Gartenflora, t. 283; Jennings' Orchids, t. 47; Griff. Notul. III, 402. Pleione pracoox, Don Prod. Fl. Nep. 37. P. Wallichii, Lindl. in Paxt. Fl. Gard. sub. t. 51 ; P. Birmanica, Reichb. fil. in Gard. Chron., 1882, II, 840. Epidendrum preceox, Smith Exot. Flora, t. 97.

Sikkim, at elevations of 6,000 to 8,000 feet, very common; Pantling, No. 96. Westward to Gharwal and eastward and southward to Bhutan, the Khasia Hills and Burma. Except the lip, the whole flower is of a brilliant rose colour, often tinged with violet.

The lip has a patch of white on the disc, with a smaller arc of yellow on the lamellæ. Dccasionally a specimen occurs with its flowers pure white. The much narrowed base of the lip coheres with the sides of the column to form a small saccate nectary.

Plate 196.-Calogyne pracox, Lindl. A plant; 3 a bract flattened out; of natural size. fig. 1 , lip flattened out, 2 column with auther in situ; 4 anther, 5 pollinia; all enlarged.

## 22. Panisea, Lindl.

Epiphytal; pseudo-bulbs small, ovoid, coespitose, 2-leaved. Leaves membranous, plicate. Scape from the base of the pseudo-bulb; the raceme lax and few-flowered, flowers rather small. Sepals and pefals membranous, sub-equal, narrow, sub-spreading, the lateral pair slightly saccate at the base. Lip membranous, as long as the sepals, adnate to the base of the column, entire, the dise not lamellate; the claw long, sigmoid, bituberculate. Column long, slender below, but dilating upwards into an erose wing, foot none. Anther sub-terminal, opercular, 2-celled. Pollinia 4, broadly oblong, the upper three-fourths oblique, the lower straight and cohering.

A genus which forms a oennecting link between Coelogyne and Otochilus, but differs from both in the curious sigmoid flexure of the base of the lip. The lip, like that of Otochilus, has no lamellæ, whereas in Ccelogyne a lamellated dise is the rule. There are two species-the following and another named $P$. apiculata.

Panisea parviflora, Lindl. Fol. Orchid. p. 1.
Pseudo-bulbs narrowly ovoid, translucent, $\cdot 6$ to 1 in. long. Leaves narrowly ellipticlanceolate, acute, tapering to the base, sub-sessile, 2 to 3 in. long. Scape filiform, decurved, about as long as the leaves, the base with membranous sheaths. Flowers 5 in. across; floral bract lanceolate, large, shorter than the stalked ovary, membranous. Sepals keeled, the dorsal linear-oblong; the lateral pair falcate, acute, gibbous at the base, Petals oblong, blunt. Lip above the sigmoid claw narrowly lanceolate, sub-acute, 3-nerved. Cupsule elliptic, turgid. Hook. fil. Fl. Br. Ind. V, 783 ; in Ann. Roy. Bot. Gard. Calc. V, 19, t. 29. P. reflexa, Lindl. Fol. Orch. 1. Coelogyne parviflora, Lindl. Gen. and Spec. Orch., 44. Dendrobium demissum, Don Prod., 34. Androgyne sp., Griff. Notul. III, 279.

Sikkim, at elevations of about 6,000 feet; Clarke, King, Pantling, No. 301 ; in flower about October. Nepal; Wallich. Khasia Hills; Griffith.

The flowers are white with brown streaks, the column being entirely brown.
Plate 197.-Panisea parviflora, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip seen from the side, 3 lip, 4 column, 5 anther, 6 pollinia; all enlarged.

## 23. Otochilus, Lindl.

Epiphytal. Stems pendulous, jointed, branched, formed of superposed elongate pseudo-bulb-like internodes, bearing roots at the nodes. Leaves in pairs from the apex of the terminal node, linear, elliptic or lanceolate, membranous, plicate. Raceme pendulous, from the pseudo-bulb just below the leaves, many-flowered, the flowers distichous, the peduncle sheathed. Flowers small, white; floral bract scarious. Sepals and petuls subequal, spreading, free, narrow. Lip with a short two-horned sac at the base and a long narrow acute entire concave deflexed terminal lobe. Column very long, slender, clavate, erect, with no foot. Anther-cells distinct. Pollinia 4, ovoid or cuneate, flattened, attached to a single bilobed membrane. Species thiee; all Indian.

> Flowers $1 \cdot 1$ in. long from apex of dorsal sepal to apex of lip.
> Leaves narrowly elliptic . . . . . . . . . . . . . . . 1. O. porrect.
> Flowers 5 to 75 in . long from apex of dorssl sepal to apex of lip.
> Leaves linear-oblong, sepals and petals obtuse
> 2. O. fusca.
> Leaves elliptic-oblong, sepals and petals acute
> 3. O. alba.

> 1. Otochilus porrecta, Lindl. in Wall. Cat., 1968; Gen. and Spec. Oreh., 36 .

Internodes of the stem cylindric, 2 to 4 in . long, often sheathed, Leavcs narrowly elliptic, acuminate, narrowed at the base to the short petiole, 5 to 10 in . long, and 1.5 to 2.5 in . broad. Raceme shorter than the leaves, very laxly-flowered, its peduncle about $1 \cdot 5 \mathrm{in}$. long. Flowers $1 \cdot 1 \mathrm{in}$. long; the floral bract broad, acute, caducous, the pedicelled ovary long and slender. Sepals sub-equal, narrowly oblong, the lateral pair sub-falcate. Petals as long as the sepals, linear, acute, spreading. Lip shorter
and broader than either sepals or petals, the saccate base with acute side lobes, the anterior lobe deflexed from its base, oblong, acute. Column very long and slender, winged and thickened towards the apex, the lip of the anther shortly pointed. Pollinias ovoid-globular. Hook. fil. Fl. Br. Ind. V, 844. O. latifolia, Griff. Notul. III, 279 ; Ic. Plant. Asiat., t. 289. Caelogyne porrceta, Reichb. fil. in Walp. Ann. VI, 236. Tetrapeltis jragrans, Wall. MSS.

Sikkim, at elevations of from 4,000 to 6,000 feet, very abundant; in flower from October to January; Pantling, No. 26. Distributed westwards to Nepal and eastwards and southwards to the Naga, Khasia and Burmese hill ranges.

In Sikkim this species forms large masses, often breaking down thick branches of trees by their weight. The flowers are white, there being, however, a patch of brown on the sac of the lip and the column being altogether brown, as is the rachis.

Plate 198.-Otochilus porrecta, Lindl. A plant; of natural size. Fig. 1 a flower, front view, 2 ovary, column, anther and lip, seen from the side, 3 bract, 4 column with anther in situ, 5 anther, lower surface, 6 pollinia; all enlarged, 7 capsule; of natural size.
2. Otochilus fusca, Lindl. in Wall. Cat., 1969 ; Gen. and Spec. Orch., 35.

Pendulous; internodes of the stem cylindric or fusiform, 1 to 3 in . long, somewhat shrunken at flowering time, often clothed with fibrous sheaths. Leaves shortly petioled, linear-oblong, acuminate, slightly narrowed to the base, 4 to 6 in . long and $\cdot 4$ to 5 in . broad. Raccmes about as long as the leaves while in flower but much longer when in fruit; the peduncle only about 1 in . long, enclosed in imbricated sheaths. Flowers $\cdot 6$ in. long; the floral bract scarious, narrow, oblong, subtruncate, with incurved edges, longer than the stalked ovary. Sepals sub-equal, free, narrowly oblong, obtuse, spreading. Petals slightly smaller than the sepals, oblanceolate, spreading. Lip with a short saccate bi-cornute base and a long oblong acute deflexed concave terminal lobe rather shorter than the sepals. Column short and with no foot, slightly winged towards the apex. Anther with a pointed lip. Pollinia cuneate. Capsule elliptic, apiculate, about 35 in . long. Bot. Mag., t. 3921 ; Hook. fil. Fl. Br. Ind. V, 844. O. • lancifulia, Griff. Notul. III, 278 ; Ic. Pl. Asiat., t. 289. Coelogyne fusca, Reichb. fil. in Walp. Ann. VI, 236. Broughtonia fusca, Wall. MSS.

Sikkim, at elevations of 3,000 to 6,000 feet; very common; in flower during December. Pantling, Nó. 61. Nepal, Assam, Khasia Hills, Manipur.

The rachis, column, ovary and fruit are brown in colour; the saccate base of the lip brown with a tinge of pink; while the sepals, petals and anterior lobe of the lip are pure white. As in 0 . porrecta and 0 . alba, there is a fibrous core running through the superposed pseudo-bulbs which compose the stem.

Plate 199.-Otochilus fusca, Lindl. A plant; of natural size. Fig. 1 front view of a flower, 2 top of column with the anther in situ, 3 part of rachis, stalked ovary, column, anther and lip, seen from the side, 4 anther, lower surface, 5 pollinia, 6 transverse section of a capsule; all enlarged.
3. Otochilus alba, Lindl. in Wall. Cat., 1967 ; Gen. and Spec. Orch., 35.

Internodes of the stem sub-cylindric, rather slender, 1.5 to 2.5 in . long. Leaves elliptic-oblong, often very narrow, acuminate, tapering at the base into the distinct narrow petiole; length 2.5 to 7 in , breadth 5 to 1 in ., petiole 5 to 1.25 in .

Raceme shorter than the leaves, laxly-flowered, its peduncle about 1.2 j in. long, enveloped in large sheaths. Flowers 5 to $\cdot 6 \mathrm{in}$. across (vertically); the floral bract large, ovate-lanceolate, longer than the stalked ovary, caducous. Sepals oblong-lanceolate, acute, the dorsal rather smaller than the lateral pair, the petals narrower. Lip somewhat longer than the sepals; the saccate base with rather broad side lobes, the anterior lobe oblong, apiculate, deflexed from the base. Column very long and slender, winged and thickened towards the apex, bent downwards at its base. Pollinia sub-globose. Capsule elliptic, tapering to both ends, $5^{5}$ in. long. Hook. fil. Fl. Br. Ind. V, 843. Coelogyne alba, Reichb. fil. in Walp. Ann. VI, 236. Broughtonia pendula, Wall. MSS.

Sikkim, at elevations of from 3,000 to 5,000 feet; common; in flower during June. Pantling No. 35. Extending to Nepal on the west and to the Khasia and Naga Hills towards the east and south. The colour of the flowers is white,

Plate 200.-Otochilus alba, Lindl. Part of a plant; of natural size. Fig. 1 front view of a flower, 2 lip, 3 stalked ovary, column and lip with the anther in situ, showing also the bases of the cut-off petals, 4 upper part of column showing anther and stigma, 5 lower surface of anther, showing the pollinia, 6 pollinia; all enlarged.

## 24. Pholidota, Lindl.

Epiphytal with jointed often branching stems with internodes like pseudo-bulbs, or with tufted pseudo-bulbs. Leaves usually in pairs (solitary in P. imbricata), membranous, many-nerved. Racemes on ebracteate peduncles, terminal or from the base of a pseudobulb (from below the leaves in two species) usually drooping and distichous; florab bract large and persistent. Flowers small, sub-globose, expanding from above downwards. Sepals concave, the lip usually without side lobes, more or less cymbiform and saccate. Petals narrower than the sepals. Column short, the apex shortly hooded or winged; anther cells more or less sub-globose. Pollinia 4 , sub-globose or clavate, cohering by pairs to one or two membranes. Species about twenty; Indian, Malayan or Chinese.
Leaf solitary . . . . . . . . . . . . . . . . . . . . 1. P. imbricata.

Leaves in pairs.
Rhizome fleshy, not jointed, more or less covered with fibrous sheaths and emitting pseudo-bulbs at intervals.

Rhizome short, raceme 8 to 10 in . long
2. P. rubra.

Rhizome 1 or 2 feet long, racemes 1 to $1 \cdot 5 \mathrm{in}$. long . . 3. P. protracta.
Stems jointed, the internodes pseudo-bulb-like; racemes terminal from between the leaves, only one from each branch.

Leaves narrowly elliptic.
Bracts rhomboid-ovate, acute, deciduous . . . . . . 4. P. articulata.
Bracts oblong or sub-orbicular, obtuse, small, deciduous . 4. P. articulata, var. Griffitiii.
Leaves narrowly oblong.
Bracts fan-shaped, with broad truncate apices, persistent . 5. P. recurva.

## 1. Pholidota mbricata, Lindl. in Hook, Fl. Exot., t. 138.

Pseudo-bulbs coespitose, cylindric, thickened at the base, 2 or 3 in . long and (at the middle) about $\cdot 6$ or $\cdot 7 \mathrm{in}$. thick; or shorter and more ovoid, furrowed, usually partly
enveloped in large fibrous sheaths. Leaf solitary, elliptic oblanceolate or lanceolate, acute, much tapered to the stout petiole; length 6 to 12 in., breadth 1.25 to 2.5 in., petiole 1.5 in. Inflorescence from the base of a pseudo-bulb, drooping, 8 or 10 in . long (longer in fruit); the peduncle slender, as long as or longer than the dense many-flowered raceme. Flowers distichous, $\cdot 25 \mathrm{in}$. long; floral bract large, convolute, sub-rotund, minutely apiculate, the edges irregularly infolded, many-nerved, longer than the slender stalked ovary, persistent. Dorsal sepal orbicular; the lateral pair connate at the base, cymbiform, with a winged keel. Petals oblong, sub-acute. Lip 3-lobed; the lateral lobes large, broad, rounded; the terminal lobe divided at the apex into two small oblong lobules separated by a broad sinus. Column broad and winged in its upper half; pollinia clavate, attached by pairs to two small membranes. Capsule ellipsoid, 75 in . long. Lindt. in Wall. Cat, 1991; Gen. and Spec. Orch., 37; in Bot. Reg., t. 1213 and 1777; Lodd. Bot. Cab., t. 1934; Wight. Ic. t. 907 ; Dalz. and Gibs. Bomb. Fl. 262 ; Honk. fil. Fi. Br. Ind. V, 845. P. pallida, Lindl. in Bot. Reg. XXI, sub t. 1777. Cologyne imbricata and C. pallida, Reichb. fil. in Walp. Ann. VI, 238. Ptilocnema bracteatum, Don Prodr. 33. Cymbidium imbricatum, Roxb. Fl. Ind. III, 460. Ornithidium imbricatun, Wall. MSS.

Sikkim, from the foot of the range to elevations of 5,000 feet; common; in flower from May to August; Pantling, No. 30. Westward to Kumaon and east-ward and southward to Bhutan, the Assam hill ranges, Chittagong, Burma, and the Andaman Islands. Also in the Deccan Peninsula and Ceylon, and in the Malayan Peninsula.

The flowers, ovaries and bracts are of an almost uniform pale brown colour.
Plate 201.-Pholidota imbricata, Lindl. A plant; of natural size. Fig. 1 a flower, 2 ovary, column and lip in profile, 3 bract, 4 lip, 5 petals, 6 front view of column, stigma and anther in situ, 7 an empty anther, 8 pollinia; all enlarged.

## 2. Pholidota rubra, Lindl., Gen. and Spec. Orch., 37.

Rhizome thick, covered with fibrous sheaths; pseudo-bulbs fusiform, furrowed, about 3 in. long, usually sheathed at the base, about 75 in . in diam. at the middle. Leaves two, narrowly elliptic, acuminate, tapering to the sessile base, 4 to 10 in . long, and 85 to 1.5 in. broad. Raceme from the base of a pseudo-bulb, almost sessile, 6 to 9 in. long, drooping. Flowers very numerous, distichous, not crowded, 2 in . long, embraced while in bud by the bract. Ovary short, stalked, slender, only half as long as the cymbiform, acute, persistent bract. Sepals ovate, with broad bases and acute apices, spreading, the midrib thick. Petals linear, obtuse, spreading. Lip oblong; the lower part cymbiform and with two small rounded lateral lobes; the anterior lobe small, broadly ovate, acute, decurved; the disc 3 - to 5 -nerved, the nerves slender. Column broadly winged at the apex; pollinia clavate, attached in pairs to two small membranes. Capsule broadly elliptic, 5 in. long. Wall. Pl. As. Rar. III, 21, t. 239 ; Hook. fil. Ic. Plant., t. 1879 ; Hook. fil. Fl. Br. Ind. V, 847. P. undulata, Lindl. in Bot. Reg. XIV, sub t. 1213 and XXVII, Misc. 6. Coelogyne rubra and C. undulata, Reichb. fil. in Walp. Ann. VI, 238.

Sikkim, at elevations of from 3,000 to 6,000 feet; in flower during November and December; Pantling, No. 58. Khasia Hills, Griffith (Kew Distrib.) No. 5044, Clarke, Mann,

The sepals and petals are of a dull pale yellowish-green, the lip and column pinkish-brown.

Plate 202.-Pholidota rubra, Lindl. A plant; of natural size. Fig. 1 a flower, front view, 2 part of rachis, bract, column and lip, 3 lip, 4 front view of column, stigma and anther in situ, 5 under surface of anther, 6 pollinia; all enlarged.

## 3. Pholidota protracta, Hook. fil. Ie. Plant. t. 1877.

Stem elongate, slender, clothed in numerous long scarious sheaths and sending off at intervals translucent fusiform pseudo-bulbs 1.5 to 2 in . long, often bracteate at the base; bearing at the apex two membranous narrowly elliptic leaves with acute apices, the bases narrowed to the short petioles, 3 to 5 in . long and $\cdot 75$ to 9 in . broad. Racemes several from the joints of the rhizome, shorter than the leaves, few-flowered, the peduncles short. Flowers nearly 25 in. long; bract broadly ovate, acute, recurved, shorter than the stalked ovary. Sepals sub-equal, broadly ovate, blunt, very concave, connivent. Petals broadly elliptic, very obtuse, somewhat shorter than the sepals. Lip oblong, concave, gibbous near the base; the apex somewhat narrowed, corrugately trilobulate. Column rather broadly winged in its upper half. Pollinia cuneate, attached by pairs to a broad membrane. Capsule sub-globular, boldly ridged, 3 in . long. Hook. fil. Fl. Br. Ind. V, 845.

Sikkim, at elevations of 5,000 to 7,500 feet; Griffith and others; in flower from October to December; Pantling, No. 55. Khasia Hills; Griffith (Kew Distrib.), No. 5042. Naga Hills; Prain, No. 27.

The flowers are green, but the lip has four small bright patches of dull yellow on its anterior lobe.

Plate 203.-Pholidota protracta, Hook, fil. A plant; of natural size. Fig. 1 a flower, front view, 2 side view of recurved floral bract, stalked ovary and flower, 3 side view of apex of ovary, column and lip, 4 lip, 5 front view of column, stigma and anther in situ, 6 anther, 7 pollinia, 8 profile of a single pollinium; all enlarged.
4. Pholidota articulata, Lindl. in Wall. Cat., 1992; Gen. and Spec. Orch. 38.

Stem jointed, branching; the internodes terete, furrowed, 2 to 4 in . long, and about $\cdot 5 \mathrm{in}$. in diam., the nodes with a few short broad scarious sheaths. Leaves thickly membranous, many-nerved, narrowly oblong, tapering to each end; length 3 to 4.5 in., breadth 1 to 1.75 in . Raceme drooping, terminal on the young pseudo-bulbs, issuing between and about as long as the leaves, many- and densely-flowered, the young leaves sheathed at the base. Flowers $\cdot 3 \mathrm{in}$. long; bract about $\cdot 5 \mathrm{in}$. long, rhomboid-ovate, convolute, acute, deciduous when the flowers expand; stalk of ovary slender. Dorsal sepal sub-orbicular; the lateral pair ovate, keeled. Petals ovate-orbicular, blunt. Lip about as long as the sepals, broadly cymbiform, with a transversely oblong broad bilobulate middle lobe infolded at its base, the dise with five bold lamellæ. Column slightly winged towards the apex, the clinandrium irregularly toothed; the rostellum large, erect, acuminate. Pollinia sub-globular, attached to a cuneiform membrane. Lindl. in Bot. Reg. for 1839, Misc. 44; Hook. fil. Fl. Br. Ind. V, 844. P. khasiana, Reichb. fil. in

Walp. Ann. VI, 238 ; in Bonplandia IV, 329. Coeiogyne articulala, Reichb. fil. in Walp. Ann. VI, 238. C. khasiana, Reichb. fil. l. c., 238.

Sikkim, common from the foot of the range to an elevation of 4,000 feet; in flower from June to August; Pantling, No. 31. Westward to Kumaon, eastward to Bhutan. Also in the Khasia Hills and Upper Burma.

The flowers are white tinged with brownish pink and the floral bracts are pale brown.

Var. Griffithii, King and Pantling. Like the type in most respects, but smaller in all its parts, the internodes less furrowed and with narrower leaves; flowers only $\cdot 2 \mathrm{in}$. across; the floral bract and dorsal sepal suborbicular, blunt; petals elliptic-lanceolate; sepals green; petals pale green; lip brown. Pholidota Griffithii, Hook. fil. Ic. Plantar., t. 1881 ; Fl. Br. Ind. V, 845 ; Wall. Cat. No. 1992 (in part).

Sikkim, at elevations of 2,000 to 4,000 feet; in flower during July and August. Griffith, Hooker filius ; Pantling, No. 32. Dehra Dun; Gamble. Khasia Hills, at 5,000 feet; Clarke, Mann.

Plate 205.-Pholidotx articulata, Lindl. A plant; of natural sise. Fig. 1 flower, side view, 2 stalked ovary, column and lip in profile, 3 lip, 4 column and anther in situ, 6 anther, 7 pollinia, all entarged; 5 bract, of natural size.

Plate 204.-Pholidota articulata, Lindl. var. Griffithii, King and Pantling. A plant; of natura? size. Fig. 1 a flower, 2 side view of stalked ovary, column and lip, 3 bracts opened out, 4 lip, 5 front view of column, stigma and anther in situ, 6 view of the inside of the anther, its lateral margins shrunken and reflexed, 7 pollinia; all enlaryed.

## 5. Pholidota recurva, Lindl., Gen. and Spec. Orch., 37.

Stems thin, jointed, branching; the internodes yellowish, polished, angled when fresh (with the appearance of being winged when dry), 1.5 to 4 in . long and only 3 in. in diam., the nodes with a few broad scarious sheaths. Leaves membranous, narrowly elliptic-oblong, acute, narrowed at the base into the short petiole, the young ones sheathed at the base; length 2.5 to 4.5 in., breadth 6 to 8 in. Racems terminal, from between and about as long as the leaves of a young pseudo-bulb, decurved, secund, with numerous crowded flowers; the peduncle short, slender. Flowers $\cdot 15$ in. long; bracts fan-shaped, with truncate apices, imbricated, secund, as long as the stalked ovary, persistent. Dorsal sepal sub-orbicular, concave; the lateral pair broadly ovate, obtuse. Petxls ovate-oblong, obtuse, spreading, as long as the sepals. Lip broadly cymbiform, with two auricle-like terminal lobes, and on the upper surface five short cylindric ridges. Column broad, with short wings near the apex; the rostellum short, transverse. Pullinia elliptic-clavate, attached in pairs to two small membranes. Capsules double-fusiform, narrow, 5 in . long. Hook. fil. Ic. Plantar., t. 1878 ; Fl. Br. Ind. V, 845. Coelngyne recurva, Reichb. fil. in Walp. Ann. VI, 238.

Sikkim, at elevations of from 2,000 to 4,000 feet; in flower during August and September; Pantling, No. 93. Distributed westward to Nepal and eastward to Bhutan.

The flowers are of a uniform pale brown, and the pseudo-bulbs of a yellowish-green passing into straw colour. The bracts persist on the racemes on the side opposite to the flowers, being quite as secund as the flowers.

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Plate 206.-Pholidota recurva, Lindl. A plant; of natural size. Fig. 1 front view of a flower, 2 lip, showing the lamellæ on the dise and the apical auricles, 3 side view of bract, stalked ovary, column and lip, 4 front view of column, stigma and anther, 5 under surface of anther, 6 pollinia; all enlarged.

## Tribe III.-VANDEAE.

Pollinia 2, 4, or rarely 8 , attached singly or in pairs or in fours by a caudicle (rarely by two caudicles) to a viscid gland derived from the stigma (in a few doubtfully from the stigma).

## Group I.-Anther terminal.

## Gland of pollinia doubtfully stigmatic-

Pollinia attached to a single caudicle-
Pollinia 4 ( 2 and deeply bifid in Acrochcene), cohering to a single caudicle expanding at its base into a gland doubtfully derived from the stigma.

> Terrestrial and with a short pseudo bulb, petals entire, column with no foot. Spur of lip long, narrowly infundibuliform at the mouth, otherwise cylindric, curved. . . . . . . . . . . . . 25. Tipularia.

Epiphytal ; the pseudo-bulbs on a creeping rhizome, each with a single leaf; lip jointed to the long foot of the column, spur none, petals fimbriate.

Lip panduriform, 2-horned at the base and with two erect lamellæ; petals and sepals inserted on the long foot of the column at a distance from each other
20. Monomeria.

Lip 3-lobed, the basal lobes erect and broad, the apical lobe narrower, acute, deflexed; petals attached to the column and the lateral sepals to its foot, but close together ; pollinia 2, bifid

Pollinia 8, clavate, cohering by fours to a viscid caudicle, or sessile on the gland.

Epiphytal and without pseudo-bulbs.
Stems thick, compressed, fleshy, unbranched, leafy ; flowers small and in dense heads. . . . . . . . . . . . . . . 28. Agrostophyllum.
Stems terete, much and dichotomously branched ; flowers solitary or two in a raceme

Pollinia attached to two caudicles-
Pollinis 4, attached in pairs to two free caudicles; gland single, double or absent ; epiphytal
30. Ione.

## Gland of pollinia truly stigmatic-

## Pollinia 8-

Pollinia cuneate or oblong, united to a large or small gland; sepals cohering into a tube; racemes secund
31. Cryptochilus.

Pollinia clavate; sepals and petals not cohering into a tube; flowers in pedunculate interfoliar racemes; the base of the lip connate into a tube with the column, usually spurred; terrestrial, mostly pseudo-bulbous (with stems in some species); leaves plicate, membranous
32. Calanthe.

Pollinia 2 or 4 (4 in the genera Cremastra, Oreorchis, Saıcochilus, Stereochilus, Dendrocolla, and Tainicphyllum).

- Rhizomatous, saprophytic, aphyllous; flowers in sparse racemes

33. Yoania.
** Terrestrial, pseudo-bulbous; flowers in pedunculate racemes, rarely in panicles, sometimes spurred; leaves plicate, membranous, manynerved.

Lip saccate or shortly spurred at the base, 3 -lobed, the iateral lobes shallow and embracing the column
34. Eulophia.

Lip broadly ventricose at the base, not spurred, obscurely 3 lobed, iuflorescence decurved while in flower

35. Geodorum.

Lip linear, parallel to the column, minutely saccate at the base, not spurred, slightly dilated and 3 -lobulate at the apex, the lateral lobules oblong and diverging, the terminal with a process at its base; pollinia 4
36. Cremastra.

Lip oblong, shortly clawed, deflexed from the middle, gibbous or not at the base, 3 -lobed; the lateral lobes short, not diverging; the terminal broad, bifid, with no process at its base; pollinia 4
37. Oreorchis.
*** Epiphytal, rarely terrestrial, with long linear sheathing leaves on a usually large fleshy pseudo-bulb, rarely with fusiform stems and few leaves; scapes racemose, flowers elongate, column without a foot or with a very short one, lip never spurred; leaves coriaceous
38. Cymbidium.
**** Epiphytal with very short stems and a few closely clustered flat coriaceous pendulous leaves; sepals and petals more or less spreading, united to the foot of the column.

Lip with forked appendages on its disc.
Lip not spurred; column short, with two horn-like processes near its base and a short foot
39. Phalenopsis.

Lip spurred, column narrowly winged but not horned, foot long
40. Doritis.

Lip without forked appendages on its dise.
Lip sessile on the rectangular foot of the column, 3 -lobed, the dise with four calli; side lobes small, erect, triangular, falcate; apical lobe fleshy, triangular, sub-acute
41. Biermannia.
**** Epiphytal with short stem and a few broad pendulous coriaceous leaves; flowers in long racemes, sometimes branched; column with a very short foot; lip with a large claw, a bent spur and a 2-lobulate apical lobe, the lateral lobules fimbriate
42. Ornithochilus.
***** Epiphytal with fleshy usually elongated stems; leaves coriaceous and flat, or terete and fleshy; inflorescence racemose or panieled; pseulo-bulbs none; lip spurred or not.

Lip not spurred.
Lip adnate to the column.
Leaves terete; flowers two or three in very short racemes, or solitary
48. Luisia.

## Leaves flat.

Apical lobe of lip laterally compressed and with two
apical sets\%; peduncle short, few-flowered
44. Diploprora.

Apical lobe of lip thiok, concave, laterally ompressed,
entire at the apux
45. Stauropsis.

Apical lobe of lip very obscure, minute, side lobes very
large; pollinia 4. . . . . . . . . . . . . 46. Sarcochilus.
Lip jointed to the column
47. Arachnanthe.

Lip spurred (giblous in one Vanăa).
Lip adnate to the column, or to its foot.
Column with a long foot, produced into a long spur without callus or septum in its interior
48. Erides.

Column with no foot or with a very short one.
Spur with no callus or septum in its interior.
Spur deep, much compressed laterally, pubescent at the mouth, side lobes none . . . . . . . .
Base of the lip sometimes only gibbous, but usuall with a widely infundibuliform spur glabrous at the mouth, not compressed; side lobes large; apical lobe fleshy (thin in $V$. teres) with many caruncled glabrous ridges, sepals and petals broad, but aften tapered to a narrow base; flowers large, cauaicle of pollinia broad
50. Vanda.

Base of the lip with a long narrow cylindric or short wide saccate spur, not compressed; side lobes of lip none or small; apical lobe either small and smooth or large and carunculate or fimbriate; flowers small; caudicle of pollinia narrow
51. Saccolabium.

Interior of spur occluded by a dorsal scale or by calli on the front and back walls, but with no septum.

Rostellum short, straight; pollinia 2. . . . . . . 52. Cleisostoma.
Rostellum long, pollinia 4
53. Stereochilus.

Interior of spur with calli and with a vertical anteroposterior septum dividing the spur into two lateral chambers
55. Sarcanthus.

Lip jointed to the column.
Lip jointed to the footless column, large, 3-lobed, its spur
wide and without septum; pollınia 4. . . . . . . 56. Dendrocolla.
Lip jointed to the long foot of the column, fleshy, with a narrow cavity, its spur thick-walled and without calli or septum; pollimia 4 57. Ornitharium.

## Group II.-Anther dorsal.

## Pollinia 4, in two pairs.

Rostellum and caudicles very long, the latter tapering to the minute gland. 54. Camarotis.

Each pair of pollinia enclosed in a funnel-shaped cup attached to a short free caudicle; the caudicles inserted on a large emarginate gland
59. Podochilus.

Pollinia sessile on a large fleshy gland, caudicles none 60. Risleya.

## Pollinia 8.

Leaf terete, continuous with the terete stem.
Column deeply lobed at the apex, the anther lying between its lobes; pollinia clavate-oylindric, attached to a short broad caudicle; gland caudate
61. Ceratostylis.

Stem with numerous short equitant leaves.
Column not deeply lobed; pollinia clavate, four of them small and imperfect, attached to a slender elongated caudicle, gland small . 62. Appendicula.
Pseudo-bulbous; leaves solitary or in pairs, flat.
Apex of the column acuminate, the caudicles of the pollinia pointing upwards
63. Thelasis.

Column with broad truncate horizontal apex on which the anther lies, the pollinia and caudicle horizontal, the caudicle joining the gland of the vertical rostellum at a right angle . . . . 64. Phreatia.

## 25. Tipularia, Nutt.

Terrestrial, with small pseudo-bulbs. Leaf solitary, ovate, shortly petiolate. Inflorescence from the base of the pseudo-bulb, much longer than the leaf, erect, slender. Flowers laxly racemose. Sepals and petals sub-equal, lanceolate, spreading. Lip consisting chiefly of a spur slightly longer than the petals, slender, and curved forward; the side lobes short, narrow, rounded, each bearing a callus; the mid-lobe ovate-lanceolate, deflexed. Column rather broad, straight, without wings; anther terminal, depressed, 2 -celled; pollinia 4, attached to a slender caudicle ending in a gland and projecting beyond the end of the rostellum. Two species; the following and one North American.

Tipularia Josephi, Reichb. fil. ex Lindl. in Journ. Linn. Soc. I, 174.

Pseudo-bulb sub-globular, pointed, $\cdot 65 \mathrm{in}$. long. Leaf broadly ovate, acute, the edges undulate, the base rounded, suddenly contracted into the short petiole, plieate, 5- to 7 -nerved, coloured, length 3 to 5 in., breadth 1.65 to $2 \cdot 5 \mathrm{in}$. Inflorescence 8 to 12 in. long, with one or two narrow bracteoles $\cdot 3 \mathrm{in}$. long on its peduncle, the raceme occupying its upper fourth. Flower 3 in. long; floral bracts broad, minute; lateral lobes of the lip with thick oblong calli, meeting a similar callus from the front of the column and almost occluding the mouth of the spur. Hook. fil. Fl. Br. Ind. V, 708.

Temperate Sikkim-Himalaya, at elevations of 10,000 to 12,000 feet, Sir J. D. Hooker; at Poang-gaon 12,000 feet, Pantling, No. 340; flowering during August.

Plate 207.-Tipularia Josephi, Reichb. fil. A plant; of natural size. Fig. 1 a flower, 2 stailked ovary, column and lip, seen from the side, 3 column, and section of lip and its spur, 4 column, front vienc, showing the terminal anther, projecting pollinia and caudicle, stigma, base of column with its forward projecting callus, and sections of the side lobes and of their inward-projecting calli, 5 empty anther, seen from its posterior end, ${ }^{6}$ pollinia and caudicle; all enlarged.

## 26. Monomeria, Lindl.

Epiphytal. Pseudo-bulbs on a stout rhizome, each bearing a single coriaceous petiolate leaf. Scape from the base of a pseudo-bulb, laxly racemose, horizontal. Flowers rather large, ringent. Sepals unequal; the dorsal parallel to the column, ovate, acuminate; the lateral pair far removed from the dorsal and much larger, attached near the middle of the long curved naked foot of the column, coherent buth at base and apex. Petals minute, broad but very short, fimbriate. Lip about as long as the dorsal sepal, jointed on the foot of the column, mobile, panduriform, with two diverging horn-like lobes at the base and two erect lamellæ on the disc. Column short, very broad, winged, toothed at the apex, the foot long and much curved. Pollinia 4, unequal, cohering into a sub-globular mass and attached to a caudicle ending in an ovoid-globose viscid gland. Distrib. Two closely allied species-one from the Himalayan and Khasia Hills; the other from Burma. The Burmese one may only, however, be a variety.

This genus combines the habit of Bulbophyllum and of Cirrhopetalum with the caudiculate pollinia of Vandece. The broad very short fimbriate petals are its chief distinguishing eharacter.

Monomeria barbata, Lindl. in Wall. Cat., 1978.
Rhizome woody, 25 in. thick. Pseuto-bulbs 2 to 3 in . apart, ovoid or elliptic, shrivelled at flowering time, 1.5 to 2 in . long. Leaf oblong, with a blunt emarginate apex, 7 to 12 in . long, and 1 to 1.25 in . broad; petiole 2.5 to 3 in . Scape nearly as long as the leaves, dark purple, the sheaths with peduncle 35 to 5 in . long. Flowers 8 to 1 in . long, floral bract short. Lateral sepals nearly twice as long as the dorsal, conjoined and decurved at the apex, the margins reflexed, the upper surface hispid in its outer half. Lip deflexed from about the middle, the lamellæ of the disc converging. Stigma with 2 glands on the lower margin. Caudicle of pollinia brittle, the gland ovoid-globose. Lindl. Gen. and Spec. Orchid, 61 ; Sert. Orchid, frontispiece; Hook. fil. Fl. Br. Ind. V, 781.

Sikkim, in tropical valleys; in flower during February; Pantling, No. 124. Nepal; Wallich. Khasia Hills; Rita.

The flowers are yellow with bold brown markings, the ovary is brown and the pseudo-bulbs are tinged with the same colour.

Plate 208.-Monomeria barbata, Lindl. Plant, of natural sise. Fig. 1 side visw of a flower, 2 front siew of the same, 3 lip seen from the base, 4 petals, 5 column, 6 anther, 7 and 8 pollinia; all onlarged.

## 27. Acrochæne, Lindl.

Epiphytic; pseudo-bulbs on a stout rhizome, each bearing a single linear-oblong coriaceous petiolate leaf. Scape from the base of a pseudo-bulb, pendulous; the raceme long, lax, many-flowered. Flower rather small, the floral bract large and persistent. Sepals sub-equal, spreading, the lateral pair obliquely adnate to the foot of the column. Petals shorter than the sepals, ciliate-fimbriate, spreading. Lip with a short claw incumbent on and articulated to the end of the long foot of the column, 3 -lobed, the basal lobes erect and broadly toothed at the apex; the apical lobe narrow, acute and deflexed. Column short, its foot long and straight. Anther broad, terminal, opercular, 2-celled. Pollinia 2 , sub-globose, each cleft above and attached below to a stout caudicle enlarged at the base into a gland-like body.

A monospecific genus characterised by its saccate mentum, spreading fimbriate petals and two large sub-globular cleft pollinia attached to a stout caudicle which expands at the end into a depressed globular swelling.

## Acrochene punctata, Lindl. Fol. Orchid., 1.

Pseudo-bulbs ovoid, 1 to 1.5 in . long about 1 in . apart, shrivelled when in flower and with a dark brown coriaceous skin; the rhizome woody, $\cdot 3$ in. thick. Leaf with an oblong obtuse emarginate blade 6 to 9 in . long and about 1.5 in . broad, tapered at the base into a petiole 3 to 5 in . long. Scape pendulous, 9 to 15 in . long, the peduncle with several broad bracts 5 to 1 in . long. Flowers glaucous, about 1 in , across; floral bract ovate-lanceolate, ${ }^{\circ} \mathrm{s} \mathrm{in}$. long, the stalked ovary $\cdot 75 \mathrm{in}$. long. Dorsal sepal elliptic-ovate, acute; the lateral pair falcately triangular, sub-acute, 7 -nerved, the lower margin undulate and slightly gibbous at the base. Petals narrowly triangular, shorter than the dorsal sepal. Lip with a short sigmoid claw; the side lobes erect, short, their apices blunt toothed and pointing forward; apical lobe tongue-shaped, with a deep groove on its upper surfacs extending from the base to the middle; lower margin of anther toothed. The fuot twice as long as the column and forming with the lateral sepals a saccate mentum. Capsules clavate, spotted, rather more than an inch long, those of the previous year dehiscing as t'e flowers open. Reichb. fil. in Walp. Ann. VI, 63j. Bulbophyllum Kingii, Hook. fil. Fl. Br. Ind. V, 760; Ic. Plantar., 2053.

Sikkim, at elevations of from 5,000 to 6,000 feet; Pantling, No. 25 ; in flower during October and November.

The flowers are of a pale yellowish-green, dotted and streaked with purplishbrown.

Plate 209.-Acrochene punctata, Lindl. A plant; of natural size. Fig. 1 a flower, front view, 2 column and its foot, anther in situ and lip, seen from the side, 3 lip, 4 column with anther and foot, 5 anther, 6 pollinia, front and back views; all enlarged, 7 capsules; of natural size.

## 28. Agrostophyllum, Blume.

Epiphytes with sheathed compressed stems and no pseudo-bulbs. Leaves membranous, distichous, linear, with large flattened persistent sheaths. Flowers very small, white, single or in pairs on membranously sheathed pedicels, crowled in dense small almost stssile terminal heads. Sepals erect, conniving, concave. Petals broad or narrow,
spreading. Lip adnate to the column or to its foot, short, erect, entire or 3 -fid, with or without a spur. Column short, stout, thickened towards the apex, with no foot or with a very short one. Anther 2-celled. Pollinia 8, clavate or elliptic, attached to a single viscus or gland. Species seven; Indian and Malayan.

Stems tufted, petals oblong, narrow, acute; lip spurred, column with
no foot . . . . . . . . . . . . . . . . . . . 1. A. khasaanum.
Stems rising from a rhizome 1 to 1.5 in . apart; lip not spurred; column with a short foot.

Flower-heads 1.25 in . in diam.; flowers 125 in . across; lip with a simple callus at the very base; column not winged
2. A. myrianthum.

Flowers-heads 1.5 in . in diam.; flowers $\cdot 25 \mathrm{in}$. across; lip with a large bifid basal callus; column not winged, elinandrium entire, caudicle attached to a globular viscid ball
3. A. oallosum.

Flower-heads 75 in. in diam.; flowers 25 in . across; lip with four calli between its lateral lobes, column slightly winged near the apex, clinandrium dentate, caudicle of pollinia attaehed to a cordate gland

4. A. brevipes.

## 1. Agrostophyllum khasianum, Griff. in Cale. Journ. Nat. Hist. IV, 378 , t. 19.

Stems tufted, double fusiform, much compressed, bearing several membranous imbricate unequal sheaths in the lower part and in the upper three or four leaves with large loose sheaths. Leaves thickly membranous, narrowly oblong, tapering to each end; the apex blunt, slightly oblique, minutely notched; the base tapering into the short channelled pe'iole. Head $\cdot 75 \mathrm{in}$. in diam., on a very short peduncle carrying many pedicels each bearing two flowers enclosed in large membranous sheaths. Flowers $\cdot 2 \mathrm{in}$. across; foral bract lanceolate, shorter than the stalked ovary. Sepals oblong, acute, the lateral pair oblique. Petals rather shorter than the sepals, narrowly oblong, the apex acute, the margins recurved. Lip constricted in the middle, the part below the constriction saccate, the part above it transversely oblong or reniform, blunt, minutely notched at the apex, the edges undulate. Column broad, with a constriction and two marginal processes below the stigma, foot none. Lip of the anther pointed in front. Pollinia clavate, attached to a sub-rotund viscus. Hook fil. Fl. Br. Ind. V, 824. A. planicaute, Reichb. fil. in Walp. Ann. VI, 909. Appendicula Hasseltii, Wight Ic., t. 1748, p. 3. (not of Blume). Eria planicaulis, Wall. MSS.

Sikkim, in tropical valleys; in flower during August; Pantling, No. 280. Khasia Hills, at 2,000 feet; Gibson, J. D. Hooker and T. Thomson. Manipur ; C. B. Clarke. Andamans, Helfer ( 5219 Kew Distrib.) and others.

The flowers are white with patches of pale yellow on the apical lobe of the lip and of ochre colour on the spur and column. The entrance to the spur is blocked by a callus on the base of the lip.

Plate 210.-Agrostophyllum khasianum, Griff. A plant; of natural size. Fig. 1 a flower, seen from the front, 2 floral bract, stalked ovary, column, anther and lip, seen from the side, 3 section through apex of ovary, column, anther and lip, $4 \mathrm{lip}, 5$ front view of column with anther in situ and stigma, 6 anther, 7 pollinia; all enlaryed.

## 2. Agrostophyllum myrianthum, new species.

Rhizome stout, woody, clothed with adpressed lanceolate scales. Stems 2 feet long, rising about 1.5 in . apart, sub-cylindric, clavate, many-leaved. Leaves linear-oblong, thickly membranous, the apices blunt and notched, narrowed below to the short subtubular sheath; length 3.5 to 4.5 in., breadth $\cdot 4$ to 5 in . Capitula hemispheric, 1.25 in. in diam., densely crowded. Flowers $\cdot 125$ in. wide, yellowish; floral bract narrow, ovate, acute, half as long as the cylindric sessile ovary; bract of suppressed pedicel spathaceous. Sepals ovate-orbicular, blunt, concave. Petals narrower, blunt. Lip as long as the sepals, oblong, 3-lobed; the side lobes rounded and with a large callus between them at the base; apical lobe broadly ovate, the apex broad, entire or very slightly notched. Column short, not winged at the apex, its foot also short. Lip of anther emarginate; pollinia sub-equal, attached to a small viscus.

Sikkim, in the valley of the Teesta, at an elevation of 1,200 feet; in flower during August; Pantling, No. 459.

A species allied to A. callosum, Reichb. fil., but differing from that species in its larger heads of smaller flowers, and in its broader leaves. This differs from A. brevipes in having a single basal callus on the lip and in having no calli on the disc above the base. The flowers are of a uniform yellowish colour throughout.

Plate 211.-Agrostophyllum myrianthum, King and Pantling. A plant; of natural size. Fig. 1 a flower, frout view, 2 side view of floral bracts, ovary, column and lip, 3 lip, 4 vertical section of lip showing the position of the basal callus, 5 column with anther, 6 empty anther, 7 pollinia; all enlarged.

## 3. Agrostophyllum callosum, Reichb. fil. in Seem. Fl. Viti, 296.

Rhizome stout, branching, clothed with thick triangular scales 25 in. long. Stems rising from the rhizome 1 or 2 in . apart, erect, one or two feet in height, slender at the base and only slightly thickened upwards. Leaves numerous, sessile, linear-oblong, tapering gradually from the base to the notched apex; length 6 in., breadth at the widest part $\cdot 5 \mathrm{in}$. Head densely-flowered, $1 \cdot \tilde{5} \mathrm{in}$. in diam. Flowers $\cdot 25 \mathrm{in}$. long; floral bract spathaceous, about as long as the sessile ovary. Sopals ovate, blunt. Petals broadly elliptic, very obtuse. Lip 3-lobed; the side lobes broad, rounded; the apical lobe decurved, ob-reniform, the apex emarginate; the basal callus large, divided into two diverging lobes each ending in a thickened blunt point opposite the sinus separating the apical from the basal lobes. Column stout, with a short foot. Lip of anther entire. Pollinia elongate-clavate, attached by elastic threads to a globular viscus. Hook. fil. Fl. Br. Ind. V, 824.

Sikkim, common at elevations of about 6,000 feet; Pantling, No. 477; in flower during June and July.

The flowers of this are of a reddish colour. The gland of the pollinia is not truly Fandaceous, and is in reality only a globular viscus to which the pollen masses are attached by elastic threads. The relation to this to A. brevipes has been explained under that species.

Plate 212.-Agrostophyllum callosum, Reichb. fil. A plant; of natural size. Fig. 1 front view of flower, 2 side view of bract, ovary, column and lip, 3 the lip, 4 vertical section of the lip, 5 column and its short foot, the anther in situ, 6 an empty anther, 7 pollinia; all enlarged.

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## 4. Agrostophyllum brevipes, King and Pantling.

Rhizoms thin, covered with spreading subulate scales. Stems 10 to 12 in . long, erect, clavate, rising from the rhizome about an inch apart, slightly compressed, clothed in the lower half with large imbricate membranous sheaths about 1 in . long. Leaves membranous, linear-oblong, widest at the sessile sheathing base; the apex sub-acute, minutely bifid; length 1.5 to 5 in., breadth $\cdot 2$ to $\cdot 35 \mathrm{in}$. Head $\cdot 75 \mathrm{in}$. in diam., composed of numerous 2 -flowered pedicels on a very short common peduncle. Flowers $\cdot 2 \overline{5}$ in. in diam., white. Sepals sub-equal. Petals sub-orbicular, 5 -nerved. Lip about the same length, oblong, 3 -lobed, concave, not spurred or saccate; the lateral lobes broad and rounded with a large callus between them and two smaller conical calli between these and the oblong shortly bifid smooth terminal lobe. Column short, siightly winged near the apex, the foot very short, the clinandrium dentate. Lip of anther acute. Pollinia 8, unequal, all cohering by a short caudicle to a small cordate gland. Capsule narrowly ellipsoid, $\cdot 35 \mathrm{in}$. long. A. callosum, Reichb. fil. Hook. fil. Fl. Br. Ind. V, 824 (in part).

Sikkim, at elevations of about 2,000 feet; in flower during June and July; Pantling, No. 34.

All the parts of the flower in this species are white, with the exception of the column aud anther which are dark crimson. This species differs from true $A$. callosum, Reichb. fil., with which it has hitherto been confused, in being a smaller plant, with stems half the length of those of true A. callosum, fewer and shorter leaves, smaller flowers in smaller heads, a winged column with a longer foot, and a fully developed cordate polliniar gland. This moreover is practically a tropical species, not ascending to more than 2,000 feet; whereas true A. callosum occurs at elevations of about 6,000 feet.

Plate 213.-Agrostopiyllum brecipes, King and Pantling. A plant; of natural size. Fig. 1 side view of a flower with its brast, attached to its pedieel, the other flower being out off, 2 apex of column, anther and lip, side view, 3 lip, 4 column and anther, 5 under surface of empty anther, 6 pollinia; all enlarged.

## 29. Ritaia, n. gen., King and Pantling.

Epiphytal; stem much and sub-dichotomously branched, densely clothed with scarious sheaths; the branches short and bearing a terminal, sheathed, 1- or 2 -flowered peduncle. Leaf fleshy, lanceolate, jointed to the axis at the end of a branch. Flowers small, puberulous. Lateral sepals with broad bases adnate to the produced foot of the column, and with acuminate connivent apices. Lip adnate by its margins to the column and its foot and forming with them a wide short sac septate and pubescent at the mouth; its anterior part very fleshy, convex, entire, sub-orbicular. Anther on the apex of the column broad, depressed, 8 -celled. Pollinia 8 , unequal (four being smaller), united by fours to a single elongate gland.

A genus resembling Appendicula to some extent in habit, but with more branching stems and a fewer-fluwered inflorescence. It differs widely from Appendicula, however, in having the anther on the summit of the column instead of on the back of it; in having 4 pollinia instead of 8 ; in having a septum at the mouth of the sac formed by the adhesion of the edges of the lower part of the lip to the column; and in the anterior part of the lip being a solid fleshy sub-orbicular mass. We have dedicatel the genus to Mr. Rita, of the Khasia Commission, an enthusiastio collector of orchids, to whom we are much beholden for most efficient assistance in the exploration of the Orchid Flora of the Khasia Hills.

## Ritaia himalaica, King and Pantling.

Stem pendulous, sub-dichotomously branched, clothed throughout with imbricate scarious strongly-nerved sheaths; the branches short, each bearing a single terminal peduncle and a solitary leaf. Leaf fleshy, linear-oblong, jointed to the axis, its apex obliquely notched and acute, its base tapering to the short petiole; length 2.5 to 4 in., breadth about 3 in . Peduncle from the axis at the side of the base of a leaf, sheathed by two bracts and with two small opposite scarious sub-rotund bracteoles at its base, 1-flowered or occasionally 2-flowered. Flowers ' 25 in. long., pale yellow, pubescent externally; the floral bract ovate, acute, sheathing, rather longer than the sessile ovary. Dorsal sepal ovate-lanceolate, concave, sub-acute; the lateral pair broader, abruptly and bluntly acuminate, incurved. Petals about as long as the sepals, spreading, linear, acute. Lip fleshy, not lobed, its lower part attached to the inner half of the column and to its foot to form a short wide sac with a septate pubescent mouth; the anterior part of the lip thick, fleshy, convex, sub-orbicular, notched at the apex. Column very short with a short foot. Stigma broad and flat. Anther 4 -celled, terminal. Pollinia 8, clavate, unequal, connected by granular threads to a small oblong gland. Ceratustylis himalaica, Hook. fil. Ic. Plant., t. 2101 ; Fl. Br. Ind. V, 826.

Sikkim, at Tendong, elevation 5,000 feet; in flower during May and June; Pantling, No. 149.

Plate 214,-Rilaia limalaica, King and Pantling. A plant; of natural size. Fig. 1 pedicel with its basal bracts, floral bract, ovary and flower, side view, 2 flower, front view, 3 half profile view of column, lip and sas, the sepals and petals having been cut off, 4 view from above of the clinandrium (c), the anther having been removed, septate moath of spur and lip, 5 empty anther, 6 pollinia; all enlarged.

## 30. Ione, Lindl.

Epiphytal; pseudo-bulbs from a creeping rhizome, 1-leaved. Scape from the base of a pseudo-bulb. Flowers elongate, solitary, in pairs, or in secund or distichous racemes. Sepals membranous; the lateral pair more or less coherent under the lip by their inner edges. Petals smaller than the sepals, spreading. Lip attached to the foot of the column by a broad base, entire, not mobile, equalling or exceeding the sepals in length, fleshy in the centre and produced at the apex into a tongue-like point, sometimes not fleshy and sometimes with an emarginate apex. Column short, with no foot or with a short one; the rostellum formed by two undivided broad and deflexed elongate processes. Pollinis 4, equal in size, ellipsoid, attached by pairs to two elongated elastic caudicles, without or with a gland or glands. About eight species; natives of the mountains of India and Ceylon.

The form and functions of the rostellum and of the caudicles of the pollinia in this genus ean be understood on'y by examination of fresh flowers. In I. paleacea and I. bicolor the rostellum consists of two long narrow downward-pointing processes. The four pollinia are of the same size and shape, and they lie in a horizontal row, all being equally exposed. They are attached by pairs to two elongated tapering caudioles of tough elastic tissue which rather exceed the rostellar processes in length. The caudicles lie on the upper surfaces of the rostellar processes, but, being longer, their ends, which are quite free, project beyond the extremities of the former. Each of these free ends is provided on its lower surface with a little mass of viscid adhesive substance. When one of these caudicles is removed by allowing its viscid end to adhere to a thin rod of wood, the two pollinia at its apex are soon seen to fall slowly forward, owing to the bending of the caudicle. In I. bicolor
this bending proceeds (as is shown in Plate 216, fig. 5) until it forms a complete fold, the convexity of which is directed forwards. In I. paleacea the bending is much less complete, the caudicle making only a slight sigmoid curve (as is seen in Plate 215, fig. 6). These arrangements resemble those which oltain in Vandeae rather than in Epidendreae. The resemblance to Vandeae in structure is, however, still greater in Ione intermedia. In that species the caudicles are similar in shape to those in the two species just referred to, except in not being free at the lower end. The rostellum, however, is very different; for, instead of consisting of two distinct elongated processes, it consists of a single broad curtain-like mass of tissue (Plate 218, fig. 2), projecting continuously along the whole upper margin of the stigma, and having in the middle a reniform diso of viscid substance, to which diso the ends of the caudicles are firmly attached. On removing this viscid dise, both caudicles, with their attached pollinia, come away together. There is, however, very little movement after removal; for the pollinia fall forward only very slightly and the caudicles scarcely bend at all. On account of the structural peculiarities above set forth, we consider that the genus Ione forms a link between the tribes Epidendreae and Vandeae, having the general appearance and habit of several genera of the former, combined with the pollinia of the latter; and this opinion receives considerable support from the functional phenomena just described. We have therefore ventured to dissociate the genus Ione from Bulbophyllum and its neighbourhood, and to place it in Vandeae. Other reasons for the separation of Ione from Bulbophyllum are to be found in its large and immobile lip, which is firmly attached by its broad base to the short foot of the column, the lip of Bullophyllum being characterised by its comparatively small size, and by its mobility. The foot of the column also is usually rather elongate in Bulbophyllum, while in Ione it is very short. To this genus we have reduced Sunipia, as careful dissections of fresh flowers show that the structure of the flowers is practically the same as that of Ione.

Since the above was written, we have discovered the new species described below under the name of I. Andersoni. In this species, each of the caudicles ends in a most distinct viscid stigmatic gland. Since this discovery we have no hesitation in remoring the genus Ione to the tribe Vandeae.

Caudicles without glands-
Flowers about 1 in . long, in elongate secund racemes . . . . . . . 1. I. paleacea.
Flowers 4 in. long, in distichous short racemes . . . . . . . . . 2. I. bicolor.
Caudicles attached to two glands . . . . . . . . . . . . . . . . . 3. I. Andersoni.
Caudicles attached to a single gland-
Pedicel not longer than the pseudo-bulb and with only 1- or 2 -flowers . 4. 1. intermedia.
Scapes longer than the leaves, many-flowered . . . . . . . . . . 5. I. scariosa.

## 1. Ione paleacea, Lindl. Fol. Orchid. 2.

Rhizome $\cdot 2 \mathrm{in}$. thick, naked; pseudo-bulbs about 1 in . short, ovoid or obpyriform, slightly wrinkled, 1.25 to 1.4 in long. Leaf narrowly oblong, the apex blunt, subretuse, much narrowed to the base, sessile, 4 to 8 in . long, and 75 to $1 \cdot 15 \mathrm{in}$. broad. Scape much longer than the leaf; the pedicel with two or three sheathing bracts; raceme shorter than the peduncle, secund, sparsely-flowered. Flowers 9 to $1 \cdot 1$ in. long, drooping; floral bract scarious, broadly lanceolate, convolute, as long as or longer than the long-pedicelled ovary. Sepals sub-equal, lanceolate-oblong, acuminate, the dorsal slightly shorter than the connate lateral pair, all transparent, with pink reticulations. Petals spreading, much smaller than the sepals, broadly oblong, blunt, erose-serrulate, 1- to 3 -nerved, similarly coloured to the sepals. Lip dark purple, nearly as long as the sepals, oblong-lanceolate, the base thickened and connate with the very short foot of the column, not jointed, tapering to the sub-acute apex; upper surface with a cancellated two-chambered callosity in the middle, thickest near the base and passing towards the somewhat convex apex into a grooved ridge, the edges entire or crenate. Column short, the rostellum consisting of two deflexed subulate processes; the foot at right angles to the column, very short. Anther sessile on the column; pollinia 4, elliptic,
in two pairs, each pair attached to a long cartilaginous caudicle lying on the upper surface of a rostellar process, free and adhesive at the end. Bot. Mag., t. 6344 (excl. syn. Griff.); Walp. Ann. VI, 636; Benth. in Gen. Plantar. III, 503. Bulbophyllum paleaceum, Hook. fil. Fl. Br. Ind. V, 769.

Sikkim, elevation about 6,000 feet; very common. Pantling No. 100; in flower during October and November, Bhutan; Clarke, Gamble.

The sepals and petals are translucent greenish-white, with numerous netted pink nerves. The lip is of a deep purple with two pale lines towards the middle; the sub-acuminate apex being of a paler purple.

Plate 215.-Tone paleacea, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with its foot and the lip, 3 callosity near the bass of the lip showing its two chambers, the narrow groove separating them and their cancellated structure, 4 column with pollinia in situ and the foot, 5 pollen masses and their caudicles, front view, 6 pollen mass, side view; all enlarged.

## 2. Ione bicolor, Lindl. Fol. Orchid. 3.

Rhizome about $\cdot 1$ in. thick, naked; pseudo-bulbs about $\cdot 75 \mathrm{in}$. apart, obpyriform, the base sometimes very broad, 5 to $\cdot 65 \mathrm{in}$. long. Leaf linear, obliquely bifid at the apex, slightly narrowed to the sub-sessile base; length 2.5 to 4 in . Scapes solitary or in pairs, somewhat shorter than the leaves; the peduncle about equal to the raceme, minutely bracteate. Raceme with six to eight distichous flowers; floral bract lanceolate, longer than the stalked ovary. Flowers 4 in . long. Sepals sub-equal, the single dorsal and the connate lateral pair widely diverging, lanceolate, acute, pale and translucent like the petals and with claret-coloured nerves. Petals elliptic, blunt, spreading at right angles to the sepals. Lip claret-coloured, panduriform, truncate at the base and with two minute auricles; the anterior part expanded and deeply serrate except at the emarginate apez; upper surface slightly concave, but with a white elliptic thickened process extending beyond the margin at the apex. Column short, the foot very short; rostellum consisting of two elongated processes on which rest the caudicles of the pollinia. Pollinia 4, equal, ovoid, attached by pairs to two elongated caudate-acuminate caudicles. Reichb. fil. in Walp. Ann. VI, 637. Sunipia bicolor, Lindl. Gen. and Spec. Orchid, 179; Sert. Orchid., frontispiece, fig. 5. Bulbophyllum bicolor, Hook. fil. Fl. Br. Ind. V, 770. Ione khasiana, Lindl. Fol. Orchid. 2; Reichb. fil. Walp. Ann. VI, 636. Dipodium lkhasianum, Griff. Notul., 354; Ic. Pl. Asiat., t. 327, fig. 2.

Sikkim, at elevations of 6,000 or 7,000 feet; very common; flowering October to December; Griffith, No. 5137; Pantling, No. 247. Nepal. Bhutan. Khasia Hills; Griffith (No. 5138), Hooker, Thomson, Mann.

Plate 216.-Tone bicolor, Lindl. A plant; of natural size. Fig. 1 flower, front view, 2 bract, stalked ovary, column with its foot, anther, side view, 3 column, front view, 4 pollinia with their caudicles, 5 two pollinis with the caudicle after removal from the anther, 7 a capsule; all enlarged, 6 two capsules; of natural size.

## 3. Ione Andersoni, new species.

Pseudo-bulbs ovoid, 3 in . long, attached close together or slightly distant from each other on a thread-like rhizome. Leaf sessile, narrowly elliptic-oblong, the apex blunt and slightly notched; length $\cdot 5$ to $1 \cdot 25$, breadth about $\cdot 25 \mathrm{in}$. Peduncle erect, as long as the pseudo-bulb, 1- to 2-flowered. Flower -35 in . across; floral bract lanceolate, half
as long as the stalked ovary. Sepals sub-equal, ovate, sub-acute, apiculate, strongly recurved (especially the lateral pair). Petals about as long as the sepals but much narrower, wide-spreading, lanceolate, blunt; the basal half dilated, membranous and with fimbriate edges; the apical half narrow, fleshy. $L i p$ as long as the sepals, with a broadly orbicular coehleate base with narrow erect rounded erose side lobes and a fleshy tongue-liks entire blunt apical lobe. Column very short. Anther with a fleshy cap containing two distant cells. Pollinia 4, ovoid, in two pairs, each pair lying remote from the other, attached to its own caudicle, and resting on its own short rostellum overhanging the stigma; the candicles flattened, dilated upwards, each ending below in an ovate gland. Stigma large, transversely oblong, occupying the whole breadth of the column in its upper half.

Bhutan, near Buxa, at an elevation of about 6,000 feet; Anderson; Pantling's drawing No. 473.

The sepals and petals of this most interesting little plant are yellowish, and the lip is purple. Plants of it were collected above Buxa, in Bhutan, by Dr. A. R. S. Anderson, Surgeon-Naturalist to H. M. S. Investigator, and Officiating Superintendent of the India Museum, Calcutta. It has not as yet been found in Sikkim. It is, however, so small that it may easily enough have escaped observation in the latter province. We make no apology, however, for introducing it here, as it affords an excellent example of an lone with unmistakeable glands to the caudicles of its pollinia, and thus strengthens the arguments for the inclusion of this genus in the tribe Vandeae. In this, as in other three of the five species here described, the pollen masses rest on the caudicles and are not attached to them by granular elastic threads as directly in the majority of typical Vandeae; but in I. scariosa such threads are present. The plant here figured, having been sent by Dr. Anderson, flowered at the Government Cinchona Plantation at Mungpoo in Sikkim in April 1897; and the drawing here reproduced was made there by Mr. Pantling.

Plate 217.-Ione Andersoni, King and Pantling. A tuft of living plants; of natural size. Fig. 1 a flower, 2 floral bract, ovary, column with anther in situ and lip in profile, 3 and 4 column showing the two pairs of pollivia in situ with their caudicles and glands, and also the stigma, 5 the petals, 6 pollinia; all enlarged.

## 4. Ione intermedia, King and Pantling in Journ. As. Soc. Bengal, Vol. LXV,

 Part 2, p. 120.Rlizome less than $\cdot 1$ in. thick, naked; pseudo-bulbs ovoid, semi-transparent, $\cdot 5$ in. long, less than $\cdot 1 \mathrm{in}$. apart. Leaf linear, notched at the apex, slightly narrowed to the sessile base, 2 to 4 in . long, and $\cdot 2$ to 25 in . broad. Scape only slightly longer than the pseudo-bulb, zig-zagged, enveloped at the base by two or three sheaths and bearing one or two flowers; floral bract lanceolate, equal to or longer than the shortlystalked ovary. Flowers 5 in . across, pale green. Sepals spreading, sub-equal, lanceolate, the lateral pair lying under the lip and coherent by their tips. Petals about half as long as the sepals, spreading, more or less twisted, linear, with dilated more or less denticulate concave bases. Lip slightly shorter than the sepals, lanceolate, with a dilated concave slightly auriculate base, and much elongate caudate-acuminate apex; the base with a very broad truncate claw attaching it to the very short foot of the column. Column short, lroad, narrowly winged at the widdle; rostellum broad, deflexed; pollinia

4, elliptic, equal, attached by pairs to elongate caudicles, the ends of which are attached to a viscid dise continuous with the stigma.

Sikkim, at Tendong, elevation about 6,000 feet ; Pantling, No. 161.
A very remarkable species, the structure of the rostellum and pollinia of which are discussed in a note on page 156.

Plate 218.-Tone intermedia, King and Pantling. A plant; of natural size. Fig. 1 a flower, front view, 2 bract, stalked ovary, column and lip, seen from the side, 3 the petals, 4 lip, 5 front view of the column showing the curtain-like rostellum and the pollinia with their caudicles in situ and viscid dise, 6 the pollinia and viscid dise removed; all enlarged.

## 5. Ione scariosa, King and Pantling.

Pseudo-bulbs ovoid or obliquely ovoid, of spongy consistence, $\cdot 75$ to $1 \cdot 25 \mathrm{in}$. long, attached about an inch apart to a stout striate rhizome. Leaf coriaceous, narrowly oblong, on a short channelled petiole, the apex blunt and notched, slightly narrowed to the base; length 4 to 6 in ., breadth ' 65 to 1 in . Scape slender, erect, two or three times as long as the leaf; the peduncle with three or four scattered tubular truncate sheaths $\cdot 5$ to $\cdot 75 \mathrm{in}$. long. Raceme deflexed, about half the length of the peduncle, its rachis compressed. Flowers numerous, rather distant, about 3 in. long, distichous; brăct very large, striate, scarious at flowering-time, ovate, cymbiform, acute, partly concealing the flower and entirely concealing the dorsal sepal. Sepals unequal, the dorsal ovate, concave, blunt; the lateral pair longer, oblong, acute, slightly incurved, and lying nearly parallel on the under-surface of the lip. Petals one-third as long as the lateral sepals, very broad, blunt, sub-retuse, the margins erose-denticulate, the bases broad and truncate. Lip fleshy, sessile on the base of the column, shorter than the lateral sepals, ovate-elliptic, blunt, without side lobes; the upper surface concave in its lower half and with a small oblong callus at the base immediately under the column. Column very short, without a foot. Anther sub-erect, sessile; its cells distant, dehiscing vertically. Pollinia 4, in two pairs, connected by elastic threads to two rather large oblong caudicles inserted by their lower ends on a single sub-quadrate adhesive gland bifid at each end and curved along the centre. Stigma large, orbicular, with the gland of the pollinia hanging in front of its centre. Sunipia scariosa, Lindl. in Wall. Cat., No. 7373; Gen. and Spec. Orch., 179; Orchid Scel., 25; Sert. Orchid., Frontisp., No. 8; Fol. Orch. 1; Reichb. fil. in Walp. Ann. VI, 633; Hook. fil. Fl. Br. Ind. V, 772 . Ornithidium bracteatum, Wall. MSS.

Sikkim, elevation 3,600 to 4,000 feet; not now common; Gamble, No. 10336; Pantling, No. 474 ; in flower during April and May. Nepal, Bhutan, Khasia, Tenasserim.

The flowers are greenish, flushed with dull purple.
Careful dissections of fresh flowers of all the Sikkim species attributed by Lindley to the genus Ione (1853) and of those of the single species of the genus Sunipia, (which Lindley attributes to Buchanan-Hamilton and which thereorore must date prior to 1816), show that the flowers of the two have practically the same structure, and that one of these genera must fall. In reducing one the older would naturally be upheld. But we find it impossible to discover what Buchanan-Hamilton's Sunipia was. He never published any description of it, and no specimen bearing the name Sunipia in his handwriting is now extant. The earliest reference to Sunipia which we have been able to
trace is in an article in Rees' Cyclopædia (1816), Vol. XXIV, under Stelis. Smith, the author of the article alluded to, there describes, under the name Stelis racemosa, a plant which he says Dr. F. Buchanan found growing on trees in Nepal. The description which follows does not in the least suggest the plant named Sunipia by Lindley; and in the Index Kerwensis it is given as a synonym of Liparis odorata, Lindl. (L. paradoxa; Reichb. fil.). The remaining Indian species of Stelis described by Smith are S. hirta, of which Smith says-"gathered by Dr. Buchanan on mossy rocks in Upper Nepal; flowering in January" (a month when Sunipia scariosa, Lindl., is never in flower). "The inhabitants," continues Smith, "call it Sunipiang, whence Dr. Buchanan named all the species of this section Sunipia, as composing a new genus, and the difference of their habit from the original Stolides countenances this measure." Smith's brief description of his Stelis hirta reads like that of a Bulbophyllum; and, in the Index Kewensis, the plant is identified with Bulbophyllum hirtum, Lindl. Smith's next species is Stelis odoratissima, "with capitate fragrant flowers." This has been identified, and rightly as we believe, with Bulbophyllum odoratissium, Lindl. Smith's last Indian S.telis is S. biflora, a 2 -flowered plant found by Dr. Buchanan in Nepal. The description here again is that of a Bulbophyllum. Smith winds up with the following remark: "We find among Dr: Buchanan's drawings and descriptions several more species referred to his genus Sunipia, whose habit agrees exactly with our four last described. The parts of the flower, however, appear more unequal or irregular than properly belongs to Stelis, as is somewhat the case with our S. biflora. We leave them therefore (having no specimens) for the future illustration, as we hope, of their ingenious and accurate discoverer." The probability thus appears to be that the majority of Buchanan's species of Sunipia belonged to Bulbophyllum. Such, however, is the basis on which Lindley (in his Orchidearum Sceletos) built his monospecific genus Sunipia, attributing it to Buchanan-Hamilton, whose idea evidently was that Sunipia contained many species! It seems probable that the genus Sunipia never was defined by Buchanan, even in his own mind, in any but the vaguest possible manner; and he certainly never published any diagnosis of it. Smith, by including Buchanan's Nepalese plants in the South American genus Stelis, threw no light (but rather darkness) on their affinities. Sunipia is thus a legendary genus; Ione, on the other hand (although dating only from 1853), is an excellently defined genus, into which the plant named Sunipia scariosa by Lindley most naturally falls; and to that genus we, without any hesitation, now reduce it.

Plate 219.-Tone scariosa, King and Pantling. Part of a plant; of naturab size. Fig. 1 a flower. front viex, 2 ovary, column with anther in situ, and lip, in profile, 3 petals, 4 apex of ovary and column showing the anther, pollinia and their appendages and the large sub-orbicular stigma, 5 the pollinia, one pair, in their natural relation to the caudicle, the other pair pulled away from the caudicle to show the elastio connecting threads; all enlarged.

## 31. Cryptochilus, Wall.

Epiphytal; pseudo-balbs crowded, 2-leaved. Leaves coriaceous, usually petiolate. Inflorescence terminal, racemose, the peduncle naked. Flowers yellow or scarlet, secund, in distichous spikes, shorter than the subulate persistent bracts. Sepals connate in a subcylindric or urceolate tube, the acute apices alone free. Petals included. Lip included, adnate to the short foot of the column. Column erect, slightly dilated at the apex;
anther 2-or 4-celled; pollinia 8, cuneate or oblong, attached to a single gland. Species 2, both Himalayan.

In his Genera and Species of Crchidaceous Plants, Lindley referred this genus to Vandeae; but in the Botanical Register for 1838 (sub t. 23) he suggested its transference to Epidendreae in the neighbourhood of Phajus and Acanthephippium. Examination of living flowers of the plants as they grow in Sikkim shows that Lindley's first view was the correct one, and that the pollinia are connected to a gland which, prior to its removal from the flower, forms an integral part of the stigma. In C. lutea this gland is very large, while in C. sanguinca it is small.

$$
\begin{aligned}
& \text { Sepaline tube scarlet, pollinia green .............. 1. C. sanguinea. } \\
& \text { Whole flower yellow, pollinia yellow . . . . . . . . . . 2. C. lutea. }
\end{aligned}
$$

## 1. Cryptochilus sanguinea, Wall. Tent. Fl. Nep. 36, t. 26 ; Cat. 7530.

Pseudo-bulbs ovoid to elliptic, crowded, the adult sheathed at the base and bearing at the apex two linear-oblong acute thickly membranous leaves narrowed at the base to a short stout petiole; length 3.5 to 8 in., breadth 85 to 1.5 in., petiole about .5 in. Racemes from an undeveloped pseudo-bulb, on a stout erect peduncle longer than the leaves. Flowers 8 in . long, scarlet, secund in two rows; floral bract nearly as long as the flower, erect. Sepaline tube slightly gibbous at the base, puberulous; its free apices divergent, triangular, acute. Petals oblanceolate, obtuse. Lip oblong, entire, slightly broader at the apex, somewhat deflexed from the curved base, smooth. Column stout, short, puberulous in front, the foot short. Anther short, 4-celled; pollinia 8, cuneate, sub-equal, attached to a rotund gland. Capsule oblong, erect, 5 in. long. Lindl. Gen. and Spec. Orch., 193 ; in Journ. Linn. Soc. III, 21; in Bot. Reg. 1838, t. 23; Wight Ic. t. 1757 ; Reichb. fil. in Walp. Ann. VI, 461 ; Hook. fil. Fl. Br. Ind. V, 827.

Sikkim, at elevations of 5,000 to 7,000 feet, common; Pantling, No. 36 ; in flower from June to August. Distributed westward to Nepal and eastward to the Khasia and Naga Hills, at alt. 4,000 to 5,000 feet; Griffith, Prain and others.

The sepaline tube is scarlet with scattered white hairs, the free apices being dull dirty white to very dark purple; the petals, lip and column are bright yellow and the pollinia green.

Plate 220.-Cryptoohilus sanguinea, Wall. A plant; of natural sise. Fig. 1 front view of the mouth of a flower, 2 petals, 3 lip, 4 column with its foot and anther in situ, 5 floral bract, ovary, column, anther and lip, in profile, 6 anther, 7 pollinia; all endargcd.

## 2. Cryptochilus lutea, Lindl. in Journ. Linn. Soc. III, 20.

$P_{\text {seudo-bulbs crowded, cylindric, }} 1.5$ to 3 in . long, bearing at the apex two narrowly elliptic, acute, fleshy leaves tapering into petioles, length 4 to 6 in., breadth ' 65 to 1 in.; petioles 65 to 1 in., sometimes much less. Raceme from a young pseudo-bulb, shorter than the adult leaves, its peduncle short or long. Flowers numerous, in two rows, sub-globular, glabrous, yellow, nearly $\cdot 25$ in. long; floral bract much longer, linear-lanceolate, ovary pubescent. Sepaline tube urceolate, the triangular apices of the component sepals alone free. Petals narrowly and obliquely rhomboid, much narrowed at the base. Lip oblong, slightly expanded, grooved and thickened towards the apex,
curved at the base. Column short, dilated towards the bifid apes, the foot narrow and very short. Rostellum emarginate. Pollinia 8, yellow, oblong, in groups of four attached to a very large sagittately lobed gland. Capsule ellipsoid, 25 in. long. Reichb, fil. in Gard. Chron., 1882, I, 733; Hook. fil. Fl. Br. Ind. V, 827.

Sikkim, at elevations of 5,000 to 7,000 feet; several collectors; Pantling, No. 86 ; in flower during May and June. Bhotan; Griffith (Kew Distrib. Nos. 5228, 5229, 5229-1). Naga Hills; at Kohima, Clarke.

Plate 221.-Cryptochilus lutea, Wall. A plant; of natural size. Fig. 1 flower, 2 petals, 3 side view of ovary, column with its foot and lip, 4 lip, 5 front view of column, stigma, anther, 6 anther, 7 pollinia and gland; all enlarged.

## 32. Calanthe, Lindl.

Terrestrial, usually pseudo-bulbous. Pseudo-stems variable in length, often tall, sometimes absent. Leaves membranous, more or less elliptic-oblong, plaited. Inflorescence usually from amongst the leaves and axillary, or from the side of the stem or pseudobulb. Flowers usually rather large, sometimes inconspicuous, in erect racemes. Sepals sub-equal, usually spreading, more or less lanceolate or oblong, rarely connivent. Petals usually narrower than the sepals. Lip variously attached to the column either to its base or to its whole length, usually 3 -lobed, the apical lobe often bifid, the dise usually lamellate. Column short, sometimes dilated at the base or apex. Anther usually conical, with an acuminate lip, 2-celled. Pollinia 8, waxy, clavate or elliptic, often unequal, cohering in fours to a granular caudicle, or the whole eight inserted on a single caudicle and attached to a gland. Capsules ellipsoid, drooping. Distrib. About 80 species; tropical or sub-tropical.

In this genus the inflorescence is produced on an undeveloped pseudo-bulb which also bears the young leaves. The latter (except in C. alismafolia, C. densiffora, and C. gracilis), do not obtain their full size or develope their petioles until after flowering has ceased.

## *Inflorescence on the same stem as the leaves.

Flower without a spur.
Pseudo-bulbs none, stems thin, cylindric, flowers white, inflorescence lateral . 1. C. gracilis.
Pseudo-bulbs not more than 1 in . long.
Leaves 2 or 3 , sub-equal; flowers green, edged with white outside; lip with short basal lobes and a small bilobed puberulous callus between them; apical lobe with a large fleshy 3 -ridged caruncle .
Leaves 5 to 7, very unequal, the lower reduced to sheaths; flowers lavender-coloured, lip with elongate basal lobes and two short calli on the dise between them; apical lobe without a callus . . .
2. C. tricarinata.
3. C. puberula.

Flower with a very short straight conical spur.
Pseudo-bulbs short.
Lip attached to the whole length of the column.
Flowers ' 2 in. in diam.; sepals and petals brownish; lip with lateral lobes
4. C. Mannii.

Flowers 1 in. in diam.; sepals and petals brown with marginal green lines; lip clawed, trowel-shaped, white, without lateral lobes Lip attached to the column for half its length, 3-lobed, basal lobes diverging; apical lobe sub-obovate, with broad emarginate apex and irregularly toothed edges; flowers dull purple

> 5. C. trulliformis.
6. C. brevicornu.

## calanthe.

> Pseudo-bulbs 6 to 9 in . long, cylindric, stem-like, the peduncle and raceme equally long; lip without distinct lateral lobes, its terminal lobe large and divided into two diverging lobules; flowers yellow and violet, inflorescence lateral
> 7. C. biloba.
> Spur more than half as long as the ovary (quite as long in C. herbacsa.)
> Lip without lateral lobes, its edges deeply incised-pectinate
> 8. C. alpina.
> Lip 3-lobed.
> Lateral lobes of lip oblong-oblanceolate, entirely incumbent on the terminal ; lip with a large lobulate callus at its base, the apical lobe with large wide lobules
> 9. C. alismœefolia.
> Lateral lobes of the lip incumbent on the apical lobe by their tips only.
> Raceme with about 20 flowers, floral bract as long as the stalked ovary; the lip with a carunculate callus at its base, its apical lobules broad, sub-obovate and diverging.
> 10. C. angusta.
> Raceme with about 16 flowers; floral bract very short ( 25 in . long), lip with a didymous callus at its base; its apical lobules broad, rounded, not diverging, spur half as long as the stalked ovary
> 11. C. chloroleuca.
> Lateral lobes of the lip spreading outwards, not incumbent on the apical one ; raceme with about 15 flowers, floral bract half as long as the spur and as long as the stalked ovary; lip with carunculate callus at its base, its apical lobules narrowly oblong, sub-falcate, diverging
> 12. C. herùacea.
> Spur longer than the stalked ovary.
> Lip 3 -lobed; flowers violet, sepals and petals spreading
> 13. C. Masuca.
> Lip without basal or lateral lobes; flowers yellow; sepals and petals more or less reflexed.
> 14. C. Whiteana.
> **Inforescence distinct from the leafy stem and rising direct from the rhizome; flowers yellow
> 15. C. densiflora.

1. Calanthe gracius, Lindl. in Wall. Cat., 7341; Gen. and Spec. Orch., 251.

Stems thin, cylindric, slightly swollen at the base, annular below and with a few tubular sheaths above. Leaves 5 to 8, elliptic or elliptic-oblong, shortly caudate-acuminate, narrowed towards the broad sheathing base, 3 to 4.5 in . long and $1 \cdot 25$ to 1.75 in . broad. Peduncles one to three, issuing singly from nodes near the middle or lower part of the stem, 6 to 9 in . long, with many tubular sheaths at the base, a long one about the middle, and at the apex a sparse raceme 4 to 6 in . long, both finely pubescent. Flowers .75 in . across, spurless; bract lanceolate, acuminate, longer than the pubescent slenderly stalked ovary, caducous. Sepals equal, spreading, lanceolate, acuminate. Petals shorter than the sepals, obovate, acute, erose. Lip shorter than the sepals, adnate to the base only of the column; concave at the base and with large triangular erect side lobes with their anterior margins broad and erose; the apical lobe small, transversely oblong, deeply emarginate at the apex, the edges much undulate and coarsely erose; the upper surface with two lamellæ from the base nearly to the apex, the disc between the lamellæ with a granular callus at its base and with small nodules scattered over the rest of its area. Column short, dilated at the base; the apex with a tuft of hair behind the
anther. Lip of anther emarginate; pollinia 8, unequal, narrowly clavate, curved, attached to a small shield-shaped gland. Bot. Mag., t. 4714 ; Griff. Notul III, 367; Walp. Ann. VI, 922; Hook. fil. Fl. Br. Ind. V, 855. C. longipes, Hook. fil. Fl. Br. Ind. VI, 195. Limatodes gracilis, Lindl. Fol. Orch:, 1.

Sikkim; at Rungbee, elevation 6,000 feet; King, Pantling No. 2; in flower during October.

The flowers are pure white, the lip having a yellow band along the centre, with a transverse band of a darker shade at the base of the apical lobe.

Plate 222.-Calanthe gracilis, Lindl. Part of a plant; of natural size; an ontire plant, much reduced in size. Fig. 1 a flower, 2 stalked ovary, column and lip, in profile, 3 lip, 4 column with anther in situ, 5 anther, 6 pollinia; all enlarged.

> 2. Calanthe tricarinata, Lindl. in Wall. Cat., 7339; Gen. and Spec. Orch., 18.

Pseudo-bulb small, broadly ovoid, 75 to 1 in. long. Pseudo-stem 3 to 8 in. long. Leaves 2 or 3, oblanceolate, acute, much narrowed in the lower half, petiolate or sessile; length 8 to 15 in ., breadth 2 to 3 in . Inflorescence from the developing pseudo-bulb, sheathed by the young leaves and rising from the axil of one of them, longer than the adult leaves, 12 to 20 in . long, the peduncle longer than the laxly-flowered raceme, the rachis and stalked ovaries pubescent. Flowers $\cdot 75$ in. across; bract lanceolate, shorter than the slender pedicel of the ovary. Sepals and petals sub-equal, broadly lanceolate, spreading. Lip adnate to the whole length of the column, broadly oblong, decurved, 3 -lobed, the base with a didymous puberulous callus; the basal lobes short, erect, broad and rounded; the anterior lobe oblong, obtuse, the edges much undulate and the upper surface with a large fleshy callus divided into three ridges. Column short, thick, its anterior surface hispid. Lindl. Fol. Orch. 2; Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848. C. occidentalis, Lindl. Fol. Orch. 3; Walp. Ann. 1. c., 848.

Sikkim, in the Lachen Valley, at an elevation of 6,000 feet; Pantling No. 389. Westward along the Himalaya as far as Kashmir.

The petals and sepals externally are green, edged with white; internally they are of a pale yellowish-green. The lip is of the same colour, but the fleshy ridged callus on its upper surface is purple, as is also the anther. The plant described by Lindley as $C$. occidentalis agrees with this, except in having five ridges on the callus of the lip, instead of three.

Plate 223.-Calanthe tricarinata, Lindl. Pseudo-bulbs, leaf and raceme; of natural size. Sketch of an entire plant; much reduced. Fig. 1 front view of a flower, 2 profile view of bract, stalked ovary, column and lip, 3 lip, 4 column and saccate base of lip, the anther having bean removed, 5 inner view of anther; all enlarged.
> 3. Calanthe puberula, Lindl. in Wall. Cat., 7342; Gen. and Spec. Orch., 352.

Pseudo-bulb small, broadly ovoid with conical apex, about 1 in. in length. $P_{\text {seudo-stem }} 2$ to 4 in . long, sometimes shorter. Leaves 5 to 7 , very unequal, the lower little more than a sheath; the upper elliptic or elliptic-oblong, acuminate, slightly narrowed to the broad loosely-sheathing base, 4 to 6 in. long and 1.75
to 2 in. brcad. Peduncle and raceme much longer than the leaves; the peduncle with several scattered lanceolate acuminate bracts; the raceme 3 to 6 in. long, laxly-flowered, the rachis puberulous. Flowers puberulous externally, lavender-coloured, 1.2 in . across; bract lanceolate, acuminate, as long as or rather shorter than the stalked ovary. Sepals ovate-lanceolate, with broad bases, acuminate, spreading. Petals linear, acute, spreading, falcate. Lip adnate to the base of the column, oblong in general outline, shortly clawed, 3-lobed; basal lobes flat, falcately oblong, blunt, with two narrow calli on the disc between them, their apices pointing forward; terminal lobe without a callus, connected to the basal by a straight narrow isthmus, ovate-orbicular with a long apiculus, its edges coarsely erose. Column short, thick. Anther pointed. Pollinia 8, clavate, attached in fours to two caudicles and these to a triangular gland. Capsule narrowly elliptic, 1.25 in. long. Lindl. Fol. Orch. 2; Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848. Bletice spec., Griff. Ic. Pl. Asiat., t. 313A.

Sikkim, at elevations of from 6,000 to 7,000 feet; in flower during July and August; Pantling, No. 181. Westward along the range to Simla and eastwards to Bhutan. Also in the Khasia Hills; Griffith (Kew Distrib.) No. 5274, Mann, Gammie. Naga Hills, Assam; Prain.

The flowers are of a beautiful, nearly uniform, pale lavender colour, the lip sometimes being of a deeper shade with a little white near the base; the column with much white on it, and with yellow and purple markings in front.

Plate 224.-Calanthe puberula, Lindl. Pseudo-bulbs, leaves and inflorescence; of natural size. Fig. 1 lip, 2 apex of ovary, column with anther in situ, 3 pollinia; all enlarged.

## 4. Calanthe Mannii, Hook. fil. Fl. Br. Ind. V. 850.

Pseudo-stem about 3 in . long, pseudo-bulb small. Leaves oblanceolate-oblong, tapering gradually into the long petiole, the apex acute, the lowermost one sheathed at the base; length of adult blade 9 or 10 in ., breadth 1.5 to 2 in . Peduncle from amongst the young leaves, pubescent, about 9 in . long; the raceme half as long as the peduncle, few-flowered, lax. Flowers only 3 in . long, deflexed after expansion; floral bract minute, lancenlate, shorter than the pedicel of the stalked ovary. Sepals sub-equal, connivent, pubescent externally, ovate-oblong, sub-acute, concave. Petals oblong, acute, not spreading. Lip slightly shorter than the sepals, shortly spurred, adhering to the column almost to its apex and forming with it a long sac, 3-lobed; basal lobes large, broad, truncate, erect; terminal lobe deflexed, subreniform, entire; upper surface with two tubercled ridges from the base to the middle of the anterior lobe and a third shorter one between them in their upper half. Column short, dilated towards the apex. Anther pointed. Pollinia unknown.

Sikkim, at Rungbee, elevation 6,000 feet; Lachen Valley, 7,000 feet; Pantling, No. 311. Western Himalaya; below Ranikhet in Kumaon, J. F. Duthie. Khasia Hills; alt. 4,000 feet, C. B. Clarke, Rita.

The colour of the flowers is dull brown. This is a self-fertile species. Mr. Pantling was unable to obtain pollinia for figuring, as in all the flowers of the only living specimen found by him, they had been more or less absorbed by the stigmas, the clinandrium having apparently become absorbed.

Plate 225.-Calanthe Mannii, Hook. fil. A plant; of natural size. Fig. 1 a flower, side view, 2 lip, 3 bract, stalked ovary, column and lip, side view, 4 seotion through column and spur, 5 column and spur, 6 anther; all enlarged.

## 5. Calanthe trulliformis, King and Pantling in Journ. As. Soc. Beng. LXIV, Pt. 2, p. 337.

Pseudo-stem short; pseudo-bulbs oblong, only 5 in. long. Leaves linear-lanceolate, acute, sessile, 9 to 12 in . long. Raceme about 9 in . long; its peduncle about the same length, puberulous. Flowers 12 to 18 , scattered, about 1 in . in diam; floral bract linearlanceolate, equal to or exceeding the stalked puberulous ovary. Dorsal sepal ovate-lanceolate, acuminate, $\cdot 75 \mathrm{in}$. long; the lateral pair lanceolate, falcate, longer than the dorsal. Petals linear-lanceolate, acute, shorter than the lateral sepals. Lip adnate to the whole length of the column, with a short thick claw and a short cylindric spur, trowel-shaped, the base entire, the sides irregularly crenate-dentate, the apex acuminate, ontire; the upper surface with two converging lamellæ extending from its base midway to the apex. Spur short, stout, its mouth triangular, its interior bristly. Pollinia 8, unequal, clavate, in four unequal pairs.

Sikkim, on Mahaldaram Peak, elevation 6,000 feet; flowering in July; Pantling, No. 168.

A species allied to C. puberula, Lindl., but differing from that plant in having sessile leaves and a lip without side lobes. The colour of the sepals and petals is brown, with mesial and marginal green lines. The lip is white, with a triangular pink mark at the base.

Plate 226 -Calanthe trulliformis, King and Pantling. A plant; of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, 3 lip, 4 column with anther in situ and the entrance to the spur, 5 anther, 6 pollinia; all enlarged.
6. Calanthe brevicornu, Lindl. in Wall. Cat., 7338; Gen. and Spec. Orch., 251.

Pseudo-bulbs small, ovoid, pointed, 1 in. long. Pseudo-stem 2 to 4 in., stout, with wide sheaths. Leaves usually 3 , sub-equal, oblong-elliptic, shortly acuminate, slightly tapered to the wide sheathing base, when adult petiolate; length of blade 9 to 12 in., breadth 2.5 to 3.5 in , petiole 4 to 8 in . Peduncle and raceme longer than the leaves; the peduncle with a few scattered short bracts; the raceme 12 in . long, laxly flowered, the rachis, ovaries and outside of the sepals puberulous. Flowers 1.5 to 1.75 in . across; floral bract narrowly lanceolate, half as long as the stalked ovary. Sepals sub-equal, oblong-lanceolate, all acute and spreading. Petals shorter than the sepals, lanceolate. Lip attached to the lower half of the column, with a short, broad, blunt, straight spur, 3 -lobed; the basal lobes oblong, blunt, diverging; the apical lobe sub-obovate with a broad emarginate apiculate apex and irregularly toothed edges, contracted at its junction with the basal lobes; the upper surface with three tubercled fleshy'lamellæ running from the base and increasing in height to near the apex. Column short. Anther beaked. Pollinia 8, clavate, attached to a common pedicel and gland. Capsule ellipsoid, about 1 in. long. Lindl. Sert. Orch., t. 9; Fol. Orch., 3; Walp. Ann. VI, 912 ; Hook. fil. Fl. Br. Ind. V, 848.

Sikkim, at elevations of 6,000 to 8,000 feet; in flower during May and June; Griffith (Kew Distrib.), No. 5278; Pantling, No. 317. Nepal ; Wallich. Kamaon; T. Anderson. Bhutan ; King's collector.

The colour of the flowers is dull purple or brick red, relieved by lines of white on the midribs of the sepals and petals and on the edges of the lip; while the lamellæ of the lip have streaks of yellow on them. The outer surfaces of the parts of the flower are all strongly flushed with white. A colour variety is occasionally found in which the dull purple of the perianth gives place to yellow, there being no difference structurally and both forms sometimes occurring on the same plant. The mouth of the short spur is lined with retroflexed hairs.

Plate 227.-Calanthe brevicornu, Lindl. Leaf and raceme; of natural size; outline of a plant; much reduced in siz. Fig. 1 lip, 2 bract, stalked ovary, column and lip, 3 section through apex of ovary, column and lip, 4 column with the anther undisturbed, 5 anther, 6 pollinia; all enlarged.

## 7. Calanthe blloba, Lindl. Fol. Orch., 3.

Pseudo-bulbs stout, cylindric, stem-like, 6 to 8 in. long. Leaves several towards the apes of the pseudo-stem, unequal, the lower short and sheath-like, broadly elliptic, shortly caudate-acuminate, undulate, tapering to the broad sheathing petiole; length of blade of upper leaf 8 to 12 in ., breadth 2.5 to 4 in . Racemes 1 or 2 from the axils of the lowest leaves, measuring with their long peduncles 18 to 30 in . in length (the raceme forming one-third), minutely puberulous. Flower 1.5 in , across (vertically); floral bract lanceolate, acuminate, shorter than the stalked ovary, the lower bracts longer than the upper. Sepals sub-equal, spreading, broadly ovate-lanceolate, caudate-acuminate; the lateral pair falcate, rather narrower than the dorsal. Petals shorter and narrower than the sepals, oblong, with somewhat expanded triangular apices. Lip longer than the sepals, with a short conical spur and a long narrow claw; its lamina broadly ovate-oblong, deeply 2 -lobed; the lobes sub-rhomboid, acute, deflexed, their margins slightly undulate; the sinns narrow with an acute apiculus; the upper surface with three shallow ridges towards the base. Column short, stout. Anther apiculate. Pollinia 8, unequal, narrowly oblong, attached by long stalks to a small transparent elliptic gland. Walp. Ann. VI, 912; Hook. fil. Fl. Br. Ind. V, 848.

Sikkim, rather common in shady places, at elevations of from 3,500 to 7,000 feet; Pantling, No. 56. Also in East Nepal; Sir J. D. Hooker; in flower during September and October.

The ovary and anterior portion of the lip of this are usually pale violet, the claw of the lip being whitish. The whole of the sepals and the petals, except their triangular apices, are ochraceous yellow beautifully mottled with purplish-brown; the column is tipped with dark brown, and the spur is pink. This colouration is, however, not constant. The wide mouth of the spur is lined with hairs which point downward. The raceme here figured is in a far-advanced stage; while young, the raceme is much more condensed and is pyramidal with a drooping apex. In this species the limits of the three stigmas which are united in the column and rostellum are marked by faint lines.

Plate 228.-Calanthe biloba, Lindl. Blade of a leaf and a raceme; of natural size; outline of an entire plant; much reduced. Fig. 1 a flower, 2 bract, ovary, column with anther in situ, and lower part of lip with spur, 3 section of the foregoing, 4 anther, 5 pollinia; all enlarged.
ann. Roy. Bot. Gard., Calcutta, Vol. VIII.

## 8. Calanthe alpina, Hook. fil. in Lindl. Fol. Orch., 4.

$P_{\text {seudo-bulbs sub-cylindric, tapering at the ends, with two or three annular markings. }}$ Pseudo-stem very short. Leaves unequal, the lower sheath-like, oblanceolate, sub-acute, tapering to the short petiole; length of blade of adult leaf 6 or 7 in ., breadth 1.4 to 1.8 in .; petiole 1 to $1 \cdot 5$, (not developed in the younger leaves). Peduncle and raceme together longer than the leaves. Raceme 4- or 5 -flowered, glabrous. Flowers (to the tip of the spur) 75 in . across ; floral bract lanceclate, half as long as the stalked ovary. Sepals sub-equal, ovate-oblong, acuminate, concave. Petals elliptic-lanceolate, sub-connivent, shorter than the sepals. Lip shorter than the sepals, with a cylindric spur nearly as long as the ovary, joined to the column about the middle, without lateral lobes, the lamina semi-orbicular, its edges deeply incised-fimbriate. Column short, broadly-winged, the margin toothed; anther with a small truncate lip; pollinia 8, clavate, attached in fours to two caudicles inserted on an ovate gland. Walp. Ann. VI, 913; Hook. fil. Fl. Br. Ind. V, 850.

Sikkim; in the Lachen Valley, at elevations of 6,000 to 10,000 feet; Sir J. D. Hooker; Pantling, No. 388; in flower during July and August.

The sepals and petals are white tipped with green; the lamina of the lip is dull red, its base and the spur being pale yellowish.

Plate 229.-Calanthe alpina, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 bract, ovary, column and lip with its spur, seen from the side, 3 lamina of lip, 4 apes of ovary, column and anther, 5 anther, 6 pollinia; all enlarged.

## 9. Calanthe alismafolia, Lindl. Fol. Orch., 8.

Pseudo-bulbs thin, cylindric, tapering to the apex, with several annular rings, somewhat curved, 1 to 2 in . long. Leaves broadly elliptic, shortly acuminate, rather abruptly narrowed at the base into a very long channelled petiole, the edges undulate; length 5 to 7 in ., breadth $2 \cdot 25$ to 3 in . Scape about as long as the leaves, with a few distant sheathing bracts; the raceme corymbose and only 1 to 2 in . long, puberulous. Flowers 8 in. across (vertically); floral bract large, cordate, acuminate, shorter than the shortly-stalked ovary. Sepals sub-equal, sub-orbicular, erecto-patent, externally with short coarse purple hairs. Petals sub-rhomboidal, about as large as the sepals, sub-acute. Lip obovate, adnate by its base to the column for quite the whole length of the latter, 3 -lobed; the basal lobes narrowly oblong-oblanceolate, obtuse, somewhat falcate, blunt, resting on the terminal lobe and pointing forwards; the terminal lobe broad with a large lobulate yellow callus at its base; the apex bilobulate, the lobules broad, rounded, and with crenulate edges, the sinus deep and apiculate at the bottom; the spur constricted at the neck, long, cylindric, blunt, nearly as long as the ovary and lying parallel to it. Column very short, with the callosities of the lip closely applied to it. Anther acuminate. Pollinia 8, clavate, attached directly (without a caudicle) to an ovate, acute gland; stigma divided into two halves by the entrance to the spur. Capsule narrowly elliptic, 75 to 1 in. long. Walp. Ann. VI, 918; Hook. fil. Fl. Br. Ind. V, 849.

Sikkim; in the Terai and near the bottoms of valleys up to 2,000 feet; in flower during May and June; Pantling, No. 316. Gharwal; Falconer (Kew Distrib.), Nos. 1055, 1056. Khasịa Hills; Hooker fil. and Thomson,

The prevailing colour in the flowers is white; but the sepals are tipped with green externally, and the lip has a blotch of pale violet near the base, the large lobulate callosity however being bright yellow.

Plate 230.-Calanthe alismafolia, Lindl. A plant; of natural sise. Fig. 1 a flower, 2 bract, staiked ovary, column and lip, in profile; 3 section through apex of ovary, stigma ( $s$ ), column and lip, 4 front view of the column showing the callosity and the base of the lip, the eutrance to the spur (e), and the stigma ( $\delta-8$ ), 5 anther, 6 pollinia; all endarged.

## 10. Calanthe angusta, Lindl. Fol. Orch., 7.

Pseudo-bulbs coespitose, conical, only 5 in. long. Leaves from the pseudo-bulbs, narrowly elliptic, acute, tapering to the sessile base ; length 6 to 9 in., breadth 2 to 3 in . Peduncle and raceme together 15 to 24 in . long; the peduncle stout, puberulous, bearing several lanceolate sheathing bracts 1 to 2 in . long; the raceme 4 to 6 in . long, many-flowered. Flowers 1 in . across, white ; floral bract broadly elliptic, acute or sub-acuminate, rather shorter than the slenderly stalked ovary. Sepals elliptic, sub-acute, spreading. Petals narrowly oblong, blunt, only one-lalf the width of the sepals. Lip spurred, longer than the sepals, adnate to the column throughout the entire length of the latter; side lobes large, oblong, sub-falcate, their apices converging and overlapping the base of the apical lobe, sub-acute; apical lobe sub-reniform, its apex with two large sub-obovate blunt lobules separated by a deep triangular sinus; the upper surface bearing a cluster of small yellow calli between the bases of the side lobes and in front of the mouth of the spur. Spur slender, long, cylindric, slightly curved, puberulous, nearly as long as the stalked ovary. Column short; stigma divided into two elongated halves by the entrance to the spur; arms of the rostellum oblong, blunt and projecting beyond the lip of the anther. Pollinia shrunken, attached to a quadrate gland. Walp. Ann. VI, 916; Hook. fil. Fl. Br. Ind. V, 849.

At the base of the range to the east of the Jaldacca river, at an elevation of about 800 feet; in flower during April; Pantling, No. 440. Khasia Hills; Lobb, Clarke. Manipur ; alt. 3,500 feet, Watt.

The flowers, which are pure white and have a sweet smell, resemble those of C. odora, Griff., although the latter have a spur longer than the ovary, and the flowers and leaves are not contemporaneous as in this. The specimens of C. odora are very scanty, but an examination of them leads us to believe that C. odora and C. angusta are probably only different names for the same species.

Plate 232.-Calanthe angusta, Lind1. A plant; of natural size. Fig. 1 a flower; 2 floral bract, stalked ovary, column and lip with its spur, side view, 3 lip, 4 column with the anther in situ, rostellum $(r)$, entrance to the spur (e) and stigma (s), 5 empty anther, 6 pollinia; all cnlarged.

## 11. Calanthe chluroleuca, Lindl. Fol. Orch., 10.

 elliptic-lanceolate, acute, gradually tapering to the broad sheathing petiole, not fully developed until after the flowering; length when adult 12 to 14 in., breadth 2.75 to ${ }_{4} \cdot 5$ in., petiole about 3 to 6 in . Peduncle longer than the leaves, puberulous,
bearing one or two ovate sheaths. Raceme about 12 in . long, sparsely-flowered; bract about 25 in . long, membranous, much shorter than the stalked ovary. Flowers 1.75 in . across (vertically); the spur stout, about as long as the sepals and much shorter than the pubescent ovary, slightly curved, cylindro-conic. Sepals ovate-lanceolate, acuminate. Petals oblanceolate, acuminate, all spreading or sub-reflexed. Lip adnate to the column to near the apex of the latter, longer than the sepals; basal lobes broadly oblong, divergent; the mouth of the spur with twin calli; apical lobe broad, divided by a narrow sinus into two broad rounded lobules with minutely erose edges. Pollinia attached in two groups of four to two caudicles, the gland elliptic. Column short, broad. Walp. Ann. VI, 920 ; Hook. fil. Fl. Br. Ind. V, $85 \check{2}$; in Ann. Bot. Gard. Calc. V, 31, t. 45. C. galeata, Lindl. Fol. Orch., 5; Walp. Ann. VI, 914.

Sikkim, altitude 6,000 to 8,000 feet; Sir J. D. Hooker ; Pantling No. 468, in flower during April and May.

This is closely allied to C. herbacea, Lindl., but differs in the manner noted under that species. The sepals and petals of this are of a yellowish-green and the lip white with an elongated patch of yellow along its middle. The flowers have the perfume of primroses.

Plate 231.-Calanthe cholorolenca, Lindl. A plant; of natural sise. Fig. 1 front view of a flower, 2 side view of bract, stalked ovary, column with anther in situ and lip, 3 lip showing the apical and basal lobes, 4 side view of column with anther in position, and of the lip, 5 anther, 6 pollinia; all enlarged.

## 12. Calanthe herbacea, Lindl. Fol. Orch., 10.

Pseudo-bulbs short, bluntly fusiform, broadly annular, slightly curved, 75 to 1.25 in. long. Leaves broadly or narrowly elliptic, shortly caudate-acuminate, tapering to the petiolate base; length 6 to 10 in ., breadth 2 to 4 in., petiole 2 to 6 in . long. Peduncle from amongst the leaves and nearly twice as long, stout, with one or two lanceolate acuminate bracts 5 to 1 in . long; the raceme lax, about 6 in . long, with about 15 flowers, glaucous. Flowers 1.5 in . in expanse from base to apex; the floral bract lanceolate, about half as long as the ovary. Sopals elliptic, sub-acute, the dorsal one rather obovate-elliptic, all spreading. Petals narrower than the sepals, sub-spathulate, reflexed. Lip longer than the sepals, attached to the whole length of the column, and having a warted triangular callus at the base; side lobes narrowly oblong, directed outwards; terminal lobe broadly triangular, deeply emarginate at the apex; the lobules diverging, oblong, falcate, the sinus wide with a small apiculus; the slender sigmoid spur nearly equal in length to the pedicelled ovary. Column rather long, forming with the base of the lip a cylindric tube. Anther pointed. Stigma divided into two segments by the entrance to the spur. Pollinia sub-equal, elongate, clavate, attached to an elliptic gland. Hook. fil. Fl. Br. Ind. V, 852; in Ann. Roy. Bot. Gard., Calc., V, 30, t. 44.

Sikkim, at elevations of from 4,000 to 6,000 feet; Hooker fil., King ; Pantling, at Rungbee, 6,000 feet, No. 80 ; in flower during June.

The sepals and petals are green, and the lip pure white except its callus which is yellow. The upper halves of the sepals and petals are sometimes ochreous yellow,
the lower halves being green. This species is very closely allied to C. chloroleuca, Lindl., but differs from it in having fewer flowers in its raceme, somewhat larger floral bracts, and a much longer spur. Moreover in this the apical lobuli of the lip are entire, narrowly oblong and diverging; while in C. chloroleuca these lobuli are crenate, broad, rounded, and not diverging. The flowers of this are inodorous, while those of C. chlorantha are delightfuily fragrant.

Plate 233.--Calanthe herbacea, Lindl. Pseudo-bulbs, leaf and raceme; of natural sise. Fig. 1 a flower, 2 column and base of lip, stigma ( 8 ) and entrance to spur (e), 3 section of column and spur, one-half of the stigma (s) (not in section), 4 anther, 5 pollinia; all enlarged.
13. Calanthe Masuca, Lindl. in Wall. Cat. 7337; Gen. and Spec. Orch., 249.

Pseudo-bulbs narrowly conical, with annular scars, 2 to 3 in. in length. Lenves more or less broadly elliptic, acute, narrowed at the base into a petiole, or sessile; length 6 to 15 in., breadth 2.75 to $4 \cdot 25$ in.; petiole 2 to 6 in., or 0 . Peduncle exceeding the leaves in length, stout, with two or three scattered acute lanceolate bracts. Raceme about 6 in . long, many-flowered, pubescent. Flowers rather crowded, depressed, 2 in. across, with a curved slender cylindric spur longer than the ovary; bract ovatelanceolate, concave, shorter than the puberulous stalked ovary. Sepals elliptic or ellipticlanceolate, acute, spreading, the lateral pair slightly longer than the dorsal. Petals smaller than the sepals, sub-acute. Lip as long as the sepals, attached to almost the whole length of the column, 3 -lobed ; the basal lobes oblong, blunt, sub-falcate, directed forwards; apical lobe large, sub-rhomboid, or cuneately reniform, deeply emarginate at the apex; the disc between the side lobes with three unequal elongate tubercular calli. Column very short. Stigma in two halves and the rostellum consisting of two projecting plates. Anther pointed. Pollinia 8, sub-equal, clavate, sub-sessile on a small oblong gland. Capsule elliptic, $1 \cdot 5$ in. long. Lindl. in Bot. Reg., 1842, Misc., 51; id. 1844, t. 37 ; Fol. Orch., 6; Bot. Mag., t. 4541 ; Paxt. Fl. Gard. I, 138 ; Walp. Ann. VI, 915. C. versicolor, Lindl. Sert. Orch., t. 42 ; Bot. Reg., 1844, sub. t. 37 ; Fol. Orch., 6. C. emarginata, Wight Ic., 918; ? Lindl., Gen. and Spec. Orch., 249 ; Fol. Orch., 5. C. Wightii, Reichb. fil. in Walp. Ann. VI, 932. ? Amblyglottis emarginata, Blume Bijdr., 370. Bletia Masuca, Don Prodr., 30. Loduba Masuca, Herb. Ham.

Sikkim, common at elevations from 1,500 to 4,000 feet; in flower during August and September; Pantling, No. 39. Distributed westward along the range to Nepal; also in the high lands of the Deccan, the Western Ghats and in Java.

The flowers are of an almost uniform violet tint, becoming of a rusty colour when beginning to wither. The calli on the lip are yellow. The coloration, however varies. In the form which was named C. versicolor the perianth is white, the lip being purple, changing to yellow. In another form the sepals are crimson and the lip deep purple. The latter variety does not, however, occur in Sikkim.

Plate 234.-Calanthe Masuca, Lindl. Stems, leaf and raceme; of natural size. Two entire plants much reduced. Fig. 1 a flower, 2 bract, ovary, column, spur and lip, in profile, 3 lip, 4 the column showing the stigma $(s)$, rostellum ( $r$ ), and entrance to the spur ( $c$ ) between the two halves of the, stigma, 5 anther, 6 pollinia; all enlarged.

## 14. Calanthe Whiteana, King and Pantling in Journ. As. Soc. Beng. LXV, pt. 2, 121.

Pseudo-bulbs only 1.5 in . long, conical, with annular scars. Leaves linear-lanceolate, acuminate, much narrowed towards the sessile base, 2 to 3 feet long and 1.5 in broad at the widest part. Scape stout, together with the densely-flowered raceme 2 to 4 feet long, puberulous and with a few short scattered sheaths. Flowers $\cdot 75$ to 1 in . across, yellowish ; foral bract 1 in . or more in length, linear, acuminate, deflexed, longer than the ovaries. Sepals $\cdot 4 \mathrm{in}$. long, ovate, blunt, 3 - to 5 -nerved, reflexed and resting upon the stalked ovary. Petals elliptic-lanceolate, acute, narrowed towards the base, erect. Lip very short, sessile, adnate to the whole length of the column; the lamina transversely elliptic or quadrate, without lateral lobes, its apex bilobulate; the lobules reflexed, their margins entire or sub-crenate ; the upper surface with five papillate ridges running along the centre from base to apex. Column short, stout; stigmatic surfaces double, one on each side of the entrance to the spur. Spur exceeding the stalked ovary, sub-clavate, slightly curved, sparsely pubescent, the inner wall with hair-like papillæ in its upper half. Pollinia 8, unequal, in groups of four, sub-sessile on an oblong gland derived from the stigma.

Sikkim, at Choongthang, elevation 6,000 feet; in flower during May; Pantling, No. 365.

This species comes nearest to C. Mannii, Hook. fil., which has, however, a very short spur. This is as yet a little-known plant, only a few specimens having hitherto been gathered. The flowers are sweet-scented. The lip is of a bright yellow and the column is nearly white, the other parts of the flower being yellowish-green. We have named it after Mr. Claude White, Political Agent in Sikkim, who has given us much help in obtaining botanical specimens from Independent Sikkim.

Plate 235.-Calanthe Whiteana, King and Pantling. A leaf and a raceme; lof natural size. Entire piant; reduced in size. Fig. 1 a flower, 2 bract, ovary and flower, side view, so as to show the spur, 3 column seen from the front with the stigma (s), 4 section of apes of ovary, column, anther and spur, the stigma marked (s), 5 anther, 6 pollinia; all enlarged.

## 15. Calanthe densiflora, Lindl. in Wall Cat., 7344; Gen. and Spec. Orch., 250.

Rhizome consisting of jointed fusiform annular lengths about 2 in . long, each producing at its thick end a pseudo-stem and flowering scape. Stem very short. Leaves about three, narrowly elliptic, acute, tapering at the base to the short broad sheathing petiole ; length 2 to 3 feet, breadth 3 to 5 in., petiole 2 to 6 in., sometimes absent. Scape from the rhizome behind the stem, 4 to 12 in . long, erect, stout, bearing three or four broad tubular acute inflated sheaths 1 in . or more in length. Raceme 2.5 to 3 in . long, at first sub-globose, afterwards cylindrical, densely-flowered, sometimes branchingFlower (to the end of the spur) $\cdot 8 \mathrm{in}$. long, and in diam. $\cdot 5 \mathrm{in}$.; bract thin, elliptic, acute, conduplicate, longer than the abruptly stalked ovary, the bracts of the lowest flowers often much longer. Spur nearly as long as the ovary and its pedicel, cylindric, slightly inflated towards the apex. Sepals and petals connivent, sub-equal, oblanceolate, acute. Lip adnate to the column from its middle ; the basal lobes large, sub-triangular, erect, and with two large semi-erect rounded lamellæ between them; apical lobe quadrate,
emarginate, the sinus broad, shallow. Column straight, thick at the base only, shorter than the spur. Stigma rounded, entire. Anther with a short oblong transparent lip. Pollinia sub-equal, globose-clavate, attached by a single caudicle to a small gland. Lindl. in Bot. Reg., t. 1646 ; Fol. Orch., 9 ; Walp. Ann. VI, 919 ; Hook. fil. Fl. Br. Ind. V, 855. C. clavata, Lindl. in Wall. Cat., 7343 ; Gen. and Spec. Orch., 251 ; Fol. Orch., 5 ; Hook. fil. Fl. Br. Ind. V, 854.

Bhutan, in the Naru Valley, at an elevation of 3,000 feet; in flower during October; Pantling, No. 351 ; collected also by Treutler and others. Khasia Hills; alt. 4,000 to 5,000 feet.

The flowers are yellow throughout. Prior to their expansion the raceme is covered by thin deciduous bracts. We can find no difference between this and C. clavata, Lindl., and have therefore reduced the latter, as being described by Lindley on a later page of his genera and species of Orchids.

Plate 236.-Calanthe densiffora, Lindl. Plant; of natural size. Fig. 1 a flower, side view, 2 bract, stalked ovary, oslumn, lip and spur, side view, 3 section of the foregoing (except the bract), 4 lip, 5 column with anther in situ, 6 anther, 7 pollinia; all enlarged.

## 33. Yoania, Maximowicz.

Saprophytic aphyllous succulent herbs with stout branched rootless rhizomes. Stem 2 to 4 in. high, erect, stout, bearing a few short fleshy bracts and, at its apex, four or five long-stalked flowers nearly 1 in . long in a short lax raceme. Sepals and petals short, concave, the former fleshy. Lip about as long as the sepals and petals, sessile on the short foot of the column, somewhat slipper-shaped, the margins of the anterior half approximated so as to convert the posterior half into an open sac; spurred or not. Stigma transverse, concave. Column stout, broad, with a tooth at the apex on each side of the anther, the margin winged. Pollinia 2, bi-partite, waxy, sessile on a large quadrate gland resembling that of Cymbidium. Distrib., two species, Japanese and Indian.

## Yoanta Prainit, new species.

Rhizome densely clothed with small imbricating narrowly lanceolate acuminate adpressed scales. Stem smooth; its two or three bracts $\cdot 4$ to $\cdot 6 \mathrm{in}$. long, loose. Flowers about 1 in . long; floral bract $\cdot 5 \mathrm{in}$. long, ovate, fleshy, the ovary and its stalk varying in length from 1 to 2 in . Sepals ovate-lanceolate, sub-acute. Petals of thinner texture than the sepals, ovate-rotund, very obtuse, entire, and with five parallel non-converging nerves. Lip with entire edges, not spurred. Anther anticous, broad, dome-shaped, beaked. Capsule 2 to 2.5 in . long, narrowly fusiform, boldly ridged, erect, on a stout stalk. Y. japonica, Benth. in Hook. Ic. Plantar., t. 1364; Hook. fil. in Fl. Br. Ind. VII, 123 (but not of Maximowica and Finet).

Sikkim-Himalaya, at Choongthang, elevation 6,000 feet; Pantling, No. 469. Naga Hills; elevation about 7,000 feet, Prain, No. 15.

This species differs from $Y$. japonica of Maximowicz, as originally described by that author in the Bulletin of the St. Petersburg Academy (Vol. XVIII, p. 68), and more recently described and figured by M. Finet in the Bulletin Soc. Bot. de France, Vol. XIV, 601, t. XII. In the present species the lip has entire edges; it has no spur and no processes on any part of its upper surface; in Y. japonica the edges of the lip are serrate, and there is curious blunt spur directed forwards and bearing
a small carunculate process in its interior. The petals of the plant here described are almost rotund and quite entire, while in $Y$. japonica they are oblong with broad oblique serrate apices. The Japanese species moreover has more slender stems than Y. Prainii, with longer flower-pedicels and a stouter rhizome sparsely clothed with larger scales. In the present species the flowers are white throughout.

Plate 237.-Yoania Prainii, King and Pantling. A plant; of natural size. Fig. 1 a flower, 2 apex of ovary, column (the anther having been removed) and lip, 3 petals, 4 lip seen from above, 5 front view of the column (the anther absent) showing the pollinia in situ, 6 pollinia and gland : all enlarged and all from a Sikkim specimen; 7 much enlarged view of a flower with the anther in position, from one of Dr. Prain's Naga Hill specimens.

## 34. Eulophia, R. Brown.

Terrestrial glabrous herbs with fleshy tubers or rhizomes, rarely pseudo-bulbous. Lsaves appearing along with or after the flowers, long, narrow, usually plicate (probably sometimes absent). Scape usually lateral, erect, tall, sheathed, bearing a raceme (rarely a panicle). Sepals and petals free, spreading, often sub-equal. Lip adnate to the base of the column or to its foot, base saccate or with a short spur, usually 3 -lobed; the lateral lobes erect and embracing the column; disc usually ridged or crested. Column with or without a foot, its apex entire and often oblique, its margins sometimes winged or lobed. Anther terminal, sometimes with two apical processes, its lip often toothed, 2 -celled. Pollinia 2, globose, attached by a caudicle to the flat gland of the rostellum. Species about 100, chiefly Asiatic; all tropical.

> Column with no foot or with a very short one-
> Inflorescence branched . . . . . . . . . . . . . . 1. E. graminea.
> Inflorescence not branched-
> Spur of lip wide, conical
> 2. E. Mannii.
> Spur of lip short, geniculate . . . . . . . . . 3. E. geniculata.
> Spur of lip short, straight, cylindric . . . . . . . . 4. E. campestris.
> Column with a long foot-
> Petals obovate, floral bract strongly deflexed
> 5. E. sanguinea.
> Petals oblong or ovate-oblong-
> Lip without side lobes, its upper surface with about nine faint vertical lines
> 6. E. nuda.
> Lip with side lobes; the upper surface with two lines below the middle, each ending in a free tooth, and above the middle with five carunculate ridges
> 7. E. bicarinata.

Norr.-Two species of Eulophia attributed in the Flora of British India to Sikkim, and one attributed to Bhutan, have never been found by us and are therefore not described here. These are-

No. 14. E. stenopetala, Lindl. Said to have been collected by Griffith in Bhatan.
No. 16. E. densifora, Lindl. Collected at the foot of the Sikkim range by Sir J. D. Hooker, and in Bhutan by Griffth.
No. 21. E. candida, Hook. fil. Collected at the base of the Sikkim-Himalaya by Sir J. D. Hooker.

1. Eulophia graminea, Lindl. in Wall. Cat., 7372; Gen. and Spec.
Orch., 182.

Pseudo-butb obpyriform, 1 to 4 in . long, epigæal. Leaves persistent, linear, acute, sheathing at the base, 8 to 14 in . long and 4 to 5 in . broad. Scape from the side of the
pseudo-bulb, branched, longer than the leaves (often measuring as much as 30 in .), with several broad-based, acuminate sheaths near the base and others scattered in the upper part. Flowers distant, $\cdot 75 \mathrm{in}$. across; floral bract lanceolate, shorter than the stalked ovary. Sepals and petals sub-equal, oblanceolate, acute, spreading; the petals a little broader than the sepals, the venation in all netted. Lip equal in length to the sepals and petals but broader, oblong-oblanceolate in general outline; the side lobes narrow, with blunt apices, pointing forwards; apical lobe sub-rotund, undulate, but not lobed; the upper surface with five ridges extending from base to apex, the edges entire between the side lobes but fimbriate on the apical lobe. Spur short, wide, bulbous. Column straight, without wings or foot. Anther with two bosses in front. Pollinia sub-quadrate, the caudicle short and the gland small. Lindl. in Journ. Linn. Soc. III, 23; Hook. fil. Fl. Br. Ind. VI, 2. E. inconspicua, Griff. Notul., 349; Ic. Plant. Asiat., t. 326; Lindl. in Journ. Linn. Soc. III, 24.

Sikkim, at the foot of the range; flowering in March, common; Pantling, No. 438. Assam, Plains of Bengal, Travancore, Ceylon; also in Tenasserim, the Nicobar Islands, Malacca and Singapore.

The sepals and petals are green with reddish nerves, the lip white with red on the ridges; they are not plicate. The short spur is slightly dilated at the apex. The leaves, of the previous year are present in a withered condition at the time of flowering.

Plate 238.-Eulophia graminea, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, ovary, column and lip, seen from the side, 3 lip, 4 apex of ovary, column with the anther in situ, and the spur, 5 anther, 6 pollinia; all enlarged.

## 2. Eulopha Mannir, Hook. fil. Ic. Plantar., t. 2115 ; Fl. Br. Ind. VI, 4.

Height of entire plant 4 to 7 feet, the leaves and inflorescence rising from an oblong, flattened tuber about 3 or 4 in . long. Pseudo-stem formed by the sheaths enclosing the bases of the leaves and scape, 2 to 3 feet long and 1 in . thick at the base, and with long acuminate sheaths. Leaves about three, linear, acuminate, much narrowed at the base, 1 to 3.5 feet long and 1 to 2 in . broad. Scapc 3 to 5 feet long, bearing four or five tightly-clasping sheaths each about 1 foot long. Raceme 12 in . long, lax. Flowers about 1 in. across, deflexed, yellow; floral bract lanceolate, about half as long as the slender stalked ovary. Sepals equal, oblanceolate, acute; the lateral pair inserted on the column and quite free from the sac of the lip. Petals broadly obovate, blunt, Lip conically saccate at the base, as long as the sepals, oblong, 3 -lobed; the side lobes large, erect, rounded; the apical lobe orbicular, crenate-undulate; the disc between the side lobes with seven to nine more or less thickened nerves which unite to form a large carunculate callus on the apical lobe. Column rather broad, narrowly winged, the foot very short. Anther beaked at the base below its apex and with a single projecting process on its summit. Pollinia 2, globular, attached by a cylindric caudicle to a triangular gland.

Sikkim, in tropical valleys; in flower during July and August; Pantling, No. 457. Upper Assam; G. Mann.

The prevailing colour of the parts of the flower is yellow, but the petals are streaked with dull brown on the inner surface. This is the tallest growing Er:lophia in Sikkim,
although, strange to say, it has not hitherto been recorded from the Province. The base of the lip forms a wide conical sac. There is no true mentum, the lateral sepals being attached to the column.

Plate 239.-Eulophia Mannii, Hook. fil. A tuber, part of pseudo-stem, and raceme; of natural sizs. Sketch of entire plant; much reduced. Fig. 1 sepals and petals shown apart, 2 floral bract, ovary, column and lip, seen from the side, 3 lip, 4 column with its short foot, anther in situ and stigma, 5 view of lower surface and interior of anther, 6 pollinia; all enlarged.

## 3. Eulophia gentculata, King and Pantling in Journ. As. Soc. Beng. LXIV, Pt. II, 327.

Tuber large, oblong-rotund. Leaves about three and a half feet in length, of which the petiole forms one-third; the blade narrowly elliptic, acute, plicate. Flowering scape about 18 in . long, clothed throughout with sheathing bracts 1 to 3 in . long, and bearing at its apex a 6 - to 8 -flowered raceme. Flowers 1 in . in diam.; floral bract lanceolate, acute, equalling the cylindric ovary. Dorsal sepal elliptic, blunt; the two lateral ellipticlanceolate, sub-acute. Petals broadly oblong, blunt, shorter than the sepals, connivent over the column. Column rather broad, with no foot. Lip oblong, with long shallow side lobes, its body with three to five parallel thickened nerves which end beyond the extremities of the side lobes in a carunculate area on the truncate apical lobe; the base with a short geniculate spur. Anther small, bicornute at the apex, the lip 2 -toothed.

Sikkim, in the valley of the Teesta, elevation about 1,000 feet; flowering in August.

The sepals of this are brown, the petals and lip pale yellow. The petioles of the two leaves form a pseudo-stem rather shorter than the scape, and they are enclosed within two sheaths about 9 in . long. This pseudo-stem is bound to the scape near its base by two short broad sheaths which originate from the tuber. The nearest ally of the species is E. lactinocheila, Hook. fil.

Plate 240.-Eulophic genieulata, King and Pantling. Parts of a plant, of natural sise. Entire plant; reduced in size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ and lip, 3 lip, 4 front view of column showing the anther, the stigma and the basal spur, 5 anther, 6 pollinia; all enlaryed.

## 4. Eulophia campestris, Wall., Cat. 7617.

Tuber irregularly oblong, lobed, horizontal. Leaves absent at flowering-time, two, linear, acuminate, plicate, 10 to 16 in . long, and 4 in . broad at the middle, proceeding from the apex of a slender sheathed pseudo-stem 6 in. long. Flowering scape 10 to 12 in . high, sheathed at intervals by membranous acute bracts each $\cdot 5$ to 1 in . long; the raceme $2 \cdot 5$ to 3.5 in . long, rather dense. Flowers 1 in . aeross; floral bract membranous, linear, acuminate, longer than the slenderly-stalked ovary. Sepals widespreading, sub-equal, oblong-lanceolate, the dorsal erect; the lateral pair inserted on the column, recurved. Petals narrower than the sepals. Lip equal in length to the sepals and petals, elliptic or elliptic-obovate in general outline; the side lobes rounded, entire; the apical lobe separated by a small sinus from the lateral, transversely oblong, obscurely bifid, the margins irregularly dentate; the basal half of the dise with three sub-parallel
smooth sharp lamellæ ending in a densely setose patch on the mid-lobe; spur short, slender, straight, cylindric, only half as long as the column and lying parallel with it. Column dilated near the stigma and grooved in front, foot none. Anther conical, with a minute upturned lip in front. Pollinıa broad, blunt, the caudicle stout, the gland elongate. Lindl. Gen. and Spec. Orch., 185; in Journ. Linn. Soc. III, 24 (excl. syn. Wight); Reicbh. fil. in Walp. Ann. VI, 647 ; Hook. fil. Fl. Br. Ind. VI, 4. E. ramentacea and E. rupestris, Lindl. in Wall. Cat., 7367, 7368; Gen. and Spec. Orchid,, 185 ; in Journ. Linn. Soc. III., 25. E. hemileuca, Lindl. in Journ. Linn. Soc. III, 25. Limodorum ramenlaceum, Roxb. Hort. Beng. 63 ; Fl. Ind. III, 467. Bletia dubia, Don Prod. Fl. Nep., 30.

In the Terai and Duars at the base of the range, at elevations about 600 to 1,000 feet; Pantling, No. 431; in flower during March. Distributed on the plains of British India from the base of the Himalaya to the Deccan.

The flowers are pale pink with darker lines of the same colour.
Plate 241.-Eulophia campestris, Wall. Plants, with flowering scape and with leaves; of natural size. Fig. 1 a flower, front view, 2 profile view of bract, stalked ovary, column and lip, 3 the lip, flattened out, 4 oolumn, 6 the pollinia, from in front, 7 side view of one of the pollinia; all enlarged.

## 5. Eulophia sanguivea, Hook. fil. Fl. Br. Ind. V, 8.

Rhizome horizontal, fleshy, $1 \cdot 5$ to 2 in. thick. Leaves unknown. Scape 6 to 18 in. long, bearing several loose sheaths. Raceme 4 to 8 in . long and bearing six to twenty-five flowers 1.5 in . across; floral bract linear, nearly as long as the stalked ovary, deflexed. Sepals elliptic-oblong, sub-acute. Petals shorter than the sepals, obovate-oblong, the apex blunt, sub-apiculate, or sometimes notched. Lip about as long as the petals, oblong; the side lobes large, erect, truncate at the apex; the apical lobe ovate-triangular, obtuse, the edges undulate, the disc between the side lobes with two granular lamellæ; the base subcalcarate and projecting. Column long, its foot broad, with dilated sides. Anther 2-lobed at the apex and with a small projection on the lip. Pollinia transversely ovate-orbicular, the caudicle rather thick, the gland broad and thin. Cyrtopera sanguinea, Lindl. in Journ. Linn. Soc. III, 32; Bot. Mag., t. 6161. Eulophia macrorhizon, Hook. fil. in Ann. Bot. Gard. Calcutta, V, 7.

Sikkim, at Mungpoo, elevation 2,000 feet; in flower during May and June, Hooker ; Pantling, No. 186. Khasia Hills, elevation 5,000 feet; G. Mann, Rita,

The flowers are of an almost uniform dull brown, slightly streaked. Leaves of this have never been observed, and it is doubtful whether any are ever produced. None of the rhizomes collected and dried by Mr. Pantling showed any marks of̃ having ever produced leaves ; and on eight living plants under observation since May 1895 no leaves had appeared up to 1897, although the tubers were still alive. In the excellent figure of this plant in the Botanical Magazine ( t . 6161) the lip is represented as white with pink markings and the calcarate base of the lip as green; and the apical lobe of the lip is described as 3 -carinate at the base, the sepals and petals being represented as brownish rather than purple. The species is therefore apparently a variable one.

Plate 242.-Eulophia sanguinea, Hook. fil. Rhizome and inflorescence; of natural size. Fig. 1 profile view of floral bract, stalked ovary, column and lip, 2 petals, 3 lip, 4 column with its foot, the anther in situ, and stigma, 5 anther, 6 pollinia before removal from the colunn, 7 the same some time after removal; all enlarged.
ann. Roy. Bot. Gard., Calcutta, Vol. VHI.
6. Eulophia nuda, Lindl. in Wall. Cat., 7371; Gen. and Spec. Orch., 180.

Tuber spherical, smooth. Leaves from the side of the tuber, forming by their sheaths a short pseudo-stem, elliptic-lanceolate, acute, variable in breadth, 10 to 14 in. long, the sheath long and tubular. Scape from the base of the pseudo-stem, 2 to 3 feet long, with a few wide sheaths at the base and several scattered upwards. Raceme few- and laxly-flowered; floral bract lanceolate, half the length of the stalked ovary. Sepals oblong, acute, erecto-patent, the lateral pair falcate. Petals ovate-oblong, blunt, shorter than the sepals, the outer nerves branching. Lip as long as the sepals, deflexed from below the middle, oblong, the side lobes suppressed, the apical lobe oblong, much undulate, obtuse; the upper surface with many (usually about nine) vertical thickened lines disappearing about the middle. The base of the lip dilated, suddenly contracted to a short flattened spur the entrance to which is ribbed. Column short, with a long foot dilated at the margins. Anther small, its apex with two small conical knobs and a third depressed one in front. Pollinia 2, transversely oblong, attached by a very broad caudicle to a narrow gland. Hook. fil. Fl. Br. Ind. V, 6 ; in Ann. Bot. Gard., Calcutta, V, 32, tt. 47 to 50. E. bicolor, Dalz. in Hook. Kew Journ. Bot. III (1851), 313 ; Dalz. and Gibs. Bomb. Flora, 264 ; Walp. Ann. VI, 647. Cyrtopera fava, Wight Ic., t. 1690; Liudl. in Journ. Linn. Soc. III, 31; Thwaites' Enum., 429; Walp. Ann. 1. e., 668 ; Cyrtopera plicata; Lindl. in Wall. Cat., 7362 ; Gen. and Spec. Orch., 190. C. nuda, Reichb. fil. in Flora, 1872, 274. C. Gardneri, Thwaites' Enum., 302. C. mysorensis, Lindl. in Journ. Linn. Soc. III, 32. C. laxifora, Gard. MSS. ex Thw. Enum., 302. Dipodium Roniata and D. plicatum, Herb. Ham.

Sikkim, in tropical valleys, at elevations up to 1,500 feet; in flower from April to July; Pantling, No. 212.

This is a widely distributed and variable species. The Sikkim form has the sepals and petals pale green, the former with brown markings externally. The lip is of a very pale green at the base, becoming white at the middle and flushed with pink near the apex. The column is white and the anther is brownish. In the fifth volume of these Annals, Sir Joseph Hooker has given an account of four distinct forms of this species which are found in Burma, the first of the four being the one which seems to agree most elosely with the plant from Nepal originally named E. nuda by Lindley. The varieties are all figured by Sir Joseph in the volume alluded to.

Plate 243 - Eulophia nuda, Lindl. A plant; of natural sizg. Fig. 1 sepals and petals separated, 2 part of rachis, bract, ovary, column with anther in situ and lip, 3 column and its foot, the anther in situ, front view, 4, pollinia, all enlarged.

## 7. Eulophia bicarinata, Hook. fil. Fl. Br. Ind. VI, 6.

Tuber oblong, irregularly lobed, compressed, about 2 in . long. Leaves absent at flowering time, linear, acuminate, much narrowed to the long petiole; length of blade 7 to 12 in., breadth about 75 in.; petiole 6 to 8 in., sheathed at the base. Scape erect, 10 to 20 in . high, with two tubular closely fitting sheaths near the base and two shorter loose ones higher up. Racems rather densely flowered, 3 to 5 in. long. Flowers 1 in: in diam.; floral bract membranous, lanceolate, shorter than the stalked ovary. Sepals oblong, acute, keeled, their edges reflexed, the lateral pair slightly wider than the dorsal and free from it at their bases, Petals narrowly elliptic, sub-acute, shorter but wider than the sepals. Lip adnate to the foot of the column, longer than the sepals,
slightly saccate at the base, 3 -lobed; lateral lobes shallow, broad, with blunt apices; apical lobe transversely oblong, emarginate, the edges slightly crisped; the dise between the side lobes with two short smooth thickened lines half as long as the latter and ending in a free triangular tooth in front of which rise five carunculate unequal ridges which run on to the base of the apical lobe. Column erect, its edges lobed opposite the stigma, its foot half as long as itself and at right angles. Anther apiculate in front. Pollinia broadly triangular, divergent, attached by a broad caudicle to a thin angular gland. Cyrtopera bicarinata, Lindl. in Wall. Cat., 7363; Gen. and Spec. Orch., 189; in Journ. Linn. Soc. III, 31 (excl. cit. Ic. Griff) Cymbidium sp., Griff. Notul. III, 343, No. 9.

Sikkim, at the foot of the range; in flower during March and April; Pantling, No 435.

There is a large form of this which, as it differs from the type-form in some other respects than size, we have made a variety.

Var. major; larger than the type, with larger tubers, stouter scapes, larger flowers ( $1 \cdot 33 \mathrm{in}$. in expanse), in a less dense raceme ; the lip with a dense cluster of callosities in front of the lamellæ.

Sikkim, at the foot of the range; in flower during March and April; Pantling, No. 436.

The sepals and petals are of a pale yellowish-green. The basal half of the lip is of the same colour, the apical lobe being of a very pale purple at the margins.

Plate 244.-Eulophia biearinata, Hook. fil. A plant; of natural sizo. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, 3 lip, 4 column with its foot, and spur, 5 empty anther seen from below, 6 pollinia; all enlarged.

Plate 244 bis.-Eulophia bicarinata, var. major, King and Pantling. A plant; of natural size. Fig. 1 a flower, 2 profile view of bract, stalked ovary, column and lip, 3 lip, flattened out, 4 column, 5 back view of anther, 6 back and front views of the pollinia; all enlarged.

## 35. Geodorum, Jackson.

Terrestrial, with underground sub-globose rhizomes. Leaves elliptic, plicate, their sheaths forming a pseudo-stem. Scape from the base of the pseudo-stem, stout, erect, sheathed, bearing a decurved corymbose raceme. Flowers rather crowded and narrow, about $\cdot 5 \mathrm{in}$. long. Sepals equal, oblong, sub-acute, erect. Pe'als as long as the sepals, but broader and blunt. Lip sessile on the base of the column, not narrowed at the callus-bearing base but broadly ventricose, without side lobes; the apical lobe broad, rounded, bifid or emarginate. Column less than half the length of the lip. Anther broad, two-celled. Pollinia 2, broadly and dimidiately ovoid, attached by a tapering slender caudicle to a small orbicular gland. Species about 10 ; Indian, Malayan and Australian.

A genus of terrestrial orchids closely allied to Eulrphin, having a similar habit and lip. The genus is less closely allied to Cremasira, but has a very different lip. In the latter the lip has a long narrow body expanding at the apex into two acule lateral and one oblong terminal lobe, the latter having a large ligulate process near its base. In the present genus the lip is deeply ventricose at the base, there are no side lobes, and the terminal lobe at the apex of the sac is orbicular and without any ligule.

## Geodorum purpureum, R. Brown in Ait. Hort. Kew, Ed. 2, V, 207.

Tuber globular, apiculate, $1 \cdot 25 \mathrm{in}$. in diam. Pseudo-stem 3 to 6 in . long. Leaves elliptic, acute, tapering to the long sheath, 6 to 12 in . long and .3 to 4 in . broad.

Infloresence shorter than the leaves, the raceme short, corymbose and drooping when in flower but lengthening and erect when in fruit; floral bract large, lanceolate, longer than the ovary. Petals with thickened midribs. Lip very ventricose at the base and much thickened; thickened also on the rounded minutely notched apical lobe, its dise much granulated. Pollinia 2, with elongate pits on their posterior surfaces. Lindl. Gen. and Spec. Orch., 175; Dalz, and Gibs. Bomb. Flora, 266; Hook. fil. Fl. Br. Ind. VI, 16. G. dilatatum, Wall, Cat. 7376, Limouorun nutans, Roxb. Corom, Plants I, t. 40; Fl. Ind. III, 470; Malaxis nutans, Willd. Sp. Pl. IV, 93.

Sikkim, at low elevations; in flower during April and May; Pantling, No. 279. Westward to Nepal and eastward to Bhutan; also in Assam, Bengal, Burma, the Andaman Islands, Ceylon and the Deccan; probably distributed in the Malayan countries.

The flowers are either pure white or pale purple with darker markings on the lip, the calli on the lip are yellow.

Plate. 245.-Geodorum purpureum, R. Brown. A plant; of natural size. Fig. 1 floral bract, ovary and flower, 2 apex of column and lip, seen from the side, 3 section through the column and lip, 4 three-fourths view of column showing the large stigma and anther in situ, 5 anther with the valves turned outwards, 6 pollinia in situ on the column, front view, 7 back view of the pollinia showing the pits; all enlarged.

## 36. Cremastra, Lindl.

Terrestrial; stem bulbous at the base and proceeding from a large nodulated root-stock, tall, erect, stout, with several large loose sheathing bracts. Leaves radical, elliptic, plicate. Flowers long and narrow, in a conical crowded raceme, pendulous. Sepals and pe'als narrowly lanceolate, closely pressed together towards the base, spreading slightly towards the apex. Lip adnate to the base of the column, erect, linear, minutely sub-saccate at the base, slightly dilated and 3-lobed towards the apex; the lateral lobes narrowly oblong, divergent; the apical lobe exceeding the lateral, oblong, blunt, with a fleshy appendage near its base. Column long, slender, straight, dilated, and 3 -lobed at the apex. Anther conical, 1-celled. Pollinia 4, cuneate-ovoid, compressed. Stigma very large. A single species; a native of India and Japan.

> Cremastra Wallichiana, Lindl. in Wall. Cat., 7349 ; Gen. and Spec. Orch., 172.

Leaves usually two, on long petioles, sometimes spotted, plicate; length of blade 6 to 12 in., breadth 3 to 5 in., petiole 4 to 6 in . Inflorescence often twin, shorter than the fully developed leaves; the racemes conical, 4 to 6 in . long. Flowers narrow, imbricate, drooping, 1.2 to 1.4 in . long; floral bract lanceolate, much exceeding the short sessile ovary. Miq. Prol., 136; Franchet and Sabatier Enum. Pl. Jap. II, 24 ; Hook. fil. Fl. Br. Ind. VI, 16. C. mitrata, A. Gray, Bot. Jap. 411. Hyacintnorchis variabilis, Bl. Mus. Bot. Lugd. Bat. I, 48, t. 16; Walp. Ann. VI, 628.

Sikkim, at elevations of 6,000 to 8,000 feet; Hooker and others. Pantling, No. 142; in flower during April.' Khasia Hills; Griffith (Kew Distrib.), No. 5204. Nepal; Wallich. Distrib., Japan.

The flowers of this are pink; the rachis of the raceme and its peduncle being green, speckled with brown. Dactylostalix ringens, Reichb. fil. Bot. Zeitung, 1878, p. 74, is probably this plant.

Plate 246.-Cremastra Wallichiana, Lindl. A plant; of natural sise. Fig. 1 a flower, 2 floral bract, ovary, column with anther in situ and lip, 3 lip, 4 upper half of column with anther, in situ, 5 apex of the column showing the pollinia attached to their gland, 6 anther; all enlarged.

## 37. Oreorchis, Lindl.

Terrestrial; pseudo-bulb corm-like, broadly ovoid, 1- or 2-leaved. Leaves long, narrow. Scape tall, slender, produced from the side of the pseudo-bulb; flowers rather small, in racemes. Sepals ovate-lanceolate. Petals sub-similar and slightly spreading or subconnivent. Lip more or less oblong, attached to the base of the column by a short narrow claw, gibbous at the base or not, the anterior part 3 -lobed ; the side lobes short, entire; the terminal lobe broad, more or less bifid. Column elongated, stout, more or less curved, the apex sub-truncate. Anther 1-celled. Pollinia 4, globose, united to a short common caudicle ending in a gland derived from the stigma. A genus of four species all inhabiting Northern Asia.

Lip with a short globose sae at the base; leaves oblong-lanceolate, solitary . 1. O. foliora.
Lip not saccate at the base ; leaves linear, usually two . . . . . . . . 2. O. micrantha.

## 1. Oreorchis foliosa, Lindl. in Journ. Linn. Soc. III, 27.

Pseudo-bulb about $\cdot 6$ in. long, the base broad and bearing a few lax fibres. Leaf solitary, terminal, solitary, oblong-lanceolate, acuminate, narrowed at the base to a short petiole, plicate, with two or three very bold nerves and slender ones between; length 4 to 9 in., breadth $\cdot 5$ to $\cdot 85 \mathrm{in}$., petiole $\cdot 75$ to $2 \cdot 25 \mathrm{in}$. Scape 12 to 18 in . long; the peduncle with two or three tubular closely fitting sheaths 1 to 2 in . long; raceme 3 to 8 in . long, laxly few-flowered; floral bract small, equalling in length the short pedicel of the ovary. Flowers 5 in. long. Sepals ovate-lanceolate, sub-acute, the lateral pair produced at the base on to the sac of the lip. Petals broader than the sepals, but not quite so long, the apices of all more or less connivent. Lip longer than the sepals, deflexed from below the middle, clawed and shortly saccate at the base; side lobes broadly oblong, oblique, obtuse, 3 -nerved, their edges entire; terminal lobe sub-reniform (when flattened out), shortly bifid, the margin thickened and erose; dise with five stout branching nerves but not lamellate. Column very slightly curved; the sides thickened, especially towards the base and passing into the short sac of the lip. Hook. fil. Fl. Br. Ind. V, 709. Corallorhiza, sp. Lindl. in Royle Ill. Him. Bot., 362.

Sikkim, Lachen Valley, elevat. 10,000 feet; Sir J. D. Hooker; Pantling, No. 399 ; in flower in July. North-west Himalaya; at Simla, Gamble, 7,800 ft. Gharwal; Royle. China; West Szechuen and Tibetan Frontier, Pratt, No. 19.

The flowers are reddish in colour.
Plate 137.-Oreorchis foliosa, Lindl. A plant; of natural size. Fig. 1 flower, 2 bract, stalked ovary, column, lip (anther and pollinia remored), seen from the side, 3 lip flattened out, 4 column soon after fertilization; all enlarged.

## 2. Oreorchis micrantha, Lindl. in Journ. Linn. Soc. III, 27.

Pseudo buıb about 75 in . long, ovoid-conic, the base with a few fibres. Leaves usually two, with occasionally an abortive third, but often solitary, linear, passing at the
base into a sheath, boldly 1 - or 2-nerved; length 6 to 12 in., breadth 25 to 4 in. (occasionally broader). Scape 12 to 18 in . long, rising from the side of the pseudo-bulb, the peduncle with two or three tubular sheaths; raceme 2 to 4 in. long, lax, few-flowered; floral bract minute, shorter than the pedicel of the ovary. Flovers 4 in. long Sepals elliptic-lanceolate, sub-acute, slightly spreading. Petals narrower than the sepals, oblanceolate, sub-acute. Lip obovate-oblong; the base narrowed to a very short claw, not saccate; side lobes long, narrowly oblong, horizontal, entire, sub-acute; the terminal lobe deflexed from its base, broadly obovate, with a deep sinus in the middle and two broad lobules; the dise with a thick linear channelled fleshy callus. Column much curved, the base dilated and concave. Pollinia globular, united to a short thick caudicle. Hook. fil. Fl. Br. Ind. V, 709.

Sikkim, in the Lachen Valley, altitude 10,000 feet; Pantling, No. 400. Western Himalaya, altitude 8,000 to 10,000 feet; Strachey and Winterbotham, (Orchid No. 56).

The colour of the flowers is pale yellow, the lip being spotted with red.
Plate 138.-Oreorchis mieruntha, Lindl. A plant; of natural size. Fig. 1 flower, front viev, 2 floral bract, pedicelled ovary, column (without anther) and lip, side viect, 3 lip, 4 column, 5 pollinia; all enlarged.

## 38. Cymbidium, Swartz.

Epiphytal, with a short stout pseudo-stem; rarely terrestrial or with an elongated leaf-bearing stem. Leaves coriaceous, very long and narrow, rarely elliptic. Inflorescence from the side of the pseudo-stem; its peduncle usually with numerous sheaths; the raceme many- or few-flowered, erect or drooping; the floral bract various. Flowers usually large and handsome. Sepals and petals sub-equal, free-spreading or erect. Lip adnate to the base of the column and embracing it more or less by its convolute side lobes; the apical lobe decurved, often with undulate edges, the disc usually with two ridges or lamellæ. Column long, without a foot. Anther 1- or imperfectly 2-celled. Pollinia 2, ovoid, pyriform, cuneiform or globular, more or less partite, sessile, on a small or large often strap-shaped gland. Species about 60 ; tropical or sub-tropical, on mountains in Asia with a few from Africa and Australia.
I.-Eucymbidium. Sepals and petals spreading; pollinia transversely ovoid or pyriform, (sub-globular in No. 3), their points divergent; rostellum not beaked.

Terrestrial; inflorescense erect, capsules fusiform and also erect.
Leaves elliptic, bome on a stem

1. C. lanoifolium.

Leaves linear, their bases forming a short pseudo-stem, lamellæ flat.

$$
\begin{aligned}
& \text { Flowers green, the lip with purple markings; pollinia } \\
& \text { horizontal, ovoid or obovoid, with divergent points . 2. C. cyperifolium. } \\
& \text { Flowers pale yellow marked with broken vertical purple } \\
& \text { lines; pollinia globular . }
\end{aligned}
$$

Epiphytal; inflorescence decurved.
Flowers not more than 1.5 in . across (usually less) in any direction.

Inflorescence less than half the Iength of the leaves.
Sepals and petals purple, broadly edged with white; ridges of the lip two, glandular-pubescent
4. C. Simonsianum.

Sepals and petals dark purple edged with yellow,
ridges of the lip two, smooth, parallel, continu-
ous; leaves acute; entire at the apex . . . 5. C. pendulum.
Inflorescence nearly as long as the leaves.
Sepals and petals ochraceous, each with a central purple band; ridges of the lip two, smooth, not continuous (disjointed near the middle); leaves sessile, broadly linear-oblong (l in. or more wide), blunt and notched at the apex
Sepals and petals purplish-brown with green stripes, ridges of the lip short, broad, smooth, continuous; leaves oblong-oblanceolate, petiolate.
6. C. aloifulium.
7. C. Detonianum.

Flowers $2 \cdot 5$ to 4 in . in diam.
Sepals and petals pale green with numerous close purplishbrown stripes; lip white, striped and spotted with purple
8. C. longifolium.

Flowers yellow with numerous brown stripes, the apical lobe of the lip with transverse blotches .
9. C. giganteum.

Sepals and petals pale green, not striped or spotted; lip yellow, spotted with brown
10. O. grandiflorum.
II.-Cyperorchis. Sepals and petals sub-equal, erect and connivent (spreading in Nos. 11, 15 and 16), long and narrow; lip narrow with the apical lobe small and sub-orbicular, pollinia cuneate or obovoid, rostellum beaked.

> Pollinia cuneate, compressed. Flowers ochraceous, striped and flushed with brown, the tips of the side lobes of the lip speckled with pink and the apical lobe yellow with purple spots; sepals and petals slightly spreading Sepals and petals pale yellowish-green spotted with dull red; lip pink spotted . . . . . . . . . . . . . . . . . . . . . . . . . . C. Whieanum.

Pollinia obovoid or pyriform, not compressed.
Flowers numerous, imbricate, pale yellow; lamellæ of lip long and narrow
13. C. elegana.

Flowers numerous, greenish-brown, the lip yellow speckled with red, with smooth lamellæ
14. C. cochleare.

Flowers few, white tipped with pink; the lip flushed with yellow, its two lamelle orange-coloured
15. C. Mastersii.

Flowers 1 or 2 , pure white; the lip with three ridges of a brilliant yellow colour
16. C. eburneum,

## 1. Cymbidium lancifolium, Hook. Exot. Flora, t. 51.

Terrestrial ; stems narrowly fusiform, 2 to 6 in . long, clothed with many large scarious sheaths and fibres, the roots long, thick and spongy. Leaves 3 or 4, oblong-oblanceolate, acute, narrowed into a very long petiole sheathing at its base; length of blade 6 to 8 in., breadth 1 to $1 \cdot 25$ in., petiole 4 to 8 in. Raceme shorter than the leaves; its peduncle 2 or 3 in . long, with several short lax sheaths. Flowers 3 or 4 , distant, 1.5 in .
rarely 2 in . across, floral bract much shorter than the pedicelled ovary. Sepals sub-equal, oblanceolate, acute. Petals shorter than the sepals, but of similar shape. Lip as long as the petals, 3 -lobed ; the lateral lobes broad, rounded, entire; the apical lobe narrow, sub-acute, much recurved; the disc between the lobes with two horizontal thickened lamellæ and broader at the apex than at the base. Column long, erect, curved. Anther quadrate, granular externally, 2-celled. Pollinia obliquely ovoid, pointed, diverging, sessile on a broad gland. Capsule fusiform, beaked, sharply 3 -angled, 3 in. long. Lindl. Gen. and Spec. Orch., 164; in Journ. Linn. Soc. III, 30; Wall. Cat., No. 7351 ; Lodd. Bot. Cab., t. 927; Hook. fil. Fl. Br. Ind. VI, 9. C. Gibsoni, Paxt. Fl. Gard. III, 618, t. 301; Walp. Ann. VI, 623. C. Javanicum, Blume Bijdr. 380; Lindl. Gen. and Spec. Orch., 170 ; Griff. Ic. Plant. Asiat., t. 300, fig. 1.

Sikkim, near Sureil, elevation 6,000 feet; in flower during June; Pantling, No. 75. Westward along the range to Nepal and eastward to Mishmi. Khasia Hills, altitude 4,000 to 6,000 feet; Griffith, Simons. Naga Hills; Prain. Perak; Kunstler, Scortechini. Distrib. Java.

The sepals and petals of this are green, the latter having a red median stripe; the lip is white with red transverse bars.

Plate 247.-Cymbidium lancifolium, Hook. A plant; of natural size. Fig. 1 column with anther in situ and lip, side view, 2 lip, flattened out, 3 cross section of the lip where its lamellæ meet, 4 column with anther in situ, 5 profile view of the upper part of the column, the anther-cap having been removed, 6 upper surface of anther, 7 lower surface of the same, 8 pollinia; all enlarged, 9 capsule, 10 transverse section of the same; of natural sise.

## 2. Cymbidium cyperifoliux, Wall., Cat. 7353 (in part).

Terrestrial; pseudo-stem thin, short. Leaves linear, finely acuminate, slightly expanded towards the sheathing base ; length 9 to 30 in., breadth 25 to 4 in., the lower two or three short and sheath-like. Inflorescence from the base of the pseudo-stem, erect, about a foot long; the peduncle clothed to the base of the raceme with long acuminate sheaths. Raceme 3- to 7 -flowered. Flowers about 1 in . long and about 1.5 in. across; floral bract lanceolate, acuminate, longer than the stalked ovary. Sepals sub-equal, narrowly oblong, acute, spreading. Petals slightly shorter than the sepals and somewhat broader. Lip glabrous, as long as the petals, oblong (when spread out), 3 -lobed; the lateral lobes long, narrow, erect; apical lobe abruptly deflexed, ovate or oblong-ovate, sub-acute or blunt, entire, the disc between the side lobes with two smooth lamellæ. Column rather stout. Anther broad. Pollinia obliquely ovoid, divergent, cleft to nearly the base, sessile on a very narrow elongate gland. Capsule ellipsoid-clavate, 2.5 in . long. Lindl. Gen. and Spec. Orch, 163; in Journ. Linn. Soc. III, 28; Hook. fil. Fl. Br. Ind. VI; 13 (excl. syn. Limodorum longifolium, Roxb.) C. viriliffurum, Griff. Itin. Notes, 126, No. 454.

Sikkim, at Choong thang, elevation 5,000 feet; in flower during November; Pantling, No. 306. Westward to Gharwal, at elevations of about 5,000 feet, and eastwards to Bhutan. Khasia and Naga Hills, at elevations of 3,500 to 6,500 feet. Shan Hills, in Burma. Perak; Java.

The flowers of this are green, becoming yellowish with age; the ovary and its stalk are dull purple, and the lip has streaks and blotches of the same colour. They are
fragrant. The rachis of the raceme is also purplish. The Ceylon plant named C. hematudes by Lindley is considered by Sir Joseph Hooker to be only a form of this. It has (according to Lindley) white sepals and petals with rose-coloured veins, a white lip with red spots and a yellow column. We have tentatively excluded from the synonymy of this Limodorum longifolium, Roxb. (Fl. Ind. III, 468), because the author's own drawing of that plant in the Calcutta Herbarium represents the colour of the flowers as of a deep rose colour, and the lip as deflexed and flattened. It is just possible, however, that Roxburgh's figure may have been coloured reddish instead of yellowish, by some blunder of the draftsman, and that the lip also may have been wrongly represented. In all other respects (including the terrestrial habit) Roxburgh's drawing of Limodorum longifolium would pass for one of Cymbitium cyperifolium. And we know of no other orchid to which this plant of Roxburgh's can be referred without even greater difficulty. Part of Wallich's No. 7353, although named C. cyperifolium by himself, is really C. longifolium, Don.

Plate 248.-Cymbidium cyperifolium, Wall. An entire plant; of natural sise. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther and lip, in profile, 3 lip, 4 column and anther, 5 anther, 6 pollinia, 7 a capsule; all enlarged.

## 3. Cymbidium Munrontanum, King and Pantling in Journ. As. Soc. Beng. LXIV, Pt. 2, p. 338.

Terrestrial; leaves stiff, erect, linear, acuminate, 16 to 20 in . long and $\cdot 75 \mathrm{in}$. broad, tapered into a petiole or not. Racemes stout, erect, about 1 foot long, (about half being stalk), with two or three distant closely embracing sheaths 1 in . long. Flowers about 7 or 8 , distant, 1 in . in diam.; floral bract shorter than the stalked ovary, lanceolate. Sepals and petals sub-equal, oblong-lanceolate, acute. Lip lanceolate (when flattened out), everywhere concave on the upper surface; the lateral lobes elongate and shallow, the disc with two parallel smooth lamellæ in its centre ending with the side lobes, the apical lobe narrow and reflexed. Pollinia plano-convex, bifid, sessile on the narrow gland.

Sikkim, in the Teesta Valley, on dry knolls at an elevation of 1,500 feet. Bhutan Duar; flowering in May; Pantling, No. 256.

The flowers of this species are sweetly-scented, the sepals and petals are strawcoloured and each has five dotted or streaked lines, the lip being pink except its apical loba which is pale yellow transversely blotched with red. Its nearest ally is $C$. ensifolium, Swartz, under which it appears to be included by Lindley and other authorities. But this Sikkim plant appears to us to differ very materially from the true Chinese C. ensifolium. The species is dedicated to the late Mr. James Munro, for many years resident in Sikkim and well known, not only as a lover of plants, but as a man of great sincerity, and of unlimited kindness and hospitality. This is the Sikkim plant referred to in a nota under the description of $C$. ensifolium in the Flora of Br . Ind. VI, 14.

Plate 249.-Cymbidium Munronianum, King and Pantling. A plant; of natural size. Fig. 1 lip, 2 floral bract, stalked ovary, column with anther and lip, side view, 3 part of ovary, column and anther, 4 empty anther from behind, 5 pollinia, front and back view; all enlaryed, 6 capsules; of natural sise.
4. Cymbidium Simonstanum, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, p. 338.

Leaves linear, sessile, not dilated at the base, the apex acute and sub-oblique, length 3 feet or more, breadth $\cdot^{4}$ or $\cdot 5$ in. Raceme 8 in. long, pendulous, shortly stalked, sheathed at the base by large imbricate bracts 1 to 2.5 in . long. Flowers about 10 to 12, sparse; their bracts triangular, very short. Sepals subequal, linear-oblong, slightly wider near the apex, about 1 in . long. Petals rather shorter than the sepals, connivent round the column. Lip with long shallow erect blunt entire side lobes parallel with, and as long as, the column; the apical lobe ovate, apiculate, deflexed; lamellæ of the lip stout, parallel, clothed with glandular hairs, ending abruptly with the side lobes, but continued partly into the apical lobe as thickened lines. Pollinia falcately ovoid, compressed, divergent, the gland narrow.

Sikkim, in the valley of the Teesta, elevation about 1,000 feet; Pantling, No. 51. Flowers in August. Assam; locality unknown.

The flowers of this species are sweet-scented; the sepals and petals are white with a crimson central line; the lip is purple, but has oblique white and yellow lines on the lateral lobes, with a large blotch of yellow on the apical lobe; the column is of a very dark crimson, and the anther of a pale yellow colour. Specimens of this plant were sent many years ago from Assam by the late Dr. J. C. Simons, to whom the Calcutta Herbarium is indebted for numerous contributions of plants, and for a large number of drawings of orchids. The species has been dedicated to his memory.

Plate 250.-Cymbidium Simonsianum, King and Pan'ling. A plant; of natural siss. Fig. 1 column with anther in situ and lip, side view, 2 lip, 3 column with anther, 4 section through the lip to show the lamello with their glandular hairs, 5 empty anther from behind, 6 pollinia, front view, 7 the same, back view; all enlarged.

## 5. Cymbidium pendulum, Swartz in Nov. Act. Upsal. VI, 73.

Pseudo-stem stout, 3 in. long. Leaves linear-oblong, acute, not notched, 24 to 30 in. long and 75 to 1 in . broad, sheathing and expanded at the base. Inflorescence 10 or 12 in . long, decurved from the base; the peduncle about 3 in ., clothed with imbricate withered sheaths each 5 to 2 in. long. Flowers numerous but not crowded, 1.25 in. across; floral bract small, triangular, stalked ovary ${ }^{5}$ in. long. Sepals equal, oblong, slightly dilated near their blunt apices. Petals nearly as long as the sepals and a little wider. Lip adnate to the short foot of the column, oblong, dilated and sub-saccate at the base; side lobes narrow, their apices blunt and pointed forwards; apical lobe oblong, blunt, emarginate, much decurved; disc between the side lobes with two parallel continuous lamellæ divergent at the base, meeting in the middle, and slightly separating at their clavate apices. Column erect, slightly narrower at the apex than at the base, with a very short foot. Anther broad, depressed, minutely papillose. Pollinia ovoid, acute, diverging, sessile on a broad thin narrow gland. Roxb. Fl. Ind. III, 458 ; Lindl. Gen. and Spec. Oreh., 165; Walp. Ann. VI, 624 (excl. cit. Bot. Reg.) C. aloifolium, Hook. fil. Fl. Br. Ind. VI, 10 (in part). C. crassifolium, Wall. Cat., 7357. C. Mannii, Reichb. fil. in Flora, 1872, 274. Epilenlrum pendulum, Roxb. Corom. Plants, I, 35, t. 44.

Sikkim, at the bottoms of tropical valleys and along the base of the range; common; in flower during May; Pantling, No. 441. In Bengal, Assam, Sylhet, Burma, Andaman Islands, S. India. Perak; Wray, No. 3738.

The flowers of this are of a dark purple brown throughout, the sepals and petals having yellow margins. This resembles C. aloifolium, Swartz, but has narrower leaves, acute, not emarginate at the apex, and a shorter raceme which is pendulous from its origin. The flowers also are smaller, and the ovary is only half as long as in that species. The lip also differs, being continuously bilamellate in this, and the apical lobe being emarginate at the apex. The flowers of this are much darker in colour than those of C. aloifolium, Swartz, as the latter occurs in Sikkim. The two plants are apparently distinct, and no intermediate forms are found. They are readily recognised in the living state while in flower; but, in the Herbarium, it is not easy to distinguish them.

Plate 251.-Cymbidium pendulum, Swartz. A plant; of natural size. Fig. 1 floral bract, stalked ovary, column, anther in situ and lip, in profile, 2 lip, 3 column with anther, 4 empty anther from behind, 5 pollinia; all cnlarged.

## 6. Cymbidium aloifoliun, Swartz in Nov. Act. Upsal. VI, 73.

Pseudo-stem short. Leaves linear-oblong, curved, obtuse, fleshy, slightly and obliquely notched at the apex, somewhat sheathing and slightly expanded at the base; length 12 to 22 in., breadth 1 to $1 \cdot 15 \mathrm{in}$. Inforescence from the base of the small pseudostem, somewhat shorter than the leaves; the peduncle 3 or 4 in . long, bearing several tubular acute scarious sheaths near the base; ruceme many-flowered, decurved, 9 to 18 in . long. Flowers 1.5 in . across; the floral bract ovate, minute, the stalked ovary nearly 1 in . long. Sepals. sub-equal, oblong, slightly oblanceolate, blunt, the lateral pair somewhat falcate. Petals as long as the sepals, ovate-oblanceolate, blunt. Lip as long as the sepals, oblong, 3 -lobed, its upper surface with two lamellæ broken and disconnected in the middle; the lateral lobes long, narrow, their apices blunt, entire, pointing forwards; the apical lobe ovate-oblong, much decurved. Column slightly thickened at the apex. Anther papillose, sub-quadrate, the gland of the pollinia small. Capsule elliptic, pointed at each end, 3 -grooved. Swartz in Schrad. Journ. Bot. 1779, II, 218; Roxb. Fl. Ind. III, 458; Lindl. Gen. and Spec. Oreh., 165; Lodd. Bot. Cab., t. 967 ; Walp. Ann. VI, 624 (excl. ic. Wight) ; Hook. fil. Fl. Br. Ind. VI, 10 (in part). Epidendr:m aloifolium, Linn. Sp. Pl. 953. ?Aerides Borassi, Smith in Rees' Cyclop. Suppl. (in part). Epinendrum aloides, Bot. Mag., t. 387.

Sikkim, at low elevations; in flower during April and May; Anderson; Pantling, No. 268. In Bengal, Assam, Andaman Islands, Perak. South of India; Wight, No. 2989. Ceylon; Thwaites, C. P., 3379 (named C. bicolor). ? China.

There has been some confusion between Swartz's two species C. aloifolium and C. pendulum. This confusion is partly dissipated if Swartz's original descriptions be consulted. From these it will be seen that both species were founded on figures, not on plants. C. aloifolium was founded on Rheede's figure of Kansjiram-Maravara in Vol. XII, t. 8 of his Hortus Malabaricus (which Linnæus named Fpidendrum aloifolium Sp. Pl. 1350). And C. pendulum was founded on Roxburgh's figure of Epidendrum pendulum in his Coromandel Plants, I, t. 44. The next author who dealt with the two
was Lindley who, in his Genera and Species of Orchids, kept them both up, distinguishing them thus:

|  | C. aluifolium. | C. perdulum. |
| :---: | :---: | :---: |
| Sepals and petals | ... lanceolate, rather obtuse. | linear-oblong, obtuse. |
| Lateral lobes of lip | ... oblong, obtuse. | orate, acute. |
| Lamelle of lip | ... interrupted, elavate, curved in the lower half | continuous, approximated at the apes. |

Sir Joseph Hooker in his Flora of British India united the two under the name C. aloifolium; and, if Herbarium material only be examined, there is much to be said for this treatment. The plants as they grow, which they do side by side in Sikkim, appear however so different that we have kept up both as a species. The sepals and petals of C. aloifolium, as we have figured it, are yellowish, each having a broad mesial purple stripe. The upper surface of the lip is purple, with darker lines of the same colour and a patch of whitish at the base of the apical lobe. The outer surface is yellowish and striped only on the apical lobe. It has broader, blunter, and more coriaceous leaves than C. pendulum, and their apices are notched; the peduncle of the raceme being erect, while the raceme itself is decurved; whereas in C. pendulum the peduncle is decurved from its origin from the stem.

Plate 252.-Cymbidium aloifolium, Swartz. A plant; of natural size. Fig. 1 apex of ovary, column and lip, side rieco, 2 lip, front view, 3 frout view of column with anther, 4 empty anther, 5 pollinia in situ after removal of anther-cap, front view, 6 pollinia and gland after removal, back view; all enlarged.

## 7. Cymbidium Devontanum, Paxt. Mag. Bot. X, 97, cum ic.

Pseudo-stem short, clothed with large scarious imbricate acute sheaths. Leaves two or three, coriaceous, narrowly oblong-oblanceolate, sub-acute, attenuated into a long-channelled petiole; length of blade 9 to 12 in., breadth 15 to 2 in., petiole 5 to 8 in. long. Inforescence about as long as the leaves, pendulous, the peduncle shorter than the raceme, bearing four to six loose lanceolate acuminate sheaths. Raceme many-flowered. Flowers about 1.25 in. across vertically, and about 85 in. horizontally; floral bract small, oblong, acute, much shorter than the stalked ovary. Sepals sub-equal, oblong-lanceolate, acute, spreading, curved. Petals as long as the sepals, ovate-lanceolate, spreading. Lip as long as the petals, oblong, concave, decurved from the base; the side lobes obscure, gradually passing into the triangular-ovate mid-lobe; the lamellæ short, broad, smooth. Column winged towards the apex, the base narrowed and with two small glands. Anther domeshaped. Pollinia ovoid, pointed, diverging, sessile on a broad gland. Capsule ovoid, pointed at each end, nearly 1.5 in. long. Warner Orch. Alb., t. 170 ; Reichb. fil. in Gard. Chron., 1881, I, 395; Hook. fil. Fl. Br. Ind. VI, 10.

Sikkim, at elevations of from 5,000 to 7,000 feet; in flower during May and June; Pantling, No. 265.

The flowers vary in colour from brownish to purple. The common coloration in Sikkim is that shown here, viz., sepals and petals purplish-brown with green lines; lip of a darker hue, with a white patch mottled with purple near the base; column greenish with purple blotches at apex and base.

Plate 253.-Cymbidium Deconianum, Paxt. A plant; of natural size. Fig. 1 bract, stalked ovary, column with anther in situ and lip, 2 lip, 3 column and anther, 4 anther from behind, 5 pollinia, resting on the column; pollinia from behind; all enlarged.

## 8. Cymbidium longifolium, Don Prodr., 36.

Pseudo-stem short. Leaves linear, acuminate, channelled below, dilated and equitant at the very base, 24 to 36 in . long and only 5 to 65 in . broad. Inflorescence very stout, sub-erect in the lower but decurved in the upper half, shorter than the leaves; the peduncle sheathed nearly to the apex; the sheaths larger upwards, all loose and acute. Raceme 10 - to 15 -flowered. Flowers 2.5 to 3 in . across; floral bract minute, triangular, the stalked ovary about 1 in. long. Sepals sub-equal, oblong, sub-acute, the dorsal broader and incurved, the lateral pair spreading. Petals as long as the sepals but narrower, spreading. Lip oblong, contracted near the base into a short claw; side lobes long, narrow, their acute pointed apices directed forwards; apical lobe thinly pubescent on its upper surface, decurved, orbicular, acute, the edges slightly undulate. Column erect, slightly saccate at the base. Anther broad, dome-like. Pollinia ovate, diverging, sessile on a quadrate gland of which the lower comers are elongated into narrow points. Wall. Cat. 1356; Lindl. Gen. and Spec. Orch., 163; in Journ. Linn. Soc. III, 29 ; Reichb. fil. in Gard. Chron, 1874, 1, 14; Hook. fil. Fl Br. Fnd. VI, 13. C. erythroum, Lindl. in Journ. Linn. Soc. III, 30. Limodorum angustifolium, Herb. Ham.

Sikkim, at elevations of 5,000 to 7,000 feet; in flower during September and October; Pantling, No. 8. Westward to Gharwal and eastward to Bhutan. Khasia and Naga Hills; at elevations of from 3,500 to 6,000 feet.

This bears a strong general resemblance to C. gigantcum, Wall., but its leaves are somewhat narrower. The greatest differences, however, lie in the flowers which have narrower and differently coloured sepals, and in the lip which in the two is dissimilar both in colour and in shape. In this the ground colour of the sepals and petals is pale green, copiously striped with brownish-purple, the dorsal sepal externally being of a dark green indistinctly striped. The disc and apical lobe of the lip are pure white, spotted with purple, the side lobes being ochraceous with numerous close purple lines.

Plate 254.-Cymbidium longifolium, Don. Parts of a plant; of natural size. Fig. 1 lip, 2 column with anther in situ, 3 empty anther, 4 pollinia, front view, 5 the same, back view; all enlarged.

## 9. Cymbidium giganteum, Wall. Cat. 7355.

Pseudo-stem and inflorescence as in C. grandiforum. Leaves also similar, but broader and not quite so long. Flowers smaller, only 25 to 3 in . across; floral bract minute, broad. Sepals sub-equal, elliptic-oblong, sub-acute, the dorsal incurved, the lateral pair spreading. Petals as long as the sepals but narrower, oblong, sub-acute. Lip shorter than the sepals, 3 -lobed, more or less puberulous; the lateral lobes large, their apices elliptic and directed forward; apical lobe ovate-oblong, sub-acute, deflexed, its edges undulate-crenate; upper surface with two parallel ridges running from the base nearly to the apex, hairy and separated by a smooth groove. Column somewhat curved, its base below the insertion of the lip with a small nectar-bearing sac. Anther slightly scabrid. I'ollinia ovoid, acute, diverging, sessile on a quadrate gland. Capsule elliptic, pointed at each end, boldly ridged, 3 in . long. Lindl. Gen. and Spec. Orch., 163;

Sert. Orchid, t. 4; Bot. Mag., t. 4844; Paxt. Mag. Bot., 241, and Fl. Gard. II, 14, fig. 143 ; Griff. Notul. III, 341 ; Walp. Ann. VI, 626 ; Warner Orch. Alb. VI, t. 284; Hook. fil. Fl. Br. Ind. VI, 12. Iridorchis gigantea, Blume Orch. Archip. Ind., 76, t. 26. Limodorum longifolium, Ic. Ham.

Sikkim, at elevations between 4,000 and 6,000 feet; in flower during October and November, common; Pantling, No. 12. Westward to Kumaon and eastward to Bhutan. Khasia Hills; elevation 4,000 to 5,000 feet.

The flowers of this have a ground colour of ochraceous yellow with numerons vertical lines of warm brown, the lip having broad transverse blotches of the same tint, externally the sepals are flushed with green. In habit and leaves the species much resembles C. grandiflorum; but the flowers are smaller, differently coloured and appear much later in the year. In the figure of this in Bot. Mag., No. 4844, the flowers are coloured by far too green.

Plate 255.-Cymlieiuum giganteum, Wall. Parts of a plant; of natural siss. Fig. 1 side view of column and lip, 2 column and anther in situ, 3 lip, 4 apex of column showing the pollinia after the removal of the cap of the anther, 5 pollinia, 6 empty anther, from behind; all enlarged; 7 capsule; of natural size.

## 10. Cymbidium grandiflorum, Griff. Notul. III, 342,

Pseuldo-stem very short. Leaves linear-oblong, acute, entire, narrowed towards the base and then expanded and equitant; length 16 to 24 in., breadth 75 to 1 in. Inflorescence from the base of the pseudo-stem, about as long as or longer than the leaves ( 2 to 4 feet long), decurved; the peduncle stout, enveloped in numerous imbricate acute sheaths increasing in length upwards. Raceme laxly 10 - to 20 -flowered. Flowers 3 to 4 in. in diam.; floral bract minute. Dorsal sepal oblong, acute, incurved; the lateral pair slightly narrower and more acute, sub-falcate, spreading. Petals smaller than the sepals, oblong, somewhat falcate, spreading. Lip as long as the sepals, 3 -lobed, pubescent and with ciliate edges, not saccate at the base ; side lobes narrow, erect, their apices oblique, acute ; apical lobe large, broadly oblong, deflexed, its apex deeply emarginate and its margins undulate, disc between the side lobes with two parallel bold hairy ridges. Column slightly winged from base to apex, straight; the anther sub-quadrate. Pollinia ovoid, acute, divergent, sessile on a quadrate gland. Capsule elliptic, boldly ridged, 2.75 in. long. Griff. Ic. Plant. Asiat., t. 321 ; Hook. fil. Fl. Br. Ind. VI, 12. C. Hookerianum, Reichb. fil. in Gard. Chron., 1866, 7; Batem. in Bot. Mag., t. 5574. C. giganteum, (in part), Lindl., Journ. Linn. Soc. III, 29. Cymbidium sp. Griff. Itin. Notes, 145, No. 698.

Sikkim, at elevations of 5,000 to 7,000 feet; in flower during February; Pantling, No. 63. Westward to East Nepal and eastward to Bhutan; Griffith and others.

The sepals and petals are apple green, the margins being of a paler tint; the lip and column are ochraceous yellow speckled with purple. This species often attains a greater size than is given in the preceding description, the scaps and raceme together sometimes measuring 3 to 5 feet in length; and the latter having as many as eighteen flowers. After fertilization of a flower has been effected the column and lip become red in colour. The flowers are fragrant.

Plate 256.-Cymbidium grandiflorum, Griff. Part of a plant; of nutural size. Fig. 1 column, 2 section of lip between the side lobes showing the two hairy ridges, 3 empty anther, from behind, 4 apex of the column showing the pollinia after removal of the cap of the anther, 5 pollinia; ail enlarged.

## 11. Cymbidium Gammieanum, King and Pantling in Journ. As. Soc. Beng. Vol. LXIV, Pt. 2, p. 339.

Pseudo-stem short. Leaves narrowly linear, acuminate, slightly narrowed below, but somewhat dilated at the equitant base, 24 to 36 in. long, and about 75 in . broad. Inflorescence from the base of the pseudo-stem, decurved, shorter than the leaves; the peduncle sub-erect, about 15 or 18 in . long, enveloped to the apex in loose lanceolate sheaths, acuminate, 3 to 6 in . long. Raceme lax or dense, rather shorter than the peduncle, bearing 15 to 20 flowers; floral bract minute. Flowers 1.75 in . long, and 2.5 to 3 in. across. Sepals linear-lanceolate or linear-oblanceolate, 7 -nerved. Petals linear-oblong, sub-falcate, slightly shorter than the sepals, 7 -nerved. Lip about as long as the sepals, oblong; the side lobes shallow, elongate, acute at the apex; the apical lobe sub-orbicular, undulate, puberulous, separated from the lateral lobes by a sinus; lamellæ of the lip 2, pubescent, meeting and ending abruptly with the side lobes opposite the ciliolate sinus, otherwise parallel. Column slender, slightly winged. Pollinia erect, cuneate, sessile on a quadrate gland. Capsule 2 in. long.

Sikkim, at elevations of from 5,000 to 7,000 feet; flowering in September and October; Pantling, No. 299.

The colour of the flowers in this species is a dirty yellow flushed with brown and with brown lines; the lip, however, is of a brighter yellow and has brown lines on its side lobes. Individuals with flowers of a paler yellow are, however, very common, and these have usually densely-flowered racemes like C. elegans, Blume; while the plants with dirty yellow flowers have lax racemes suggestive of those of C, longifolium, Don. This species, although common in Sikkim, has hitherto remained unnamed. It has been suggested that it may possibly be a natural hybrid between C. giganteum and C. elegans, as its flowers combine the characters of these species. It is dedicated to Mr. J. A. Gammie, Deputy Superintendent of the Government Cinchona Plantation in Sikkim, whose work in the cultivation of the medicinal species of Cinchona and in the local manufacture of Quinine is so well known and so highly appreciated. The species is allied to C. Mastersii, Benth. and to C. affine, Warn.

Plate 257.-Cymbidium Gammiennum, King and Pantling. Part of a plant. Fig. 1 column with anther in situ, 2 lip, 3 side view of the same; all of natural size, 4 pollinia in situ on the apex of the column, the cap of the anther having been removed, 5 pollinia removed from the column and seen from behind, 6 empty anther, lower surface; all enlarged.

## 12. Cymbidium Whitee, new species.

Pseudo-stem 2 to 6 in . long. Leaves linear, acuminate, narrow in the lower two-thirds, but dilated at the equitant base, 24 to 36 in . long and about 65 in . wide at the widest point. Inflorescence from the base of the pseudo-bulb, 15 to 18 in . long, strongly decurved from the base; the peduncle as long as the raceme, clothed throughout with scarious oblong-lanceolate acuminate bracts 1 to 5 in . long. Raceme 6 to 8 in . long, 10- to 12-flowered. Flowers 1.75 in . long; floral bract $\cdot 25$ to $\cdot 35 \mathrm{in}$. long, lanceolate, acuminate, shorter than the stalked ovary. Sepals lanceolate, acute, connivent. Petals linear-oblong, sub-falcate, as long as the sepals. Lip as long as the lateral sepals, sparsely pubescent on the upper surface; side lobes shallow, elongate, their apices cblique, sub-acute, directed forwards; apical lobe orbicular, crenate-undulate, slightly deflexed, dise with two
pubescent lamellæ near the apices of the side lobes becoming faint towards the base. Column straight except at the summit. Anther oblique with a blunt apex and beaked lip. Pollinia cuneate, sessile on a quadrate gland. Capsute ellipsoid, 1.75 in . long.

Sikkim, at Gantok, elevation 5,000 feet; discovered by Mrs. Claude White, after whom it is named; in flower during November; Pantling, No. 425.

The sepals and petals are pale yellowish-green spotted with dull red. The lip is white or pale pink spotted profusely on the side- and end-lobes with pale red.

Plate 258.-Cymbidium Whitece, King and Pantling. Part of a plant; of natural size. Fig. 1 bract, stalked ovary, column and lip, seen from the side, 2 lip, 3 column with anther in situ, 4 front and back views of the pollinia, 5 pollinia and gland, 6 empty anther; all enlarged.
13. Cymbidium elegans, Lindl. in Wall. Cat., 7354; Gen. and Spec. Orch., 163.

Pseudo-stem short. Leaves narrowly linear, acuminate, slightly expanded and equitant at the base; length 18 to 24 in., breadth 65 to 75 in. Inflorescence axillary, decurved, about as long as the leaves; the peduncle longer than the raceme, clothed to the apex by a few lanceolate acuminate convolute sheaths. 4 to 6 in. long; raceme imbricately and densely flowered; floral bract membranous, minute. Flowers 1.5 to 1.75 in. long and only about $\cdot 6 \mathrm{in}$. across. Sepals and petals sub-equal, erect, oblanceolateoblong, acute or sub-acute and slightly concave at the tips. lip as long as the petals, narrowly oblong; the side lobes near the apex, incurved, rounded; the disc between them with two narrow parallel ridges united at the apex and with a large pubescent callus at the base; the apical lobe small, sub-orbicular or obcordate, undulate, incurved. Column long, slender, slightly pubescent at the base in front, the apex slightly curved forwards. Anther terminal, ovoid, beaked in front. Pollinia obovoid, erect, sessile on a quadrate gland. Capsule elliptic, 1.25 in. long and 75 in. in diam. Lindl. Sert. Orch., t. 14 ; in Journ. Linn. Soc. III, 28; Reichb. fil. in Gard. Chron., 1875, I, 429. Cyperorchis elegans, Blume Rumph. IV, 47 ; Orch. Archip. Ind. 77, t. 48, C; Bot. Mag., 7007; Benth. in Journ. Linn. Soc. XVIII, 318 ; Hook. fil. Fl. Br. Ind. VI, 14. C. densiflorum, Griff. Notul. III, 337 (the plant from Myrung only).

Sikkim, at elevations of from 5,000 to 6,000 feet; in flower during October and November; Pantling, No. 14. Westward to Nepal and eastward to Bhutan. Khasia Hills, at 6,000 feet; Hooker, Collett, Mann. Naga Hills; Prain.

The flowers of this are usually of a pale lemon yellow, the lamellæ of the lip being of a cadmium yellow. Occasionally the sepals are flushed with pink or brown, and still more rarely the flowers are nearly white.

Plate 259.-Cymbidium elegans, Lindl. Part of a plant; of natural size. Fig. 1 lip, 2 column with anther in situ, 3 under surface of anther, showing its interior, 4 pollinia; all enlarged, 5 capsule; of natural size.

## 14. Cymbidium cochleare, Lindl., in Journ. Linn. Soc., 28.

Pseudo-stem 3 to 6 in. long, stont. Leaves linear, finely acuminate, dilated at the equitant base; length 24 to 36 in., breadth $\cdot 4$ to 5 in. Inflorescence axillary, pendulous, much shorter than the leaves; the peduncle much longer than the raceme, with numerous lanceolate, acuminate, convolute, lax scarious sheaths 4 or 5 in. long;
the raceme with twelve to twenty imbricate fowers about 1.75 in . long, the stalked ovary $\cdot 75$ to 1 in.; the floral bract triangular, minute. Sepals and petals sub-equal, not spreading, oblanceolate, blunt. Lip of the same length as the sepals and petals, oblongoblanceolate in general outline; side lobes long, shallow, with triangular pointed apices; the apical lobe pubescent, sub-orbicular, undulate; upper surface with two smooth lamellæ united at their apices. Column slender, straight, with a few hairs at its base in front, rostellum projecting. Anther obovoid, beaked in front. Pollinia erect, sessile on a quadrate gland. Capsule broadly elliptic, tapering to each end, 1 in . long and 6 in . in diam. Cyperochis cochleare, Benth. in Journ. Linn. Soc. XVIII, 318; Hook, fil. Fl. Br. Ind. VI, 15.

Sikkim, at elevations of from 4,000 to 6,000 feet; Hooker and others; Pantling, No. 352 ; in flower during October and November. Khasia Hills; Griffith, No. 5263 (Kew Distrib.). Assam; G. Mann.

The sepals and petals are of a dull brown flushed with green, the lip is ochraceous yellow minutely speckled with brown and the column is pale green.

Plate 260.-Cymbidium cochleare, Lindl. Part of a plant; of natural size. Fig. 1 bract, stalked ovary, columin and lip, in profile, 2 lip, 3 column ; of natural size, 4 pollinia as they lie in the anther on the column, 5 pollinia removed, 6 empty anther, lower surface; all onlarged.
15. Cymbidium Mastersif, Griff. MSS. ex Lindl. in Bot. Reg., 1845, t. 50.

Pseudo-stem 2 to 12 in . long, sometimes branched, Leaves linear, acuminate and minutely and obliquely bifid at the apex, tapering towards the slightly expanded equitant base, length 12 to 24 in ., breadth 6 to $\cdot 7 \mathrm{in}$. Inflorescence axillary, from amongst the leaves, and only about half their length, erect; the peduncle much longer than the raceme, clothed to its apex by acuminate, lanceolate, convolute sheaths 4 or 5 in. long. Raceme somewhat decurved, 4 to 6 in . long, 4- to 6 -flowered ; floral bract triangular, minute, stalked ovary about 5 in . long. Flowers crowded, 2 to 2.5 in . long. Sepals and petals sub-equal, oblong-lanceolate, about 2 in . long, the latter narrower than the sepals and with slightly recurved apices. Lip minutely pubescent, nearly as long as the petals, narrow, oblong; the side lobes long, shallow, erect, their apices acute and directed outwards; apical lobe sub-orbicular, undulate and irregularly crenate; the disc between the side lobes with two smooth lamellæ converging and ending at the base of the apical lobe. Column slender, slightly curved, with a small sac at the base, the rostellum projecting. Anther oblique, with a pointed lip. Pollinia erect, sessile on a quadrate gland. Capsule ellipsoid, $2 \cdot 25$ in. long. Lindl. in Gard. Chron., 1845, 643; Paxt. Fl. Gard. t. 78; Reichenbachia, t. 66. C. micromeron, Lindl. in Journ. Linn. Soc. III, 29. ? C. affiné, Griff. Notul. III, 336 ; Ic. Plant. Asiat., t. 291, f. 3; Lindl. Journ. Linn. Soc. III, 28. Cyperorchis Mastersii, Benth. in Journ. Linn. Soc. XVIII, 318; Hook. fil Fl. Br. Ind. VI, 15.

Sikkim, at elevations of from 5,000 to 7,000 feet; in flower during October and November; Hoeker and others; Pantling, No. 101. Khasia Hills; elevation 5,000 to 6,000 feet; Griffith, No. 5266 (Kew Distrib.), Hooker, Mann.

The prevailing colour in the flowers of this is white; the sepals and petals, especially toward their apices, being flushed with pink. The lip is yellowish externally and the lamellæ on its disc are orange-coloured. The column is greenish. The flowers are sweet-scented.

Plate 261.-Cymbidium Mastersii, Griff. Part of a plant; of natural size. Fig. 1 bract, stalked ovary, column and lip, in profile, 2 lip, 3 vertical section of lip, 4 column; of natural size, 5 summit of column with the cap of the anther removed, 6 pollinia, 7 empty anther (Nos. 5 to 7 enlarged).

## 16. Cymbidium eburneum, Lindl. in Bot. Reg., 1847, t. 67.

Pseudo-stem short, stout. Leaves numerous, linear, the apex sub-acute and not notched, broad, sheathing and jointed near the base; length 12 to 24 in., breadth 25 to $\cdot 5$ in. Scape much shorter than the leaves, erect, clothed to the top with loose lanceolate, acuminate sheaths 2.5 to 5 in . long. Flowers only one or two, large, white, 3 to 4 in . across; the pedicel with ovary $1 \cdot 5 \mathrm{in}$. long, exceeding the lanceolate acuminate bract. Sepals spreading, oblong, sub-acute, the dorsal concave. Petals like the sepals but sub-falcate. Lip oblong-obovate; the side lobe narrow, obtuse, the terminal lobe only slightly deflexed, short, sub-ovate, its edges undulate-crenulate; side lobes obscure, rounded, the disc between them with a broad pubescent 3 -ridged yellow band ; apical lobe broadly triangular, sub-acute, the edges undulate. Column long, thin, with a small sac at its base below the insertion of the lip. Anther truncately dome-shaped. Pollinia broad, sub-quadrate, erect, the rostellum projecting. Capsule broadly ellipsoid, ridged, 3 in . long and 1.5 in . in diam. Lindl. in Journ. Linn. Soc. III, 28 ; Bot. Mag., t. 5126 ; Paxt. Mag. Bot. XV, t. 145 ; Jennings' Orch., t. 16; Gartenflora, 1880, t. 155 ; Wien. Ill. Gartenz., 1887, t. 7 and 8; Gard. Chron., 1882, I, 497, f. 78; 1884, II, 77, f. 17 ; Hook. fil. Fl. Br. Ind. VI, 11. C. syringodorum, Griff. Notul. III, 338.

Sikkim, common between elevations of 1,000 and 3,000 feet; in flower during March and April; Pantling, No. 108. Westward to Nepal and eastward to Bhutan. Khasia Hills, at elevations of 3,000 to 4,000 feet; Griffith, G. Mann.

The prevailing colour in the flowers (which are very sweet-scented) is pure white. The ridge on the lip is, however, of a brilliant yellow, and there is a patch of the same colour on the apical lobe, while the column is tinged with pink.

Plate 263. --Cymbidium elurneum, Lindl. Part of a plant; of natural size. Fig. 1 lip, 2 column with anther in situ, 3 summit of the column, showing the pollinia in situ, the cap of the anther having been removed, 4 empty anther, from behind, 5 capsule. Fiys. 1, 2 and 5 are of natural size, 3 and 4 are enlarged.

## 39. Phalænopsis, Blume.

Epiphytic, without pseudo-bulbs and with very short stems. Leaves coriaceous, flat. Inforescence from the side of the stem, or axillary, erect or pendulous, Flowers usually large, in loose racemes. Sepals and petals widely spreading. Lip clawed or sessile, adnate to the base or foot of the column, not spurred, more or less lobed, the side lobes erect, the apical lobe various; dise variously appendaged, usually with a forked plate or callus. Column sub-erect, with or without a foot. Anther 2-celled. Pollinza 2 , obovoid, sulcate or bipartite, attached by a linear or spathulate caudicle to a large or small gland. Species about 32 ; Indian or Malayan.

[^6]
## 1. Phalenopsis Parishit, Reichb. fil. in Gard. Chron., 1865, 410; 1871, 802 ;

 var. Lobbii, Reichb. fil. in Saunders' Refug. Bot., t. 85.Leaves broadly-elliptic, minutely and obliquely notched at the apex, 3 to 5 in. long and 1.25 to 1.75 in . broad. Raceme shorter than the leaves, 4- to 6 -flowered, erect. Flowers 8 to 1 in . across; bract elliptic, blunt, much shorter than the stalked ovary. Sepals sub-equal, orbicular-ovate, sub-acute. Petals smaller than the sepals, oblong-obovate, very blunt. Lip as long as the sepals, jointed, mobile, reniform, its lateral margins inflexed, bearing on its base a semi-circular erose flat dise with two superposed processes on its surface, each divided from about the middle into two awns. Column short, the base much dilated and with two large oblong erect basal lobes; rostellum long and narrow. Anther depressed. Pollinia obovoid-elliptic, attached by an elongated tapering flattened caudicle to a small triangular gland. Reichb. fil. Xen. Orch. II, 144, t. 156, fig. 1 ; Bot. Mag., 5815 ; Rolfe in Gard. Chron., 1886, II, 276 ; Hook. fil. Fl. Br. Ind. VI, 31.

Sikkim, in the valley of the Teesta, up to elevations of 1,200 feet, common; in flower during March and April ; Pantling, No. 74. Bhutan, Cachar and Tenasserim, also in some parts of the Malayan Archipelago.

The form of this species which occurs in Sikkim is that which has been figured in Saunders' Refugium, t. 85, as var. Lobbii. It differs from the typical form only in having a white lip with two chestnut bands, whereas the typical form has amethyst bands. The rest of the flower is pure white, with the exception of the column which has a dash of yellow and two brown spots.

Plate 263.-Phalenopsis Parishii, Reichb. fil. var. Loblii, Reichb. fil. A plant, growing on a branch; of natural size. Fig. 1 a flower, 2 apex of ovary, bract, stalked ovary, column with anther in situ and lip, 3 the flat plate and 4 -awned process from the base of the apical lobe of the lip, 4 column showing its basal processes, the stigma, and the anther in situ, 5 lower surface of empty anther, 6 apex of the column with the pollinia in situ, the cap of the anther having been removed, 7 pollinia after removal; all enlarged.
2. Phalenopsis Mannir, Reichb. fil. in Gard. Chron., 1871, 902; 1876, 503.

Leaves oblong-oblanceolate, obtuse, but with an abrupt minute apiculus, tapering to the sessile base, length 5 to 14 in., 2 to 4 in. wide at the widest part. Raceme about as long as the leaves, pendulous, sometimes branched, laxly many-flowered. Flowers 1 to 1.25 in. in diam.; bract ovate-lanceolate, acute, much shorter than the long-stalked ovary. Sepals unequal; the dorsal oblong, acute; the lateral broadly oblanceolate, sub-acute. Petals shorter than the sepals, oblong, acute, falcate. Lip shorter than the petals, adnate to the base and short foot of the column ; the hypochile with two large erect truncate connivent lobes; mesochile with an erect 2 -lobed callus situated at the base of the claw of the epichile; epichile broadly sagittate, the lobules wide-spreading, erose; the dise with a flattened sword-shaped appendage in front of the two awns, and the epichile with a few backward-directed setæ. Column with a short two-horned foot; rostellum much elongated. Anther broad. Pollinia obovoid-elliptic, attached by a long flat tapering caudicle to a small oblong gland. Cepsule 4 in . long, narrowly clavate-ellipsoid, with six bold ridges. Rolfe in Gard. Chron., 1886, II, 276 ; Hook. fil. Fl. Br, Ind, VI, 30 ; in Ann. Bot. Gard., Calcutta, V, 37, t. 56.

Sikkim, in the valley of the Teesta, at low elevations, common; in flower during May; Pantling, No. 263. Assam.

The sepals and petals are yellow with bold horizontal and vertical brown markings, the lip is paler, more ochraceous than yellow, and the lobes of the mesochile are pink; the column is yellow, boldly marked with purple near the base.

Plate 264.-Phalenopsis Mannii, Reiehb. fil. A plant; of natural size. Fig. 1 a flower, 2 apex of ovary, column with its foot, anther in situ and lip, seen from the side, 3 lip, 4 longitudinal section of lip, 5 column, front view, 6 lower surface of empty anther, 7 apex of column, showing the rostellum and the pollinia in situ, the cap of the anther having been removed, 8 pollinia; all enlarged. 9 a capsule, 10 section of 'capsule; of natural sise.

## 40. Doritis, Lindl.

Epiphytic, with short stems and no pseudo-bulbs. Leaves flat, coriaceous. Inforescence and flowers as in Phalcenopsis, but the column narrowly winged and the foot long and forming, with the sides of the lip, a conical sac bearing the lateral and apical lobes at its mouth. Species 5; Indian and Malayan.

Lip with a short wide spur; leaves oblong-oblanceolate, obtuse . . . . . 1. D. Wightii.
Lip with a long sub-cylindric spur, leaves narrowly elliptic-oblong, acute . 2. D. tenialis.

## 1. Doritis Wightir, Benth. in Gen. Plant. III, 574.

Roots flat, much shorter than the leaves. Stem 1 in. long. Leaves about three, pendulous, oblong, slightly oblanceolate, the edges sub-undulate; the apex blunt, minutely and obliquely notched, gradually tapered to the sessile shortly sheathed base; length 6 to 8 in ., breadth 1.35 to 2 in . Inflorescence pendulous from the stem beneath the leaves and shorter than them, slender below, somewhat thickened upwards, sometimes with a short branch. Flowers 5 or $\cdot 6 \mathrm{in}$. long; floral bract ovate, acute, minute. Sepals unequal; the dorsal oblong-obtuse, blunt; the lateral pair shorter but broader, falcate, their apices obliquely truncate. Petals as long as the lateral sepals, oblong, blunt. Lip adnate to the foot of the column, the hypochile forming a conical sac with two erect very broad ridged fleshy truncate lobes; epichile obovate, narrow at the base, the apex broad and emarginate, its disc with a forked appendage. Column stout, shortly winged, the foot short. Anther depressed; rostellum long, narrow. Pollinia ovoid, attached by a curved flat tapering caudicle to a small triangular gland. Hook. fil. Fl. Br. Ind. VI, 32. Phalcenopsis Wightii, Reichb. fil. in Bot. Zeit., 1862, 214. Arides latifolium, Thwaites' Enum. Pl. Ceyl., 429.

Sikkim, in the valley of the Teesta, at low elevations; in flower during July; Pantling, No. 94. Assam; Jenkins. Bhutan; Lister. Burma; Parish. Coco Islands; Prain; also in Malabar and Ceylon.

The ground colour of the flowers is pale ochraceous yellow with purple markings on the lip and column. The bases of the petals and sepals are slightly mottled with pink.

Plate 265.-Doritis Wightii, Benth. A plant; of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ, and lip, seen from the side, 3 section of flower, 4 lip, 5 column with its foot, anther and stigma, 6 anther with the pollinia in situ, from below, 7 apex of column with the pollinia in situ, the cap of the anther having been removed, 8 pollinia, side view; all enlarged.

## 2. Doritis tenialis, Benth. in Gen. Plant. III, 574.

Roots numerous, long and flat, forming large tufts. Leaves few, pendulous, often solitary, sometimes absent, narrowly elliptic-oblong, acute, tapering to the sessile base; length 3 to 5 in., breadth 6 to $\cdot 8 \mathrm{in}$. Racemes longer than the leaves, pendulous, 6- to 8 -flowered. Flowers -8 in . across; bract broadly triangular, minute. Sepals unequal, blunt; the dorsal oblong, slightly oblanceolate; the lateral pair broader, elliptic, blunt, Petals obovate, blunt, shorter than the sepals. Lip adnate to the foot of the column, shorter than the petals; hypochile produced below into a stout sub-cylindric spur, and sending upward two long narrow falcate backward-pointing lobes; the epichile spathulateoblong, entire, attached to the hypochile near its base, running parallel to it for part of its length and then curving forwards, its upper surface with a forked appendage, Column long, narrowly winged, dilated towards the foot; the stigma large, the rostellum long and narrow. Anther depressed. Pollinia sub-globose, attached by a long curved tapering flat caudicle to a small triangular gland. Hook. fil. Fl. Br. Ind. VI, 31. D. Braceana, Hook. fil. in Ann. Bot. Gard., Calc., V, 40, t. 60. Arides teeniale, Lindl. Gen. and Spec. Orch., 239 ; in Journ. Linn. Soc. III, 41. A. carnosum, Griff. Notul. III, 365 ; Ic. Plant. Asiat., t. 338A.

Sikkim, at elevations from 3,000 to 6,000 feet; in flower during May; Pantling, No. 82. Westward to Kumaon and eastward to Bhutan. Khasia Hills, Manipur, Burma.

The colour of the flowers is a delicate pale purple, the anther and epichile of the lip being dark purple. Specimens with white flowers are not uncommon; but, after fertilization has been effected, these change to yellow. In both the white and the purple-coloured flowers the column swells after fertilization and its margins close in.

Plate 266.-Doritis tanialis, Benth. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther in situ and lip, seen from the side, 3 longitudinal section of the foregoing, 4 epichile of lip, 5 lower surface of empty anther, 6 column with its foot, anther in situ and stigma, 7 apex of column with the pollinia in situ, the cap of the anther having been removed, 8 pollinia after removal; all enlarged

## 41. Biermannia, new genus, King and Pantling.

Epiphytal; stem very short. Leaves three or four, fleshy, linear. Raceme about as long as the leaves, few-flowered, Sepals sub-equal, ovate-lanceolate, the lateral pair attached to the base of the column. Petals shorter than the sepals. Column straight, with a-short foot at right angles to itself. Lip attached at right angles to the foot of the column, as long as the petals, concave, fleshy, lobed or not, apex broad or sub-acute, the dise with two or more calli. Stigma large, orbicular. Anther depressed, apiculate, shortly beaked in front. Pollinia 2, orbicular or oval, attached by a subulate caudicle to a small gland. Capsule cylindric, ribbed, narrow. Two species; Sikkim and Khasia.

This genus is dedicated to the memory of Adolph Biermann, at one time Curator of the Botanic Garden, Calcutta. The only species at present belonging to it are B. Khasiana, published by us in the Journ. As. Soc., Bengal, for 1897, and the present plant whioh was originally published by us in the same Journal (Vol. LXIV, pt. 2, 340) under the name Sarcochilus bimaculatus. But as the genus Sarcochilus in the present work is defined exactly as we believe its author desired that it should be, this plant cannot be included in it; and, as its characters agree with those of no other genus, we have been obliged to form one for it reception.

Biermannia bimaculata, King and Pantling.
Stem very short. Leaves linear-oblong, narrowed to the base, sub-falcate, the apex obliquely bifid, 2 in . long, and $\cdot 35 \mathrm{in}$. broad. Raceme stout, 75 in . long, compressed, and with persistent triangular bracts. Flowers confined to the upper half of the rachis, distichous, 35 in . in diam.; bract broad, much shorter than the sessile ovary. Sepals sub-equal, ovate-lanceolate, apiculate, the lateral pair attached to the foot of the column. Petals shorter than the sepals, ovate, sub-acute. Lip springing at right angles from the short foot and lying parallel to the column; its side lobes narrow, elongate, falcate, erect, acuminate at the apex; apical lobe triangular, very fleshy and with two flat calli on its upper surface at the base where the side lobes end; the disc between the side lobes with larger elongate calli near its union with the foot. Stigma large. Rostzllum short. Pollinia 2, ovoid, the caudicle oblanceolate; the gland very small, ovoid. Capsule $1 \cdot 5 \mathrm{in}$. long, triquetrous. Sarcochilus bimaculatus, King and Pantling in Journ. As. Soc., Beng., Vol. LXIV, Pt. 2, 340.

Sikkim, in the valley of the Teesta, elevation about 1,500 feet; flowering in July; Pantling, No. 209.

The flowers are white with two blotches of brown on the calli of the lip. They open singly, smell of almonds, and are very fugacious.

Plate 267.-Biermannia bimaculata, King and Pantling. A plant; of natural size. Fig. 1 a flower, seen from the side, 2 bract, ovary, column with anther in situ and lip, side view, 3 sepals and petals, separated, 4 lip, 5 column with anther in situ and stigma, 6 pollinia, 7 capsule, 8 section of the capsule; all enlarged.

## 42. Ornithochilus, Wall.

Epiphytal, without pseudo-bulbs. Stem very short. Leaves few, softly coriaceous, broadly oblong, flat, crowded. Inflorescence supra-axillary, racemose or panicled. Sepals sub-equal, spreading, incurved at the apex; the lateral pair obliquely obovate. Petals much smaller, cuneate-oblong, blunt. Lip much longer than the sepals, adnate to the foot of the column by a long broad claw; the claw with a rectangularly bent subcylindric spur at its junction with the apical lobe; side lobes shallow, sub-quadrate; apical lobe with three lobules, the two lateral recurved and pectinate, the central triangular, entire and infolded; the mouth of the spur closed by two calli projecting from its back and front walls; the latter hairy. Column short, cylindric, stout, with a short foot; the rostellum forked; the stigma circular, surrounded by a hairy rim. Anther oblong. Pollinia 2, sub-globose; caudicle very broad, obcuneate, gland large. Species 1 or 2 ; Indian and Chinese.

Ornithochlus fuscus, Wall. in Lindl. Gen. and Spec. Orch., 242.
Leaves sub-acute, narrowed to the sessile sheathing base, 3 to 6 in . long and 1 -5 to 2 in . broad. Inflorescence two or three times longer than the leaves. Flowers $\cdot 4$ in. across; floral bract lanceolate, much shorter than the long-stalked ovary. Capsule fusiform, 1 in. long. Hook. fil. Fl. Br. Ind. VI, 76 O. eublepharon, Hance in Journ. Bot. XXII (1884), 364. Erides difforme, Wall. in Lindl. Gen. and Spec. Orch., 242; Sert. Orch., frontisp. fig. 7; Reichb. fil. in Gard. Chron.; 1865, 698; Lindl. in Journ.

Linn. Soc. III, 41; Walp. Ann. VI, 899. A. Hystrix, Lindl. in Journ. Linn. Soc. III, 42 (not of Gen. and Spec. Orch.)

Sikkim, at elevations from 4,000 to 6,000 feet; in flower during July and August; Pantling, No. 38. Westward along the range to Gharwal and eastward to Bhutan. Khasia Hills, Burma.

The ground colour of the flowers is greenish-yellow; the sepals and petals have bold bands of brown, and the pectinate lateral lobules of the lip are also brown passing into purple below.

Plate 268.-Ornithochilus fuscus, Wall. A Ilant; of natural size. Fig. 1 a flower, side view, 2 vertical section of column spur and lip, 3 apical lobe of lip, 4 column with anther in situ, 5 anther, 6 and 7 pollinia before and after removal; all enlarged, (Ncs. 6 and 7 very much so).

## 43. Luisia, Gaud,

Epiphytal, with rigid terete sheathed stems woody below, usually erect (pendulous in $L$. volucris). Leaves terete, fleshy, distant, spreading. Flowers usually small and dull in colour, in short extra-axillary spikes with stout axes; floral bract short, scarious, persistent. Sepals sub-equal or the depressed dorsal, smaller. Petals equal to the sepals or much longer, spreading. Lip sessile on the base of the column, divided into two parts; the hypochile saccate, concave or flat; and the epichile decurved, broad and ridged, entire or crenate, undulate, more or less blunt. Column much shorter than the lip, stout. Stigma usually large. Anther broad, 2 -celled. Pollinia 2, ovoid or sub-globose, attached by a broad caudicle to a sub-quadrate or elongate gland. Capsule narrow, ridged, sub-erect. Species about 15 ; mostly tropical Asiatic, a few Australasian.
Sepals and petals sub-equal.
Lip quite entire . . . . . . . . . . . . . . . . . 1. L. indicis_.
Lip lobed.

## 1. Luisia indivisa, new species.

Stem 5 to 7 in. long, rather stout, not branching. Leaves rather long, slender, spreading, $\cdot 15$ to $\cdot 2$ in. thick, and 4.5 to $5 \cdot 5 \mathrm{in}$. long, the internodes $\cdot 75 \mathrm{in}$. long. Spikes about $\cdot 2 \mathrm{in}$. long, 4 - to 5 -flowered. Flowers 4 in . long; floral bract minute, triangular. Sepals sub-equal, oblong, blunt; the lateral pair somewhat broader and subcymbiform, not keeled. Petals narrowly oblong, falcate, sub-acute, slightly exceeding the dorsal sepal in length. Lip as long as the sepals, broadly oblong, quite entire except for two triangular indentations near the base, the apex sub-acute; the upper surface slightly concave at the base, the dise not furrowed. Column short, the stigma transversely elliptic.

Sikkim, at the kase of the range, collected by C. A, B. Anderson; in flower during March; Pantling's Drawing No. 470.

The flowers of this spocies are pale green throughout. It is distinguished by its entire lip from all the Indian species of Luisia. Plants of it were sent in 1893 to the Botanic Garden; Calcutta, by the late Mr. C. A. B. Anderson. These flowered during the year 1896, Nobody else has as yet collected it.

Plate 269.-Luisia indivisa, King and Pantling. A plant; of natural size. Fig. 1 a flower, 2 floral bract, ovary, column and lip, 3 the petals, 4 lip, 5 . column with anther and stigma; all enlarged.
2. Luisia trichorhizs, Blume Mus. Bot. Lugd. Bat. I, 63.

Stem 4 to 10 in . long, very stout, not branching. Leaves fleshy, only slightly tapered to the apex, 2 in . thick and 4 to 7 in . long, the internodes 4 in . long. Spikes 4- or 5 -flowered, stout. Flowers $\cdot 4 \mathrm{in}$. long; floral bract broad, with an acuminate point, persistent. Sepals unequal; the lateral pair obliquely ovate, acute, keeled, longer than the blunt oblong dorsal one. Petals oblong, blunt, longer and narrower than the lateral sepals, all spreading. Lip larger than the sepals, the basal half deeply concave and with erect rounded edges, the apical half broadly cordate, tapering to the subtruncate minutely emarginate apex, the upper surface with short blunt vertical ridges. Column half as long as the lip, stout; the anther sub-quadrate, compressed, rostellum broad. Pollinia ovoid, attached by a broad tapering caudicle to the cuneate-quadrate gland. Lindl. Fol. Orch. 2; Reichb. fil. Xen. Orch., t. 77, figs. 8 to 18; Hook. fil. Fl. Br. Ind. VI, 23. Vanda? trichorhiza, Hook. Exot. Fl.; Vol. I, t. 72.

Sikkim, at low elevations; in flower during March and April; Pantling, No. 205. Gharwal ; Falconer.

This has much stouter stems and thicker and blunter leaves than either $L$. brachystachys or L. teretifolia. The flowers also are produced on short thick tubercles, and they are larger than in these two species. In colour they approach most to those of the former, the sepals being pale green with faint purple lines, and the lip dark dull purple, the basal portion or hypochile being faintly outlined by pale green lines, and the ridges of the apical half (epichyle) being tinged with the same shade of green.

Plate. 270.-Luisia trichorhiza, Blume. A plant; of natural sise. Fig. 1 the sepals and petals, separated; of natural size, 2 a flower, 3 bract, ovary, column with anther in situ, and lip in profile, 4 column (with the bases of the perianth) showing the anther in situ and the stigma, 5 lower surface of anther, 6 pollinia; all enlarged.
3. Luisia teretiolia, Gaud. Bot. Freyc. Voy., 426, t. 37.

Stem 6 to 12 in . long, stout, sometimes branching. Leaves terete, spreading, 2.5 to 6 in . long, and from $\cdot 15$ to $\cdot 2 \mathrm{in}$. thick, the internodes $\cdot 6 \mathrm{in}$. long. Spikes very short, $\cdot 2$ to $\cdot 3 \mathrm{in}$. long, 2- or 3 -flowered. Flowers • 2 j in . long; floral bract broad, pointed. Sepals and petals sub-equal, the petals slightly longer, narrowly oblong, blunt, spreading, the lateral pair ending in a tooth. Lip longer than the sepals and much broader, with a square sub-saccate base, and a deflexed rhomboid apical lobe with five or six vertical lines on its upper surface and a subtruncate apex. Column less than half as long as the lip, stout. Anther depressed. Pollinia 2, ovoid, attached by a stout caudicle to a broadly oifong gland. Blume Rumphia, IV, t. 194, fig. 3, t. 197D; Mus. Bot. Lugd. Bat. I, 63 ; Lindl. Fol. Orch., 2 (excluding from all the synonym Ep. tista) ; Hook, fil. Fl. Br.

Ind. VI, 22. L. brachystachys, var. flaveola, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 144. L. burmanica, Lindl. Fol. Orch. 3. L. platyglossa, Reịchb. fil, in Walp. Ann. VI, 622. L. zeylanica, Lindl. Fol. Orch., 3. Cymbidium triste, Roxb. Fl. Ind. III, 461 ; Bot. Mag., t. 3648 ; Wight Ic. 911 (text only); Griff. Notul. III, 340 (the Mergui plant). C. tenuifolium, Wight Ic. 1689 (excl. text).

Sikkim, in the bottoms of valleys, ascending to 3,000 feet; in flower during May; Pantling, No. 115. Khasia Hills, Bengal, Pegu and Tenasserim, Andamans, the Western Ghats and Ceylon.

The sepals and petals are of a uniform green and the lip and column of a deep purple, the anther is pale yellow. The plant, as found in the Bengal Sunderbans, has flowers coloured exactly as above described, but the stem and leaves are more slender and the ovaries are longer. Blume's two figures of this show larger flowers than we ever met with in British Indian specimens.

Plate 271.-Luisia teretifolia, Gaud. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column, anther and lip, side view, 3 column and anther, 4 empty anther, lower surface, 5 apex of column with pollinia in situ, the cap of the anther having been removed, 6 pollinia, after removal; all enlarged.

## 4. Luisia inconspicua, Hook. fil. MSS. in Herb. Hort. Calc.

Stem 4 to 6 in. long, slender, not branching. Leaves spreading, 1.4 to 2.5 in . long, $\cdot 1$ in. in diam. or less, the internodes 5 in . long. Spikes $\cdot 15$ to $\cdot 2 \mathrm{in}$. long, slender, 1 - to 3 -flowered. Flowers 15 in . long; floral bract membranous, triangular, acuminate. Sepals ovate-lanceolate, sub-acute, spreading. Petals oblong, tapering slightly to the blunt apex. Lip as long as the sepals, the basal part (hypochile) hemispherically saccate ; the anterior part (epichyle) decurved, flat, sub-reniform, notched at the apex, its upper surface minutely hispid and with 5 or 6 vertical lines. Column half as long as the lip, stout. Anther depressed, rostellum large. Pollinia broadly ovoid, attached by a slender caudicle to an oblong-quadrate gland. Saccolubium? inconspicuum, Hook. fil. Fl. Br. Ind. VI, 56. Cymbidium inconspicuum, Wall. MSS.

Sikkim, at low elevations; in flower during June and July; Pantling, No. 159. Assam (fig. in Herb. Bot. Gard. Calcutta); Jenkins, Simons.

This is a smaller and more slender plant than $L$. teretifolia, and it has smaller flowers, the prevailing colour in which is pale yellowish green, the column being purple and the basal half of the lip having spots of that colour. A coloured drawing of this was prepared in Dr. Wallich's time from a specimen sent from Assam by the late Colonel Jenkins. Dr. Wallich named it Cymbidium inconspicuum, and it was published by Sir Joseph Hooker in the Flora of British India as a doubtful species of Saccolabium under the name S.? inconspicuum. After seeing dried specimens of the plant from Sikkim, Sir Joseph saw that the plant is a Luisia, and he wrote on the Calcutta drawing the name here published.

Plate 272.-Luisia inconspicua, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 ovary, column and lip, in profile, 3 petals, 4 column with anther in situ, 5 empty anther, seen from below, 6 apex of column with the pollinia in silu, the eap of the anther having been removed, 7 pollinia; all enlarged.

## 5. Luista volucris, Lindl., Fol. Orch., 1.

Pendulous; stems slender, 2 to 5 feet long, branching. Leaves inserted on one side only of the stem, rather slender, $\cdot 15 \mathrm{in}$. thick, and 6 to 8 in . long, internodes 2 in . long. Spikes rising half way between the leaves, $\cdot 5 \mathrm{in}$. long. Flowers 3 or 4 , expanding only one at a time; bract broad, blunt, sheathing Spalls sub-equal, spreading, oblong, obtuse, the lateral pair concave towards the apex, all keeled on the midrib behind. Petals equalling the sepals in length at first, but lengthening to more than twice as long, linear, spathulate, widely spreading. Lip slightly longer than the sapals, the basal part (hypochile) cuneate-quadrate, auricled at the base, the edges upturned; the apical part (epichyle) decurved, oblong-cordate, narrowed to the rather broad emarginate apex, the edges crenate-undulate, and the upper surface with shallow broad vertical ridges. Column about half as long as the lip, broad, dilated opposite the larg ${ }^{3}$ transverssly oval stigma. Anther depressed, sub-quadrate. Pollinia oval, attashed by a broad short caudicle to a transversely elongate gland. Walp. Ann. VI, 619 ; Hook fil. Fl. Br. Ind. VI, 25. L. filiformis, Hook. fil. Fl. Br. Ind. VI, 23. L. Grovesii, Hook. fil. l.c. 25.

Sikkim, at low elevations; in flower during March and April; Pantling, No. 122. Khasia Hills.

A species with pendulous habit, much resombling Sarcanthus filiformis, Lindl., the stems often attaining a length of as much as five feet. The sopals and patals are always of a pale green. The lip varies in colour, somatimas resombling the sepals and patals, but in other specimens being wholly of a dull dark purplish-brown. In the majority. (as depicted in the figure, the epichyle is broadly margined with pale green.

Plate 273.-Luisia volusris, Lindl. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther in situ, and lip, 3 column with the anther in situ and the stigma, front view, 4 apex of column with the pollinia in situ (the cap of the anther having been removed), 5 pollinia after having completed their movement, 6 empty anther, from below; all enlarged.

## 44. Diploprora, Hook. fil.

Stem short, slender, pendulous. Leaves flaccidly fleshy, oblong-lanceolate, sessile; peduncle short, leaf-opposed, few-flowered. Sepals elliptic, keeled, spreading. Petals oblong, obtuse, reflexed. Lip as long as the petals, adnate to the base and also slightly to the sides of the column, cymbiform and sigmoidly curved; the hypochile concave, with recurved erect edges; the epichyle triangular, compressed and suddenly narrowed to the bicaudate apex, the disc with an erect keel. Column very short, with no foot. Stigma large. Anthsr conical, 2-celled. Pollinia 2, ovoid, bifid behind; caudicle short, flat; gland small, thin. Capsule narrow. The only species.

This genus is allied to Luisia and Vanda, from both of whieh it differs in the suddenly contracted, lateraliy compressed, apically, bifid epichyle of its lip. From Luisia it is at once distinguished by having flat instead of terete leaves. When dried the leaves appear to be membranous in testure; they are, however, not really so when alive. On the contrary, they are then thick and almost coriaceous. The plump appearance is due to the presence of much water in their tissues, the removal of which by drying gives rise to their membranous appearance in the Herbarium. As far as testure of leaves goes, this plant might be a Vanla or Arachnnnthe, and its ssparation from these genora deponds on the peculiarities of the lip.

## Diploprora Championi, Hook. fil. Fl. Br. Ind. VI, 26 ; Ic. Plant.,

t. 2020 .

Stem 3 to 6 in . long. Leaves flaccidly fleshy, acute, slightly narrowed at the rounded base, 2.5 to 3.5 in. long, and $\cdot 6$ to $\cdot 75$ in. broad. Peduncle $\cdot 5$ to 1 in. long, ending in a short 3 - to 4 -flowered flexuose undulate raceme. Flowers 75 in. across; floral bract short, ovate, keeled. Petals narrower than the sepals. Hypochile of the lip attached to the lower part of the sides of the column. Column very short and broad. Stigma large, caudicle of pollinia bent. Hook. fil. Fl. Br. Ind. VI, 26. Cottonia Championi, Lindl. in Hook. Journ. Bot. VII (1853), 35; in Journ. Linn. Soc. III, 39 ; Benth. Fl. Hongkong, 357. Luisia bicaudata, Thwaites' Enum. 302. Vanda bicaudata, Thwaites, l. c. 429.

Bhutan, above Engo, elevation about 2,000 feet; Gammie; Pantling, No. 284; in flower during July and August. Khasia Hills; elevation 3,000 to 4,000 feet; Hooker and Thomson. Assam, Mikir Hills; Simons, G. Gammie. Ceylon; Thwaites. Hongkong; Hance.

The sepals and petals of this are yellow; the lip and column white, the latter being marked with cinnamon-brown.

Plate 274.-Diploprora Championi, Hook. fil. A plant; of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther in situ and lip, in profile, 3 front view of column, with anther in situ, showing the stigma and rostellum, 4 apex of column with pollinia in situ, the cap of the anther having been removed, 5 empty anther from below, 6 pollinia; all enlarged.

## 45. Stauropsis, Reichb. fil.

Epiphytal; stem stout, rigid, leafy. Leaves coriaceous, flat or keeled, spreading, bilobed at the apex. Racemes extra-axillary. Sepals and pelals widely spreading, spathulate-lanceolate or obovate, the latter smaller than the former. Lip smaller than the sepals and petals, adnate to the base of the column, channelled, its basal part (hypochile) concave, prominently auricled; the mesochile contracted, and the epichyle thickened, laterally compressed and concave, the dise with two long glabrous or hairy ridges. Column short, stout, without any foot, truncate at the apex. Anther depressed. Pollinia 2, sub-ovoid, plano-convex, bipartite on the posterior surface, attached by a caudicle to a large gland. Species about 6; Indo-Malayan.

A genus differing from Vanda chiefly by its lip, which is neither saccate nor spurred at the base, but which is concave and auricled, the mesochile being narrowed and the epichyle thickened and concave. The sepals and petals also are less narrowed at the base than those of Vanda.

Stauropsis undulata, Benth. ex Hook. fil. in Fl. Br. Ind. VI, 27.
Stsm 8 to 14 in . long, erect, minutely warted like the peduncle. Leaves narrowly oblong, blunt, retuse, not tapering at the base, 3 or 4 in . long, and 75 in . broad. Peduncle leaf-opposed, stout, rigid, diverging, with a few distant short sheaths 6 to 8 in. long; raceme lax, few-flowered, 2 to 3 in . long. Flowers $1 \cdot 5 \mathrm{in}$. across. Sepals and petals with very wavy edges, all more or less reflexed. Lip adnate to the base only of the column; the auricles of the hypochile large, rounded, erect, embracing the column, mesochile short, epichyle concave, dise with two ridges running from the base nearly
to the apex. Column very short and stout. Stigma large, sub-orbicular. Pollinia ovoid, attached by a slender caudicle to an orbicular gland. Hook. fil. Fl. Br. Ind. VI, 27 ; Ann. Roy. Bot. Gard., Calcutta, Vol. V, 36, t. 55 ; Vanda undulata, Lindl. in Journ. Linn. Soc. III, 42 ; Reichb. fil. in Gard. Chron., 1875, I, 202; id. 1878, I, 168.

Sikkim, at elevations from 5,000 to 7,000 feet; in flower during April and May; Pantling, No. 72. Bhutan, Khasia Hills.

The sepals and petals are fleshy in texture and white in colour, flushed with pink and sometimes tipped with green. The lip is yellowish-green striped with pink. The peduncle, the rachis of the raceme, and the young shoots are green, spotted with purplish-brown.

Plate 275.-Stauropsis undulata, Benth. A plant; of natural sise. Fig. 1 a flower, 2 column with anther in situ and stigma, 3 empty anther, under surface, 4 pollinia, front view, 5 the same, back view; all enlarged.

## 46. Sarcochilus, R. Brown.

Epiphytal. Stem none or very short. Leaves narrowly oblong or absent. F'owers usually in pendulous racemes. Sepals and petals sub-equal, free, spreading; the dorsal sepal concave, the lateral pair broader and partly adnate to the foot of the column. Lip jointed or adnate to the long produced foot of the column, without a spur; the side lobes very large, erect; the apical lobe minute, tooth-like; the dise with hairy ridges and calli. Column thick, shorter than its foot, wingless, rostellum short. Anthor terminal, depressed, shortly beaked in front, sometimes bearing two lateral setæ. Polliniu four, in pairs, compressed; the caudicle slender, flattened, the gland small. Species probably about ten, Indian and Australian.

The genus Sarcochilus, as reconstituted by Bentham, embraces the Sarcochilas of Robert Brown and of so much else besides that it is diffienlt to kiow what its limits are. Sir Joseph Hooker, in his Flora of British India, adopts the Benthamian genus, but characterises it as "a polymorphous one, no doubt to be dismembered when better known." And in the Botanical Magazine (sub. t. 7044) he remarks as follows:-
"Sarcochilus, as reconstituted in the 'Genera Plantarum,' consists of a very difficult group of thirty or forty Indian, Malayan, Australian, and Pacifie Island orohids differing greatly in habit, and out of which some eight or ten genera" (thirteen are given in the Index Kewensis) "had been differentiated." ***"For this enlurged genus Reichenbach filius proposed to adopt the name of Thrixspermum, Loureiro (1790), as being anterior to Sarcochiliss, Brown (1810), a course which Bentham did not adopt in the 'Genera Plantarum,' on the very sufficient grounds that the name is utterly bad in construction, and because the description of the latter is so incomplete that it would have been impossible to recognise the plant intended by it, but for a scrap contained in Loureiro's Herbarium preserved in the British Museum. On the other hand, Sarcochilus has been recognised by all authors for three-quarters of a century, and many species have been described under that generic name."

Of the species described under Sarcochilus in Hooker's Flora of British India, six are natives of Sikkim, viz., (1) S. suaveolens, H. f.; (2) S. obtusus, Benth.; (3) S. Munnii, H. f.; (4) S. hirtus, Benth.; (5) S. Arachnites, Reichb. fil.; and (6) S. luniferus, Reichb. fil. Of these six, the last (S. luniferus) is the only one which has the charaeters of the genus as we believe Robert Brown originally constituted it, and which occur in the only species which he described, viz. S. falcatus. These characters are the presence in the lip of two very large side lobes and of a very short anterior lobe, together with the total absence of a spur. The other five Sikkim species attributed to Sarcochilus in the Flora of British Indis we have disposed of as follows:-For S. suaveolens we have revived the genus Ornitharium which Lindley provided for the plant when it first came under his notice, the very peculiar.
lip of this plant excluding it, in cur opinion, from any other genus. For S. obtusus and S. Mannii we have re-established the Liudleyan geuus Camarotis (to which the former originally belonged under the name Camarotis obtusa). The characters which make the revival of Camarotis necessary are the dursal position of the anther, the shape and direction of the enormously developed rostellum, and the form of the lip. For S. hirtus we retain the genus Siereochiius which Lindley originally founded for it; and we have transferred, for reasons given under our description of the species, to the same geuus the plant described in the Flora of British India as Cleisostoma bicuspidatum. Stereochilus has a spurred lip; the middle lobe is large and the lateral lobes are very small; the anther is terminal and the rostellum at right angles to the column-charasters which exolude it fr m the Sarcochitus of Brown. Finally, we have, on account of the conspicuous spur, the small size of the side lobes, and the comparatively large sizo of the apical lobe-but above all on account of the fact that the lip is jointed to the column-restored S. Arachnites to Blume's genus Dendrocolla.

Leafless; racemes pubescent, many-flcwered : . . . . . . . . 1. S. luniforus.
Leafy; racemes glabrous, with only two to three flowers . . . . 2. S. pygmous.

## 1. Sarcochilus luniferus, Benth. MSS. ex Hook. fil. in Bot. Mag., t. 7044.

Roots numerous, elongated, flattened and greenish in colour. Stem and leaves absent. Inflorescence pendulous, pubescent, 3 to 15 in . long; the peduncle short and with a few minuto distant bracteoles; the raceme many-flowered, lax. Flowers almost sessile, 5 in. across; bract membranous, ovate-lanceolate, almost equalling the sub-sessile pubescent ovary. Sepals unequal, the dorsal ovate, blunt, concave and over-arching the column; the lateral pair ovate rotund, b'unt, spreading. Petals broader than the sepals, sub-quadrate, truncate. Lip parallel to the column and jointed to its long foot, forming a deep triangular pouch and having very large erect obliquely oblong blunt glabrous side lobes; the apical lobe reduced to a small knob. Column short, thick, its foot longer than itself but not so fleshy. Anther dome-shaped, rather depressed, bearing two long decurved lateral setæ. Pollinia four, orbicular in outline, unequal, compressed, attached by a slender cylindric caudicle to a small thick gland. Hook. fil. Fl. Br. Ind. VI, 37. Thrixspermum luniferum, Reichb. fil. in Gard. Chron. 1868, 786.

Sikkim, in tropical valleys; in flower during May; Pantling, No. 66. Burma; Falconer, Brandis, Kurz.

The sepals and petals of this are yellow with large brown spots; the lip is also yellow with broad bands of brown, and the column has two bands of brown below the stigma. In the structure of its flowers this exactly agrees with Sarcochilus falcatus, R. Brown, as figured by Fitzgerald in his Orchids of Australia, part 5. Brown's generic desoription is a yery brief one, and contains nothing that does not fit this plant, which without hesitation we refer to Surcochilus, as Brown defined it.

Plate 276.-Sarcochilus luniferus, Benth. A plant in flower and fruit; of natural sise. Fig. 1 a flower, 2 braet, ovary, column and lip, side cieno, 3 the lip, looked at from the base, the top having been cut off, 4 longitudinal section of column and lip, 5 oolumn, front view, showing the anther with its setae and the stigma; 6 the under surface of the anther with the pollinia in situ, 7 the polinia, front and lack viects; all enlarged.

## 2. Sarcochilus pygmeus, new species.

Stem 1 in. long, pendulous. Leaves two or three, fleshy, linear-oblong, acuminate; their apices entire; length 2.5 in., breadth 35 in. Racemes one or two, glabrous, their

Sikkim, at elevations of from 6,000 to 8,000 feet; in flower during November; C. B. Clarke. Pantling, No. 20. Bhotan; Gammie and Lister.

This so closely resembles A. Cathcartii that the two are indistinguishable except when in flower. The leaves of this are slightly firmer than those of A. Cathcartii. The colour of the posterior surface of all the pieces of the perianth is white; that of the anterior is gamboge-yellow with broad but unequal rich chestnut-brown bands, the lip being horizontally striped with the same tint of brown. The column is white, speckled in front and flushed behind with pink; the anther is yellow, but its apex is tipped with pink.

Plate 279.-Arachnanthe Clarkei, Rolfe. Part of a plant, of natural size. Fig. 1 lip, 2 stalked ovary, column with anther in situ, and lip, 3 section of lip to show the infundibuliform hollow in its substance, 4 column with anther and stigma, 5 pollinia with caudicle (c) and gland (g), 6 the same from behind, 7 empty anther-all enlarged, 8 fruit; of natural sise.

## 3. Arachnanthe bilnguis, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 573.

Stem stout, woody, enveloped in the bases of fallen leaves, probably pendulous. Leaves coriaceous, keeled, close together, linear-oblong, blunt, unequally bilobed, not narrowed at the sheathing base, 6 to 9 in . long and about 8 in . broad. Raceme as long as or longer than the leaves, sometimes branching; the peduncle and rachis slender, the latter with distant short tabular sheaths. Flowers distant, 85 to 1.5 in. across; floral bract broad, blunt, scarious, much shorter than the peduncled ovary. Sepals sub-equal, oblong-oblanceolate, blunt. Petals slightly smaller, oblong, acute. Lip shorter than the petals, sagittate in general outline, shortly clawed, the basal auricles shallow; the blunt apex with a large papilla just behind it on the under surface, and a blunt recurved cylindric spur between the papilla and the base, the spur equal in length to the column; upper surface convex, with six narrow pink ridges. Column stout, curved. Anther conical, its apex blunt; pollinia globose, attached to the apex of a triangular caudicle, the gland very thick. Hook. fil. Fl. Br. Ind. VI, 28. Renanthera bilinguis, Reichb. fil., Xenia Orchid. I, 7, t. 4. R. labrosa, Reichb. fil. l. c. 88. Arrlynchium labrosum, Lindl. in Paxt. Fl. Gard. I, 42.

Bhotan near the Sikkim frontier in the Rumpti Valley at a low elevation; J. L. Lister, Pantling, No. 183; in flower during August. Khasia Hills; Assam, Simons.

The sepals and petals are pale yellow with dark brown markings; the lip, at first white, afterwards becomes yellow and has pink lines on its ridges and bright blotches of the same colour on its basal auricles.

Plate 280.-Arachnanthe Vilinguis, Benth. A plant, of natural sise. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ, and lip with its spur, 3 seotion of lip, 4 pollinia; all onlarged.

## 48. 㧨rides, Lour.

Epiphytic, with leafy stems. Leaves coriaceous, linear or terete. Flowers usually numerous and brightly coloured, in decurved racemes, sometimes solitary; the floral bract minute. Sepals and petals broad, spreading, the lateral sepals adnate to the base or foot of the column. Lip adnate to the column, spurred; the side lobes large or small,
sometimes absent; the mid-lobe larger than the side lobes, or smaller and incurved. Column short, its foot short or long; rostellum short or long and bifid. Anther 2-celled, with or without a beak; pollinia two, globose, sulcate; caudicle long or short; gland various. Species about 50; Eastern Asiatic.

Leaves terete

1. $\boldsymbol{E}$. longicornu.

Leaves flat, keeled-
Apical lobe of lip small, narrowly oblong
2. $\boldsymbol{E}$. odoratum.

Apical lobe of lip large and hastate, acute
3. E. multiflorum.

## 1. Ærides longicornu, Hook. fil. Ic. Plant. 2127.

Stem slender, elongate, pendulous. Leaves terete, 4.5 to 7 in . long and about $\cdot 1$ in. thick. Peduncle extra-axillary, very slender, 1 - to 2 -flowered, 1.25 to 2 in. long. Flowers 1.25 in . long. Sopals oblong; the dorsal erect, apiculate; the lateral pair spreading, sub-falcate, flexuose. Petals as large as the dorsal sepal, oblong, tapering somewhat towards the blunt apex, the edges much undulate. Lip adnate to the long foot of the column, consisting chiefly of an elongated narrowly infundibuliform spur curving slightly forwards, its mouth with two unequal hooked linear acute lateral lobes on each side; the apical lobe oblong, decurved, slightly dilated and cuneiform at the apex. Column short, the foot much longer. Anther shortly beaked; pollinia globose; caudicle filiform, dilated at the apex; the gland small, oblong. Capsule narrowly cylindric, ridged, 1.75 in . long. Hook. fil. Fl. Br. Ind. VI, 44. Mesoclastes uniflora, Lindl. in Wall. Cat. 1993; Gen. and Spec. Orch 45. Luisia uniffora, Blume Rumph. IV, 50 ; Mus. Bot. Lugd. Bat. I, 64 ; Lindl. Fol. Orch. 3.

At Dumsong, in Bhotan, elevation 5,500 feet; Pantling No. 350; in flower during September. Nepal; Wallich. Upper Assam, in the Naga Hills, at an elevation of 5,500 feet; Clarke.

The flowers are white with a flush of pink on the spur; they are inodorous. The species appears to be to a great extent self-fertile. Mr. Pantling, who kept living plants of it under observation, recorded the following note on this point:-
"The contraction after removal of the dilated portion of the caudicle immediately below the pollen masses, and the backward movement of the masses to a right angle, suggest that these phenomena are arrangements for securing self-fertilization. Moreover, the main portion of the caudicle is so very slender and the pollinia and anther are so delicately attached to the column that the whole becomes easily influenced either by the force of the wind, or by the jar caused by the leaves striking against the flowers. On dislocation taking place, the masses hang as by a thread in front of the stigmatio cavity, and in that position very little is needed to bring them in contact with the viscid surface of the stigma, and so to effect self-fertilization. Of seven flowers which opened near my house, all were thus self-fertilized."

Specimens of this from the Khasia Hills, as figured by Sir J. W. Hooker in his Icones Plantarum, have the apical lobe of the lip more dilated and slightly bifid than those from Sikkim as figured here.

Plate 281.- Erides langicornu, Hook. fil. A plant, of natural size. Fig. 1 a flower, 2 section of column and its foot and of the lip, 3 column and foot with anther in situ, front view, 4 apex of column with the pollinia in situ, the cap of the anther having been removed, 5 pollinia shortly after removal, the bending of the caudiele having been completed, 6 empty anther seen from below; all enlarged.
ann. Roy. Bot. Gard., Calcutta, Vol. VIII.
2. Arides odoratum, Lour. Fl. Coch. Ch., 525.

Stem very stout. Leaves flat, keeled, oblong, tapering somewhat to the blunt unequally and obtusely bilobed apex, not contracted at the sheathing base; length 6 to 12 in., breadth 1 to 1.75 in . Racemes supra-axillary, deflexed, as long as or longer than the leaves, many-flowered; the pedunele short, stout, with short distant sheaths. Flowers 1 in . long and about 8 in . wide; floral bract broad, sheathing, blunt, much shorter than the stalked ovary. Sepals unequal, spreading; the dorsal broadly elliptic-ovate, blunt; the lateral pair somewhat larger, blunt. Petals oblong, falcate, shorter than the sepals. Lip adnate to the short foot of the column; the spur large, infundibuliform, curved forwards; the lateral lobes very shallow, truncate, erose; apical lobe linear, its margin emarginate or erose, lying between the edges of the lateral lobes. Anther triangular, depressed, beaked; pollinia globose; caudicle linear, gland quadrate. Capsule fusiform, $1 \cdot 25 \mathrm{in}$. long. Lindl. Gen. and Spec. Orch. 239; in Journ. Linn. Soc. III, 41; Bot. Mag. 4139; Walp. Ann. VI, 898; Lindenia, t. 14 (var.); Hook. fil. Fl. Br. Ind. VI, 47. Erides cornutum, Roxb. Hort. Beng. 63 ; Fl. Ind. III, 472 ; Bot. Regist., t. 1485.

Sikkim, common along the base of the range and ascending to 3,000 feet; in flower during May and June; Pantling, No. 443. Westward to Nepal. In the Khasia Hills, Sylhet, Chittagong and Burma; also in Cochin China, China and Java.

The flowers are very fragrant. The prevailing colour in them is white with numerous pink spots.

Plate 282.- Wrides odoratum, Lour. A plant, of natural size. Fig. 1 a flower, 2 apical lobe of the lip, 3 the column with its foot and the anther in situ, 4 anther seen from below, 5 pollinia; all enlarged.

## 3. Ærides multiflorum, Roxb. Corom. Pl. III, 63, t. 271.

Stem 4 to 10 in . long, stout. Leaves narrowly oblong, conduplicate, recurved, slightly tapered to the oblique bifid apex, not narrowed to the base, frequently flushed with a reddish tinge; length 6 to 10 in ., breadth $\cdot 75$ to $1 \cdot 25 \mathrm{in}$. Racemes longer than the leaves, simple, axillary, densely many-flowered; the peduncle long and with distant short sheaths. Flowers $\cdot 75$ in. in diam. Sepals and petals sub-equal, oblong, blunt. Lip twice as long as the sepals, entire, triangular, adnate to the base of the column, the margins erose, the apex acute or blunt; its basal half thick and with a retrorse tooth or callus pointing across the mouth of the rectangularly bent spur. Column with its margins thickened and slightly winged near the base, foot none. Anther depressed and with a long curved beak in front; polliria globular, caudicle filiform, gland very narrow. Roxb. Flora Indica, III, 475; Belg. Hortic. 1876, 286 ; Reichb. fil. in Walp. Ann. VI, 897; Hook. fil. Fl. Br. Ind. VI, 44. AX. affine, Wall. Cat. 7316 ; Lindl. Gen. and Spec. Orch. 239 ; Sert. Orchid., t. 15 ; in Journ. Linn. Soc. III, 41 ; Bot. Mag., t. 4049; Warner Sel. Orch. Ser. I, t. 21. A. roseum, Lodd. ex Paxt. Fl. Gard. II, 109, t. 60 ; Regel Gartenflora VIII,; 253, t. 267. AE. Lobbii, Hort. ex Ill. Hort. 1868, t. 559. AX. Veitchii, Hort. ex Morven in Belg. Hortic. 1876, 291. L. trigonum, Klotzch in Otto and Diet. Allgem. Gartenz, 1855, 177.

Sikkim, in trepical valleys; in flower during April; Pantling, No. 446. Assam; G. Mann.

The ground colour of the flowers is white, but they are freely marked with pink or purple. The species is closely allied to AE. Fieldingii, Lodd., but that is a more robust plant and has wider leaves, which are flat. Its flowers, moreover, are rather larger. AE. Fieldingii has not been recorded from Sikkim.

Plate 283.—Arides multiflorum, Roxb. A :flowering plant, of natural size. Fig. 1 a flower, 2 side view of bract, stalked ovary, column and lip, 3 lip showing the callus (c) at the point of insertion on the column, 4 column, 5 empty anther, 6 pollinia; all enlarged.

## 49. Rhynchostylis, Blume.

Epiphytic. Stem elongate, stout, leafy. Leaves very coriaceous, linear-oblong, truncately or bluntly bilobed at the apex. Racemes pendulous, many-flowered. Flowers brightly coloured. Sepals and petals spreading, broad, obtuse, the petals narrower than the sepals. Lip adnate to the short foot of the column, the hypochile forming a deep wide pubescent sac without side lobes; the epichile obovate, acute, concave, the margins erect. Column short, stout, dilated at the base and with a very short foot. The stigma small. Anther terminal, rounded; pollinia two, elliptic, attached by a slender long caudicle to the small oblong gland. Species two or three, Malayan and Indian.

## Rhynchostyils retusa, Blume Bijdr. 286, t. 49.

Stem stout, clothed in the sheaths of decayed leaves, 4 to 8 in . long. Leaves curved, keeled, premorse or bluntly bilobed; length 6 to 18 in., breadth about 1 in . Racemes longer than the leaves, cylindric, densely-flowered, the peduncle short with a few small scattered sheaths. Flowers 75 in . across, the spur compressed, equal in length to the lip. Lateral sepals broadly ovate, obtuse or apiculate, the dorsal oblong. Capsule clavate, 1 to 1.5 in. long. Hook. fil. Fl. Br. Ind. VI, 32. R. prcemorsa, Blume Bijdr. 286. R. guttata, Reichb. fil. in Bonplandia II, 93. R. garvalica, Reichb. fil. in Walp. Ann. VI, 888. Saccolabium guttatum, Lindl. in Wall. Cat. 7308; Gen. and Spec. Orch. 220 ; in Journ. Linn. Soc. III, 32; Bot. Mag., t. 4108; Wight Ic. tt. 1745-6; Dalz. and Gibs. Fl. Bomb. 263; De Vriese Orch. t. 14; Griff. Ic. Pl. Asiat. Notul. 22, t. 8 and 9. S. promorsum, Lindl. Gen. and Spec. Orch., 221. S. Rheedii, Wight Ic. V, 19. S. retusum, Flore des Serres, tt. 1463-4. S. Heathii, Hort. ex Gard. Chron. 1885, II, 369. S. Blumei, Lindl. Sert., t. 47; in Bot. Reg. 1841, misc. 55. S. gurvalicum, Lindl. in Journ. Linn. Soc. III, 32; in Gard. Chron. 1879, II, 102. Sarcantlus guttatus, Lindl. in Bot. Reg., t. 1443. Erides guttutum, Roxb. Fl. Ind. III, 471; Regel Gartenflora, 1863, 415. A. retusum, Swartz in Schrad. Dar. 1799, 130; Willd. Sp. Plant. IV, 130; Grah. Cat. Bomb. Pl. 204. AE. spicatum, Don Prod. Fl. Nep. 31. EE. premorsum, Willd. 1. c.; Grah. Cat. Bomb. Pl. 264. Limodorum retusum, Swartz in Nov. Act. Upsal. VI, 80. Epidendrum retusum, Linn. Sp. Plant, 953.

Sikkim, common in tropical valleys and ascending to 3,500 feet ; Pantling, No. 442 ; along the base of the Himalaya westward to Gharwal and eastward to Bhotan. In Assam, the Khasia Hills, Burma, Southern India, Ceylon and the Malayan Archipelago.

The flowers are white or pink, variously marked with purple or violet. The hypochile of the lip forms a sac varying in length; the epichile also varies in shape,
being sometimes cuneiform; moreover, its disc is in some specimens flat, in others channelled. The plant is widely distributed and local varieties have been too freely treated as species. There is considerable divergence also as to time of flowering. The form here figured is that found in Sikkim.

Plate 284.-Rhynchostylis retusa, Blume. A plant, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ, and spurred hypochile, seen from the side, 3 section of spur, 4 lower surface of anther, 5 column with anther in situ, 6 pollinia; all enlarged.

## 50. Vanda, R. Brown.

Epiphytes with leafy stems. Leaves thickly coriaceous or fleshy, flat and keeled or terete. Racemes axillary. Flowers large and usually handsome, in simple lax or dense racemes, sometimes solitary; the floral bract much smaller than the ovary. Sepals and petals sub-equal, spreading or connivent, narrowed at the base. Lip large, with its base usually saccate or spurred; the side lobes large or small (rarely absent), adnate to the short foot of the column or to the sides of the sac or spur; apical lobe fleshy, varying in shape, its disc usually ridged or lamellate, sometimes carunculateColumn short, stout, without a foot or with only a short one. Anther 2-celled; rostellum small; pollinia two, didymous, globose-obovoid or broadly ovoid; the caudicle broad and short, or long and geniculate; gland usually large. Species about 30, tropical Asiatic and Australian.

$$
\begin{aligned}
& \text { Leaves terete. . . . . . . . . . . . . . . . . . . . V. teres. } \\
& \text { Leaves narrowly oblong, keeled. } \\
& \text { Lip spurred at the base. } \\
& \text { Apical lobe of lip oblong, carunculate, not ridged, its apex broadly } \\
& \text { emarginate or minutely bilobed . . . . . . . . . . . V. parviflora. } \\
& \text { Apical lobe of lip boldly ridged and carunculate; its apex with } \\
& \text { two divaricating lobules and with a downward pointing horn . . . V. cristata. } \\
& \text { Apical lobe ridged but not carunculate, its apex sub-truncate . . . . V. pumila. } \\
& \text { Lip gibbous, but not spurred or saccate at the base . . . . . . . . 5. V. alpina. }
\end{aligned}
$$

1. Vanda teres, Lindl. in Wall. Cat.; Gen. and Spec. Orch., 217.

Stem 2 to 8 feet long, sub-scandent, slender, branched, smooth, naked. Leaves fleshy, terete, tapering to the sub-obtuse apex, 4 to 8 in . long and as thick as a goose-quill. Peduncle extra-axillary, slender, longer than the leaves, sub-erect, bearing a few short bracts; raceme 2- to 6 -flowered. Flowers 2.5 to 3 or even 4 in. across. Dorsal sepal broadly elliptic, rotund or obovate, blunt; the lateral pair broadly oblong or obovate, falcate, obtuse, somewhat undulate. Petals larger than the lateral sepals, sub-rotund, wide-spreading. Lip longer than the sepals, adnate like the lateral sepals to the very short foot of the column; spur infundibuliform, puberulous inside, the mouth very wide, with large rounded obliquely elliptic side lobes; the apical lobe clawed, obovate, deeply bifid. Column short with a broad base and a very short foot, pubescent in front. Anther with a long apical beak, depressed. Pollinia broadly ovoid, bifid; caudicle stout, tapered to the large reniform or cordate gland. Capsule narrowly fusiform, 2.5 in . long. Lindl. in Wall. Cat. 7324 ; Gen. and Spec. Orch. 217 ; Fol. Orch. 7; in Bot. Reg.
t. 1809 ; Bot. Mag., t. 4114 ; Paxt. Mag. Bot. V, t. 193 ; Griff. Notul. III, 353 ; Warn. Sel. Orch. Ser. III, t. 2; Reichenbachia, I, t. 27; Hook. fil. Fl. Br. Ind. VI, 49. Dendrobium teres, Roxb. Fl. Ind. III, 485.

Sikkim, common in the Terai and occasionally found in very hot valleys; in flower during March and April; Pantling, No. 45. Assam, Sylhet, Khasia Hills, Chittagong and Upper Burma, Andaman and Nicobar Islands.

The sepals and petals are rose-coloured, as are the side lobes and apex of the lip. The spur is yellow or ferruginous, boldly lined with purplish-brown externally and speckled with red in the throat. A variety with the rose colour supplanted by white is occasionally met with. In this species as found in Sikkim the flowers measure only two and a half inches in expanse, the form with flowers four inches wide not yet having been observed in the Province. At the base of the Khasia Hills, and in many parts of Assam, the large and small-flowered forms grow together. They are structurally the same. The nearest ally of this is the Malayan V. Hookeriana, Benth. On the removal of the pollen apparatus from the anther, the pollinia fall forward because of the folding of the caudicle, and they ultimately rest on the gland.

Plate 285.-Vanda teres, Lindl. Upper part of a plant, of natural size. Fig. 1 ovary, column and lip, side viev, 2 column with anther in situ and foot, 3 apex of column with pollinia in situ, 4 pollinia after removal and after the bending of the caudiele, 5 empty anther, from below; all enlarged.

## 2. Vanda parviflora, Lindl. in Bot. Reg. XXX (1844), Misc. 45.

Stem stout, 4 to 12 in. long, clothed with the remains of sheaths of fallen leaves. Leaves linear-oblong, conduplicate, keeled, unequally and obtusely. 2-lobed at the apex, the base not narrowed; length 3 or 4 in., breadth when flattened out 4 to 5 in. Inflorescence from below and about as long as the leaves; the peduncle as long as the raceme, bearing a few small scattered sheaths; raceme few-flowered. Flowers 6 in. in diam. Sepals spathulate, obtuse, the lateral pair shorter than the dorsal. Petals spathulate-oblong, falcate, as long as the lateral sepals. Column thick, short, with a very short foot. Lip adnate to the foot of the column, spurred; the spur narrowly infundibuliform, half as long as the ovary, its mouth with erect oblong, rounded or sub-acute, side lobes; the apical lobe fleshy, decurved, oblong; the apex broad, erose, minutely emarginate or 2-lobulate; the upper surface caruncled and with a deep groove down the centre. Anther depressed, very slightly beaked in front; pollinia sub-globose, bifid. Capsule 8 in . long, fusiform, with winged ridges. Wight Ic. 1669; Reichb. fil. in Gard. Chron. 1877, II, 166; Hook. fil. Fl. Br. Ind. VI, 50. Arides Wightianum, Lindl. in Wall. Cat. 7320 ; Gen. and Spec. Orch., 238 ; in Journ. Linn. Soc. III, 40 ; Bot. Mag., t. 5138; Wight Ic. V, p. 8; Dalz. and Gibs. Fl. Bomb., 265.

Sikkim, at the base of the range and in the bottoms of hot valleys; in flower from April to June; Pantling, No. 270. Westward to Kumaon and Nepal; eastward and southward to Assam and Burma; also on the Western Gháts of Southern India and in Ceylon.

The sepals and petals are pale buff, and the apical lobe of the lip is bluishpurple. There is, however, some variation as to colour, one form having sepals and petals brown, and another sepals and petals white; but neither of these has hitherto been found in Sikkim.

Plate 286.-Vanda paroifora, Lindl. A plant, of natural size. Fig. 1 sepals and petals, spread out, 2 flower, 3 apex of ovary, column with anther in situ, and lip, in profile, 4 section of the foregoing, 5 lower surface of anther, 6 pollinia; all enlarged.
3. Vanda cristata, Lindl. in Wall. Cat. 7328; Gen. and Spec. Orch. 216.

Stem 3 to 12 in . long, stout, covered with old sheaths. Leaves numerous, narrowly oblong, conduplicate, truncately and unequally bilobed at the apex, dilated towards the jointed widely sheathing base; length 3 to 4 in., breadth (when flattened out) '6 or $\cdot 7$ in. Racemes equal to or shorter than the leaves, axillary, 2 - or 5 -flowered. Flowers 1.5 to 2 in. across. Sepals sub-equal, spreading, oblong, obtuse. Petals oblong, narrower than the sepals. Lip longer than the sepals, adnate to the base of the column; the spur widely infundibuliform, half as long as the stalked ovary, its mouth with triangular erect side lobes; the apical lobe oblong, its apex with two divaricate oblong lobules, and under the apex a horn-like fleshy beak pointing downwards, the upper surface with five carunculate ridges. Column short, with no foot. Anther depressed, with a mesial ridge; pollinia ovoid, attached by a broad short caudicle to a quadrate gland. Capsulel narrowly clavate, 2 to 2.5 in. long. Lindl. Sert. Orch. frontisp., fig. 3; in Bot. Reg. 1842, t. 48; Fol. Orch. 10; Bot. Mag., t. 4304; Walp. Ann. VI, 869; Warner's Orch. Alb. VII, t. 290; Gartenflora, t. 680; Hook. fil. Fl. Br. Ind. VI, 53. Ewrides cristatum, Wall. MSS. AErides sp., Griff. It. Notes, 203, No. 1188.

Sikkim, at elevations from 2,000 to 6,000 feet, common; Pantling, No. 118. Westward to Kumaon, but not common. Bhutan, Sylhet.

The sepals, petals and ovary are of a pale olivaceous green or yellowish; the lip is also green, but boldly blotched with dull purplish-brown. The pollen-masses, after removal from the anther, fall forward owing to the bending of the caudicle, until they ultimately rest on the gland.

There are two forms of this in Sikkim; one found at elevations of 2,000 to 4,000 feet, with racemes producing as many as four or five flowers an inch in diameter; the other with flowers nearly twice as large as the former, but with only two of them on the raceme. The latter is most common at elevations of about 5,000 feet. In structure and coloration the flowers of the two are exactly alike. The second is the form figured here.

Plate 287.-Vanda cristata, Lindl. A plant, of natural size. Fig. 1 bract, ovary, column with anther in situ, and lip in profile, 2 section of the upper part of the foregoing, 3 column with anther, front vien, 4 apes of column, pollinia, and caudicle in situ, 5 lower surface of anther, 6 pollinia after removal, the caudicle having bent; all enlarged.

## 4. Vanda pumila, Hook. Fil. Fl. Br. Ind. VI, 53.

Stem and leaves as in V. cristata and V. alpina. Racemes much shorter than the leaves, 2 -flowered. Flowers 1 in. across, drooping, floral bract minute. Sepals and petals subequal; the lateral sepals slightly broader, oblong, obtuse, curved, connivent. Lip shorter than the sepals, the base with a wide infundibuliform sae with small triangular oblong side lobes; apical lobe large, fleshy, broadly ovate, the apex sub-truncate, the upper surface
with two small knobs near the apex and four to six short thickened ridges in the centre. Column thick, short, with no foot. Anther depressed, slightly apiculate behind; pollinia broadly ovate, their apices divaricate; the caudicle quadrate; the gland large, broad, angled. Capsule clavate, ridged, 2.75 in . long. Hook. fil. Fl. Br. Ind. VI, 53. Vanda cristata, var. B., Lindl. Fol. Oreh. 10.

Sikkim, in the bottoms of hot valleys; in flower during May; Pantling, No. 73.
The flowers are cream-coloured, the lip having long red markings, and the sepals and petals being slightly speckled with the same colour. They are very sweet-scented.

Plate 288.—Vanda pumila, Hook, fil. A plant, of natural size. Fig. 1 bract, stalked ovary, column with anther in situ, and lip, 2 lip, 3 column with anther in situ, front view, 4 under surface of anther, 5 pollinia with the caudicle extended and the gland, 6 the same after removal, the caudicle having bent and brought the pollinia into contact with the gland; all jenlarged.

## 5. Vanda alpina, Lindl. Fol. Orchid. 10.

Stem and leaves as in V.cristata. Racemes much shorter than the leaves, 2-flowered, or flowers solitary, nodding, 75 in . long. Sepals and petals sub-equal, oblong, blunt, rather connivent than spreading, the petals somewhat smaller than the sepals. Lip adnate to the column, gibbous but not saccate or spurred at the base; side lobes shallow, rounded; apical lobe ovate, oblong, obscurely trilobulate towards the apex; the side lobules small, entire; the apical lobule retuse, its upper surface with shallow ridges. Column short, stout, with no foot. Anther flattened, pollinia ovoid, caudicle sub-quadrate, gland broadly and transversely oblong. Capsule narrowly clavate, ridged, 3 in. long. Hook. fil. FI. Br. Ind. VI, 53. V. Grifithiii, Lindl. in Paxt. Fl. Gard. II, 22; Fol, Orch. 10 (excl. cit. Griff.). Luisia alpina, Lindl. in Bot. Reg. 1838, Misc. 56.

Sikkim, at Tendong, elevation 5,000 ; in flower during July; Pantling, No. 164. Westward to Gharwal. Khasia Hills; Hooker and Thomson.

This has pretty nearly the colouring of $V$. cristata, Lindl., but the lip is different, there being no sac at its base, but only an expansion; the anterior lobe, moreover, has neither shallow smooth ridges nor is it carunculate like that of $V$. cristata. In habit and foliage it resembles $V$. pumila and $V$. cristata.

Plate 289.-Vanda alpina, Lindl. A plant, of natural size. Fig. 1 a flower, 2 bract, ovary, column with anther in situ, and lip, 3 section of the foregoing, 4 column with anther in situ, 5 under surface of anther, 6 pollinis and caudicle in situ on the apex of the column, 7 the same some time after removal; all enlarged.

## 51. Saccolabium, Blume.

Epiphytes without pseudo-bulbs. Leaves coriaceous, flat or conduplicate, often keeled. Inflorescence leaf-opposed or supra-axillary, racemose, sub-corymbose, umbellate or panicled; floral bract minute, much shorter than the stalked ovary. Sepals and petals adnate to the column, sub-equal, usually spreading, sometimes reflexed. Lip sessile on the footless: column, consisting of a cylindric or saccate spur, without calli and non-septate, (with calli and horizontal septum in S. trichromum), with or without small lateral lobes; the apical lobe small, without a scale or callus under the short broad truncate column, often hairy.

Anther 1- or imperfectly 2 -celled; pollinia two, entire or bipartite. natives of Eastern Asia.

Spur without septum or callus.
Spur of lip cylindric, straight or curved.
Spur long, more or less parallel to the ovary, straight.
Apical lobe of lip decurved, transversely rugulose ; caudicle of pollinia slender, not dilated at the apex; flowers in panicles or umbels; stems very stout, elongate; leaves large, flat, keeled.
Flowers in umbels
Flowers in panicles.
Panicles longer than the leaves, many-branched Panicles shorter than the leaves, few-branched
Spur long, slender, curved, not parallel to the ovary; flowers in racemes.

Spur curved backwards; apical lobe of lip narrow, tongue-like, side lobes none ; caudicle of pollinia slender, not dilated at the apex; stem 3 to 5 in . long, stout; leaves rigid, keeled .
Spur curved forwards ; apical lobe of lip broadly triangular, acute, much decurved; side lobes small, rounded; caudiele of pollinia dilated towards the apex; leaves flat, stem under -5 in. long
Spur of lip infundibuliform.
Spur long, curved forwards; apical lobe small, often fleshy, glabrous; caudicle of pollinia broadly cordate or 2-lobed at the apex, the pollinia attached by a hooked process; flowers in racemes; leaves flat, keeled, stems elongate.

Racemes longer than the leaves
Racemes shorter than the leaves.
Side lobes of lip rounded, erose; leaves not exceeding 3 in . in length
Side lobes of lip none; leaves narrow, 3 to 5 in . long
Spur short with a very wide mouth and a bulbous bifid apex; the pollinia sessile on the dilated apex of the caudicle; apical lobe of lip narrowly oblong; flowers in panicles, stem elongate, leaves flat

Spur of lip short, wide, saccate, at right angles to the ovary.
Apical lobe of lip semi-cireular or reniform, fimbriate or papillose; caudicle of pollinia filiform; flowers in corymbose racemes or umbels; leaves flat, not setulose.
Stemless; upper surface of lip quite smooth, its edges deeply laciniate
Stem short; upper surface of the apical lobe of the lip papillose-hairy

## Stem elongate.

Apical lobe of lip semi-eircular, not lobulate, densely fringed with white fimbreæ, spur with three faint external ridges
Apical lobe reniform, 3 -lobulate, the edges fimbriate-erose, the upper surface glabrous except a broad papillosepubescent border; spur with one internal ridge

1. S. papillosum.
2. S. buccosum.
3. S. dasypogon.
4. S. intermedium.

Species about 55 ,
-
2. S. ochraceum.
3. S. longifolium.
4. S. ampullaceum.
5. S. Pumilio.
6. S. obtusifolium.
7. S. acuminatum.
8. S. lancifoliun.
11. S. calceolare.

13. S. aculifolium.

> Apical lobe of lip small, semi-circular or broadly oblong, entire, glabrous, without calli or with small calli or ridges; caudicle of pollinia slender; flowers in short racemes, stems very slender, leaves flat with setulose apices. Apical lobe of lip triangular. Apical lobe with two small conical calli near its base . 14. S. distichum. Apical lobe with two mesial ridges. ............ . . . . affine. Apical lobe of lip broadly cordate, blunt, without calli or ridges . . . . . . . . . . . . . ....... . 16. S. pseudo-distichum.

Spur with two calli about the middle and a small horizontal plate or septum
near the mouth
17. S. trichromum.

## 1. Saccolabium papillosum, Lindl. in Bot. Reg. t. 1552 (excl. syn.).

Stems erect, rigid, clustered, 35 in . thick, bearing many sub-horizontal leaves, sometimes branched. Leaves coriaceous, curved, conduplicate, the apex truncate or obliquely notched; length 3 to 4 in., breadth (when flattened out) $\cdot 6$ to 8 in. Peduncle leaf-opposed, about 5 in . long, bearing a sub-corymbose 4 - to 8 -flowered raceme. Flowers - 35 in. across; floral bract triangular. Sepals sub-equal, oblong, sub-acute, spreading. Petals narrower than the sepals, sub-spathulate. Lip slightly longer than the sepals, adnate to the base of the column, its base with a cylindric, slightly tapering spur half as long as the ovary and sub-parallel to it, hairy within; side lobes none; apical lobe decurved, ovate-oblong, blunt, crenate, the upper surface transversely rugulose. Column short. Anther broadly conical; pollinia two, deeply bipartite, sub-ovoid; caudicle elongate, tapering downwards to the small oblong-quadrate gland. Capsule fusiform, ridged, 1.25 in. long. Lindl. Gen. and Spec. Orch. 222; Hook. fil. Fl. Br. Ind. VI, 63. S. carinatum, Griff. Notul. III, 354. Acampe papillosa, Lindl. Fol. Orch. 2; Walp. Ann. VI, 873.

Sikkim, at low elevations ; in flower from October to January; Pantling, No. 243. Khasia, Assam, Chittagong, the Bengal Sunderbans, and Burma.

In Sikkim the sepals and petals of this are yellow with brown bars, the spur of the lip is pale yellow, and the apical lobe is white with transverse pale purple markings.

Plate 290.-Saccolabium papillosum, Lindl. A plant, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ and lip, in profile, 3 section of preceding, 4 under surface of empty anther, 5 pollinia; all enlarged.
2. Saccolabium ochraceum, Lindl. in Bot. Reg. 1842, Misc. 2.

Stem stout, 1 to 3 feet long, bearing numerous sub-horizontal leaves. Leaves fleshy, rigid, keeled, oblong; the apex blunt and unequally bifid, the base not contracted at the junction with the sheath; length 6 to 9 in., breadth 1 to $1 \cdot 3$ in. Panicles leaf-opposed, nearly erect, slender, rigid, twice as long as the leaves; the branches numerous, 2- to 6 -flowered Flowers $\cdot 4 \mathrm{in}$. across; floral bract minute, broadly triangular; ovary sessile, sparsely pubescent. Sepals unequal, the dorsal broadly oblanceolate, blunt; the lateral pair smaller, oblong, sub-falcate, blunt. Petals as long as the sepals, spathulate. Lip shorter than the sepals and petals, the base with a long cylindric spur nearly as long as the ovary and parallel with it, hairy within; the side lobes, near the base
of the apical lobe, small, sub-triangular, erect, toothed below; apical lobe deflexed, fleshy, broadly oblong, blunt, the upper surface carunculate and the margins slightly wavy. Column short, thick, with a stout tooth on each side of the anther. Anther dome-shaped, with a short, broad, recurved beak; pollinia two, unequally bipartite, broadly ovoid, cohering to the long narrow caudicle; gland small, oblong. Capsule fusiform, 1 to 1.5 in. long. Hook. fil. Fil. Br. Ind. VI, 62. S. lineolatum, Thwaites' Enum. Pl. Ceyl. 304. Acampe dentata, Lindl. Fol. Orch. 3; Reichb. fil. in Gard. Chron. for 1872, p. 1752; in Walp. Ann. VI, .894. A. Wightiana, var. . longe-pedunculata, Thwaites' Enum. Pl. Cey. 303.

Sikkim, along the base of the range and in the bottoms of low valleys; in flower during November and December; Hooker, Pantling No. 133. Bhotan, Khasia and Tenasserim; also in Malabar and Ceylon.

The sepals and petals are yellow with irregular brown markings. The spur of the lip is also yellow but without brown spots, and the apical lobe is white speckled with purple.

Plate 291.-Saccolabium ochracoum, Lindl. A plant, of natural size. Fig. 1 a flower, 2 bract, ovary, column with anther and lip, seen from the side, 3 section of the foregoing, 4 apex of the column, showing its teeth and the pollinia in situ, the cap of the anther having been removed, 5 pollinia after removal, 6 anther, upper surface; all enlarged.

## 3. Saccolabium longifolium, Hook. fil. Fl. Br. Ind. VI, 62.

Stem very stout, 24 to 36 in . long. Leaves coriaceous, oblong; the apex broad, emarginate or sub-bifid; the base jointed to the short wide sheath, not tapered; length 10 to 14 in., breadth $1 \cdot 5$ to 2 in . Inflorescence leaf-opposed, stout, rigid, erect, much shorter than the leaves, bearing a few distant sheaths in its lower part, and a terminal sub-corymbose few-flowered raceme, often with one or two lateral, short, sub-corymbose branches smaller than the terminal one. Flowers fleshy, 5 in. across; floral bract ovate, much shorter than the ovary. Sepals elliptic-oblong, sub-acute. Petals smaller than the sepals. Lip with a short conical spur, narrow acute-angled side lobes, and a fleshy ovate apical lobe transversely wrinkled on the upper surface. Apex of anther with two conical points; pollinia ellipsoidal. Acampe ? Tongifolia, Lindl. Fol. Orch., Acampe, 1. ?A. multiflora, Lindl. 1.c. Vanda longifolia, Lindl. in Wall. Cat. 7322; Gen. and Spec. Orch. 215; in Journ. Hort. Soc. VII, 267 ; Reichb. fil. in Walp. Ann. VI, 872. V. multiflora, Lindl. Collect., t. 38.

Sikkim, in tropical valleys and along the foot of the range; in flower during June; Pantling, No. 250. Upper Assam ; Mann. Burma; Wallich. Distrib. ? China.

Plate 292.-Saccolabium longifolium, Hook. fil. Part of a plant, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column, lip with anther in situ, 3 section of the foregoing, 4 lip, 5 column, 6 and 7 pollinia, before and after removal from the anther; all enlarged.

## 4. Saccolabium ampullaceum, Lindl. in Wall. Cat. 7307; Sert. Orch., t. 17.

Stems stout, clustered, 3 to 5 in. long, clothed at the base with the sheaths of fallen leaves. Leaves thickly coriaceous, narrowly oblong, keeled, acutely bifid, sometimes toothed between the lobes, the base jointed to the sheath and not narrowed. Racemes from the axils of the leaves, erect, shorter than the leaves, many-flowered; the peduncle
short, stout and sheathed at the base, the flowering rachis slender. Flowers 65 in . in diam. vertically; floral bract very minute, the stalked ovary about 4 in . long. Sepals and petals sub-equal, spreading, obovate, blunt. Lip with a spur longer than the sepals, flexuose, cylindric, blunt, sometimes inflated at the bend; side lobes none; apical lobe linear-oblong, sub-acute, entire, its tip upturned. Column short, stout. Anther domeshaped, shortly beaked in front; pollinia two, globose, divaricate; caudicle strap-shaped, its margins in-folding after removal from the column; gland oblong-quadrate. Capsule sub-clavate, 1 in. long. Lindl. in Journ. Linn. Soc. III, 35 (excl. syn.); Paxt. Mag. Bot. XIII, t. 49; Bot. Mag., t. 5595 ; Hook. fil. Fl. Br. Ind. VI, 64 . ACrides ampullaceum, Roxb. Fl. Ind. III, 476.

Sikkim, common at elevations of 1,000 to 3,000 feet; Pantling, No. 259. Westward to Nepal; eastward and southward to Sylhet, Munipur, Burma, Khasia Hills; in flower during March and April.

All the parts of the flower except the pollinia are coloured pink of various shades, and the leaves are invariably mottled with brown; the pollinia are deep purple. In Sikkim all specimens have the spur of the lip flexuose, not straight. This is very closely ${ }_{j}$ allied to S. curvifolium, Lindl., which has, however, orange-scarlet flowers and longer narrower leaves. A plant of this collected in Assam by Dr. G. Watt, c.I.E., had brick-red flowers, but their structure in no way differed from those of the plant here figured.

Plate 293.-Sacolabium ampullaceum, Lindl. A plant, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ and lip, seen from the side, 3 section of the foregoing, 4 under surface of empty anther, 5 pollinia as they rest on the column prior to removal, 6 the same after removal; all enlargod.
5. Saccolabium Pumiro, Reichb. fil. in Walp. Ann. VI, 886; Gard. Chron. 1875, II, 98.

Stem very short, pendulous. Leaves two or three, linear-oblanceolate, slightly falcate, the acute apex minutely and obliquely bifid; length 1.5 to 3.5 in., breadth 4 to 6 in. Inflorescence about as long as the leaves; the peduncle slender, shorter than the manyflowered raceme, with a tubular sheath about the middle; rachis of raceme stout. Flowers $\cdot 2$ in. long; floral bract minute, ovate, acute. Sepals unequal; the dorsal oblanceolateoblong, obtuse, concave, overhanging the column; the lateral pair spreading, elliptic, obtuse. Petals linear-oblanceolate, obtuse, toothed at one side, smaller than the sepals. Base of lip with a long tapering spur exceeding the ovary and curving forwards; the side lobes at the mouth of the spur small, short, rounded; the apical lobe broadly triangular, acute, much decurved. Column stout, not winged. Anther much depressed, shortly beaked. Pollinia obovoid, attached by a stout tapering caudicle to a small narrow gland. Capsule cylindric, tapering at the base, ribbed, 8 in. long. Hook. fil. Fl. Br. Ind. VI, 56. S. discolor, Reichb. fil. Ot. Hamb., 42. S. pusillum, Lindl. in Journ. Linn. Soc. III, 36 (not of Blume). Eccooclades pusilla, Lindl. in Wall. Cat. 7332; Gen. and Spec. Orch., 237.

Sikkim, at elevations of about 1,500 feet ; in flower during April; Pantling, No. 112. Sylhet ; Wallich.

The flowers are cream-coloured with a dash of purple at the entrance of the spur and at the base of the apical lobe of the lip, the column being brownish pink. On
the removal of the pollinia from the anther, the caudicle (previously somewhat bent) immediately falls forward to the same plane as the gland, while the pollinia move in a reverse direction until they assume a position at right angles to the caudicle.

Plate 294.-Saccolabium Pumilio, Reiohb. fil. Two plants. Fig. 8, fruit; of natural size. Fig. 1 a flower, 2 profile view of bract, sub-sessile ovary, column with anther in situ, and lip, 3 section of ovary and lip, 4 apex of ovary and column with anther in situ, 5 lower surface of anther, 6 apex of column with pollinia in situ, the cap of the anther having been removed, 7 pollinia after completion of the movement which follows removal, 9 section of fruit; all enlarged.

## 6. Saccolabium obtusifolium, Hook. fil. Ie. Plant., t. 2134.

Stem pendulous, 35 in . thick and 4 to 6 in . long. Leaves oblong, flat, somewhat tapered to the bluntly bilobed apex and slightly contracted to the jointed base; length 6 to 8 in ., breadth 1 to 1.25 in . Inflorescence from below the leaves or leaf-opposed, longer than the leaves; the peduncle stout, with three or four short broad blunt sheaths; the raceme about as long as the peduncle, densely many-flowered. Flowers $\cdot 5$ in. across; foral bract oblong, blunt, more than half as long as the shortly-stalked ovary. Sepals obovate, blunt, sub-connivent, the dorsal concave. Petals broader than the sepals and somewhat shorter, blunt. Lip longer than the sepals, consisting mainly of a large very wide-mouthed infundibuliform sac much curved forward and bulbous at the apex; the side lobes on the edge of the mouth of the spur near the column, small, triangular; apical lobe thickened, laterally compressed, pouched and 3 -lobulate; the two posterior lobules oblong, blunt, directed backwards; the middle one broadly triangular, acute and directed upwards. Column short, rostellum beaked. Anther tumid, with a long beak. Pollinia two, small, obliquely ovoid, attached by a curved process to the apex of the large caudicle; caudicle broadly cordate or 2 -winged at the apex, narrowed below to the oblong-ianceolate gland. Capsule fusiform, $\cdot 65 \mathrm{in}$. long. Hook. fil. Fl. Br. Ind. VI, 65. Uncifera obtusifolia, Lindl. in Journ. Linn. Soc. III, 40.

Sikkim, at elevations of 3,500 to 5,000 feet; in flower during September and October ; Pantling, No. 234. Bhutan; Lister. Khasia Hills; Hooker and Thomson, Mann.

The flowers are of a pale yellow tint, the apical lobe of the lip and the apices of the petals and sepals being of a brighter tone. The attachment of the pollinia to the caudicle and the shape of the latter are peculiar, and induced Lindley to form for the reception of all the species with the same arrangement the genus Uncifera. The pollinia lie inverted and are attached to the end of a small curved process which proceeds from the apex of the caudicle. The caudicle is an elongated body broadly cordate or two-winged at the apex, and tapering to the point by which it is inserted on the large elongate gland. On removing the whole apparatus from the anther the wings of the caudicle close, but the pollinia retain their inverted position,

Plate 295.-Saccolabium obtusifolium, Hook. fil. A plant, of natural sise. Fig. 1 a flower, 2 bract, ovary, column with anther in situ, and lip, side vien, 3 apex of ovary and the column, showing the inverted pollinia ( $p$ ), the large caudiele (c) and the elongate gland ( $g$ ), 4 empty anther from the side, 5 pollinia, caudicle and gland as seen from the front, 6 the tip of the caudicle and the pollinia; all eniarged.

## 7. Saccolabium acuminatum, Hook. fil. Ic. Plant; t. 2135.

Stem slender, pendulous, 6 to 9 in. long, clothed below with the narrow tubular sheaths of fallen leaves. Leaves linear-oblong, slightly narrowed to the sheathing base; the apex acuminate, not bifid; length $1 \cdot 35$ to 3 in., breadth 3 to $\cdot 5 \mathrm{in}$. Racemes leaf-opposed, rather shorter than the leaves, 8 - to 12 -flowered. Flowers 25 in across, crowded ; floral bract ovate, acute. Sepals ovate-rotund, the dorsal concave. Petals broader, oblique, sub-truncate. Lip consisting chiefly of an infundibuliform spur longer than the ovary and boldly curved forwards; side lobes rather large, rounded, erose; apical lobe very fleshy, broadly triangular. Column short, thick; the rostellum large, projecting; pollinia globose, attached to a thick hooked process proceeding from the apex of the caudicle; caudicle with two broad shoulders at its apex, gradually tapering to the narrow pointed gland. Hook. fil. F1. Br. Ind., VI, 65. Uncifera acuminata, Lindl. in Journ. Linn. Soc. III, 40.

Sikkim, at elevations of 6,000 or 7,000 feet; in flower from July to September. Gamble No. 10453; Pantling, No. 290. Khasia Hills; Griffith (Kew Distribution No. 5257), Clarke No. 14,286, G. Mann; at 4,000 feet, G. Gammie.

The flowers are of a pale green, almost white on the anterior lobe of the lip and on the tips of the petals. On removing the pollinia from the anther, the caudicle falls forward suddenly to the same plane as the gland, and the curved process at its apex to which the pollinia are attached, is then seen to consist of a folded membrane which opens along the upper margin and slightly separates the two masses. This species is rare in Sikkim, only a single specimen having as yet been collected. It is, however, common in the Khasia Hills. This is allied to $S$. obtusifolium, but is a more slender plant with shorter, narrower, entire, acuminate leaves and smaller paler flowers.

Plate 296.-Saccolabium acuminatum, Hook. fil. A plant, of natural size. Fig. 1 a flower, 2 profile of bract, ovary, column with anther in situ, and lip, 3 vertical section of column and lip, 4 apex of column with the anther in situ, the cap of the anther not having been removed; the small stigma $(\mathrm{s})$ is seen beneath the rostellum, 6 apex of column with the pollinia, caudicle and gland in situ, the cap of the anther having been removed, 5 anther from the side, 7 pollinia, after removal; all enlargod.
8. Saccolabium lanctfolium, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 122.

Stem slender, pendulous, 8 to 12 in . long. Leaves fleshy, linear, acuminate, aristate at the apex, slightly keeled, 3 to 5 in . long and 25 to $\cdot 3 \mathrm{in}$. broad. Racemes axillary, densely-flowered, 1.5 to 2 in . long, their peduncles as long as themselves and bearing a few membranous lanceolate scattered bracts. Flowers 3 in. across; floral bracts minute, triangular, much shorter than the short ovary. Dorsal sepal broadly ovate, very concave, its apex broad and slighitly emarginate; the lateral pair obliquely obovate, blunt, all three connivent. Petals oblong, blunt. Lip boat-shaped, its limb about as long as the sepals, the apex very fleshy, blunt. Spur funnel-shaped, longer than the ovary, much curved forwards, its apex not thickened. Column very short, the rostellam beaked. Pollinia two, globular-ovoid, attached to the inflexed beak of the caudicle; caudicle broad below the beak, much narrowed to the base; gland elongate, notched at its base.

Sikkim, at Rissisoom, elevation 6,000 feet; flowering in June; Pantling, No. 152.

Allied to S. acuminatum, Hook. nil., but with longer, narrower, and more sparsely arranged leaves. The lip is also different, there being no trace of side lobes; the caudicle differs also.

Plate 297.-Sacolabium lancifolium, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 profile of bract, ovary, column, anther and lip, 3 longitudinal section of column and lip, 4 petals, 5 half front view of column, the stigma (s), 6 apex of column with pollinia in situ, the cap of the anther having been removed, 7 pollinia, \&c., after removal, 8 empty anther, side view; all enlarged.
9. Saccolabium buccosum, Reichb. fil. in Gard. Chron, 1871, 938.

Stem pendulous, 6 to 12 in . long, slender, covered with the sheaths of fallen leaves. Leaves narrowly oblong; the apex blunt and divided into two broad unequal slightly oblique lobules; the base slightly narrowed and jointed to the sheath; length 2.75 to 3.5 in ., breadth $\cdot 6$ to $\cdot 75$ in. Panicle leaf-opposed, longer than the leaves; the peduncle shorter than the leaves, bearing one or two sub-tubular acute sheaths; the branches only one or two, racemose. Flowers lax, $\cdot 35$ in. across; the stalked ovary $\cdot 3$ or $\cdot 4$ in. long, slender; the floral bract subulate and much shorter. Sepals sub-equal, broadly ovate or subobovate, longer than the spur. Petals much smaller than the sepals, cuneately obovate. Lip longer than the sepals, the base with a bottle-shaped spur with a narrow mouth and contracted neck, the apex globose and didymous; side lobes spreading, rounded or angled; the apical lobe narrowly oblong. Column long, with broad truncate wings, its apox rounded and recurved. Lip of anther with a long point; pollinia globose; the caudicle very slender, arched; the gland linear, minute. Hook. fil. Fl. Br. Ind. VI, 58. S. parvulum, Lindl. in Journ. Linn. Soc. III, 36 (in note). Eceoclades paniculata, Lindl. in Wall. Cat. 7334 ; Gen. and Spec. Orch. 236. Cymbidium SatJrium, Herb. Ham.

Sikkim, at elevations of about 2,000 feet; in flower during May and June; Pantling, No. 158. Bhotan; Lister. Assam; Hamilton. Sylhet; Wallich. Tenasserim; Parish.

Plate 298.-Saccolabium buccosum, Reiohb. fil. A plant, of natural sizo. Fig. 1 a flower, 2 side view of bract, ovary, column and lip, 3 vertical section of the preceding, 4 the column showing the rostellum ( $r$ ) and the entrance to the stigmatio cavity ( $s$ ), 5 empty anther, 6 pollinia, 7 a single pollen mass ; all enlarged.

## 10. Saccolabium dasypogon, Lindl. Gen. and Spec. Orch., 222.

Stem very short, pendulous. Lerves oblong; the apex acute, minutely and unequally notched, slightly tapered to the shortly sheathed base; length 4 to 9 in., breadth 1 to 1.65 in . Raceme corymbose, much shorter than the leaves; its peduncle stout, with a broad tubular sheath near the base. Flowers crowded, 85 in across ; floral bract broad, blunt. Sepals and petals sub-equal, spreading, oblong-oblanceolate, blunt. Lip about as long as the sepals and petals, adnate to the greater part of the column, widely saccate, compressed below; side lobes shallow; apical lobe thick, semi-circular, produced at the ends, its edges laciniate, the disc quite glabrous. Column very short. Antler depressed, with a short broad beak in front; pollinid glolular, umbilicate in front; the caudicle long, slender, expanded at the apes between the pollinia; gland oblong, cordate. Capsule cylindric, tapering at the ends, ridged, $1 \cdot 25 \mathrm{in}$, long. Hook.
fil. Fl. Br. Ind. VI, 66. Arides dasypogon, Smith in Rees' Cyclop., Suppl. Epidendrum umbellatum, Ham. MSS.

Sikkim, at elevations of about 1,000 feet; in valleys and along the southern face of the range; in flower during November and December; Pantling, No. 248. Westward to Nepal. Assam, at Goalpara; G. Mann. Jaintia Hills, at Jowai ; King's Collector.

The sepals and petals are bright yellow with brownish-purple spots; the lip is white except a patch of yellow with minute brown spots near the apex and a purple line round the edges of the sac; the column is pink. This is closely allied to S. calceolare, Lindl., with which for many years it has been confused. The two plants, although much alike, are not really difficult of separation, In the first place they live at different elevations and flower at different seasons. S. calceolare is found between 4,000 and 6,000 feet, and flowers during March and April; while $S$. dasypogon is found at or below 1,000 feet and is in flower during November and December. The leaves of S. dasypogon are broader, and the apical notch is less deep than is the case in the leaves of S. calceolare, and the stem of S. dasypogon is shorter. The coloration of the flower of S. calceolare is constant; but in that of C. dasypogon the perianth may be pale or deep yellow, and either without spots or with numerous spots. Finally the lips of the two differ. In S. calceolare the sac is smaller ; the apical lobe is papillosehairy; while in S. dasypogon the apical lobe has deeply laciniate edges and its upper surface is perfectly smooth.

Plate 299.—Sacoolabium dasypogon, Lindl. A plant, of natural size. Fig. 1 a flower, 2 profile of oolumn, anther and lip, 3 transverse section of the sacoate portion of the lip, 4 section of apex of ovary, column and lip, 5 anthor, upper surface, 6 pollinia, front and baok views; all enlarged.

## 11. Saccolabium calceolare, Lindl. in Wall. Cat. 7302 ; Gen. and Spec. Orch., 223.

Stem short, pendulous. Leaves narrowly oblong, the apex unequally bifid, the base slightly narrowed and jointed to the short wide sheath; length 4 to 11 in ., breadth .75 to 1.15 in . Racemes corymbose, many-flowered, much shorter than the leaves, the peduncle with several short sheaths. Flowers 65 in . across, crowded; floral bract broad, blunt. Sepals unequal, spreading, the dorsal obovate-oblong; the lateral pair oblong, falcate, narrower than the dorsal. Petals oblong-obovate, shorter than the sepals. Lip adnate to the lower half of the column; the base forming a wide short sac, nearly parallel with and about half as long as the ovary; side lobes absent; the apical lobe at right angles to the sac, semi-circular, its margin and the whole of its upper surface, except a triangular yellow pad at the base, covered with white hair-like papillæ. Column very short, thick. Anther depressed, very shortly beaked; pollinia broadly ovoid-elliptic, attached ty a slender caudicle to a small triangular-cordate gland. Lindl. Sert. Orch., Frontisp. 6; in Bot. Reg. 1838, Misc. 139; in Journ. Linn. Soc. III, 33 (excl. synonym) ; Griff. Notul. III, 356 ; Itin. Notcs, 170, No. 869 ; Ic. Pl. Asiat., t. 334; Walp. Ann. VI, 883; Hook. fil. Fl. Br. Ind. VI, 60. LErides calceolare, Smith in Rees' Cyclop., Suppl. EE. leoparlorum, Wall. MSS. Gastrochilus calceolaris, Don Prodr. 32. Sarcochilus nepa ensis, Spr. Syst. Veg. III, 721, Epidendrum calceolare, Ham. MSS.

[^7]Sikkim, at elevations from 4,000 to 6,000 feet; in flower during March and April; Pantling, No. 68. Westward along the range, at similar elevations, to Gharwal. In the Khasia Hills; Griffith (Kew Distrib. No. 5207), G. Gammie.

The sepals and petals are pale green with large roundish brown markings; the sac of the lip is bright yellow with brownish-red markings, and the apical lobe, except the smooth yellow speckled pad at its base, is pure white; the column is reddish. This species is allied to S. dasypogon, as is stated under that species.

Plate 300.-Saccolabium calceolare, Lindl. A plant, of natural sze. Fig. 1 a flower, 2 side view of braot, stalked ovary, column, anther and lip, 3 section of apex of ovary, column and lip, 4 transverse section of sao of lip, 5 apex of column with the pollinia in situ, the cap of the anther having been removed, 6 pollinia removed from anther; all enlarged.

## 12. Saccolabiua intermedium, Griff. MSS. ex Lindl. in Journ. Linn. Soc. III, 33.

Stem slender, pendulous, 8 to 24 in . long, clothed with old leaf-sheaths. Leaves linear, acuminate, entire, the base not narrowed at its junction with the sheath; length 3 to 8 in., breadth 3 to $\cdot 4$ in. Umbels scarcely longer than the sheaths of the leaves, 3 - or 4 -flowered; the peduncle less than 5 in. long. Flowers 5 in . across; bract ovate, acute, minute. Sepals spreading, oblanceolate-oblong, blunt, the lateral pair narrower than the dorsal. Petals oblong, slightly oblanceolate, blunt, smaller than the sepals. Lip fleshy, as long as the sepals, adnate to the lower part of the column, the base forming a deep blunt sac with three faint ridges externally; side lobes obscure; apical lobe semicircular from a broad base, blunt, minutely papillose, its edges with a thick fringe of coarse white fimbriæ. Colum:i short, stout. Anther dome-shaped, shortly beaked in front, minutely papillose; pollinia broadly ovate, somewhat oblique; caudicle filiform, gland oblong, bifid. Hook. fil. Fl. Br. Ind. VI, 61. S. calceolare, Paxt. (not of Lindl.) Mag. Bot. VI, 97. Saccolabium, Griff. Notul. III, 357 ; Ic. Pl. Asiat., t. 333.

Sikkim, at Gopal-dara, on the Nepal frontier, elevation 3,000 feet; in flower during August; a rare plant; Pantling, No. 356. Khasia Hills ; alt. 3,000 to 5,000 feet; Griffith, Gibson, Hooker and Thomson.

The flowers of this are yellow, boldly spotted with brownish-purple, the fimbrix at the apex of the lip alone being white. The column is pinkish. This species is allied to S. calceolare, S. dasypogon, and S. acutifolium, but differs from all in having a very long slender stem with elongated linear leaves and short umbels bearing only three or four flowers.

Plate 301.-Saccolabium intermedium, Griff. A plant, of natural siss. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther in situ, and lip, in profile, 3 vertical section of apex of ovary, column and lip, 4 part of the lip, 5 transverse section of sac of lip, showing the three small external ridges, 6 anther seen from above, 7 apex of column with pollinia in situ, the cap of the anther having been remoyed, 8 pollinia removed and seen from the side; all enlarged.
13. Saccolabium acutifolium, Lindl. Gen. and Spec. Orch., 223.

Stem 8 to 14 in . long, clothed with the short erose sheaths of fallen leaves. Leaves fleshy, oblong-lanceolate, acuts, slightly and obliquely bifid, the base sub-amplexicaul, jointed to the short tubular sheath; length 4 to 6 in., breadth 85 to $1 \cdot 25$ in. Raceme
leaf-opposed; the peduncle about 1.75 in . long, with two tubular sheaths. Flowers six to eight in an umbellate raceme, 85 in. wide (measured across the lateral sepals); floral bract broadly oblong, blunt. Sepals and petals fleshy, sub-equal, slightly reflexed, oblongoblanceolate, blunt. Lip shorter than tho petals, adnate to the column almost to its apex, the base forming a wide but rather shallow sac with a rudimentary septum inside it; side lobes very narrow, entire or almost obsolete; apical lobe reniform, obscurely 3 -lobulate, the edges fimbriate-erose; the upper surface with a large, broadly ovate, fleshy, glabrous patch near the base and with a broad thin margin, papillosepubescent on the surface. Column short, thick. Anther dome-shaped, beaked in front; pollinia globular; caudicle filiform, dilated at base and apex; gland elongate, bifid. Lindl. Sert. Orch., Frontisp. 2; in Journ. Linn. Soc. III, 33 ; Walp. Ann. VI, 883; Hook. fil. Fl. Br. Ind. VI, 61. S. denticulatum, Paxt. Mag. Bot. VII, t. 145 ; Bot. Mag., t. 4772. Arides umbellatum, Wall. MSS.

Sikkim, at elevations of about 3,000 feet; in flower during November and December; Pantling, No. 3. Khasia Hills.

The sopals and petals are either of a dull pale green, flushed and mottled with dull brown, or they are of a uniform yellow colour. The lip is white, the fleshy dise on its upper surface being bright yellow spotted with dull red, and the fundus of the sac externally being greenish-yellow. The column is purple.

This species is allied both to S. calceolare and to S. dasypogon, but not so much to cither as those are to each other. It grows at elevations intermediate between them. This, unlike the other two, has an elongated stem and an inflorescence bearing not more than eight flowers which form an umbel rather than a corymb. The sac of the lip is also more shallow than in those, and the coloration of the sepals and petals is different. The apical lobe of the lip is in this distinctly trilobulate, while in those it has no trace of lobulation. There are further differences in the apical lobe of the lips of the three species, which may be shortly summarized thus; that of $S$. dasypogon is glabrous with laciniate but not lobulate edges; that of S. acutifolium has trilobulate, fimbriateerose edges, and its uppor surface has a large thickened smooth spot with a broad thin margin covered with papillose hairs; while that of C. calceolare is not lobulate, and its upper surface is papillose-hairy, except a small glabrous patch.

Plate 302.-Sacolabium acutifolium, Lindl. A plant, of natural size. Fig. 1 a flower, 2 apex of ovary, column with anther in situ, and lip, in profilo, 3 longitudinal section of the preceding, 4 transverse section of sac to show the internal ridge, 5 anther, from alove, 6 pollinia, front and side views; all enlargod.

## 14. Saccolabium distichum, Lindl. in Journ. Linn. Soc. III, 64.

Stems very slender, pendulous, branching, many-leaved, 6 to 10 in. long. Leavos fleshy, lanceolate, the apex acuminate and bearing two, rarely three, fine setae; the base sessile and slightly oblique; length 75 to 1 in., breadth near the base 2 to 25 in . Peduncles leaf-opposed, about equal to the leaves in length, bearing two to four flowars in a lax raceme. Flowers 45 in. across; floral bract oblong, sub-acute. Sopals and petals subequal, oblong-elliptic, obtuse. Lip about as long as the sopals, adnate to the lower half of the column, the base with a wide blunt sac at right angles to the ovary, its inner

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surface free from hairs or calli, side lobes absent; apical lobe fleshy, semi-circular, entire, smooth, its margins deflexed, with two blunt conical calli at its base. Column broad; the rostellum short, broad. Anther sub-quadrate, with a short beak in front; pollinia two, elliptic, with a lateral shoulder; caudicle long, slender, cylindric; gland elongate, bifid. Capsule fusiform, ${ }^{\bullet} 65$ in. long. Reichb. fil. in Ot. Hamb., 43; Hook. fil. Fl. Br. Ind. VI, 64 ; in Ann. Bot. Gard. Calc. V, 49, t. 73 (in part).

Sikkim, common at elevations of 6,000 to 8,000 feet; in flower during Mareh, April and May; Gamble No. 8075; Kurz; Griffith ¡Kew Distrib. No. 5211); Pantling No. 132. Manipur ; Watt No. 6338.

The flowers of this are green of various shades, marked with irregular brown spots, the apical lobe of the lip being pale yellow. This grows along with S. pseudodistichum, but flowers at a different season. The two have hitherto been confused under the name of this. The leaves are sometimes speckled with brown.

Plate 303.-Saccolabium distichum, Lindl. A plant, of natural size. Fig. 1 flower, 2 bract, ovary, column with anther in situ, and lip in profice, 3 section of column and lip, 4 column and anther, front vier, 5 apex of ovary with pollinia in situ, the cap of the anther having been removed, 6 pollinia; all enlarged.

## 15. Saccolabium affine, new species.

Stem and leaves as in S. distichum, Lindl. and S. pseudo-distichum, King and Pantling. Peduncle slender, 75 in . long, bearing two or three flowers in a short raceme. Flowers 3 in . across. Floral bract ovate, acute, much shorter than the stalked ovary. Sepals and petals sub-equal, ovate-elliptic, obtuse, spreading, except the concave incurved dorsal sepal. Lip as long as the sepals, adnate to the base of the column, the base with a wide dorsally compressed sub-acute conical sac almost at right angles to the ovary, smooth on the inner surface, without calli, bifid at the apex; side lobes very narrow; apical lobe decurved, broadly triangular, sub-acute, its margins erose near the base, its upper surface with two thick mesial ridges from base to apex. Column and pollinia as in S. distichum.

Sikkim, above Pemiongtsi, elevation 8,000 feet; in flower during June; Pantling No. 444.

The colour of the sepals and petals is green flushed with brown; that of the lip is yellowish.

This comes very near $S$. distichum and S. pseudo-distichum, and ought possibly to be treated as a variety rather than as a species. From both the plants just mentioned it differs by its dorsally compressed conical bifid sac, and by the broad triangular ridged apical lobe of its lip. The original specimen of this was collected on the western frontier of Sikkim, and for a long time no other specimen was obtained. Recently, however, plants have been obtained from eastern Sikkim. The characters in both western and eastern specimens are constant.

Plate 304.-Saccolabium affine, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column with anther in situ, and lip, profile view, 3 vertical section of the lip, 4 apex of the column with the anther in situ, 5 empty anther from below, 6 pollinia; all enlarged.

## 16. Saccolabium fseudo-distichum, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, p. 341.

Stems slender, 6 to 9 in . long, slightly branching, pendulous. Leaves fleshy, lanceolate, the apex finely and minutely bifid, $\cdot 5$ to $\cdot 75 \mathrm{in}$. long and $\cdot 2$ to $\cdot 25 \mathrm{in}$., broad. Peduncle $\cdot 35 \mathrm{in}$. long, sub-umbellately $5^{-}$- or 6 -flowered. Flowers $\cdot 3$ in. in diam., bract minute. Sepals and petals sub-equal, oblanceolate-oblong, spreading. Lip with a wide subhemispheric spur, side lobes absent; terminal lobe broadly cordate, blunt, entire, fleshy, concave, deflexed, quite without calli. Column very short. Anther shortly beaked. Pollinia two, entire, ovoid-globose; caudicle long, cylindric; gland deeply 2 -lobed. S. distichum, Hook. fil. in Ann. Bot. Gard. V, 49, t. 73, in part.

Sikkim, at elevations of 6,000 to 8,000 feet; flowering time, August to October; Pantling No. 49 ; Clarke 36327; King 3052, 4949 ; Gamble 8013. Khasia Hills ; Mann.

This grows along with $S$. distichum, Lindl., to which it is closely allied. As in that species, the sepals and petals are greenish with brownish-purple spots; the lip in this is yellow, except the terminal lobe, which is orange. The chief distinction between the two is to be found in the lip, which in this is entirely without calli of any kind, while in $S$. distichum the lip has two large calli situated at its base. The times of flowering of the two are, moreover, separated by four months,

Plate 305.-Saccolabium pseudo-distichum, King and Pantling. A plant, of natural siso. Fig. 1 a flower, 2 vertical section of column and lip, 3 lower surface of anther, 4 apex of column with the pollinia in situ, the cap of the anther having been removed, 5 pollinia; all enlargod.
17. Saccolabium trichromum, Reichb. fil. in Hamb. Gartenzeit, 1859, 51.

Stem pendulous, 1 to 3 feet long, clothed below with the sheaths of fallen leaves, above bearing 10 or 12 leaves. Leaves narrowly oblong, tapering slightly to the obliquely and bluntly bifid apex; the base jointed to the sheath, not narrowed; length 4.5 to 6 in., breadth 5 or $\cdot 6 \mathrm{in}$. Racemes supra-axillary, about half as long as the leaves, divergent, secund, few-flowered. Flowers 1 in. long; bract broad, blunt, minute. Sepals spreading, sub-equal, narrowly oblong, sub-acute. Petals slightly shorter than the sepals but broader, obovate-oblong, apiculate. Lip adnate to the short foot of the column, consisting chiefly of an infundibuliform slightly curved blunt spur almost as long as the ovary and parallel to it; spur with two large projecting calli half way down its tube which almost touch, the anterior one sending a plate upwards which divides the upper part of the spur for a short distance into two chambers; side lobes erect, broadly triangular, blunt; apical lobe short, triangular, concave, acute, entire, without calli. Column rather long, with a somewhat curved foot half its own length. Anther depressed, with a long beak in front; pollinia two, globular; caudicle cylindric, dilated at its junction with the broad orbicular gland. Xenia Orchid. 119, t. 139 ; Hook. fil. Fl. Br. Ind. VI, 65; in Ann. Bot. Gard. Calc. V, 50, t. 75. Saccolabium pallens, Cathe. ex Lindl. in Journ. Linn. Soc. III, 35.

Sikkim, at elevations between 1,000 and 2,500 feet, common; in flower during July and August; Pantling No. 92 ; also in Bhotan. Assam ; Simons.

The sepals and petals are of a pale straw colour with a central vertical band of pale pink; the spur is rose-coloured and the column white,

The spur is in this species distinct'y divided into two unequal antero-posterior chambers for a short space near the mouth by a horizontal plate which (as shown in figs. 3 and 4) proceeds from the anterior callus. The spur is also constricted below this plate, and about its middle, by the calli which project from its back and front walls and almost divide it into an upper and a lower section. In theso respects this is not a true Saccolabium, as that genus is understood in this work, there being in the spur of Saccolabium neither callus nor septum. Nor is it a true Cleisostoma, the spur of which genus is occluded not only by antero-posterior calli, but sometimes also by a plate proceeding from the back wall. Neither is it a Sarcanthus, in which genus there is, besides calli, a vertical antero-posterior septum dividing the spur into two lateral chambers. In fact there is as much justification for making this the type of a new genus as there was for the formation of Cleisostoma as a genus; for the presence of a horizontal p'ate (forming a small chamber) on the anterior wall is of as much importance as the presence of a p.ate on the posterior wall. But, in our opinion, there are already too many genera in this neighbourhood. We therefore leave this plant in Sacoolabium, where it is placed by Dr. Reichenbach and Sir Joseph Hooker, being in entire agreement with the remark of the latter distinguished botanist (Fl. Br . Ind. VI, pp. 66, 71) that, but for the undesirable disloaation of synonymy which would result, it would be better to reduce both the genera Cleisostma and Sarcanthus to Saccolabium.

Plate 306.-Saccolabium trichromum, Reichb. fil. Part of a plant, of natural size. Fig. 1 a flower, 2 stalked ovary, column with anther in situ, and lip, 3 longitudinal section of column and spur, 4 transverse section of spur above the middle, 5 lower surface of empty anther, 6 pollinia in situ on the apex of the column, 7 the same removed; ail enlarged.

## 52. Cleisostoma, Blume.

Epiphytes without pseudo-bulbs. Stems more or less elongated, leafy. Leaves coriaceous or fleshy, flat or semi-terete. Inflorescence leaf-opposed, racemose or paniculate. Sepals and petals adnate to the column, spreading, sub-equal. Lip sessile on the footless column, the base with a large saccate or infundibuliform spur, sometimes dilated at the apex, its cavity more or less closed by two calli the posterior of which is often bifid, and sometimes also by a dorsal scale, but never by a septum; the lateral lobes small or absent; the apical lobe thickened, concave. Column short, thick, with no foot. Anther depressed; pollinia two, often bifid; caudicle single. Species about 40; Eastern Asiatic and Australian.

[^8]> Mouth of spur occluded by two calli and by a semi-circular erose scale on the column; leaves broad, obtuse and obliquely bifid at the apex. Spur with rather thin calli, its mouth closed by a scale from the posterior wall
> 4. C. Wendlandorum.

> Posterior callus of spur not bifd; dorsal or columnar scale none.
> Apical lobe of lip fleshy, convex, its edges erose; spur wide, saccate, blunt
> 6. C. micranthum.

> Apical lobe of lip concave, its edges entire; spur narrowly eylindric
> 5. C. bambusarum.
> 7. C. gemmatum.

1. Cleisostoma armigerum, King and Pantling in Journ. As. Soc., Bengal, Vol. LXV, pt. 2, p. 123.

Stems erect, rigid, 2 to 4 in. long. Leaves very fleshy, semi-terete, channelled in front, the apex sub-spinous, not narrowed at the sheathing wrinkled base. Racemes extra-axillary, $\cdot 5 \mathrm{in}$. long. Flowers crowded, $\cdot 25 \mathrm{in}$. across. Sepals spreading, ovaterotund, apiculate. Petals much smaller, also spreading, oblanceolate. Lip with a wide sacciform spur half as long as and parallel to the ovary, its edges with broad shallow triangular side lobes; apical lobe ovate, blunt, concave; the interior of the spur with opposing thick calli from the posterior and anterior walls, the latter much the larger and occluding the passage; the dorsal callus curved and dilated upwards, its upper surface produced into two broad scale-like teeth pointing outwards. Column short, adherent for half its length to the lip. Anther depressed; rostellum beaked; pollinia two, globose, bifid; caudicle stout, thickened at its junction with the pollinia; gland with two ovoid lobes with decurved margins.

Sikkim, at low elevations, common; in flower during September; Pantling No. 252.
The flowers are pale straw-coloured, flushed with pink. A coloured drawing of this has been in the Calcutta Herbarium since 1856, but until recently there have been no specimens, the original from which that drawing was made having been lost.

Plate 308.-Cleiscstcma armigorum, King and Pantling. A plant. Fig. 2 transverse section of a leaf, of natural size. Fig. 1 a flower, 3 side view of floral bract, ovary, column, anther in situ and lip, 4 transverse section of spur below the calli, 5 the posterior callus inside the spur, 6 longitudinal section of the ovary column and spur, 7 under surface of anther, 8 pollinia-side and back vious; all enlarged.

## 2. Cleisostoma brevipes, Hook. fil. Fl. Br. Ind. VI, 73.

Stems about as thick as a goose-quill, branching, pendulous, 8 to 16 in . long. Leaves thickly coriaceous, wrinkled, narrowly oblong-lanceolate, acute, not narrowed at the sheathing base; length 2.5 to 3.5 in., breadth 4 to .5 in . Spikes extra-axillary, much shorter than the leaves, pendulous, the rachis very stout, the pedicel short. Flowers crowded, $\cdot 4 \mathrm{in}$. in diam. vertically; floral bract broad, sub-acute, short. Sepals sub-equal, broadly ovate-elliptic, sub-acute, the dorsal somewhat concave. Petals oblanceolate, blunt, shorter than the sepals. Lip longer than the sepals, the base forming a short wide sac almost at right angles to the ovary, its mouth with triangular falcate side lobes; apical lobe fleshy, elongate, triangular-hastate with a narrow aristately bifid decurved apex. Column stout, with a large bifid callus at its base, hispid on the anterior surface and projecting into the spur to meet the thick callus on the anterior wall, and thus closing the orifice of the sac; dorsal scale none. Anther depressed,
not beaked; pollinia two, broadly ellipsoid or sub-globular, bifid; the caudicle slightly thickened near its apex, slender below; gland very large, 2-lobed. Capsule fusiform, striate, 1 to 1.5 in . long. Hook. fil. in Ann. Bot. Gard. Calc. Vol. V, 55, t. 82.

Sikkim, common in tropical valleys; in flower during August; Pantling No. 175. Assam.

The sepals and petals are yellow with broad brown bands on the midribs and edges; the lip is pale buff, except the apical lobe which is pure white.

Plate 307.-Cleisostomà brevipes. Hook. fil. A plant, of nàtural size. Fig. 1 a flower, 2 side view of bract, ovary, column, anther and lip, 3 section of the preeeding, 4 the bifid callus at the base of the column which protrudes into the mouth of the spur, 5 lower surface of anther, 6 apex of column aifter removal of the cap of the anther, showing the pollen masses, the caudicle and the gland in situ, 7 pollen-apparatus after removal; all enlarged.
3. Cleisostoma spicatum, Lindl. in Bot. Reg. 1847, under t. 32.

Stem pendulous, as thick as a swan's quill, 6 to 14 in. long. Leaves coriaceous, oblong, slightly contracted at the sheathing base; the apex blunt, shortly unequally and broadly bifid, length 4 to 6 in., breadth 1.2 to 1.4 in . Inforescence pendulous, leafopposed, about as long as the adult leaves; its peduncle stout, short, with a small wide annular sheath at the base; the raceme densely-flowered. Flowers 4 in . long and ' 25 in . across; floral bract lanceolate, much shorter than the puberulous ovary. Sopais sub equal, broadly elliptic, the dorsal concave; the lateral pair spreadiag like the smaller sub-obovateoblong petals. Lip longer than the sepals, adnate wholly to the sides of the column, consisting chiefly of an infundibuliform spur, dilated, compressed and minutely 3 -notched at the apex; the mouth with very narrow erose side lobes; the interior contracted at two points by calli on the front and back walls; the posterior callus divided into two triangular recurved teeth; dorsal scale none; the apical lobe thick, triangular-ovate, acute. Anther depressed, long-beaked; pollinia two, globose; caudicle somewhat dilated near the apex; the gland minute, elongate, emarginate. Hook. fil. Fl. Br. Ind. VI, 72 ; in Ann. Bot. Gard. Calc. V, 55, t. 83. Sarcanthus densiflorus, Par. and Reichb. fil. in Trans. Linn. Soc. XXX, 136. Saccolabium densiflorum, Lindl. in Wall. Cat. 7311; Gen. and Spec. Orch. 220; in Bot. Reg. 1838, Misc. 56. LErides densiflorum, Wall. MSS.

Sikkim, in the valley of the Teesta, at an elevation of 1,000 feet; in flower during June; Pantling No. 169. Tenasserim ; Parish. Penang; Wallich, King. Perak; Scortechini, No. 2075. Borneo.

The flowers are yellow, mottled and banded with brownish-purple; the column is white.

Plate 311.-Cleisostomi spicatum, Lindl. A plant, of natural sise. Fig: 1 a flower, 2 bract, ovary, eolumn, anther and lip, seen from the side, 3 section of the foregoing, 4 the callus on the dorsal wall of the spur, 5 apex of the column with the anther in situ, the stigma $(s), 6$ the same with the cap of the anther taken off, 7 the pollinia removed; all enlarged.

> 4. Cleisostoma Wendlandorum, Reichb. fil. in Otto and Dietr. Algem. Gartenzeit, 1856, 219 .

Stem very short. Leaves crowded, pendulous, somewhat keeled, oblong, obtase and obliquely 2 -lobed at the apex, slightly narrowed at the base, sessile, 5 to 9 in . long and
$\cdot 9$ to 1.35 in. broad. Panicles rigid, about half as long as the leaves, axillary, stout, usually 3 -branched; the branches unequal, spikate. Flowers numerous, somewhat crowded, - 25 in. across; floral bract minute, triangular. Sepals and petals sub-equal, obovate-elliptic to sub-orbicular, blunt, concave, spreading; the dorsal sepal arching over the column, and the lateral pair embracing the sac of the lip. Lip slightly longer than the sepals and petals; the base with a wide short sub-globose spur as long as the ovary, its cavity contracted at the mouth by two pointed fleshy calli, the anterior callus larger than the posterior (or columnar) one; side lobes narrow, truncate, obscure; apical lobe fleshy, reniform. Column stout bearing a semi-circular erose scale; rostellum large, pointed and projecting forwards; pollinia two, sub-globose, grooved; the caudicle strap-shaped, slightly narrowed at each end, gland V-shaped. Capsule linear-oblong, 85 in. long. Hook. fil. Fl. Br. Ind. VI, 74; Hook. fil. in. Ann. Bot. Gard. Calc. V, 57, t. 85. C. callosum, Reichb. fil. in Bonplandia (not of Blume). Pomatocalpa spicatum, Kuhl and Hasselt ex Reichb. fil. in Dietr. Algem. Gartenzeit, l. c.

Sikkim, in tropical valleys ascending to elevations of 1,500 feet; in flower during May and June; Pantling No. 135. Cachar; Keenan. Tenasserim; Parish. Andaman Islands; Berkeley, Kurz, King's Collectors.

The ground-colour of the flowers is pale yellow, flushed with pink about the neck of the spur. The apical lobe of the lip has two bright red spots.

Plate 309.-Cleisostoma Wendlandorum, Reichb. fil. A plant, of natural size. Fig. 1 front view of a flower, 2 floral bract, ovary, and flower in profile, 3 column, profile view, and lip with the anther in situ, 4 longitudinal section of the preceding, 5 empty anther, 6 and 7 views of the pollinia, the latter with the caudicle flattened out to show the outline-all enlarged; 8 young capsule; of natural size.

## 5. Cleisostoma bambusarum, King and Pantling.

Stem none or very short. Leaves fleshy, linear-oblong, acute, keeled and channelled, slightly narrowed to the base; length 1.5 to 4.5 in., breadth 25 to 3 in. Inflorescence pendulous, equalling or exceeding the leaves in length; its peduncle with three or four sheathing bracts; raceme about 12-flowered, its rachis thicker than the peduncle. Flowers $\cdot 35$ to $\cdot 45 \mathrm{in}$. across; floral bract lanceolate, more than half as long as the ovary. Sepals sub-equal; the dorsal sub-orbicular, very concave; the lateral pair broadly ovate with broad bases, sub-acute. Petals obovate-rotund, clawed, shorter than the sepals. Lip with a wide spur more than half as long as the ovary, its apex dilated and truncate; the dorsal plate or scale thin, its apex resting on the thickened callus on the anterior wall; the mouth with short sub-quadrate erect lobes; apical lobe of lip very thick, triangular-ovate, acute, with a convexity in the middle. Column short, with a short incurved fleshy arm on each side of the rostellum; pollinia two, ellipsoid, compressed; the caudicle dilated and bifid at the apex, tapering to the small minute cordate gland. Sarcanthus bambusarum, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 124.

Bhotan, at the Rumpti Lake below Nimbong; elevation 1,500 feet; in flower during May; Pantling No. 211.

The dorsal sepal is brown externally, flushed with yellow; internally it is buffcoloured; the lateral sepals and petals are buff; the lip is also buff on the upper surface, with some brown streaks on the side lobes and a bold patch of yellow on the apical lobe.

All the specimens hitherto obtained of this have been found growing on the nodes of the stems of bamboos, their roots twining amongst the decaying bracts and scales found in these situations. No plants have ever been found growing on the internodes. The scale or plate proceeding from the back wall of the spur in this species is flattened, and somewhat resembles a septum. The plant, however, is, as we now believe, a true Cleisostoma, and we therefore transfer it from Sarcanthus in which genus we originally placed it.

Plate 310.-Cleisostoma bambusarum, King and Pantling. A plant growing on the node of a living bamboo, of natural sise. Fig. 1 sepals and petals separated, 2 a flower, 3 side view of bract, ovary, column and lip, 4 section of the foregoing, 5 front view of the end of the spur, 6 profile view of anther, 7 pollinia-all enlarged; 8 transverse section of a leaf; of natural size.

## 6. Cleisostoma micranthum, King and Pantling.

Stem stout, compressed, 3 to 8 in. long, covered by leaf-sheaths. Leaves narrowly oblong, keeled, obliquely truncate and slightly bifid, the base shortly sheathed; length 2.5 to 3.5 in., breadth 5 to $\cdot 6 \mathrm{in}$. Racemes leaf-opposed, longer than the leaves, the peduncle and rachis stout. Flowers numerous, but only a few expanding at a time, 2 in. across ; floral bract broad, blunt, less than half as long as the short sessile ovary. Sepals broadly ovate, obtuse, spreading. Petals smaller than the sepals, oblong, spreading. Lip fleshy, as long as the sepals; the base with a wide blunt spur adpressed to and as long as the ovary, its interior with two calli near the mouth, one on the back wall and a larger one on the anterior wall; dorsal scale absent; lateral lobes small; the apical lobe oblong, convex, blunt; the edges thin and erose, the upper surface smooth. Column very short, stout, with no foot, but with a large cheek-like protuberance on either side of the rostellum. Anther depressed, with a long pointed beak; pollinia two, obovoid, the caudicle triangular, cordate or oblong, much larger than the triangular gland. Saccolabium micranthum, Lindl. in Wall. Cat. 7300 ; Gen. and Spec. Orch. 220. Saunder's Refug. Botan., t. 110 ; Hook. fil. Fl. Br. Ind. VI, 59.

Sikkim, at elevations from 2,000 to 3,000 feet; in flower during July and August; Pantling No. 78. Westward along the range to Dehra Dhoon, and eastward to Bhotan ; also in the Naga and Khasia Hills and in Tenasserim.

The sepals and petals are white with large pink spots, the lip is entirely pink or purple. The caudicle of the pollinia varies in form and is always fragile. In the Sikkim plant the spur of the lip equals the sepals in length, and the callus at the mouth of the spur is large and solitary, not double. As this callus protrudes so as to meet a smaller callus projecting from the posterior wall and thus to close the opening into the spur, the species is removed from Saccolabium to the genus Cleisostoma.

Plate 312.-Cleisostoma micranthum, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 floral bract, ovary, column with anther in situ, and lip, side view, 4 section of the foregoing, 3 lip, 5 apex of column, showing the processes by the sides of the rostellum, the stigma and the anther in situ, 6 under-surface of empty anther, 7 pollinia; all enlarged.

## 7. Cleisostoma gemmatum, King and Pantling.

Stem slender, pendulous, 6 to 12 in . long. Leaves linear, curved, the margins much infolded, sometimes almost sub-terete, minutely 3 -toothed at the apex, neither
narrowed nor sheathing at the base, 2.5 to 5 in. long, and about $\cdot 2 \mathrm{in}$. broad when unfolded. Panicles axillary, slender, longer than the leaves, their branches few and racemose. Flowers not crowded, only $\cdot 15$ in. long; floral bract minute. Sepals and petals connivent; the sepals broadly oblong, obtuse; the petals smaller, obovoid. Lip longer than the sepals, fleshy, concave; its base with a stout cylindric blunt spur parallel to the ovary and nearly as long, its interior with a small posterior and a large anterior callus occluding the mouth; dorsal scale none; side lobes obscure; apical lobe ovaterotund, blunt, entire, concave. Column very short, thick, bearing on its sides two translucent teeth. Anther dome-shaped, with a long beak in front; pollinia two, broadly ovoid, attached by a broad flat oblong caudicle to a much-elongated oblong gland. Capsule oblong, curved, sub-sessile, ${ }^{2}$ in. long. Saccolabium gemmatum, Lindl. in Bot. Reg. 1838, Misc. 50; Reichb. fil. in Walp. Ann. V, 885 ; Hook. fil. Fl. Br. Ind. VI, 55 ; in Ann. Bot. Gard. Calc., Vol. VI, Pt. 1, 46, t. 70.

Sikkim, at elevations between 2,000 and 6,000 feet, common ; in flower during July and August; Pantling No. 126 ; Bhotan, Khasia and Jaintia Hills.

The prevailing colour in the flower and ovary of this is purple, the apical lobe of the lip and the inner surface of the petals being white. The specific name given to the plant by Lindley is gemmatum, and not geminatum, as it has sometimes been inadvertently written.

We have removed this and Sacc. micranthum from the genus Saccolabium, as the mouth of the spur in both is quite closed by the large calli which occur in that situation; whereas in Saccolabium, as limited by the late Mr. Bentham and by Sir Joseph Hooker, there is neither callus nor plate in the spur. In Cleisostoma, on the other hand, the spur is occluded by calli, or by a dorsal plate, or by both. In this and in $S$. micranthum there is no dorsal plate, but the occlusion of the mouth of the spur by calli is complete. Moreover, both of them have the facies rather of Cleisostoma than of Saccolabium. The difficulty which we found in dealing with Saccolabium trichromum, which has calli and a ventral plate in its spur, was met, as is explained in the note following our description of that species, by retaining it as an aberrent Saccolabium rather than by making a new genus for it, its facies being that of the latter genus.

Plate. 313.-Cleisostoma gemmatum, King and Pantling. A plant, of natural size. Fig. 1 part of rachis, ovary and flower, side view, 2 bract, ovary, column with anther in situ, and lip, side view, 3 column, 4 section of column and lip, 5 anther, side view, 6 pollinia, caudicle and gland before depression, side view, 7 and 8 the same after depression; all enlarged.

## 53. Stereochilus, Lindl.

Epiphytal. Stem short. Leaves coriaceous, narrowly oblong, usually bifid at the apex. Racemes extra-axillary, drooping, lax, many-flowered, glandular-pubescent, (glabrous in one species). Sepals sub-equal, spreading. Petals smaller than the sepals, spreading. Lip about as long as the sepals, fleshy, sessile on the base of the column, spurred, obscurely 3 -lobed; the side-lobes small, triangular, erect, acute or minutely bifid; the apical lobe much larger, concave; the interior of the spur occluded by two antero-posterior thick calli. Column short, nearly straight; rostellum subulate, horizontal, directed forwards or to one side. Anther depressed, apical, with a long beak; pollinia four, plano-convex,
attached by their backs in pairs to a long caudicle broad above but tapering to a small gland. Species three, all Indian.

Lindley's original description of this genus, as regards the structure of the lip, is not in harmony with the specimens on which he founded it. This is no doubt on account of his having worked on Herbarium material. We have therefore modified it and, as now defined, the genus differs from Camarotis in having a terminal, not a dorsal, anther ; and also in having a spurred, distinctly 3 -lobed lip, instead of a lip consisting almost entirely of a sac with very small obscure side and apieal lobes and no spur.

Glabrous, flowers $\cdot 3$ in. across . . . . . . . . . . . . . 1. S. bicuspidatus.<br>Inflorescence pubescent, flowers 75 in . across . . . . . . . . 2. S. hirtus.

## 1. Stereochilus bicuspidatus, King and Pantling.

Stem 3 or 4 in. long, with very numerous roots at the base. Leaves coriaceous, narrowly oblong, deeply and obliquely bilobulate at the apex, the lobules often erose; length 3.5 to 6 in., breadth 8 to 1 in . Inflorescence from the stem below the leaves, slender, glabrous, usually longer than the leaves; the peduncle with a few minute distant sheaths. Flowers in racemes or shortly-branched panicles, numerous but not crowded, $\cdot 3$ in. across; floral bracts minute. Sepals sub-equal, spreading, the dorsal obovate-elliptic, the lateral pair broadly elliptic. Petals oblanceolate, blunt, oblique, smaller than the sepals. Lip as long as the sepals, adnate to the column; the base with a spur nearly as long as and parallel to the ovary, cylindric towards the blunt non-dilated apex; the mouth infundibulate, its edges with broad rounded erose side lobes; the apical lobe broad, ovate, concave, acute; the interior of the spur with a smooth callus below the column and a much larger one on the anterior wall below the mouth, the two calli touching and occluding the entrance to the spur. Column short, thick; the rostellum long, bent to one side and slightly hooked at the apex. Anther depressed and with a long beak in front; pollinia four, orbicular, compressed, attached by pairs; the caudicle thickened in the middle, tapered at the apex, and also at the base to the small oval gland. Capsule cylindric, ridged, 5 in long. Cleisostoma bicuspidatum, Hook. fil. Fl. Br. Ind., VI., 75.

Sikkim, at elevations of about 2,000 feet; in flower during July and August; Pantling No. 178. Khasia Hills; Mann. Tenasserim; Parish.

The flowers are yellowish, marked with pink along the midribs of the sepals and petals and on the lobes of the lip. The rostellum is long and twisted, and the pollinia are attached to the sides of the apex of the caudicle as in Stereochilus hirtus. In Cleisostoma, to which Sir Joseph Hooker (deceived no doubt by the drawings of the native artists of the Calcutta garden) referred this plant, the rostellum is shorter and quite straight; moreover the pollen-masses are attached behind the apex or at the extremity of the caudicle. We have therefore ventured to transfer this species to Stereochilus. The Sikkim plant differs, however, from the Khasia plant figured by Sir Joseph Hooker (Ann. Bot. Gard. Calc., V, t. 87, fig. B. 2) in having the calli inside the spur smooth, not pubescent, and it may be different from the Khasia one.

Plate 314.-Stereochilus bicuspidatus, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 ovary, column, anther and lip, side view, 3 longitudinal section of the preceding, 4 front view of the apex of the column, showing the anther in situ, the twisted rostellum with the gland of the caudicle at one side, 5 the callus on the posterior wall of the spur below the column, 6 transverse section of the spur, 7 empty anther seen from below, 8 pollinia, side and baok views; all enlarged.

## 2. Stereochilus hirtus, Lindl. in Journ. Linn. Soc. III, 58.

Stem erect, stout, clothed with the sheaths of the leaves. Leaves narrowly oblong, rigid, fleshy, almost terete, narrowed towards the minutely bifid apex, widest at the base and jointed to the short rugulose sheaths; length 3 to 5 in., breadth 5 in. Racemes axillary, decurved, longer than the leaves; the peduncle and rachis covered with short coarse glandular hairs; raceme sparsely flowered; floral bract minute, ovate, acute, hairy like the rachis and ovary. Flowers 75 in. across, glabrous. Sepals spreading, oblong-lanceolate, blunt. Petals oblong, sub-spathulate, the apices blunt and crenateserrate. Lip adnate to the base of the column, consisting of a wide compressed conical sac adpressed to the ovary, with triangular converging side lobes and with two large calli (one of them bilobed) at the mouth of its oblong cavity and just below the column; the limb oblong-ovate, blunt, concave. Column dilated at the base, with no foot; rostellum very large, curving downward to near the middle of the column. Anther depressed, with a very long beak; pollinia four, in two pairs, broadly ovoid, attached by their bases to a long thin flat caudicle ending in a small gland. Sarcanthus hirtus, Benth. in Gen. Plant. III, 576; Hook. fil. Fl. Br. Ind. VI, 35.

Sikkim, at Tendong, elevation 6,000 feet; in flower in June; Pantling No. 157. Khasia Hills, elevation 5,000 feet; Hooker and Thomson. Tenasserim; Parish.

The flowers of this are glabrous; the sepals and petals are pink, the lip white and pink, the column white and the anther parple. After the removal of the pollenmasses from the anther, the caudicle twists so that the pollinia acquire an oblique direction. This arrangement is no doubt to facilitate contact with the stigma when an insect to which the viscid disc has adhered visits another flower. Without such twisting, the pollinia would be prevented from reaching its stigma by the long stout rostellum which hangs down in front of that organ.

Plate 315.-Stereochilus hirtus, Lindl. A plant. Fig. 8 transverse seotion of a leaf, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column and lip, 3 vertical section of ovary, column and lip, 4 anther from below, 5 pollinia in situ, the cap of the anther having been removed, 6 pollinia after removal, 7 section of spur between the calli and the tip; all enlarged. Notr.-Fig. 7 is erroneous in showing the partition in the spur as continuous; it really consists of two approximated flat calli.

## 54. Camarotis, Lindl.

Epiphytal. Stem elongate, bearing distant coriaceous keeled leaves obliquely bifid at the apex. Racemes extra-axillary, many-flowered, lax. Sepals and petals spreading or reflexed, sub-equal. Lip sessile on the column, consisting of a thick-walled sac, the cavity narrowed by two calli and divided by a septum completely or partially into two chambers; side lobes small, obscure; the apical lobe small, thick, concave and entire or almost obsolete. Column twisted, without a foot; rostellum very long, narrow, subulate, curved, twisted to one side. Anther dorsal, depressed; polliria four, in pairs, attached by their bases to a very long narrow caudicle tapering to a minute gland. Species four; Indian and one from the Philippines.

The other three species belonging to this genus are the Indian C. purpurea, Lindl. (Arides rostratum, Roxb.) ; C. pallida, Lindl. (Exides pallidum, Roxb.) ; and C. Philippensis, Lindl.

The first sppearance of the genus Camarotis was in Wallich's Catalogue, in which he issued, under the number 7329 and the name C. purpurea, Lindl., the plant whioh Roxburgh had previously named

Arides rostratum. In 1832 Lindley published in the Botanical Register his genus Micropera, to which he referred Roxburgh's Arrides pallidum. In 1851 Dalzell, oblivious of Lindley's genus of the same name, published in Hooker's. Journal of Botany his genus Micropera, and under it he described two species (M. viridiflora and M. maculata), one of which (M. viridiflora) is, according to Lindley and Sir Joseph Hooker, a Saccolabium. The other (M. maculata) is also considered a Saccolabium by Messrs. Bentham and Hooker. Lindley, however, kept up Dalzell's name for the latter, as he had in the meantime discovered that his own Micropera is identical with Camarotis, to which he therefore himself reduced it (Journ. Linn. Soc. III, 38). Camarotis is allied to Stereochilus, from which it is, however, at once distinguishable by its dorsal anther, differently shaped lip, and elongated stems.

> Sepals and petals broadly oblong; the lateral sepals connivent under the lip and partly adherent to it; flowers 75 in . across
> 1. C. obtusa.

> Sepals and petals obovate, free, spreading; flowers 25 in . across
> 2. C. Mannii.

## 1. Camarotis obtusa, Lindl. in Bot. Reg. 1844, Mise. 73.

Stem stout, erect, leafy, 8 to 10 in . long. Leaves coriaceous, horizontal, linear-oblong, slightly and obliquely bifid at the apex, not narrowed at the base, jointed to the short sheath; length 2 to 3 in., breadth $\cdot 3$ to $\cdot 65$ in. Racemes leaf-opposed, rigid, horizontal, about as long as the leaves when in flower, slightly longer in fruit; the peduncle with a few short sheaths; raceme with about ten flowers of which only two to four open at a time. Flowers (from the tip of the dorsal sepal to the tip of the lip) 75 in. across; bract small, ovate, acute; rachis of raceme, ovary, and exterior of sepals sparsely furfuraceous. Sepals unequal, reflexed, the dorsal broadly oblong, its edges towards the apex reflexed; the lateral pair larger, oblong, sub-falcate, obtuse, adnate for about a third of their length to the sides of the lip, and for the rest connivent under it. Petals oblong, blunt. Lip fleshy, adnate to the base of the column and forming with it a right angle, its anterior wall cut away in the upper part, the apical half conical, its cavity partly occluded by two large calli from the back and front walls, the latter sending a septum across and dividing the cavity into an upper and a lower chamber; the latter chamber nectariferous, the side lobes along the mouth of the spur narrow and incurved; the apical lobe minute, narrowly triangular, also incurved. Column short ; the rostellum very long, hooked at the apex, and twisted to one side. Anther depressed, beaked; pollinia four, plano-convex, sub-orbicular, attached by pairs to the long tapering slender caudicle; gland small, subrotund. Capsule linear, ridged, 1.5 in . long. Reichb. fil. in Walp. Ann. VI, 881. Sarcochilus obtusus, Benth. MSS. ex Hook. fil. Fl. Br. Ind. VI, 36. Camarotis obliquirostris, Parish MSS.

Sikkim, in tropical valleys at low elevations; flowering during August; Pantling No. 48. Tenasserim; Parish.

The flowers of this in Sikkim are white, the lip having a large yellow spot in front. The flowers originally sent to Lindley, and on which he founded his C. obtusa, were however described by him as of a dull dirty rose colour. It is therefore possible that the reduction of that species to this is incorrect.

Plate 316.-Camarotis obtusa, Lindl. A plant, of natural sise. Fig. 1 front view of a flower, 2 profile viow of floral bract, ovary, column, and lip, 3 vertical section of the lip, 4 front view of the column, showing the twisted rostellum, stigma, and the base of the labellum ( $l$ ), 5 an empty anther, 6 and 7 pollinia; all enlarged.

## 2. Camarotis Mannir, King and Pantling.

Stems pendulous, slender, 8 to 12 in. long, leafy, sometimes branched, clothed with the ridged sheaths of fallen leaves. Leaves coriaceous, linear, acute and very minutely bifid at the apex, 3 or 4 in . long. and 3 or 4 in . broad. Racemes straight, rigid, shorter than the leaves, extra-axillary; the peduncle very short, stout like the rachis. Flowers not crowded, about 25 in . in diam.; bract membranous, oblong, acute, one-third the length of the sessile scurfy ovary. Sepals and petals sub-equal, obovate, narrowed at the base, the petals slightly falcate, all reflexed. Lip an elongated sac at right angles to the ovary, adnate to the column, its anterior wall cut away at a right angle in the upper half; the edges of the mouth with two minute, oblong, obliquely truncate, erect side lobes, and between them a minute broad shallow triangular apical lobe; the margins of all the lobes slightly incurved; the apical lobe with a flat callus or scale immediately within it and projecting into the cavity of the spur; the posterior wall of the interior of the spur with a raised ridge, but forming no real septum. Column short, stout, twisted; the rostellum sigmoid and beak-like. Anther depressed; pollinia four, plano-convex, attached by pairs to the long tapering caudicle; gland small, oblong. Sarcochilus Mannii, Hook. fil. Fl. Br. Ind. VI, 36.

Sikkim, valley of the Teesta at an elevation of 1,200 feet; flowering during June and July; Pantling No. 173.

The flowers of this are very pale pink, the sepals, petals and lip being spotted near their bases with crimson.

Plate 317.-Camarotis Mannii, King and Pantling. A plant, of natural size. Fig. 1 flower, 2 bract, ovary, column with its foot, and the lip, 3 front view of the column with the anther in situ and the lip, the anterior wall of the saccate portion of the latter cut away so as to show the ridge along the posterior wall, 4 the lateral and apical lobes of the lip as seen from behind, showing the upper surface of the callus which lies behind the apical lobe and protrudes into the cavity of the spur, 5 lower surface of the anther, 6 apex of the column, showing the pollinia in situ, the cap of the anther having been removed, 7 pollinia; all enlarged.

## 55. Sarcanthus, Lindl.

Epiphytes, without pseudo-bulbs. Stems usually elongate. Leaves fleshy, terete or flat. Inflorescence extra-axillary, racemose or paniculate. Sepals sub-equal, all spreading or reflexed, or the dorsal concave and connivent over the column. Petals smaller than the sepals, spreading. Lip adnate to the base of the column or of its foot, rarely jointed; the base with an infundibuliform spur sometimes dilated at the apex, the interior with a callus both on the anterior and the posterior wall, and always divided into two lateral compartments by a vertical antero-posterior septum; lateral lobes small, more or less triangular and acute; apical lobe small, triangular or hastate. Column short, stout, often with a foot as long as or longer than itself. Anther depressed; pollinia two, bifid. Species about 35, eastern tropical Asia.

[^9]
## 1. Sarcanthus appendiculatus, Hook. fil. Fl. Br. Ind. VI, 67.

Stem erect, rigid, as thick as a goose-quill, 8 to 15 in . long, with a few sheaths near the base. Leaves fleshy, terete, obtuse, 3 or 4 in . long and about $\cdot 15 \mathrm{in}$. thick. Inforescence extra-axillary, longer than the leaves, drooping; the peduncle with a few distant small sheaths, as long as the lax few-flowered raceme. Flowers ' 6 in . long; foral bract triangular, blunt, minute. Sepals unequal, spreading; the dorsal broadly oblong, 3 -nerved, the apex rounded; the lateral pair smaller, acute. Petals smaller than the lateral sepals, narrowly oblong, acute. Lip longer than the sepals, jointed to the foot of the column; the base with a long, somewhat compressed, narrowly infundibuliform spur with an obtuse, somewhat dilated, slightly emarginate tip; the side lobes broad at the base but suddenly narrowed to a conical point ; the apical lobe fleshy, broadly triangular, decurved; the interior of the spur with a large projecting callus on both front and back walls near the mouth. Column short with a thick short foot. Anther depressed, its anterior edge produced into a short broad erose appendage; pollinia two, broadly triangular, their apices divaricating; caudicle abruptly contracted between the pollinia; the gland quadrate, at right angles to the caudicle. Capsule fusiform, boldly ridged, 1 in. in length. Hook. fil. in Ann. Bot. Gard. Calc., Vol. V, pt. 1, 51, t. 76 ; Ie. Plantar. t. 2136. S. teretifolius, Reichb. fil. in Trans. Linn. Soc. XXX, 136 (not of Lindl.) Arides appendiculatun, Wall. Cat. 7315 ; Lindl. Gen, and Spec. Orch., 242.

Sikkim, in tropical valleys; in flower during August; Pantling No. 241. In Assam, Burma and Mysore.

The ground colour of the flowers is a warm buff with many longitudinal purple or brownish-purple markings, the apical lobe of the lip being pale lavender or pink.

Plate 318.-Sarcanthus appendiculatus, Hook. fil. A plant, of natural size. Fig. 1 a flower, front view, 2 profile view of floral bract, stalked ovary and flower, 3 longitudinal section of apex of ovary, column and lip, 4 callus on the back wall of the spur, 5 transverse section of spur, 6 lower surface of anther, 7 pollinia, caudicle and gland; all enlarged.
2. Sarcanthus flutrormis, Lindl. in Bot. Reg. 1842, Mise. 61.

Stems slender, terete, distantly sheathed near the base, pendulous, 10 in. to 6 feet in length. Leaves hanging more or less to one side, terete, fleshy, obtuse, 8 to 10 in. long and about 2 in . thick. Inforescence extra-axillary, slender, shorter than the leaves; the peduncle short, sheathed at the base only, the raceme long and lax. Flowers ${ }^{4} 45$ in. long; floral bract short, broadly oblong, obtuse, scarious. Sepals oblong, blunt, the dorsal concave towards the apex, all reflexed. Petals linear, much smaller than the sepals, also reflexed. Lip fleshy, adnate to the foot of the column; the base with a long infundibuliform compressed sac; its mouth with auriculate infolded side lobes; the apical lobe small, triangular, horizontal; the interior of the spur 2 -celled because of the septum passing between its front and back walls, and with a large triangular lobed hispid callus projecting from the latter and narrowing the cavities. Column with a broad base, tapered to the apex. Anther depressed, beaked. Pollinia two, elliptic, grooved, attached obliquely to the somewhat twisted caudicle; the gland small, oblong. Capsule clavate, about 5 in. long. Bot. Mag., t. 4639 ; Walp. Ann. VI, 891 ; Lem. Jard. Fleur. I, 266; Hook. fil. Fl. Br. Ind. VI, 66.

Sikkim, common in tropical valleys; in flower during August and September; Pantling No. 52. Khasia Hills, Burma.

The sepals and petals are brown with their edges and midribs yellowish or buff. The lip is white, flushed on the apical lobe with pink.

Plate 319.-Sarcanthus filiformis, Lindl. Part of a plant, of natural size. Fig. 1 a flower, 2 longitudinal section of apex of ovary, column and lip, 3 transverse section of the spur, 4 under surface of anther, 5 apex of column with pollinia in situ, 6 pollinia, after removal from anther; all enlarged.

## 3. Sarcanthus pallidus, Lindl. in. Bot. Reg. 1840, Misc. 78.

Stem very stout, short ( 4 to 6 in.), leafy to the base. Leaves coriaceous, flat, obliquely bifid at the obtuse apex, not narrowed to the loosely sheathing base ; length 8 to 12 in., breadth 1.4 to 1.6 in. Panicles ascending, axillary, much longer than the leaves, much-branched and many-flowered; their peduncles slender, with a few distant tubular sheaths. Flowers $\cdot 4$ or $\cdot 5$ in. across; floral bract broad, very short. Sepals equal, spreading, broadly elliptic, blunt or sub-acute, the dorsal concave. Petals smaller than the sepals but of the same shape. Lip fleshy, longer than the sepals, adnate to the column; the base with a blunt cylindric spur rather shorter than the ovary, curved forwards, its mouth with broadly triangular side lobes; the apical lobe fleshy, ovate, acute, with an incurved apical beak; its upper surface with a vertical plate running down into the spur and dividing the latter into two chambers; the back wall of the spur with a large protruding fleshy 2-lobed callus just under the column. Column short, broad, with a very short foot. Anther depressed, shortly beaked; pollinia two, ovoid or sub-ovoid, bifid, the caudicle thin, the gland small. Lindl. in Journ. Linn. Soc. III, 39 ; Hook. fil. Fl. Br. Ind. VI, 68 ; in Ann. Bot. Gard. Calc. V, 53, t. 79. S. racemifer, Reichb. fil. in Walp. Ann. VI, 891. S. tricolor, Reichb. fil. in Bonplandia III, 219. Saccolabium racemiferum, Lindl. Gen. and Spec. Orch. 224, Aerides racemiferum, Wall. MSS. Sarcanthus affinis, Wall. MSS.

Sikkim, at elevations of from 2,000 to 4,000 feet; in flower during August; Pantling No. 43. Westward to Nepal and eastward to Bhotan. Khasia Hills, Burma.

The sepals and petals of this are dull brown edged with yellow, and the lip is white.

Plate 320.-Sarcanthus pallidus, Lindl. Parts of a plant, of natural size. Fig. 1 a flower, 2 section of ovary, column and lip, 3 transverse section of spur, 4 apex of ovary with pollinia in situ, 5 pollinia removed, seen from behind, 6 lower surface of anther ; all enlarged.
4. Sarcanthus secundus, Griff. Notul. III, 362 ; Ic. Pl. Asiat., t. 336.

Stem slender ( 15 in . in diam.), pendulous, 6 to 12 in . long. Leaves narrowly oblong-lanceolate, acuminate, abruptly narrowed at the sheathing base, channelled; length 25 to 4 in., breadth 25 to 35 in . Racemes pendulous, less than an inch long, few-flowered ; the peduncle about $\cdot 5 \mathrm{in}$. long. Flowers $\cdot 25 \mathrm{in}$. across; floral bract ovate, sub-acute, much shorter than the stalked ovary. Sepals equal, ovate-elliptic, sub-acute, spreading. Petals smaller than the sepals, obovate-oblong, spreading. Lip fleshy, equal to the sepals, adnate to the column; the apical lobe sub-horizontal, concave,
oblong, acute; the base with a short blunt infundibuliform spur parallel to but much shorter than the ovary, with two short broad triangular side lobes at its mouth; its interior with an antero-posterior septum and a bulbous projecting callus from the front and back walls. Column very short and stout, without a foot. Anther depressed and with a long beak; pollinia two, ovoid, bifid; caudicle tapering; gland round, minute. Capsule ellipsoid, faintly ridged, 5 to 75 in. long. Hook. fil. Fl. Br. Ind. VI, 67 ; in Ann. Bot. Gard. Calc. V, 51, t. 77. S. oxyphyllus, Wall. MSS. in Herb. Calc. Micropera pallida, Lindl. in Wall. Cat. 7321 (in part, not of Gen. and Spec. Orch.).

Sikkim, at the base of the range and in the lower parts of hot valleys; Pantling No. 151. Sylhet, Assam, Khasia Hills, Chittagong.

The sepals and petals of this are pale yellow with intramarginal bands of brown. The lip is white, except its apical lobe which is pink. Griffith's specific name is inappropriate, as the flowers are not secund.

Plate 321.-Sarcanthus secundus, Griff. A plant, of natural size. Fig. 1 a flower, 2 bract, stalked ovary, column, anther and lip, 3 section of part of the foregoing, 4 apex of column with pollinia in position, 5 pollinia removed, 6 empty anther from below; all enlarged.

## 56. Dendrocolla, Blume.

Epiphytal. Stem elongate, leafy, erect and with many roots. Leaves coriaceous, narrow. Raceme leaf-opposed, its rachis bearing large persistent equitant bracts, proliferous. Sepals and petals sub-equal, spreading, often linear, the lateral petals adnate to the foot of the column. Lip short, jointed to the column, with a sac or spur at its base, 3-lobed, the lateral lobes small, the apical lobe oblong. Column short, broad at the base, with a short foot. Anther depressed, 2-celled; pollinia four, in pairs, unequal, or two and deeply bifid, attached by a short caudicle to a small often curyed gland. Capsule narrow, elongate. Species about six, mostly Malayan, one Indian.

The genus, as above limited, includes only the plants put by Blume into his first seotion, Cuculla; those of his sections Tubera and Fornicaria being excluded by their differently shaped lips.

## Dendrocolla Arachnites, Blume Bijdr. 287, t. 67.

Stem erect, rigid, rather stout, 6 or 8 in. long, bearing six or eight horizontal leaves and many roots. Leaves coriaceous, narrowly oblong, minutely bifid at the apex, not narrowed at the slightly sheathing base, 3 or 4 in . long and 6 to 75 in . broad. Inflorescence leaf-opposed, slightly longer than the leaves, spreading, rigid; the peduncle with one or two short sheaths, persistent and bearing flowers for about three years; the raceme shorter than the peduncle; floral bracts distichous, equitant, broadly triangular, persistent. Flowers about 1 in . across, the stalked ovary about twice as long as the bract. Sepals and petals sub-equal, linear-oblong, acuminate, 1.25 in . long. Lip jointed to the column, less than one-third of the length of the sepals and petals, with a short wide posteriorly projecting sac at the base, 3-lobed; the lateral lobes small, their truncate apices directed forwards; the apical lobe oblong, tumid, blunt, puberulous; disc between the side lobes with a fleshy callus. Column short, broad at the base, narrower at the apex and with a short foot. Stigma small. Anther depressed, truncate in front; pollinios
four, in pairs, narrowly elliptic, very unequal, the posterior one in each pair very small; caudicle short, quadrate; gland narrow, curved. Arides Arachnites, Lindl. Gen. and Spec. Orch. 238. Thrixspermum Arachnites, Reichb. fil. Xen. Orch. II, 121. . Sarcanthus Arachnites, Reichb. fil. in Walp. Ann. VI, 498; Hook. fil. Fl. Br. Ind. VI, 41. S. serrceformis, Reichb. fil. in Walp. Ann. VI, 498. Liparis? serrceformis, Lindl. in Wall. Cat., 1946 ; Gen. and Spec. Orch. 33 (in part).

Bhotan, at the foot of the range east of the Jaldacca river; in flower during September; Pantling No. 463. Assam; Jenkins, Mann. Khasia Hills; Clarke. Tenasserim; Wallich, Parish. Penang; Kunstler. Distrib. Java.

The flowers of this are very short-lived; they open rather late in the morning, and by evening they have withered. They appear singly at intervals of two or three weeks, and the raceme continues growing for several years. In colour the sepals and petals are yellow and the lip is speckled with red. In the Malayan countries the rachis often attains a length of many inches. As the bracts persist, the flowering rachis has a pectinate appearance.

Plate 322.-Dendrocolla Arachnites, Blume. A plant, of natural size. Fig. 1 a flower, 2 profile view of the apex of the raceme, showing the bracts of future flowers, the bract of an existing flower, its stalked ovary, column and lip, 3 front view and vertical section of lip, 4 apex of ovary and column with anther in situ, 5 empty anther, under surface, 6 apex of column, showing the pollinia and caudicle (g) and the stigma (s), 7 the pollinia after removal, front and back views; all enlarged.

## 57. Ornitharium, Lindl.

Epiphytic. Stems long, leafy. Leaves coriaceous, narrowly oblong, notched at the apex. Racemes extra-axillary, long, pendulous. Flowers rather small. Sepals and petals more or less oblanceolate, all spreading except the connivent dorsal sepal. Lip jointed to the foot of the column, fleshy, spur-like, with a narrow cavity, bearing at its mouth minute side and apical lobes; the cavity without callus or septum. Anther depressed, shortly beaked; pollinia two, ovoid-globose, the caudicle lanceolate, the gland small. A single species.

Ornitharium striatulum, Lindl. in Paxt. Fl. Gard. I, 188, fig. 117.
Stem pendulous, slender, woody, sheathed, 3 to 6 in . long. Leaves decurved, narrowly oblong, obliquely bifid at the apex, slightly narrowed at the base into a short stemclasping sheath; length 3.5 to 7 in., breadth 65 to 85 in. Racemes pendulous, opposed to and usually longer than the leaves, many-flowered, their peduncles short and with a few short broad bracts. Flowers lax, 5 in. in diam.; floral bract minute, lanceolate, the stalked ovary very slender. Sepals sub-equal, narrowly obovate, blunt, the lateral pair slightly falcate. Petals smaller than the sepals, oblong, sub-acute, slightly falcate. Lip jointed to the foot of the column, narrowly infundibuliform, contracted below the slightly bulbous tip, slightly constricted also at the mouth; the side lobes small, oblong, their blunt apices pointing backwards; apical lobe very short, truncate. Column very stout, slightly dilated towards the apex, its foot strongly introflexed, as long as and running almost parallel to itself; rostellum short. Anther depressed, 2-celled; pollinia broadly ovoid, their apices divergent, attached by a thick short caudicle to the small gland. Sarcochilus suavcolens, Reichb. fil. Xen. Orchr, t. 140; Hook. fil. Fl. Br. Ind. VI, 33. Erides suaveolens,

Roxb. Fl. Ind. III, 473. Ornithochilus striatulus, Herb. Calc. Thrixspermum teres, Reichb. fil. Xen. Orch. II, 121, 123 (excluding all the synonyms except those given above).

Sikkim, in tropical valleys at low elevations; Pantling No. 286. Chittagong and Tenasserim.

The sepals and petals of this are yellow with brown spots; the lip is also yellow at the base, but its upper surface is white and its tip dark-purple. The flowers are sweet-scented. The racemes appear to lengthen and to produce flowers at different periods during the year. The individual flowers live, however, only a single day. This is one of the plants included in the genus Sarcochilus as enlarged by Mr. Bentham. But, as its lip is a spur-like body with a narrow cavity throughout its whole length, and bearing at the mouth minute side lobes, we do not think it ought to be reduced to a genus which its author characterised as having a lip with very large side lobes and no spur. We do not find any other genus into which it can justly be reduced, and we therefore venture to resuscitate for it that originally formed for it by Lindley.

According to another view of the morphology of the flower of this plant, the whole lip consists of a spur jointed to the foot of the column, and mobile. On this view the lip has a narrow cavity extending its whole length and dilated at the apex. But, on neither view is the lip like that of Sarcochilus, as Robert Brown (its founder) understood that genus.

Plate 323.-Ornitharium striatulum, Lindl. A plant, of natural size. Fig. 1 the sepals and petals separated, 2 lip, front view, 3 vertical section of lip, 4 floral bract, stalked ovary, column, its foot, anther in situ, and lip, side view, 5 column and its foot and anther, front view, 6 under surface of anther, 7 pollinia; all enlarged.

## 58. Tæniophyllum, Blume.

Small stemless epiphytes, leafless when flowering, pseudo-bulb none; roots large, flat, greenish. Leaves linear, few, or absent. Scape short, filiform, simple, bearing a few minute flowers in a spike. Sepals and petals sub-equal, spreading, free or connate at the base, the lateral sepals sometimes attached to the lip. Lip adnate to the base of the column, conspicuously saccate or spurred, side lobes short or absent; mid-lobe fleshy, broad and short, or elongated and narrow. Column short, thick. Anther 2-celled; pollinia four, more or less broadly ovoid, attached in pairs by a caudicle to a gland. Species about 15; Indian, Malayan and Australasian.
Apex of lip with a recurved spike-like process . . . . . 1. T. retro-spiculatum.
Apex of lip broad, obtuse . . . . . . . . . . . . . 2. T. crepidiforme.

## 1. Teniophyllum retro-spiculatum, King and Pantling.

Leafless; the roots large, numerous and flat. Scape about 75 in . long, bearing at its apex one or two minutely bracteolate flowers $\cdot 2 \mathrm{in}$. long. Sepals and petals sub-equal, linear-lanceolate, wide-spreading, the lateral sepals inserted on the sides of the lip. Lip linear-lanceolate, with a globose spur at the base, the apex with a retrorse tooth, the base sub-gibbous, side lobes none, the mouth of the spur contracted. Column very short. Pollinia four, broadly elliptic; the caudicle short, dilated below the pollinia, the gland ovate. Sarcoochilus retro-spiculatus, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt 2, 340.

Sikkim, at elevations of about 5,000 feet; flowering in June; Pantling No. 165.
A very inconspicuous species, remarkable for the curious retroflexed apical spiculelike appendage of the lip. The flowers open singly, they are green in colour.

Plate 324.-Tceniophyllum retro-spiculatum, King and Pantling. A plant growing on a tree-branoh, of natural sise. Fig. 1 a flower, 2 side view of apex of ovary, column and lip, 3 lip with its spur, front view, 4 and 5 anther as seen from above and from below, 6 pollinia; all enlarged.

## 2. Teniophyluum crepidforme, King and Pantling.

A minute leafless plant with comparatively large spreading roots. Racems erect, $\cdot 35$ in. long. Flowers $\cdot 15 \mathrm{in}$. long, distichous, opening singly; bract ovate, minute. Sepals sub-equal, ovate, blunt, concave, incurved; the lateral pair attached to the sides of the column. Petals shorter than the sepals, lanceolate. Lip sessile on the column, forming a roundish cup with entire edges; spur dilated, horizontal, pilose just inside its mouth, about as long as the lip. Column very short. Anther thin, with a slightly deflexed fleshy lip. Pollinia four, broadly ovoid, attached by pairs to a single thread-like caudicle; gland ovate. Ovary long, sub-sessile; fruit 1 in . long, cylindric. Sarcochilus crepidiformis, King and Pantling in Journ. As. Soc. Bengal, Vol. LXIV, Pt. 2, 340.

Sikkim, in tropical valleys; flowering in September; Pantling No. 193.
The sepals and petals of this curious little plant are greenish, the lip is white, and the stigma has purple margins. It is named from the resemblance of the combined lip and spur to a slipper or last.

Plate 325.-Taniophyllum crepidiforme, King and Pantling. A plant growing on a branoh of a tree, of natural sizs. Fig. 1 bract, ovary and flower, 2 part of ovary, column and lip, side vieco, 3 lip and portion of spur, 4 column and apex of ovary, anther (a), rostellum ( $r$ ), stigma ( $s$ ), 5 anther, lower surface, 6 pollinia; all enlarged.

## 59. Podochilus, Blume.

Stems tufted, usually slender, erect or diffuse. Leaves numerous, uniform, flat; or equitant and laterally compressed. Inflorescence terminal or leaf-opposed. Flowers minute, spicate or racemose, bracts persistent. Sepals and petals connivent or erecto-patent; the lateral sepals united at the base to form a wide sac or false mentum. Lip clawed, jointed to the produced foot of the column, sometimes with long basal lobes, ? mobile. Column very short; rostellum terminal, triangular, erect, bifid. Anther dorsal; pollinia four, in two pairs; each pair enclosed in a funnel-shaped cup attached to a short free caudicle, the caudicles inserted on a single small or large gland. Species about 12 , Indo-Malayan.

> Leaves equitant, apex of lip bifid . . . . . . . . . . . 1. P. cultratus. Leaves not equitant, apes of lip entire, acute . . . . . . . . 2. P. khasiants.

## 1. Podochlus cultratus, Lindl. in Wall. Cat. 7336.

Stems 6 in. long, clothed throughout with equitant flattened falcately lanceolate acute leaves 65 in . long and 25 in . broad. Raceme slender, terminal, about 5 in . long, 2- to 4 -flowered, often producing one or two roots at the base. Flowers $\cdot 2 \mathrm{in}$. long; floral bract broadly ovate, cuspidate, about equal in length to the sessile ovary

Sepals ovate, acute. Petals trapeziform, blunt or sub-acute. Lip oblong, slenderly attached on the under side and in front of the gibbous base to the much-produced foot of the column (see fig. 2), doubtfully mobile, flat or very slightly deflexed from the middle; the apex blunt, bilobulate, the dise smooth throughout. Column very short. Anther dorsal, curved, beaked. Stigma a shallow pouch, with an erect acute arm on either side; pollinia four, in pairs, each pair held within a funnel-shaped process and supported by a slender geniculate free caudicle; the two caudicles attached to the small shield-shaped gland. Lindl. Gen. and Spec. Orch. 234 ; in Journ. Linn. Soc. III, 37 ; Hook. fil. Fl. Br. Ind. V, 80.

Sikkim, at elevations from 2,000 to 3,000 feet; in flower during September and October; common; Pantling No. 188. Westward along the range to Nepal; eastward to Assam, Cachar and Burma.

The flowers are white, slightly flushed with pink.
Plate 326.-Podochilus cultratus, Lind1. A plant, of natural sise. Fig. 1 a flower, 2 side view of bract, ovary, column with anther in situ and lip, 3 petals, $4 \mathrm{lip}, 5$ column and apex of ovary, the stigma (s), 6 empty anther, 7 pollinia; all enlarged.

## 2. Podochilus Khasianus, Hook. fil. Ic. Pl. 2146.

Stems 4 to 6 in. long, simple, slender, sub-erect. Leaves coriaceous, linear-lanceolate, acute, sub-falcate, somewhat tapered to the base and articulated to the very short sheath, $\cdot 35$ to $\cdot 6$ in. long. Raceme terminal, erect, about $\cdot 25$ in. long. Flowers three or four, distichous, 15 in. long; floral bract exceeding the sessile ovary, broadly ovate, acute, persistent. Sepals ovate, sub-acute, connate below, the lateral pair forming a short wide sac (or mentum) at the base. Petals ovate-oblong, blunt, narrowed 'at the base. Lip oblong, sagittate at the base, the narrow basal lobes with a claw between them attaching the lip to the column, the margins slightly incurved and minutely ciliolate towards the acute apex, the upper surface smooth. Column short, stout; rostellum very broad, blunt. Stigma pouched and with a narrow transverse slit for its mouth. Anther dorsal; pollinia clavate, each pair enclosed in a funnel-shaped process ending in a short free caudicle; the gland large, oblong, bifid below. Hook. fil. Fl. Br. Ind. VI, 81. P. microphyllus, Wall. Cat. 7335B; Lindl. Gen. and Spec. Orch. 234 (in part); in Journ. Linn. Soc. III, 37.

Sikkim, on Sittong, at elevations of 5,000 to 6,000 feet; in flower during September; Pantling No. 187. Khasia Hills; Hooker and Thomson. Assam ; Simons.

The flowers are white slightly flushed with yellow. The foot of the column is produced along the front of the ovary with which it is adnate, and with the lateral sepals it forms a small mentum.

Plate 327.-Podochilus Khasianus, Hook. fil. A plant, of natural size. Fig. 1 a flower, side view, 2 bract, ovary, column and lip, side view, 3 petals, 4 lip, 5 empty anther, lower surfaee, 6 column, 7 pollinia; all enlarged.

## 60. Risleya, new genus, King and Pantling.

A small aphyllous terrestrial herb, without tuber or pseudo-bulb. Scape 2 to 5 in. long with two sheaths at the base. Flowers minute, fleshy, densely crowded in a short raceme. Sepals and petals sub-equal, oblong, blunt, spreading. Lip adnate to the base of
the column, about as long as the sepals, broadly ovate, very concave, fleshy, slightly crenulate near the base, otherwise entire; the apex blunt but with a small upturned apiculus. Column short, terete; rostellum stout, elongate. Anther dorsal, persistent, membranous, two-celled; the cells quite free and distinct, each dehiscing transversely by the broad blunt apex. Pollinia four, in two pairs, waxy; both pairs sessile on the rather large oblong fleshy gland, caudicle none.

An anomalous genus with the pollen of Vandeae, and the habit and general appearance of Aphyllorchis. The waxy nature of the pollinia and their attachment to a gland make it, however, impossible to include it in the latter genus. We find no genus in which it can be placed, and we have therefore founded one for its reception, naming it in honour of the Honourable H. H. Risley, c.r.e., of the Bengal Civil Service, one of the Secretaries to the Government of Bengal, a distinguished ethnologist and author of an important work on the Tribes and Castes of Bengal.

## Risleya atropurpurea, King and Pantling.

Height of the whole plant 2.5 to 5 in . Sheaths at the base of the leafless scape wide, tubular, blunt, 5 to 1 in . long. Raceme 5 to 1.5 in . long; the flowers very numerous, inverted, $\cdot 06 \mathrm{in}$. across ; the floral bract as long as the stalked twisted ovary. Petals rather narrower than the sepals, rostellum projecting.

Sikkim, near Jongri; at an elevation of 13,000 feet; in flower during June and July; Pantling No. 451.

The flowers are of a deep blackish-purple colour.
Plate 328.-Risleya atropurpurea, King and Pantling. Two plants, of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther in situ, and lip, in profile, 3 lip, 4 apex of ovary, column with anther in situ, side view, 5 summit of the oxary, showing the two empty anther cells and the rostellum ( $r$ ), 6 pollinia; all much enlarged.

## 61. Ceratostylis, Blume.

Epiphytic herbs with crowded stems without pseudo-bulbs. Stems tufted, simple and rush-like or branched, sheathed, with usually only one leaf. Leaf narrow, coriaceous, fleshy, or sub-terete. Flowers minute, solitary or in small clusters and sometimes enveloped in a cymbiform sheath with scarious bracts. Sepals sub-equal, the lateral pair broad at the base and forming a mentum with the foot of the column the lateral sepals and the base of the lip. Petals narrower than the sepals. Lip spathulate, clawed, expanded, the apex thickened and fleshy. Column short, deeply two-lobed, each lobe bearing a stigmatic area near the apex of its inner surface. Anther dorsal, lying in the sinus between the lobes of the column; foot of the column long, narrow. Pollinia eight, attached to a common membrane and that in turn to a gland. Species probably about 10 ; Malayan, Indian and Australasian.

## Ceratostylis teres, Reichb. fil. in Bonplandia, II, 89.

Stems crowded, rising from a dense fibrous rhizome, terete, rush-like, sheathed at the base, erect or curved, bearing a single terete leaf at the apex jointed to and in the same line with the stem. Head of flowers from the leaf-joint, 25 to 35 in. in diam.;
sessile, subtended by a few scarious sheathing bracts. Flovers sparsely pubescent, •1 in. long; floral bract small, scarious, much shorter than the ovary. Sepals sub-equal, ovatelanceolate, acute, spreading. Petals broadly lanceolate, acute. Lip narrowly spathulate, the claw with undulate edges, the apex clavate; the upper surface with two raised lines from base to apex, granular near the apex. Column short, deeply bilobed, each lobe with a stigmatic surface on its inner face; the anther lying in the sinus between the lobes and on a lower level than the two stigmatic surfaces (? distinct stigmas); foot much longer and narrower than the column, and forming with the base of the lip a long narrow somewhat curved sac; pollinia eight, clavately ellipsoid, attached to a large membrane and that in turn to a cordate gland. Capsule ellipsoid, $\cdot 2 \mathrm{in}$. long. Reichb. fil. in Walp. Ann. VI, 470 ; Hook. fil. Fl. Br. Ind. V, 825. Appendicula teres, Griff. Notul III, 359; Ic. Pl. Asiat., t. 332.

Sikkim, in the valley of the Teesta at an elevation of 1,000 feet; Pantling No. 229; in flower during May and June. Upper Assam ; Griffith, Watt. Khasia Hills; J. D. Hooker.

The flowers are white, the end of the lip alone being yellow. The structure of the column is very remarkable. It is divided into two lobes by a deep sinus at the bottom of which lies the anther, the pollinia being quite concealed, while the gland (although visible in front) does not project from the cleft between the lobes. The two halves of the stigma lie on the inner or opposing surfaces of the lobes of the column. Each is of an obovate acute shape (the broad ends being uppermost); and the two lower and acute ends join in the sinus between the lobes, and thus forming a narrow belt from which the gland connecting the pollinia is derived.

Plate 329.-Ceratostylis teres, Reichb. fil. A plant, of natural size. Fig. 1 side view of a flower, 2 side view of floral bract, ovary, column and lip, 3 front view of column and its foot (the ovary being behind), showing the two lobes of the column with the two stigmatic surfaces (marked $s$ ) and of the anther, (the gland of the pollinia being marked $g$ ), 4 inner surface of one of the lobes of the column, showing the stigmatic surface (marked s), 5 the lip, 6 anther, 7 pollinia; all enlarged.

## 62. Appendicula, Blume.

Stems tufted, slender, leafy, often compressed. Leaves numerous, uniform, flat. Inforescence terminal or leaf-opposed, short. Flowers in racemes spikes or heads, minute; floral bract persistent. Sepals connivent, the lateral pair connate at the base and adnate to the long foot of the column to form a mentum. Petals linear, elliptic-oblong or obovate. Lip erect, adnate to the foot and sometimes to the sides of the column. Column very short; rostellum erect, bifid. Anther dorsal, erect; pollinia eight, (four often imperfect), attached by fours to a slender elongate caudicle and small gland. Capsule minute. Species about forty; tropical Asiatic, Australian and Polynesian.

Appendicula bifaria, Lindl. in Hook. Kew Journ. Bot. VII (1855), 35.
Stems slender, unbranched, 10 to 24 in . long. Leaves lanceolate, sub-acute, minutely bilobulate at the apex and often apiculate between the lobules; the base sessile and jointed to the short sheath; length $\cdot 9$ to $1 \cdot 25$ in., breadth 35 to $\cdot 4 \mathrm{in}$. Racemes chiefly terminal, rarely leaf-opposed, half an inch long, or shorter, 6 - to 8 -flowered. Flowers • 15
to ' 25 in . long; floral bract lanceolate, acuminate, longer than the ovary, ultimately reflexed. Sepals oblong, obtuse. Petals ovate. Lip as long as the sepals, narrowly oblong, blunt, fleshy, its upper surface with a superposed horse-shoe-shaped appendage slightly constricted beyond the middle and with a globose callus near its apex. Column long, its apex with two pointed obliquely truncate or bifid processes as long as the rostellum; pollinia eight, unequal, clavate, attached by fours to a single caudicle; gland minute, brown. Capsule turgidly ellipsoid, $\cdot 25$ in. long. Hook. fil. Fl. Br. Ind. VI, 82 ; Benth. Fl. Hong-Kong, 358 ; Reichb. fil. in Walp. Ann. VI, 893. A. reduplicata, Reichb. fil. Ot. Hamb., 45.

Sikkim, in tropical valleys; in flower during August; Pantling No. 288. Cachar; Keenan. Tenasserim; Helfer, No. 5221 (Kew Distrib.). Perak; Scortechini, No. 1866. Pahang; Ridley, No. 2370.

The flowers are white flushed with yellow, the gland of the pollen-masses is brown. The lip is very curious and gives the idea that a second lip, rather smaller than the real one, is laid on top of the latter. This no doubt was the origin of Reichenbach's specific name reduplicata.

Plate 330.-Appendicula bifaria, Lindl. A plant, of natural size. Fig. 1 a flower, 2 floral bract, ovary, column with anther in situ, and lip, side viev, 3 lip, showing the globose sub-apical callus and the superposed laminar process, 4 vertical section of the lip, 5 column and its foot, at the apex the two processes and between them the rostellum, 6 under surface of anther, 7 pollinia; all enlarged.

## 63. Thelasis, Blume.

Epiphytes, with small few-leaved pseudo-bulbs or with short compressed stems and equitant leaf-sheaths. Leaves narrowly oblong, flat or loriform. Inflorescence from the base of the pseudo-bulb, sparsely sheathed. Flowers inverted, minute, in spikes, their texture cellular. Sepals connivent, sub-equal, concave, keeled or winged. Petals narrow, membranous. Lip sessile on the base of the column, ovate or oblong, erect. Column very short, with no foot; the rostellum terminal, large. Anther dorsal, elongate, erect, 8-celled; pollinia eight, minute, globose, attached by granular elastic threads to the slender caudicle; gland long, linear. Capsule small, turgid. Species about 14, in tropical Asia and in the islands of the Pacific.

Leaves 1 to 3 in . long, lip with side lobes . . . . . . 1. T. pygmea.
Leaves 4 to 6 in . long, lip with no side lobes . . . . . 2. T. longifolia.

1. Thelasis pygmea, Lindl. in Journ. Linn. Soc. III, 63.

Pseudo-bulbs ovoid-globose, $\cdot 4$ to 65 in. in diam., bearing at the apex one or two linear-oblong fleshy leaves, minutely and obliquely bifid at the apex, narrowed at the sessile base ; 1 to 3 in . long and $\cdot 2$ to $\cdot 45 \mathrm{in}$. broad. Scape longer than the leaves, rising from the base of the pseudo-bulb, sheathed at the base and at intervals above; raceme from $\cdot 5$ to 1 in . long. Flowers crowded, $\cdot 1 \mathrm{in}$. long; floral lract ovate, acuminate, as long as the ovary, scarious, persistent. Dorsal sepal ovate-lanceolate, acute; the lateral pair linear-oblong, concave, keeled. Petals oblong, blunt, 1-nerved, their apices recurved. Lip somewhat shorter than the sepals, oblong, blunt; the lateral lobes shallow, broad. Column tapering to the apex; the rostellum long, minutely bifid. Anther dorsal; pollinia globose, resting on a large mass of granular elastic tissue; caudicle single, slender; gland linear,
two-thirds of the length of the caudicle. Cansule subcylindric, tumid, 2 in . long. Par. and Reichb. fil. in Linn. Trans. XXX, 145 ; Reichb. fil. in Walp. Ann. VI, 923 ; Hook. fil. Fl. Br. Ind. VI, 86. Euproboscis pygmeea, Griff. in Calc. Journ. Nat. Hist. V, 371, t. 72; Wight Ie. 1732.

Sikkim, at low elevations; in flower during August and September; Pantling No. 235. Malabar; Jerdon. Tenasserim; Parish. The flowers are pale green.

Plate 331.-Thelasis pygmea, Lindl. A tuft of plants, of natural sise. Fig. 1 part of rachif, bract, ovary and flower, side viev, 2 petals, 3 bract, ovary, lip and column, seen from behind, 4 lip, 5 view of the column from below, 6 anther, 7 pollinia; all enlarged.

## 2. Thelasis longifolia, Hook. fil. Ic. Plantar. t. 2155.

Pseudo-bulls conical, 5 to $\cdot 75 \mathrm{in}$. long, bearing at the apex a single narrowly oblong or occasionally somewhat oblanceolate leaf, blunt and very minutely bifid at the apex and narrowed to the sessile base, 4 to 6 in . long and 5 to 7 in . broad. Scape from a developing pseudo-bulb, slightly longer than the adult leaf, with one or two scattered, short, thick, spreading sheaths along it and also several at the base. Raceme 1 to 2 in . long. Flowers numerous but not crowded, minute, $\cdot 2 \mathrm{in}$. long; bract broadly ovate, acute, much shorter than the ovary. Sepals without keels; the lateral pair ovate, blunt, the dorsal longer and narrower. Petals narrowly ovate, sub-acute. Lip elliptic, blunt, minutely bifid at the apex, otherwise entire, without side lobes, somewhat thickened in the middle near the base, the upper surface quite smooth. Column tapering to the apex; the rostellum long and narrow. Anther long-beaked, 2 -celled, each cell with four compartments; pollinia broadly elliptic; the caudicle very long and slender, slightly dilated at the apex; gland small, oblong. Hook. fil. Fl. Br. Ind. VI, 87.

Sikkim, in tropical valleys; in flower during July and August; Pantling No. 223. Khasia Hills. The flowers are green in colour.

Plate 332.-Thelasis longifolia, Hook. fil. A group of plants, of natural size. Fig. l, flower with ovary and bract, side viex, 2 lip, 3 bract, ovary, column, anther, and lip, from above, 4 view of the column from underneath, 5 anther, 6 pollinia; all enlarged.

## 64. Phreatia, Lindl.

Coespitose plants, often minute, with or without pseudo-bulbs. Leaves not plicate, articulated on rather wide equitant sheaths. Scape interfoliar and from the base of the pseudo-bulb, erect, racemose or spicate, many-flowered. Flowers minute, resupinate, expanding centrifugally. Sepals equal, connivent or spreading; the lateral pair adherent to the column. Petals narrower than the sepals. Lip fleshy, entire, decurved, adnate to the short foot of the column, broad or narrow. Column short, with a broad apex; the rostellum small, erect on the front edge of the truncate apex, bifid. Anther occupying the apex of the column; the pollinia eight in two rows, attached to a narrow caudicle lying horizontally and attached at a right angle to a gland contained in the cleft of the vertical rostellum. Capsule minute, ovoid. Species about ten, Malayan and Pacific Islands.

We have removed this genus from Epidendreae to Vandeae. From the extremely delicate texture of the flowers, it is impossible to make out the polliniar structure with certainty in dried specimens. Very careful dissections of the living flowers have shown us that the eight pollen-masses are attached to a caudicle which ends in an elongated gland situated in the fork of the vertical bifid rostellum. The
position of the anther at first glance appears to be erect, but a minuter examination shows that the pollinia and their caudicle lie horizontally on the broad truncate apex of the column. On the edge of this truncate apex stands the bifid erect rostellum, and in its cleft lies the gland to which the horizontal caudicle attaches itself. The genus is allied to Thelasis and, as Sir Joseph Hooker remarks in I.. Plant. sub t. 2155, the texture of the petals in both genera is of the same soft, lax, succulent nature.

## Phreatia elegans, Lindl. Gen. and Spec. Orch., 63.

Pseudo-bulbs tufted, ovoid, compressed, $\cdot 75$ in. long. Leaves thickly membranous, narrowly elliptic, sub-acute or acute, somewhat narrowed to the large tubular sheath, 4 to 6 in . long and about $\cdot 75 \mathrm{in}$. broad. Scape erect, much longer than the leaves, proceeding from the base of a pseudo-bulb bearing about three distant convolute sheaths half an inch long; the raceme about 4 in . long, densely-flowered, the flowers opening from above downwards or sometimes from the centre towards the base and apex. Flowers minute (only $\cdot 125 \mathrm{in}$. across), white; the bract lanceolate, equalling or somewhat longer than the sessile ovary. Sepals sub-equal, ovate, acute, spreading; the petals narrower. Lip oblong, entire, sessile on the narrow foot of the column, deflexed about the middle, its upper surface hispid or smooth, grooved down the midrib. Rostellum bifid, erect; pollinia sub-rotund, cohering to a single thin caudicle; the gland long, narrow. Lindl. in Journ. Linn. Soc. III, 61; Hook. fil. Fl. Br. Ind. V, 811. Thelasis elegans, Blume Mus. Bot. Lugd. Bat. II, 187.

Sikkim, at Choongthang; elevation 6,000 feet; in flower in August; Pantling No. 295. Khasia Hills; G. Mann, King's Collectors.

Plate 333.-Phrcatia elegans, Lindl. A plant, of natural sizo. Fig. 1 a flower, front view, 2 lip, 3 column with anther in situ, showing polliniar gland ( $p g$ ) and stigma ( $s$ ), 4 front view of the same, the anther having been removed to show better the forked rostellum $(r), 5$ floral bract, ovary, column and its foot, anther and lip, side viev, 6 lower surface of anther, 7 pollinia; all enlarged.

## Tribe IV.--LISTEREAE.

Anther terminal (dorsal in Epipactis), pollinia two or four, cohering by their sides, without gland or caudicle (a rudimentary caudicle in Epipogum); pollen powdery, granular or in small masses, never waxy.

Anther truly terminal.
Pollinia with small thin caudicles but no gland, lip spurred
65. Epipogimn.

Pollinia without caudicles.
Lip flat, neither clawed spurred nor saccate, pendulous and usually at right angles with the curved, more or less elongate, always inappendiculate, column; sepals and petals free, spreading or reflexed; leaves two (absent in one species)
66. Listera.

Lip not pendulous, transversely elliptio, neither clawed spurred nor saccate ; its upper surface somewhat concave and with two elongated tooth-like calli near its base; column with a short transverse horizontal sub-truncate process near its middle, and at its base a sub-erect tongue-like 2 -lobed process . . . . . 67. Pantlingia.
Lip concave or convolute, not clawed, spurred or saccate, rarely pendulous; sepals petals and column various.
Saprophytes or parasites with brown or yellowish stems, usually leafless.
Sepals united, pollinia two or four.
Sepals united into a ventricose tube near the mouth of which the minute petals are attached; pollinia two
68. Gastrodia.
Sepals and petals united into a 5 -toothed tube; the dorsal sepal and petals forming an upper and the lateral sepals a lower lip; pollinia four.
69. Didymoplexis.
Sepals free; pollinia two.
Stem unbranched, roots fibrous, flowers in apical racemes
70. Aphyllorchis.
Stem erect or scandent, often branched, flowers in terminal or lateral racemes or panicles . . . 71. Galeola.
Not saprophytic or parasitic, stems and leaves green.
Leaf solitary.
Leaf radical, usually not contemporaneous with the flowers; pollinia two or four
72. Pogonia.
Leaf borne on the stem close to the flower and contemporaneous with it
73. Corysanthes.
Leáves numerous, plicate; pollinia four, in pairs . . 74. Cephalanthera.
Anther dorsal; leaves numerous, plicate; pollinia four, in pairs . . . . 75. Epipactis.

## 65. Epipogum, Gmelin.

Terrestrial, leafless, brown-coloured herbs with tuberous or coralloid roots. Stem crect, sheathed. Flowers few, racemose. Sepals and petals sub-equal, free, narrowly oblong, erect or connivent. Lip adherent to the base of the column, ovate, entire or 3 -lobed; the base broad and spurred; the dise with papillose ridges. Column short, with no foot. Stigma broad and prominent. Anther thickened, convex, 2-celled; pollinia two, broad, bifid, each attached to a short rudimentary caudicle; gland none. Two species, both Indian.

$$
\begin{aligned}
& \text { Spur as long as the lip and ovary; root branched . . . . 1. E. aphyllum. } \\
& \text { Spur much shorter than the lip and ovary, root a large tuber } \\
& \text {. 2. E. nutans. }
\end{aligned}
$$

## 1. Epipogum aphyllum, Swartz Sumn. Veg. Scand., 32.

Glabrous; height of the whole plant not exceeding 8 inches; root branching, coralloid. Stem stout, sometimes swollen at the base, with two unequal sheathing bracts, one near the base and the other higher up. Raceme 1.5 in . long and about 4-flowered. Flowers :75 in. across from apex of dorsal sepal to apex of lip; floral bract membranous, oblong-elliptic, concave, longer than the slenderly stalked tumid ovary. Sepals and petals narrowly oblong, sub-acute. Lip large, 3-lobed; the side lobes large, rounded, erose at the apex; the apical lobe deflexed, ovate, acute, concave, its upper surface with three short and two long parallel caruncled ridges; the spur thick, blunt, dorsally flattened, as long as the lip and longer than the ovary.

Coiumn stout, curved, the edges of the clinandrium lobulate. Stigma very large, occupying two-thirds of the anterior face of the column. Anther globose, with a semicircular opening in front; pollinia broadly obovoid, compressed, their caudicles very slender. Boiss. Fl. Orient. V, 93 ; Reichb. Ic. Fl. Germ. XIII, t. 468 ; Hook. fil. Fl. Br. Ind. VI, 124. E. Gmeliniz, Richard Orchid. Europ. Annot. 36 ; Lindl. Gen. and Spec. Orch. 383 ; in Journ. Linn. Soc. I, 176; Bot. Mag., t. 4821. Satyrium Epipogium, Linn. Syst. Veg. 676; Jacq. Fl. Austr., t. 84.

Sikkim, in the Lachen Valley, at an elevation of 12,000 feet; in flower during September; Pantling No. 418. Along the Himalayan range to Kashmir. Distrib.-Europe, N. Asia.

The whole plant is of a faint yellowish colour, except the lip which has red streaks on its spur and on the carunculate ridges of its upper surface.

Plate 334.-Epipogum aphyllum, Swartz. A plant, of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column and lip, in profile, 3 sepals and petals, separated, 4 apex of ovary, column with anther in situ, and stigma, 5 empty anther, 6 pollinia (swollen from immersion in fluid); all onlarged.
2. Epipogum nutans, Reichb. fil. in Bonplandia for 1857, p. 36.

Glabrous; whole plant 4 to 16 in . high. Stem short or slender, proceeding from an oblong or fusiform under-ground tuber 2 in . or more in length; sheaths few, lax, scattered, broad, obtuse, 5 or $\cdot 6 \mathrm{in}$. long. Raceme 2 to 8 in. long, with distant drooping flowers $\cdot 5 \mathrm{in}$. long (excluding the ovary) ; floral bract membranous, elliptic, acute, concave, shorter than the shortly-stalked ovary. Sepals and petals linear-oblong, acute, connivent. Lip elliptic, from a broad base, concave, entire, the apex with a short blunt apiculus, the upper surface with two (? sometimes three) parallel carunculate ridges; the spur short, slightly bulbous, less than half as long as either ovary or lip. Column short, stigma small. Anther large, sub-quadrate; pollinia two, each with two unequal lobes and attached below to a thin rather long caudicle. Lindl. in Journ. Linn. Soc. I, 177 ; Benth. Fl. Austral. VI, 308; Hook. fil. Fl. Br. Ind. VI, 124. E. roseum, Lindl. 1. c. 177 . Gatera nutans, Blume Bijdr. 416, t. 3 ; Mus. Bot. Lugd. Bat. II, 187; Fl. Javæ, Orchid. 117, t. 52C. and 54E ; Lindl. Gen. and Spec. Orch. 500. G. rosea, Blume Mus, Bot. Lugd. Bat. 188. Podanthera pallida, Wight Ic. t. 1759 . Ceratopsis rosea, Lindl. Gen. and Spec. Orchid. 384. Limodorum roseum, Don Prod. 30.

Sikkim, in hot valleys, ascending to elevations of 4,000 feet; in flower from April to June; Pantling No. 147. Westward as far as Nepal, in similar situations, Khasia Hills; G. Mann. The Deccan, Ceylon. Distrib. Java, Australia, West Africa.

The stem and ovaries are of a very pale ochraceous yellow, the sheaths being brown. The flowers in the Sikkim plant are white, the lip having a few reddish-brown spots on its upper surface. Occasionally the flowers are spotted with pink. In expanded flowers, the pollinia rest directly on the stigma, and become absorbed in it as the plant gets old; only in the bud are the pollinia found lying within the anther:

Plate 335.-Epipogumt nutans, Reichb. fil. A plant, of natural size Fig. 1 floral bract and flower, in profite, 2 stalked ovary, column and lip,' in profile, 3 the lip, 4 profile of the column, showing the anther ( $a$ ), pollinia ( $p$ ), stigma $(s)$, column $(c)$, and ovary $(o), 5$ front of column showing anther (a), two grooves in which the caudicles of the pollinia lie ( $g$ ), Follinia ( $p$ ), stigma ( $s$ ), 6 pollinia; all enlarged.

## 66. Listera, R. Brown.

Terrestrial, erect, slender, 2 -leaved herbs (leafless in one species), with fibrous roots. Leaves opposite or sub-opposite, rarely alternate, membranous, sessile or sub-sessile. Flowers small, racemose. Sepals and petals sub-equal, free, spreading or reflexed. Lip adnate to the base of the column, pendulous, longer than the sepals, narrow, the apex usually bifid, sonetimes 3 -fid or entire. Column stout, cylindric, usually curved forwards. Anther depressed, its lip obtuse; pollinia two or four cohering in pairs, rostellum short. Species about 16, natives of N . temperate regions and of high altitudes in the Himalaya.

The genus Neottia was founded by Linneens in 1735 to include only $N$. Corallorrliza. In his Spesies Plantarum, published in 1753, however, Linnæus omitted Neottia altogether; and his old Neottia Corallorrliza appeared there in the genus Ophrys, into which also he put 0 . nidus-avis, $O$. ovata, and $O$. corlata, together with several others. Corallorrliza (a name first used by Haller in 1742) was, within the chronological limits of binominal nomenclature, taken as a generic name by R. Brown, who in 1813, on page 209 of Aiton's Hortus Kevensis (Ed. II, Vol. 5), brought under it the Ophrys Corallorrhisa of Limneus's binominal period. It is thus junior as a genus to the same author's Listera, which he first deseribed on page 201 of the work just quoted. Two species which formed part of Linnæous's genus Ophrys of 1753 (viz., $O$. ovata and $O$. cordata) were put by Brown into the new genus Listera which, as has just been stated, he founded for their reception. Listera is, according to Kuntze, identical with Diphryllum of Rafinesque (published in 1808). In 1818, Riehard (Mem. Museum Paris, 1818, Vol. 4, p. 58) resuscitated the generic name Neottia, and under it he put $N$. nidus-avis, $N$. convallarioides, and also N. latifolia ( $=$ Listera ovata, Br.) and N. cordata ( $=$ Listera cordata, Br.). The Neottia of Linneous, dating as it does from 1735, and prior to its author's inauguration of the binominal nomenclature, and being moreover omitted in his Specics Plantarum of 1753 , falls entirely to the ground as a Linnean genus. The reconstituted Neottia of Richard, dating only from 1818, is five years junior to the Listera of R. Brown (1813), and must give precedence to the latter. Amongst the plants attributed to the Neottia of Richard is N. listeroides, published by Lindley in Royle's Hllustrations of Himalayan Botany in 1839, p. 368. The same plant was also figured by Decaisne in Jacquemont's Voyage (1840), p. 163, t. 163, as Neottia Lindleyana, Decne. In his Genera and Species of Orchids (p. 457) Lindley remarks that "with regard to the genera Neottia, Rich., and Listera, Brown, there is nothing that can be pointed out as a satisfactory distinctive mark, except their habit." In the opinion thus expressed we entirely agree, and we would suppress the Neottia of Riehard. But according to the custom which makes priority the supreme consideration in changes of names, Neottia listeroides should, if transferred to Listera, become Listera listeroides. To avoid this absurdity we have therefore taken for the species Decaisne's more recent specific name (Lindleyana). The decision to use the name Listera for the conjoined genus may seem to some unsatisfactory, but no other course appears to us to be possible; for if, with Kuntze, one takes the Linnæan generic names prior to the establishment of the binominal nomenclature, then the name Neottia is applicable only to Corallorliza. But if one begins with the publication of Limnæeus's Species Plantarum in 1753, the name Neottia is of later date (1818) than the name Listera (1813) or than Diphryllum (1808)-the latter an altogether obscure and unfamiliar one which we decide to have nothing to do with.

## Leafy —

The edges of the lip entire except at the apex.
Apes of lip 3 -fid

1. L. micrantha.

Apex of lip 2-fid.
Lip brown, the rest of the flower green.
Column short, straight
2. L. tenuis.

Column long, much curved
3. L. pinetorum.

Whole flower green.
Flowers '6 in. long
4. L. longicaulis.

Flowers 25 in. long.
Leaves close to the root, opposite . . . . . 5. L. brevicaulis.
Leaves close to the raceme, sub-opposite or
alternate . . . . . . . . . . . . 6. L. alternifolia.
The whole margin of the lip dentate-pectinate . . . . . . . 7. L. dentata.
Leafless.
8. L. Lindleyana.

## 1. Listera micrantha, Lindl. in Journ. Linn. Soc. I, 176.

Whole plant 3 to 5 in . high, slender, erect, the stem below the leaves an inch or more long, glabrous and bearing a single oblong blunt short sheath. Leaves opposite, orbicular-ovate or cuneate-ovate, blunt or sub-acute, sessile, 3 to 5 in . long and nearly as broad. Peduncle twice as long as the stem, minutely puberulous; the raceme about half as long as the peduncle, sparsely 4 - to 6 -flowered. Flowers 2 in . long; bract ovate, acute, concave, half as long as the pedicel of the ovary. Sepals and petals sub-equal, elliptic, sub-acute, spreading. Lip as long as the sepals, quadrate, decurved from the somewhat auriculate base; the apex with three acute unequal lobules, the middle much longer than the lateral, upper surface smooth. Column very short, straight. Anther depressed, its anterior edge truncate, rostellum very short. Capsule ovoid-globose. Hook. fil. Fl. Br. Ind. VI, 104; Ic. Plantar. t. 2171.

Sikkim, Lachen and Lachoong Valleys, at elevations of 10,000 to 11,000 feet; in flower during July; Hooker, Pantling No. 377.

The flowers are of rather a pale green, the column alone being whitish.
Plate 336.-Listera micrantha, Lindl. A plant, of natural size. Fig. 1 front view of a flower, 2 floral bract, ovary, column with anther in situ, and lip, 3 lip, 4 column with anther in situ, front wiel, 5 anther, 6 pollinia; all onlarged.

## 2. Listera tenuis, Lindl. in Journ. Linn. Soc. I, 176.

Whole plant 4 to 6 in . high, the stem bearing a wide loose sheath about half way between the root and the leaves. Leaves elliptic-ovate, acute, inserted nearer the raceme than the root, sessile, $\cdot 5$ to $\cdot 75 \mathrm{in}$. long. Raceme glandular-puberulous, 4 - to 8 -flowered, about as long as the peduncle. Flowers ' 25 in. long; floral bract membranous, narrowly ovate, sub-acute, shorter than the stalked ovary. Sepals and petals sub-equal, oblong, sub-acute, comnivent, the lateral sepals sometimes acute. Lip longer than the sepals and petals, cuneately obcordate, the lobules of the apex rounded, the sinus somewhat blunt, the upper surface flat with a central dark line, the base with a small pit. Column slightly curved, short, rostellum obtuse. Anther papillose, its anterior edge obtuse. Hook. fil. Fl. Br. Ind. VI, 104 ; Ic. Plantar. t. 2169.

Sikkim, in the Lachen Valley. Bhotan, in the Chumbi Valley; at elevations of 11,000 to 12,000 feet; in flower during July; Hooker, Pantling No. 378.

The sepals and petals are of a pale olivaceous green, the lip being pale brown with a dark midrib and faint oblique lines proceeding from it to the edges.

Plate 337.-Listera tenuis, Lindl. A plant, of natural sizs. Fig. 1 bract, ovary and flower, side viev, 2 lip, upper surface, 3 apex of ovary, column with anther in siiu, the pollinia having been removed, 4 anther, 5 pollinia; all enlarged.

## 3. Listera pinetorum, Lindl. in Journ. Linn. Soc. I, 175.

Slender, erect, whole height. 4 to 8 in ., of which three-fourths are stem below the leaves. The stem naked. . Leaves very broadly cordate or reniform, acute, sessile, from $\cdot 5$ to 1 in . long and about equally broad. Peduncle about $\cdot 5 \mathrm{in}$. long, covered with coarse glandular hairs ;- raceme 2- to 10 -flowered, puberuleus. Flowers $\cdot 35$ to 5 in. long; floral bract ovate-lanceolate, acuminate, herbaceous, convolute, shorter than the pedicelled ovary. Sepals sub-equal, spreading, ovate-oblong, sub-acute. Petals somewhat shorter than the sepals, linear oblong, sub-acute. Lip much longer than the sepals, obovate-oblong, narrowed to the base, flat, the apex divided into two blunt slightly oblique lobules by a narrow blunt sinus with almost parallel sides; the upper surface with two small erect triangular calli near the base whence runs a broad raised dark line throughout its entire length. Column rather long, cylindric, much curved forwards; rostellum and anther blunt, pollinia clavate. Hook. fil. Fl. Br. Ind. V, 104; Ic. Plantar. t. 2170.

Sikkim, in the Lachen Valley, Hooker. Bhotan, in the Chumbi Valley; King's Collector; at elerations of from 10,000 to 11,000 feet; in flower during July; Pantling No. 376.

The sepals and petals are of rather pale olivaceous green, slightly flushed with brown ; the lip is pale brown with a broad dark band along the central ridge; the column is warm reddish-brown below, but green near the summit.

Plate 338.-Listera pinetorum, Lindl. A plant, of natural size. Fig. 1 a flower, 2 bract, ovary, column with anther and lip, sule view, 3 apex of ovary, column with anther and pollinia in sith, 4 anther, 5 pollinia; all enlarged.

## 4. Listera longrcaulis, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 126.

Length of the whole plant 6 to 14 in., of which half is the raceme and its peduncle. Stem rather stout, glabrous. Leaves at the apex of the stem, orbicularovate to reniform, sub-acute or blunt, from 1.25 to 1.5 in . long and about as broad. Raceme longer than the peduncle, puberulous, with 8 to 14 distant flowers $\cdot 6$ in. long. Ovary with its pedicel 4 in. long; floral bract lanceolate, about as long as the slender pedicel. Dorsal sepal ovate-lanceolate, erect; lateral sepals and petals linear-lanceolate, sub-falcate, all slightly reflexed. Lip large, three times as long as the lateral sepals, flat, ovate-elliptic, the apex blunt and rather deeply bifid, the margins minutely ciliolate, the upper surface with a thickened mesial line from base to apex from which diverge glandular-pubescent branching nerves. Column rather long, sharply curved at the apex.

Lachen Valley, elevation about 7,000 feet; in flower in July; Pantling No. 391.
A species resembling $L$. japonica, Bl., which however is a smaller, more slender plant, with a much more deeply bifid lip.

The flowers are of a nearly uniform green colour, veined with a darker shade of the same.

Plate 339.-Liparis longicaulis, King and Pantling. A plant, of natural size. Fig. 1 a flower, front view, 2 a flower, side view, 3 lower surface of anther, 4 pollinia; all enlarged.

## 5. Listera brevicaulis, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 126.

Whole plant 6 to 9 in. high; the rather stout stem bearing, quite close to the ground, a pair of unequal ovate-rotund acute leaves 8 to 1 in . long; the peduncle of the inflorescence as long as the raceme, sparsely puberulous and bearing two distant linear-lanceolate bracts 5 in . long. Raceme 3 to 4 in . long, puberulous, with 12 to 16 scattered flowers 25 in . long; floral bract ovate-lanceolate, acute, longer than the pedicel of the ovary. Sepals and petals sub-equal, shorter than the lip, lanceolate, acute, sub-connivent. Lip fleshy, obcordate and with a thickened mesial line throughout its entire length; the apical lobes divergent, broad and blunt, their edges recurved and meeting underneath, the sinus wide, the base much narrowed and with two conical forward-pointing teeth at its junction with the short curved column.

Sikkim, in the Lachen Valley; elevation 9,000 feet; flowering in July; Pantling No. 392.

The flowers are of a dull olivaceous green throughout, the central ridge of the lip alone being brown.

Plate 340.-Listora brevicaulis, King and Pantling. A plant, of natural size. Fig. 1 a flower, in profile, 2 bract, ovary, column with anther in situ and lip, side viow, 3 lip, spread out, 4 lower surface of anther; all enlarged.

## 6. Listera alternifolis, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 126.

Height of entire plant 8 to 10 in . Stem glabrous, 4 to 6 in . long, sheathed at the base by a blunt oblanceolate bract nearly 2 in . long, and bearing near its apex two alternate or sub-opposite, more or less obovate or elliptic leaves 5 to 6 in. long. Peduncle puberulous; raceme bearing seven to nine distant nodding olivegreen flowers nearly 25 in . across; floral bract lanceolate, about as long as the slender pedicel of the ovary. Sepals lanceolate, spreading, sub-acute. Petals narrowly oblong, blunt. Lip rather longer than the sepals, oblanceolate-oblong, with a thickened central line from base to apex, the apex blunt and shortly 2 -lobed, the sinus short, the margins ciliolate, the base broad and with a wart-like callus at each side. Column short, stout, curved. Anther depressed, blunt.

Sikkim, Lachen Valley, elevation about 10,000 feet; in flower in July; Pantling No. 390.

A species of which the leaves are usually alternate, whereas in all other species of the genus they are invariably opposite.

The flowers are of a nearly uniform green colour.
Plate 341.-Listora alternifolia, King and Pantling. A plant, of natural sise. Fig. 1 a flower, 2 bract, ovary, column with anther in situ and lip, sido view, 3 lip, 4 column with anther in situ, 5 anther, 6 pollinia; all enlargod.

## 7. Listera dentata, new species.

Whole plant 8 to 12 in . high; the stem forming three-fourths of the whole, glabrous, and bearing near its base two unequal sheaths $\cdot 5$ to 1.5 in. long. Leaves
two, opposite, at the very apex of the stem and at the base of the peduncle, orbicular-cordate, acute, 1 to 1.5 in . long and about the same in breadth. Peduncle about $\cdot 5$ in. long, pubescent. Racems 3 to 4 in. long, many-flowred, its rachis pubescent. Flowers - 25 in. across; floral bract ovate-lanceolate, acute, concave, equalling or exceeding in length the pedicelled ovary. Sopals sub-equal, ovate, acute, the dorsal recurved, the lateral pair spreading. Petals elliptic-oblong, sub-acute, recurved. Lip fleshy, clawed, reniform in outline, its edges dentate-pectinate, the dise with a thickened mesial line from base to apex, (becoming thicker near the apax), the claw with two antrorse teeth. Column short, stout, the rostellum blunt. Anther very fleshy; pollinia two, pyriform, with a small abortive pair on the under surface.

Sikkim, at Jongri, elevation 13,000 feet; in fower during July; Pantling No. 452.
The flowers are green in colour throughout.
Plate 342.-Lis'era dentata, King and Pantling. A plant, of natural siso. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther in situ and lip, seen from the side, 3 column showing anther, rostellum and stigma, 4 anther, 5 and 6 the pollinia, seen from the front and the back; all enlargel.

## 2. Listera Lindleyana, King and Pantling.

Whole piant 8 to 14 in. high, stout or slender. Stem slightly longer than the raceme and bearing three or four loose convolute rather blunt sheaths about 1 in . long; sub-glabrous in its lower, glandular-pubescent in its upper part like the raceme. Flowers from $\cdot 3$ to $\cdot 5 \mathrm{in}$. long, lax; floral bract oblong, as long as or longer than the pubescent stalked ovary. Sepals elliptic-ovate, somewhat falcate, coacave, sub-acute. Petals much smaller, linear, blunt. Lip two or three times as long as the sepals, narrowly oblong; the apex deeply cleft into two oblong, lanceolate, acute lobules; the sinus broad, with a small triangular prosess at its apex; upper surface minutely puberulous, the midrib thickened. Columi much curved, expanded at base and apex. Capsule turgid, ridged, 3 in. long, its pedicel about as long. Nesttia listeroides, Lindl. in Royle Ill. Him. Bot., p. 368 ; Gen. and Spec. Oreh., 158 ; in Journ. Linn. Soc. I, 176 ; Hook. fil. Fl. Br. Ind. VI, 103. N. Lindleyaia, Dızne. in Jacquem. Voy. Bot., p. 163, t. 163.

Sikkim, in the Lachen Valley; elevation 10,000 feet; Pantling No. 393 ; in flower during July. Westward along the range to Kashmir, at elevations of from 5,000 to 10,000 feet.

The flowers are probably of a reddish-brown colour when fresh. The specimens from which the drawing was made were not quite fresh, and we are doubtful about the colour of their flowers being normal.

Plate 343.-Listera Lindleyana, King and Pantling. A plant, of natural sise. Fig. I a flower, 2 floral bract, ovary, column with anther in situ, and lip, 3 lip, 4 anther; all enlargod.

## 67. Pantlingia, Prain.

A small terrestrial saprophytic aphyllous rhizomatous herb. Stems 3 to 4 in. high, each with a small solitary ovate bract about its middle. Flowers minute, fəw, racemose. Sepals sub-equal, free, narrow. Petals linear. Lip adnate to the base of the column, transversely elliptic, slightly concave, entire; the upper surface with two elongated parallel calli extending from the base to about the middle. Column slightly curved forwards, with
an acute auricle on each side of the anther, otherwise wingless; its anterior surface bearing about the middle a short transverse horizontal sub-truncate emarginate plate and, at its base just above the insertion of the lip, a sub-erect, rigid, transversely and unequally 2-lobed fleshy tongue-like process half as long as itself. Anther opening vertically; pollinia four, in two pairs, confluent by their bases with the narrow strap-shaped rostellum, without either caudicle or gland. A single species, Indian.

## Pantlinga paradoxa, Prain in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 107.

Rhizome short, about half as thick as a goose-quill, pubescent. Stems 1 or 2 , from 3 to 4 in. long, pubescent near the base, otherwise glabrous, bearing about the middle a single ovate acute bract 25 in . long. Flowers 2 or 3 , racemose, $\cdot 15 \mathrm{in}$, or (with the ovaries) $\cdot 4-6$ in. long; floral bract ovate, acute, about as long as the slender pedicel. Lateral sepals linear, lying under and adpressed to the lip; the dorsal longer than the lateral, linear-oblong, slightly shorter than and adpressed to the column. Petals linear, reflexed or spreading. Lip with the margins somewhat incurved. Anther with a vertical suture; pollinia in two pairs, confluent by their bases with the narrow strap-shaped rostellum.

Sikkim Himalaya, at Choongtong; elevation 6,000 feet; in flower during September; Pantling No. 420.

The pollen masses are attached by their bases to the strap-shaped rostellum, which is not detachable from the top of the stigma. They appear to fertilize the latter by the gradual absorption and disappearance of the rostellum. The nearest alliance of the genus is with Limodorum, some of the species of which have small processes on the column in the situation of those that are so highly developed in this singular plant; the lip in Limodorum is, however, altogether different.

The colour of the flowers is pale yellow, with a purple blotch on the lip and on the bifid tongue at the base of the column.

Plate 344.-Pantlingia paradoxa, Prain. Two plants, of natural size. Fig. 1 a flower, 2 bract, ovary and flower, viewed from the side, 3 the lip flattened out, 4 the column, showing the anther and the auricles by the side of it, the transverse plate proceeding from the front of the column, and the 2 -lobed obliquely pointed fleshy process at its base, 5 pollinia; all enlarged.

## 68. Gastrodia, R. Brown.

Terrestrial leafless herbs of a brown colour with rhizomes and elongated roots. Stem ereet, sheathed. Flowers in a lax raceme. Sepals connate into a ventricose tube 3 -toothed at the apex. Petals minute, inserted close to two of the sinuses of the mouth of the sepaline tube. Lip short, adnate to the foot of the column, oblong, entire, clawed at the base, the claw often bearing calli. Column usually long, narrowly winged, the foot short; rostellum small, stigma large. Anther terminal, convex ; pollinia two, sub-clavate, without caudicle or gland. Species nine, Asiatic and Australasian.

> Gastrodia Dyeriana, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, pt. 2, 342.

Rhizome short, twice as thick as the stem, horizontal, with slender spreading roots. Stem about the thickness of a crow-quill, 12 to 15 in . long, bearing, at intervals, sheathing
bracts 5 in. long. Flowers three or four near the apex of the stem, 5 or 6 in. long, brownish, nodding. Sepaline tube cylindric, glabrous, the mouth 3-lobed. Petals minute, sub-rotund, entire, inserted on the sepaline tube near the bases of two of its sinuses. Lip as long as the column but shorter than the sepaline tube, ovate-lanceolate, clawed, flat, with undulate-crenate edges and with four parallel thickened lines from the base to nearly the tip; claw short, and bearing two sub-globular calli. Column with winged sides, the apex truncate and 4 -toothed; pollinia narrowly and obliquely ovoid.

Sikkim, at elevations of about 7,000 feet; flowering in August; Pantling No. 293.
The whole plant is of a pale dull brown colour, except the column and lip which are yellowish-white. The species is allied to G. exilis, Hook. fil., but that species has smaller flowers with fimbriate (or glandular) lateral petals and a lip with two long wing-like central lamellæ. It is less closely allied to G. orobanchoides, Benth, which has erect flowers and a ventricose sepaline tube. It agrees with $G$. elata, Blume, in having two callosities on the claw of the lip. We have dedicated the species to Mr. W. T. Thiselton Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Gardens, Kew.

Plate 345.-Gastrodia Dyoriana, King and Pantling. Two plants, of natural size. Fig. 2 a flower, 1 section of the same, showing the minute petals within the sinus of the sepaline tube, 3 the lip showing the callosities on its claw, 4 apex of ovary, column and lip, side view, 5 column with the anther in situ, 6 anther, 7 pollinia; all enlarged.

## 69. Didymoplexis, Griff.

Terrestrial aphyllous herbs with tuber-like roots. Scape simple, bearing a scanty raceme of small flowers, the pedicels elongating in fruit. Sepats and petals cohering by their margins into a short tube, their apices alone free, the dorsal sepal and petals forming the upper 3 -lobed lip, the lateral sepals forming the lower entire or bifid lip. Lip shorter than the perianth-tube, inserted on the very short foot of the column, rather broad, its disc studded with numerous minute calli. Column long, nearly straight, narrowly winged in the upper part and 3-toothed at the apex. Stigma broad. Anther 2-celled, depressed; pollinia 4, unequal, in pairs. Capsutes elliptic, tumid, ridged, their pedicels accrescent and often reaching a length of six inches. Two species, one Indo-Malayan, the other Australasian.

Didymoplexis pallens, Griff. in Calc. Journ. Nat. Hist. IV, 383, t. 17.
Root long, branching, moniliformly tuberous. Stem erect, 3 to 6 in. long, with one or two blunt sheaths about 2 in. long. Raceme 4 -to 8 -flowered. Flowers about $\cdot 35$ in. long; floral bract triangular, much shorter than the gradually lengthening pedicel of the ovary; pedicel and ovary at first about $\cdot 2$ or $\cdot 25 \mathrm{in}$. long, the former lengthening with the ripening of the fruit to as much as 6 inches. Dorsal sepal ovate, obtuse, concave; the lateral pair united to the middle, their free portions obtuse. Lip with a short curved claw, cuneately oblong, the apex truncate and minutely erose; the disc bearing an oblong thickening, studded, especially towards the base and apex, with minute granulations. Column nearly straight, winged in its upper third, the apex with three teeth; produced below into a very short foot, forming with the lateral sepals a short mentum. Pollen grains closely adherent to each other. Capsule 7 º to 1 in . long, tumid. Kurz in Seem. Journ. Bot. 1866, 40 (excl. syn.

Epiphanes and Gastrodia); Hemsl. in Journ. Linn. Soc. XX, 311, t. 28; Hook. fil. Fl. Br. India, VI, 121. Leucorchis sylvatica, Blume Mus. Bot. Lugd. Bat. I, 31; Floræ Javæ, Och. 123 (with wood-cut). Apetalon minutum, Wight Ic. t. 1758 ; Blume 1. c. 124 (with wood-cut). Arethusa ecristata, Griff. Notul., III, 378; Ic. Plant. Asiat, t. 343, 344. A. bengalensis, Hort. Bot. Calc.

Sikkim, in the bottoms of tropical valleys, usually under clumps of bamboo and evidently parasitic on their roots; in flower during May and June; Pantling No. 146. Distributed over the whole of Bengal and Assam from the base of the Sikkim Himalaya to the Bay of Bengal; also in Southern India and Perak.

The colour of the whole plant is ochraceous white, the flowers being tinged with warm brown. The growth of the flower-pedicel after fertilization of the ovary is very remarkable.

Plate 346.-Didymoplexis pallens, Griff. Plants in flower and fruit, of natural siso. Fig. 1 a flower, 2 pedicel, ovary and flower, seen from the side, 3 apex of ovary, column and lip, in profile, 4 floral bract and part of pedicel, 5 the lip, spread out, 6 apex of ovary and column with anther in situ, 7 apex of column after removal of the anther, showing the three apical teeth, 8 anther, 9 pollinia; all enlarged.

## 70. Aphyllorchis, Blume.

Terrestrial leafless herbs with rhizomes and thick roots. Stom simple, sheathed. Flowers racemose, brown in colour. Sepals sub-equal, free, erect or spreading. Petals smaller than the sepals. Lip sessile on the base of the column or attached to it by a short claw, as long as the sepals, oblong, sometimes auricled at the base, entire or 3 -lobed. Column usually rather long, wingless. Stigma anticous, concave, ovate or oblong. Anther shortly stipitate, its cells contiguous; pollinia oblong or clavate. Species about five, Indian and Malayan.
Floral bract much longer than the ovary, strongly reflexed . . . . 1. P. aipina.
Floral bract shorter than the ovary, not reflexed.
Flowers $\cdot 15$ in. long . . . . . . . . . . . . . . 2. P. parvifora.
Flowers $\cdot 75$ in. long . . . . . . . . . . . . . . . . 3. P. montana.

## 1. Aphyllorchis alpina, new species.

Height of the whole plant 18 to 30 inches. Rhizome elongate, loosely clothed with small imbricating polished scales. Stem nearly as thick as the little finger, bearing numerous unequal tubular blunt sheaths 5 to 2.5 in . long. Raceme 8 to 12 in. long. Flowers 75 to 1 in . across, numerous, distant; the ovary and its slender stalk about 1.25 in. long; floral bract large, linear, acuminate, much deflexed, 1 to 1.25 in. long. Sepals sub-equal, lanceolate, acuminate, concave, spreading. Petals smaller than the sepals, ovate-lanceolate, the midrib thickened on the outer surface. Lip shorter than the petals, clawed; the claw winged, adnate to the sides of the column and forming with them a small pouch; the basal half with erect rounded sides; the apical half ovate, acute, with involute margins and an elliptic convexity near the apex. Column stout, curved, striate on its anterior surface; the
stigma with an overlapping irregularly-lobulate edging. Anther 2-celled; pollinic cohering in two pairs, mealy.

Sikkim, at Sin-ga-le-la and Mon Lepeha; elevation about 14,000 feet; Pantling No. 462, in flower during July and August; King's Collector No. 4459.

The flowers of this, the largest species of the genus yet obtained in India, are yellowish-red in colour. The specific name is given on account of the very high elevations at which the plant grows. A specimen of it collected in 1877 (King's Collector No. 4459) was sent to the late Professor Reichenbach, who, however, never described it. When his great Herbarium shall be exhumed after its twenty-five years sepulture in Vienna, this plant will probably be found to bear a Reiehenbachian manuscript name.

Plate 347.-Aphyllorchis alpina, King and Pantling. Rhizzme, part of the stem, and the inflorescence of a plant; of nntwal siza. Fig. 1 a flower, 2 floral bract, ovary, columm with anther in situ, and lip, 3 lip, 4 columm showing the sac at its base formed with the claw of the lip, the stigma with its Iobulate margin, and the anther, 5 empty anther; all enlarged.

## 2. Aphyllorchis parviflora, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, pt. 2, 128.

Height of entire plant about 10 inches, glabrous. Rhizoms short, with many fibrous fascicled rootlets. Stem erect, about $\cdot 1$ in. thick, leafless, but with four or five sheathing bracts 5 to 2.5 in . long. Rxcems about 2 in . long, many-flowered, the rachis stout. Flowers $\cdot 15$ in. across, the labellum superior; floral bract lanceolate, shorter than the straight untwisted tumid ovary. Sepals sub-equal, linear, acuminate, spreading, their apices recurved; petals similar but smaller, all keeled externally. Lip ovate, the base broad, obscurely lobed, sub-acute, concave. Column very short, rostellum prominent; anther with reflexed margins. Pollinia two, clavate, the grains loosely cohering.

Sikkim in the Lachoong Valley, at an elevation of 10,000 feet; flowering time July; Pantling No. 383.

The ovary of this not having the usual half-twist, the labellum is superior. The whole plant is of a pale brown colour, except,the anther which is white, and the pollinia which are yellow.

Plate 348.-Aphyllorchis parviffora, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 bract, ovary, column and lip, showing the anther (a), the pollinia (p) and the rostellum ( $r$ ), seen from the sitc, 3 lip, 4 apex of ovary, column with anther in situ, 5 inside view of an anther, the margins being refleexed, 6 pollinia; all enlarged.

## 3. Aphyllorchis montana, Reichb. fil. in Linnæa XLI, 57.

Stem about 24 in . high, glabrous near the base and bearing 6 to 10 unequal short blunt tubular sheaths; pubescent in the upper part and bearing a few distant ovatelanceolate acute sheaths not tubular at the base. Racems 4 to 6 in . long, bearing 8 to 14 distant flowers about 75 in . across; the ovary 75 to 1 in . long, its stalk very short and twisted; the floral bract linear, spreading, about $\cdot 5 \mathrm{in}$. long. Sepals subequal, oblong, blunt; the dorsal coneave, overhanging the column; the lateral pair curved, spreading, sub-acute. Petals slightly longer than the sepals, oblong, blunt, spreading. Lip somewhat longer than the sepals, owate oblong, shortly elawed at the

Vase; the side lobes broad, rounded; the apical lobe broadly oblong, sub-undulate, the edges minutely erose, the whole of the upper surface minutely carunculate. Column slender, much curved forwards, the apex not thickened. Anther erect; pollinia four, oblong, united in pairs. Hook. fil. Fl. Br. Ind. VI, 116. Apaturia montana, Thwaites Enum. PI. Ceyl. 301 (not of Lindl.).

Sikkim, at Guru Bathan; elevation 2,000 feet; Griffith; Pantling No 344 ; in flower during August. ? Khasia Hills. Ceylon; Thwaites.

The whole plant is of a pale brown colour, the only exception being the pollinia which are yellow. The roots are very thick.

Plate 349.-Aphyllorchis montana, Reichb. fil. A plant, of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with anther in situ, and lip, in profice, 3 lip, 4 column showing the stigma, pollinia ( $p$ ) and eap of the anther, 6 pollinia; all enlarged.

## 71. Galeola, Lour.

Leafless, yellow or brown, climbing or erect herbs. Flowers rather large, in racemes or panicles on the ends of the branches and stem. Sepals sub-equal, concave, free, connivent or spreading. Petals as large as the sepals, or narrower or broader. Lip adnate to the base of the column and convolute round it, broad, concave, with or without lateral Iobes; apical lobe large, broad. Column dilated towards the apex. Anther conical, 2-celled; pollinia two, broad, often compressed, powdery. Species 12; Indian, Malayan and Australian.

Stems scandent; flowers not exceeding 1 in . in diam.
All the sepals linear-oblong, lip cuneate at the base . . . . . . 1. G. Cathcartii.
Dorsal sepal oblong; the lateral pair obliquely ovate, sub-falcate, acute; lip cordate at the base
2. G. Hydra.

Stems erect, not scandent ; flowers 1.5 in , or more in diam.
Flowers 1.5 in . in diam., anther papillose ; capsule sub-trigonous, 6 or 7 in. long; rhizome 1 in, thick
3. G. Lindloyana.

Flowers 2 in . in diam., anther smooth; capsule sharply 3 -angled, falcate, 9 in. long; rhizome 1.5 to 2.5 in . thick. . . . . . . 4. G. Falconeri.

## 1. Galeola Cathcartif, Hook. fil. Fl. Br. Ind. VI, 89.

\$tem scandent, smooth, scurfy, branching and bearing roots at intervals, 20 to 30 feet in length and 5 in . in thickness, rising from a rhizome 5 to 75 in. thick. Panicles 3 to 6 in. long, lateral, spreading or drooping, pubescent, sheathed at the base by one or two broad oblong blunt glabrous coriaceous bracts. Flowers (exclusive of the ovary) 75 to 90 in . long; floral bract minute, triangular, much shorter than the pubescent sub-cylindric ovary. Sepals linear-oblong, sub-acute, recurved, furfuraceous outside. Petals of the same shape but smaller than the sepals, both recurved. Lip shorter than the petals, obovate (when spread out), very concave, entire in its basal third, erose-laciniate in its upper two-thirds, its upper surface papillose and with a small oblong callus near the rounded apex. Column half as long as the lip, bent forwards from the middle; the clinandrium with dentate margins. Anther fleshy, conical, its apex directed backwnrds; pollinia mealy, broadly and obliquely elliptic. Capsule cylindric, furfuraceous, probably 6 or 8 in. long when ripe.

Sikkim, in the valley of the Rungeet, at an elevation of 1,500 feet; in flower in June; Pantling No. 318; (only once collected).

The flowers are yellow, the lip having red lines in its basal half.
Plate 350.-Galeola Cathcartii, Hook. fil. Parts of a plant. Fig. 1 the sepals and petals, separated and flattened out, of natural size. Fig. 2 a flower, 3 floral bract, ovary, column and lip, seon from the side, 4 the lip flattened out, 5 apex of ovary, column with anther in situ, 6 anther so as to show its interior, 7 pollinia; all enlarged.

## 2. Galeola Hydra, Reichb. fil. Xen. Orch. II, 77.

An extensive climber with stout root-bearing furfuraceously puberulous branches; bracts few, scattered, fleshy, ovate, cymbiform, unequal, those on the flowering branches very small. Racemes 2 to 4 inches long, laxly-flowered. Flowers 1 in . in diam.; floral bract fleshy, pointed, much shorter than the stalked ovary. Sepals sub-equal in length ; the dorsal oblong, sub-acute; the lateral pair obliquely ovate, sub-falcate, acute. Petals somewhat shorter than the sepals, the lower edge rounded; the upper undulate, rather straight. Lip sub-orbicular, very concave, cordate at the base; the edges erosefimbriate, not lobed; the upper surface papillose-pubescent, the dise with a smooth elongate callus towards the base. Column much curved. Anther irregularly ribbed; pollinia broad, bifid, excavated. Capsule cylindric, 8 or 9 in. long. Hook. fil. Fl. Br. Ind. V, 89. G. altissima? Reichb. fil. in Trans. Linn. Soc. XXX, 135. Vanilla pterosperma, Lindl. in Wall. Cat. 7402. ?V. rubiginosa, Griff. Notul. III, 247. Erythrorchis altissima, Lindl. Gen. and Spec. Orch., 438 (in part, not of Blume).

Sikkim, in the Rishap Valley, climbing on tall trees; King, Pantling No. 321; in flower during July. Tenasserim, Penang, Perak, Singapore, Malacca, Java and Sumatra.

The colour of the flowers is yellow, with red markings at the base of the lip and on the anther.

Plate 351.-Galeola Hydra, Reiehb. fil. Parts of a flowering plant, and fig. 1 the sepals and petals, of natural sise. Fig. 2 stalked ovary and lip, seen from the side, 3 base of the lip, showing the callus on the dise, 4 apex of the ovary, column, anther and stigma, 5 anther, 6 pollinia; all enlarged; 7 piece of the base of the stem and rhizome, 8 a mature capsule; of natural size.

## 3. Galeola Lindleyana, Reichb. fil. Xen. Orchid. II, 78.

Rhizome an inch thick, reddish, clothed in large cordate fleshy scales. Stems 4 or 5 feet high, bearing numorous short acute sheaths in the lower half, furfuraceous like the panicles and ovaries. Panicles with short, lax, few-flowered, drooping branches. Flowers sub-globose, thick and somewhat spongy in texture, 1.5 in . across; bract ovate, sessile, withered when the flowers expand, shorter than the short stalk of the cylindric ovary. Sepals sub-equal, the dorsal elliptic oblong, the lateral pair wider, all with strong, toothed, wavy ribs externally. Petals broadly ovate, blunt, longer than the sepals, the margins ciliate. Lip cup-shaped with a very narrow obscurely 3 -lobed border; the whole upper surface papillose, but bearing at the base, just below the column, a small smooth glabrous chamber; the dise lamellate, the margins ciliolate. Column clavate, slightly curved forwards and bearing two erect granular processes near its base. Anther boldly papillose, curved backwards. Pollinia two, free, compressed, eac' cleft at the base. Capsuie oblong,
obtusely sub-trigonous, bluntly apiculate, narrowed slightly at the base, 6 or 7 in . long and about 125 in . in diam., tardily dehiscent. Hook. fil. Fl. Br. Ind. VI, 88. Oyrtosia Lindleyana, Hook. fil. and Thoms. in Ill. Him. Plants, t. 22. Erythrorchis Lindleyana, Reichb. fil. in Bonplandia, V, 37.

Sikkim, at elevations of 5,000 to 7,000 feet; Hooker and other collectors; Pantling No. 88. ? Khasia Hills, at an elevation of 4,000 feet; Hooker and Thomson. Naga Hills; Prain.

This is one of the most striking orchids in Sikkim. The stems are brownishpurple in colour, becoming paler and yellowish upwards. The flowers are bright yellow throughout, with a reddish patch on the lip at each side of the column. The anther is coloured crimson-lake.

Plate 352.-Galeola Lindleyana, Reichb. fil. A panicle. Fig. 1 a ripe eapsule-both of natural size, 2 bract, sub-sessile ovary and lip, 3 vertical section of the lip, showing the chamber at its base, 4 column, showing its basal processes and the anther in situ, 5 lower surface of anther, 6 pollinia; all enlarged.

## 4. Galeola Falconeri, Hook. fil. Fl. Br. Ind., VI, 88.

Rhizome 1.5 to 2.5 in . thick," branching, clothed with large fleshy triangular scales. Stems 6 to 10 feet in height and about one inch in thickness at the base, bearing at intervals lanceolate to triangular acute bracts one to two inches in length. Panicle 2 to 3 feet long, its branches 3 to 9 in . long, drooping, lax. Flowers of a spongy texture; bract lanceolate, concave, $\cdot 5 \mathrm{in}$. long, shorter than the short stalk of the ovary. Ovary 15 to 2 in . long. Sepals sub-equal, broadly ovate, sub-acute, sparsely furfuraceous like the ovary. Petals ovate, acute, the edges erose. Lip sessile, without side lobes, deeply concave, the base with a small fold forming a pseudo-nectary under the column, the apex rounded, the margins undulate-ciliolate; the upper surface papillose but with a broad glabrous patch in the middle. Column stout, slightly clavate and somewhat bent forward. Anther fleshy, glabrous, its lip entire. Pollinia two, much compressed, thin, oblique in outline. Capsule oblong, 3 -angled, sub-falcate, 9 in. long, sub-furfuraceous. Pogochilus sp., Falc. in Hook. Journ. Bot. (1842), 73.

Sikkim, at elevations of 5,000 to 7,000 feet; Thomson, Pantling No. 87 ; not now common. Westward along the range to Gharwal; in flower during July and August.

The flowers of this are of a bright yellow colour and have an odour of vanille. The ripe capsules are pale brown. This closely resembles G. Lindieyana, of which Sir Joseph Hooker suggests that it may be a variety; but it has larger flowers than that plant; also larger, less furfuraceous and much more sharply-angled sub-falcate capsules. The rhizome also is very much stouter.

Plate 353.- Galeola Falconeri, Hook. fil. Parts of a plant. Fig. 1 front view of a flower, 2 bract, stalked ovary and lip, side vien, 8 a capsule, of natural sizo; 3 portion of upper surface of lip, showing the pseudo-nectary, 4 vertical section of lip, also showing the pseudo-nectary, 5 column with the anther in situ, 6 lower surface of anther, 7 pollinia; all enlargot.

## 72. Pogonia, Juss.

Terrestrial 1-leaved herbs; the flower scapes from the same tuber as the leaf and appearing before it (contemporaneous in some species); tuber emitting, just below the
surface of the ground, two or three runners, each producing at its extremity a tuber smaller than that of the parent. Lexf broadly cordate or orbicular, strongly plicate. Flowers solitary, few or in racemes, cften pendulous. Sepals and petals sub-equal, narrow, connivent or spreading. Lip sometimes slightly saccate, at the base, adnate to the base of the column, rather narrow, the lower part convolute round the column; the lateral lobes small, usually triangular; the apical lobe flat, ovate or orbicular, entire or fimbriate. Column elongate, clavate upwards; the stigma anticous, oblong to orbicular. Pollinia two or four, elongate, often cohering together, but without either caudicle or gland. Species about 70, Asiatic and American, with a few West Indian.

The Indian species, with the exception of P. Hookeriana and of a new species recently discovered in Burma, belong to the section Nervilia, in which the leaf and flowers are not contemporaneous. The species with contemporaneous leaf and flowers are mostly natives of America, only one being Japanese, and two Indian.

Sect. I, Eu-Pogonia.-Liaf and flowers contemporaneous and from the same tuber

1. P. Hookeriana.

Sect. II, Nervilia.-L3af appearing after the flowers and produced by a
different tuber.
Flower solitary.
Anterior lobe of lip fimbriate . . . . . . . . . . . . 2. P. Prainiana.
Anterior lobe of lip not fimbriate.
Flower 1 in. long . . . . . . . . . . . . . . . 3. P. macroglossa.
Flower ${ }^{4}$ to $\cdot 6 \mathrm{in}$. long . . . . . . . . . . . . . 4. P. falcata.
Flowers two or three ; scape 3 to 6 in . long . . . . . . . . . . 5. P. plicata.
Flowers 7 to 15 , racemose ; scape 6 to 16 in. long.
Flowers 1 in. long ; sepals and petals pink . . . . . . . . . 6. P. Gammieana.
Flowers about - 65 in. long, sepals and petals green
7. P. Scottii.

## 1. Pogonta Hookerlana, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 129.

Stem 2 in. long, glabrous, with one or two sheathing bracts near the base. Leaf 2 in. broad, appearing with the flowers, reniform-orbicular, the margins undulate, the nerves sub-scaberulous near the base; petiole nearly as long as the stem, sub-scaberulousstriate. Flowers two, about 1 in . long; the floral bract linear-lanceolate, half as long as the pedicellate ovary. Sopals and petals sub-equal, linear-lanceolate. Lip oblong, with two short blunt sub-triangular side lobes about its middle, and an ovate-oblong sub-acute terminal lobe; the upper surface with three parallel ridges extending from its base to the end of the side lobes.

Sikkim, at an elevation of 3,000 feet; in flower in August; G. King, No. 2153.
Collected only once, and the exact locality unknown. The leaf and flower are contemporaneous, and in this respect the species is unique amongst the Sikkim species of the genus. The foregoing description is drawn up from a dried specimen. But, in accordance with the arrangement of figuring only species of which fresh specimens were available, no drawing of this has been printed.

## 2. Pogonia Pranniana, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 129.

Tuber globular, warted, 5 to 6 in . in diam. Scape 3 to 6 in . high, 1 -flowered, bearing five or six bracts, the lower four or five being unequal sheathing and blunt; the uppermost acuminate and about 1 in . long. Leaf orbieular, reniform and plicate, 2.5 in . broad, its petiole 1 in . long. Floral bract triangular, minute, very much shorter than the ovary. Flower 1 in . in diam., nodding. Sepals narrowly oblong, blunt, 75 in . long. Petals linear-oblanceolate, blunt. Lip longer than the sepals, the lower part convolute round the column; the side lobes short, triangular; the terminal lobe shortly sub-orbicular, its margins fimbriate and its disc with about seven densely glandularpubescent vertical lines. Column clavate, anther elongate.

Sikkim, Lachoong Valley, at an elevation of about 6,500 feet; flowering in June; Pantling No. 372.

The sepals and petals are very pale green, as is also the convolute part of the lip; the apical lobe or expanded part of the lip is pink.

Plate 355.-Pogonia Prainiana, King and Pantling. Flowering and leaf-bearing plants, of natural sise. Fig. 1 a flower, 2 bract, ovary and lip, seen from the side, 3 lip, 4 apex of ovary, columh with anther in situ, 5 anther, profile and front views; all enlarged.

## 3. Pogonia macroglossa, Hook. fil. Ic. Plantar. t. 2195 A.

Tuber sub-globose, faintly annulated and boldly warted, 75 in . in diam. Flowering stem 3 to 6 in . long, mostly enveloped in one or two long, tubular, lax sheaths; pedicel about 1 in . long, bearing a single nodding flower slightly over an inch in length; floral bract oblong, convolute, erect, shorter than the shortly-stalked elliptie truncate ovary. Sepals and petals sub-equal, linear-lanceolate, sub-acute, slightly spreading. Lip gibbous at the base, slightly longer than the sepals, narrowly oblong; the basal half convolute round the column, and with two slightly raised lines along its upper surface; the apical half expanded, sub-acute, with two obscure side-lobes near its base. Column elongate, the apex slightly clavate, the lower part slightly curved. Anther broad, convex; pollinia narrowly clavate, conjoined, the lower ends very finely pointed. Leaf reniform, the apex bluntly apiculate, the edges sub-undulate, the petiole 3 in. long. Hook. fil. Fl. Br. Ind. VI, 120.

Sikkim, in tropical valleys, ascending to elevations of 4,000 feet; in flower during April; Pantling No. 261.

The sepals and petals are white, minutely streaked with rose-colour; the upper surface of the lip having, in addition to the rose-coloured streaks, deep rose-coloured spots. The flowering stems and sheaths are white flushed with rose, and the leaf is pale green flushed with pale brown, especially towards the centre,

Plate 356.-Pogonia macroglossa, Hook. fil. Three flowering plants and one leaf-bearing, of natural sise. Fig. 1 floral bract, ovary and lip, scen from the side, 2 upper surface of lip, 3 apex of ovary and column with the anther in situ and the stigma, 4 anther, 5 pollinia; all enlarged; 6 tuber of flowering stem, of natural size.

> 4. Pogonia falcata, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 129.

Tubers globular, warted, 25 to 35 in. in diam. Scape 1.75 to 2.5 in. high, glabrous, 1-flowered, bearing several oblong sheathing thin membranous bracts at intervals. Flower $\cdot 4$ to $\cdot 6$ in. long including the ovary; the floral bract lanceolate, longer than the stalked ovary. Sepals and petals sub-equal, linear, acute, sub-connivent, 3 to $\cdot 4$ in. long. Lip oblong, convolute and embracing the column, the upper surface with a single broad thickened glandular-pubescent line from the middle to nearly the apex, the base not saccate, the disc pubescent, the lateral lobes falcate, acute, the terminal lobe obovate and very blunt. Column clavate, its anterior surface puberulous; the anther large and fleshy; the pollinia narrowly clavate-ellipsoid, stigma large.

Western Dooar of Bhotan, east of the Jaldacca river ; flowering in April; Pantling No. 439.

A species near P. velutina, Par. and Reichb. fil., and P. macroglossa, Hook. fil. Only three plants of this have as yet been collected, and the leaf is still unknown.

Plate 357.-Pogonia falcata, King and Pantling. Three flower-producing plants, of natural size. Fig. 1 floral bract, ovary and flower, side viev, 2 stalked ovary and lip in profile, 3 the lip flattened out, 4 apex of ovary, column with anther in situ, and stigma, 5 anther, 6 pollinia; all enlargod.

## 5. Pogonia plicata, Lindl. Gen. and Spec. Orch., 415.

Tuber globose, 5 in. in diam. Scape 3 to 6 in. long, enveloped in two or three tubular sheaths with sub-acute dilated bifid apices, and a single linear-lanceolate bract above the sheaths. Flowers two or three, about $\cdot 75$ in. long; floral bract very small, ovate, acute, shorter than the pedicel of the urn-shaped ridged ovary. Sepals and petals sub-equal, spreading, narrowly oblong-oblanceolate, acuminate. Lip ovate when flattened out, convolute and embracing the column, entire except the minutely emarginate apex, the midrib thickened and callus-like for more than half its length, the base slightly saccate. Column narrowed and sigmoidly bent in its lower half, the apex clavate. Anther broad, depressed, retuse, the clinandrium irregularly crenulate; pollinia four, narrowly oblong; the grains polymorphous. Leaf orbicular-cordate, the nerves shortly setose, the edges remotely ciliate, 3 or 4 in . long and about as much broad; petiole thickened in its upper half, nearly 2 in . long. Hook. fil. Fl. Br. Ind. VI, 119. Epipactis plicata, Roxb. Fl. Ind. III, 454. Arethusa plicata, Andr. Bot. Rep., t. 321.

Sikkim, near the base of the hills, at Sembree, elevation 1,500 feet; in flower during May; Pantling No. 140.

The sepals and petals are green. The lip is lilac with a green spot at the base and a yellow line along the thickened part of the midrib. The leaf is of a dark green beautifully mattled with purplish-brown; it lies flat on the ground, and appears some time after the flowers have withered.

Plate 358.-Pogonia plicata, Lindl. Flowering and leaf-producing plants, of natural size. Fig. 1 a flower, 2 apex of ovary, column and lip in profile, 3 the lip, flattened out, 4 floral bract, stalked ovary and column, showing the stigma and front of the anther, 5 anther, 6 pollinia; all onlarged.

## 6. Pogonia Gammieana, Hook. fil. in Bot. Mag, t. 6671.

Tuber globular, about $1 \cdot 25 \mathrm{in}$. in diam. Scape of flowering plant 6 to 8 in . high, below about as thick as a goose-quill, bearing three long tubular bracts with acute or bifid apices. Peduncle about 2 in., shorter than the lax 7 - or 8 -flowered raceme. Flowers 1 in. long, drooping; floral bract linear-lanceolate, acuminate, longer than the truncate stalked ovary, strongly deflexed; stalk and ribs of the ovary winged. Sepals and petals sub-equal, elliptic-oblanceolate, acuminate, sub-connivent. Lip minutely saccate at the base, elliptic-obovate when spread out, the lower half convolute round the column and bearing two short triangular forward-pointing side lobes; the anterior half expanded, its edges crenulate-lobulate; the disc of the convolute part with two parallel central ridges, that of the expanded part with three ridges and many long wavy hairs. Leaf reniform, abruptly apiculate, glabrous, the edges undulate, 5 or 6 in. in diam. and about the same in length. Petiole 5 or 6 in . long, sheathed at the base. Hook. fil. Fl. Br. Ind. VI, 120.

Sikkim, at elevations of from 2,000 to 2,500 feet; in flower during May; Pantling No. 310. Gharwal; Strachey and Winterbottom No. 19; Falconer.

The sepals and petals are pink with lines of white and of dark pink, The lip is pale green in its apical and white in its basal half. The column is white, except the apex which is dark pink. The whole of the flowering axis is more or less shaded with pink, as are also the floral bracts and the ovary.

Plate 359.-Pogoniz Gammi ana, Hook. fil. A flower- and a leaf-bearing plant, of na'ural sizo. Fig. 1 portion of rachis, floral bract, stalked ovary and lip, 2 lip spread out, 3 apex of ovary, column with anther and stigma, 4 apex of the column, the anther having been removed, 5 anther, 6 pollinia; all enlurged.

## 7. Pogonia Scottit, Reichb. fil. in Flora, 1872, 276.

Tuber depressed-globular, $1 \cdot 25 \mathrm{in}$. in diam. Scape of flowering plant 8 to 15 in . long, slender, bearing at the base two unequal tubular sheaths, with a third near the apex. Raceme 3 to 5 in . long, with numerous rather distant drooping flowers about $\cdot 65$ in. long; floral bract linear, acuminate, longer than the stalked ovary, much deflexed; ovary and its stalk winged, the latter truncate at the apex. Sepals and petals sub-equal, linear-lanceolate, sub-connivent. Lip minutely saccate at the base, broadly sub-obovate when spread out, the lower two-thirds sub-convolute round the ovary and with bluntly triangular irregularly erose lateral lobes; the disc with three parallel hispid lamellæ; the anterior third or lobe broadly ovate, tapering to the sub-obtuse apex, its edges coarsely undulate-crenate, the upper surface velvety. Column clavate, nearly straight. Anther with a broad keel; pollinia oblong, conjoined. Leaf large, ovate-reniform, shortly and sharply apiculate, glabrous, 6 to 8 in . in diam.; petiole 4 to 8 in. long, smooth. Hook. fil. Fl. Br. Ind. VI, 120 ; in Ann. Bot. Gard. Calc., Vol. V, 62, t. 93. Pogonia No. 2, Griff. Notul. III, 377; Ic. Pl. Asiat., t. 345.

Sikkim, in tropical valleys about elevations of 2,500 feet; in flower during May; Pantling No, 143. Chittagong at Sitakund; Scott. ? Burma; Griffith.

The ovary, sepals and petals are green with dark red lines; the lip has its lateral lobes green with faint dark red oblique striæ, the disc being faint lavender and the
apical lobe of the same colour with bold irregular red markings. The anther and top of the column are red, the base white.

Plats 360.-Pogonia Scottii, Reiohb. fil. Flower- and leaf-bearing plants, of natural size. Fig. 1 a flower, 2 part of rachis, stalked ovary, and lip, seen from the side, 3 lip spread out, 4 ovary, column with anther in situ, 5 anther, 6 pollinia; all enlarged.

## 73. Corysanthes, R. Brown.

Very small, terrestrial, 1-leaved, 1-flowered herbs. Leaf cordate or sub-orbicular. Flowers large. Sepals unequal; the dorsal large, concave, concealing and arching over the column, the lateral pair filiform. Petals filiform like the lateral sepals, or absent. Lip large, erect, convolute round the column, its base usually with two short spurs; its apical lobe free, expanded, and with dentate or fimbriate margins. Column short, erect, 2-winged at the apex. Anther erect; pollinia oblong, free, or sessile on the rostellum, Stigma large. Capsule erect, on an elongate pedicel.

This genus is mainly Australasian; thirteen species being natives of Australia, New Zealand and Samoa, while five are Malayan. The flower is remarkable for the great development of the dorsal sepal, the lateral sepals being filiform; the petals also are either very small or, as in the present instance, altogether absent. Until the disoovery of the species described below, no species of Corysanthes had been known to grow farther north than the central mountain range of Perak in the Malay Peninsula.

> Corysanthes himalaica, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 128.

Height of the entire p.ant 2 or 3 inches; the tuber 25 to 35 in . in diam., depressed-globose, hairy. Stem g'abrous, with a single convolute sheath near its base. Leaf solitary, 3 to $\cdot \bar{j}$ in. long, sessile just under the flower, concave, cordate, acute, sometimes apiculate, green in colour, the midrib and nerves thickened and white. Flower solitary, 6 in. long; the bract linear-lanceolate, slightly longer than the thick sessile ovary. Dorsal sepal oblanceolate, blunt, concave, arching over the column and the basal half of the lip; lateral pair short, filiform, bifurcate, lying between the two spurs of the lip. Petals none. Lip oblong, longer than the dorsal sepal, deflexed from about the middle; the basal portion convolute, with two short cylindric straight spurs at the base; the anterior half broadly ovate, concave, with unequally denticulate margins, the apex blunt. Column short, stout; stigma orbicular; anther erect.

Sikkim, at Lam-teng in the Lachen Valley, at an elevation of 9,000 feet, on a moist vertical rock; in flower in July; Pantling No. 38..

The dorsal sepal and lip are transparent and have rich dark purple markings. The nearest ally of this is Corysanthes mucronata, Blume, a native of high mountains in Java.

Plite 361,-Corysanthes himalaica, King and Pantling. Four plants in various stages; of natural size. Fig. 1 leaf, bract, ovary, and flower, in half profile, 2 apex of ovary, column, stigma and empty anther, 3 the foregoing in profile, 4 dorsal sepal flattened out-all onlarged, 5 tuber; of nutural size
74. Cephalanthera, Richard.

Terrestrial aphyllous herbs with tuberous roots, or leafy and with fibrous roots. Leaves (when present) sessile, plicate. Flowers in spikes or racemes, sub-erect. Sepals
and petals sub-similar, free, connivent. Lip shorter than and concealed by the sepals. and petals, adnate to the base of the column, the basal half concave or saccate and embracing the column, the anterior half short and ribbed. Column semi-cylindric ; the rostellum short or almost obsolete. Anther erect; pollinia two, bipartite. Stigma anticous. Capsule erect. Distrib -North temperate regions; about 10 species.

Cephalanthera enstfolia, Rich, Orchid. Annot., 29.
Stem green, 6 to 18 in . long, rising from a thin creeping rhizome. Leaves lanceolate or ovate-lanceolate, conduplicate, increasing in length and decreasing in breadth from below upwards, 2 to 4 in . long and 4 to 1.25 in . broad according to the position on the stem. Peduncle 1 to 1.5 in . long. Raceme glabrous, longer than the peduncle, 8- to 20 -flowered. Flowers from 45 to 6 in . long; floral bract ovate-lanceolate, acuminate, shorter than the ovary. Ovary shortly-stalked, sub-cylindric, lengthening with age. Sepals ovate-lanceolate, acute. Petals slightly smaller, elliptic, obtuse. Lip oblong, distinctly divided by an oblique narrow sinus into a hypochile and epichile; the former convolute, slightly ribbed; the latter concave, boldly 3 - or 4 -ribbed. Coiumn long, terete. Pollinia linear-oblong, grooved, in pairs. Lindl. Gen. and Spec. Orchid 412 ; in Journ. Linn. Soc. I, 172, 175 ; Boiss. Fl. Orient. V, 85 ; Hook. fil. Fl. Br. Ind. VI, 125. C. Xyphophyllum, Reichb. Ic. Fl. Germ. XIII, t. 470 . C. acuminata, Lindl. in Wall. Cat. 7405 ; Gen. and Spec. Orch. 412 ; Wight Ic., t. 1721; Decne in Jacquem. Voy. Bot. 164, t. 164.

Sikkim; near Gnatong, elevation about 12,000 feet; in flower during July and August; Pantling No. 364. Distrib. along the whole Himalayan range at suitable elevations from Bhotan to Kashmir. Distrib. also in Western Siberia, Affghanistan, Europe, Northern Africa. The flowers are white, the lip having a few yellow markings.

Plate 362.-Cephalanthera ensifolia, A. Rich. A plant, of natural sise. Fig. 1 apex of ovary and flower, seen from the side, 2 floral bract, ovary, column and lip, seen from the side, 3 lip, 4 apex of ovary, column and anther, 5 anther, 6 pollinia; all onlarged.

## 75. Epipactis, Adans.

Terrestrial herbs with green leaves and fibrous roots. Leaves sessile, plicate. Flowers racemose, drooping, floral bract elongate and often leafy. Sepals and petals broadly lanceolate, acuminate, strongly-nerved. Lip adnate to the base of the column, distinctly divided into hypochile and epichile; the hypochile strongly deflexed, concave or saccate, jointed to the epichile at a right angle, both entire. Column short; stigma large, anticous; rostellum broad, prominent. Anther erect, obtuse, its cells contiguous; pollinia two, bipartite, very narrow. Species about 10, Northern Temperate Hemisphere.

> Sepals glabrous; hypochile globular-saceate, epichile broadly cordate . . 1. E. latifolia.
> Sepals pubescent externally; hypochile trough-shaped, epichile lanceolate . 2. E. consimilis.

## 1. Eptpactis latifolia, All. Fl. Pedem., II, 152.

Whole plant 12 to 36 inches high. Stem slender, glabrous in the lower part, puberulous in the upper like the peduncle and raceme. Leaves broadly elliptic, occasionally sub-orbicular or ovate-lanceolate, many-nerved, acute, glabrous, but the
margins often ciliolate; 1.5 to 2.5 in . long and 1 to 1.5 in. broad, (smaller upwards). Peduncle 2 to 3 in . long. Raceme longer, 8 - to 12 -flowered, its rachis sometimes spiral. Flowers $\cdot 5$ in. across; floral bract linear-lanceolate, acuminate, longer than the nearly glabrous stalked ovary. Sepals lanceolate, acuminate, glabrous. Petals similar but smaller. Lip shorter than the petals; the hypochile globularly saccate; the epichile broadly cordate, the edges erose, the upper surface with two globose calli near its base. Column very short, narrowed to the base; stigma broad. Anther erect, narrow; pollinia elliptic, falcate. Swartz in Act. Holm. for 1800, 232 ; Lindl. Gen. and Spec. Orchid. 461; Boiss. Fl. Orient. V, 87 ; Reichb. Ic. Fl. Germ. XIII, tt. 134-136; Hook. fil. Fl. Br. Ind. VI, 125. E. marrostachya, Lindl. in Wall. Cat. 7404. E. consimilis, Don Prod. Fl. Nep. 28. E. Dalhousice, Wight Ic. t. 1723.

Sikkim, at Gnatong, elevation about 11,000 feet; in flower during July; Pantling No. 330. Distributed westward along the range to Kashmir ; also in Northern Asia, Europe and Northern Africa.

The whole plant is green, except the column which is pure white.
Plate 363-Epipactis latifolia, All. A small plant, of natural sise. Fig. 1 a flower, 2 ovary, column with anther in situ, and lip, site vice, 3 lip, 4 apex of ovary and front of column, showing the stigma and anther, 5 anther, 6 pollinia; all enlarged.

## 2. Epipactis consimilis, Wall. Cat. 7403 (not of Don).

Height of the whole plant 18 to 24 in . Stem glabrous. Leaves lanceolate, acuminate, 6 to 8 in. long, the lowest the broadest, those of the upper part of the stem very narrow. Peduncle short. Raceme 4 to 6 in. long, laxly-flowered, tomentose like the peduncle. Flowers $\cdot 75$ to 1 in. across, floral bract variable. Sepals unequal, concave; the dorsal lanceolate, acute; the lateral pair twice as wide, all spreading and pubescent externally. Petals ovate, acute, the midrib externally thickened and tomentose. Lip nearly as long as the sepals; hypochile of lip trough-shaped, bearing granular unequal calli inside, the two near the apex large, obtuse, semi-transparent and nectar-exuding; epichile lanceolate, with erect side lobes, the upper surface with a raised mesial line disappearing near the white apex. Column stout, much curved. Stigmx large, sub-rotund and with two glands on the lower margin. Anther tumid. Hook. fil. Fl. Br. Ind. VI, 126. E. veratrifolia, Boiss. and Hohen. Diagn., Ser. I, XIII, 11; Boiss. Fl. Orient. V, 87 ; Lindl. in Journ. Linn. Soc. I, 174.

Sikkim, in damp ground in the Teesta valley at an elevation of about 1,000 feet; in flower during February and March; Pantling No. 125. Distributed along the mountain range from Nepal to Peshawar, also in Syria.

The sepals of this are on the outside of a deep lavender colour with white hairs; on the inner surface they are green with broad unequal vertical brown bands, and the petals on both surfaces are coloured like them. The hypochile of the lip is purple and the epichile bright pale brown, the apex being pure white. The column is green throughout.

Plate 364.-Epipactis consimilis, Wall. A plant, of natural size. Fig. 1 a flower, 2 floral bract, stalked ovary, column with the anther in situ, and the lip, side view, 3 lip, 4 column, showing the stigma with its two glands and the anther, 5 summit of column and hypochile, 6 anther, 7 pollinia; all enlarged.

## Tribe V.-GOODYEREAE.

Anther posticous, vertical but inverted; pollinia two, or four in two pairs, attached to a single gland either by one or by two caudicles, or without a caudicle; pollen granular or sectile.

Stigma single, anticous; pollinia two, or four in two pairs.
Lip spurred (except in Corymbis and one Tropidia).
Pollinia narrow, clavate, grooved, produced and united below to a single caudicle inserted on a long narrow gland; leaves plicate; stem erect (not decumbent at the base), sometimes branching.

Lip with a very long claw and an abruptly dilated apical lobe, the base neither saccate nor spurred.
Lip short, concave; the base saccate or spurred, not elawed
76. Corymbis.
77. Tropidia.

Pollinia narrow, elongate, each inserted within a free hornshaped oaudicle with a gland at its base
78. Herpysma.

Pollinia clavate, grooved and bifid, united below and inserted on a small narrow elongate gland, caudiole none
79. Physurus.

Lip without spur claw or sac; pollinia clavate, grooved, inserted without caudicle on a small elongate gland
80. Spiranthes.

Lip saccate at the base, the sac usually setose or tubercled within; pollinia sessile on a variously shaped gland, caudicle none .

81. Goodyera.

Stigmas two, distant, lateral (united into a narrow transverse band in one species of Zeuxine, and conjoined and anticous in one species of Ancectochilus) ; pollinia two, bipartite (four in one species of Anectochilus).

## Lip inferior.

Sepals free.
Lip saccate or cymbiform at the base; the sac with calli or laminx; mesochile when present not pectinate or toothed
82. Zouxine.

Lip saccate or spurred at the base, and with a long toothed or pectinate mesochile (entire in one species); apical lobe with two divergent lobules . . . . . 83. Anactochilus.
Sepals united into a tube
84. Cheirostylis.

Lip superior
85. Hetaria.

## 76. Corymbis, Thouars.

Terrestrial rigid erect herbs with tall leafy stems and fibrous roots. Leaves broad, sheathing, plicate. Nepals and petals narrow, at first cohering in a tube, their tips alone free, finally quite free and spreading. Lip parallel to the column and adnate to its base, narrowly linear, without side lobes, channelled, the apex abruptly dilated and decurved. Column long but shorter than the perianth, straight, terete with a
clavate bi-auriculate tip, rostellum bifid; stigma single, two-lobed, anticous. Anther dorsal, vertical, 2-celled, the lip acuminate; pollinia long, narrow, deeply grooved, tapering slightly to the thin caudicle, gland peltate. Capsule linear or fusiform. Species six; all tropical.

Cortmbis veratrifolia, Reichb. fil. in Flora XLVIII (1865), 184.
Stem 3 or 4 feet high and $\cdot 3$ in. thick. Leaves elliptic-lanceolate, caudate-acuminate, sessile on the long ridged sheaths, length 12 to 18 in., breadth 3 to 4 in . Panicles 3 or 4 in . long, few-flowered. Flowers 1.25 to 1.5 in . long; the bract lanceolate, acuminate, shorter than the sessile ovary. Sepals linear-oblanceolate, acute, the upper half with inflexed edges. Petals like the sepals but flat and slightly shorter. Lip as long as the sepals with a long linear claw adpressed to the column; the apical lobe orbicular, slightly apiculate, the edges finely erose and minutely undulate. Column narrowly cylindric, the apex dilated; stigma with two deflexed lobes. Anther fleshy; pollinia attached by a slender caudicle to an elliptic gland. Hook. fil. Fl. Br. Ind. VI, 91. C. disticha, Lindl. Fol. Orch. 1 (in part). Macrostylis disticha, Breda Gen. and Spec. Orch. Javan., t. 2. Hysteria veratrifolia, Reinw. in Bot. Zeit. for 1825, II, 5; Lindl. Gen. and Spec. Orch. 439. Rhyncanthera paniculata, Blume Bijdr., t. 78. Corymborchis veratrifolia, Blume Orch. Archp. Ind., 105 tt. 42 E, and 43 f. 1. C. assamica, Blume 1. c. 106, t. 43, f. 2 A. and B.

Sikkim, at elevations of 1,500 to 2,500 feet, in swampy ground; Pantling No. 475. Assam, Burma, the Andaman and Nicobar Islands. Distrib. Perak, Sumatra, Java, New Guinea.

The flowers are white in colour, and fragrant.
Plate 354.-Corymbis veratrifolia, Blume. Part of a plant, of natural size; an entire plant, much reduced in size. Fig. 1 a flower, 2 bract, ovary, column and lip, side view, 3 lip, 4 upper part of column, front view, 5 side view of the same, showing polliniar gland ( $g$ ), stigma ( $s$ ), with its two lobes ( $l$ ) and anther (a), 6 under surface of anther, 7 pollinia; all enlarged.

## 77. Tropidia, Lindl.

Terrestrial herbs with erect, often branching stems, glabrous, membranous, plicate, usually many-nerved leaves with sheathing petioles. Flowers resupinate, small, in terminal or leaf-opposed bracteate spikes. Sepals connivent; the lateral pair more or less connate, the dorsal (ventral in actual position) free. Petals similar to the sepals but usually smaller. Lip superior, adnate to the column, cymbiform or produced into a cylindric blunt spur, oblong, without side lobes, the apex reflexed, the dise with short or long intramarginal ridges or lamellæ. Column short or long; the rostellum very long, erect, often bifid. Stigma single, anticous. Anther erect, dorsal, acute or acuminate, the cells contiguous; pollinia two, narrow, clavate or cylindric, grooved or even bifid, attached by a single long slender caudicle to a narrow gland. Capsule cylindric-clavate. Species eight; Indian, Malayan and Chinese.

Lip spurred, leaves broadly elliptic . . . . . . . 1. T. angulosa.
Lip not spurred, leaves narrowly elliptic-oblong . . . 2. T. curculigoties.

## 1. Tropidia angulosa, Blume Oreh. Archipel. Ind, 122.

Stem 8 to 12 in. high, slender, erect, clothed with obtuse sheaths an inch or more in length, and bearing at the apex two broadly elliptic plicate many-nerved leaves with acute apices and widely sheathing bases, 4 or 5 in . long and 2 to 3 in , broad, Spike solitary, terminal, conical, shorter than the leaves, its peduncle bearing numerous linear spreading bracts nearly as long as the flowers. Flowers resupinate, crowded, $\cdot 65$ in. long; floral bract lanceolate, caudate-acuminate, curving upwards, longer than the sessile ovary. Sepals sub-equal, oblong-lanceolate, the lateral pair connate nearly to the apex. Petuls somewhat smaller and less acute. Lip about as long as the petals, oblanceolate-oblong, obtuse, entire, concave towards the base, adnate to the column, the base with a cylindric blunt spur half as long as and parallel to the column. Column short; the rostellum and anther very long, lanceolate, acuminate; p )llinia clavatecylindric, elongate, deeply grooved, united below; the caudicle long and slender; gland linear, half as long as the caudicle. Capsule clavate-cylindric, boldly ridged, 75 in . long. Hook. fil, Fl. Br. Ind. VI, 92. T. Govindovii and T. semilibera, Blume 1. c. Decaisnea angulosa, Lindl. in Wall. Cat. 7388. Cnemiliz angulosa and C. semilibera, Lindl. Gen. and Spec. Orch. 463. Govindvviz nervosa, Wight Ic. 2090.

Sikkim, in the valley of the Teesta, at elevations of about 1,000 to 2,000 feet; in flower during September and October; Pantling No. 349. Sylhet, Assam, Upper Burma and Tenasserim; also in Malabar and Travancore.

The flowers are white flushed with pale ochre-colour.
Plate 305.-Tropidia angulos7, Blume. Root and upper part of a plant, of natural siso. Fig. 1 ovary and flower, 2 the conjoined lateral sepals, 3 floral bract, ovary, column, anther and lip, side evew, 4 lip, 5 apex of ovary, column with anther in situ, profile view, 6 view of the under surface of the column, showing the stigma, 7 anther, 8 pollinia; all enlarged.

## 2. Tropidia curculigroides, Lindl. in Wall. Cat. 7386A; Gen. and Spec. Orch. 497.

Stem 1 to 2 feet high, slender, erect, sometimes branching. Leaves narrowly elliptic, tapering to each end, acuminate, sessile on the sheath, many-nerved, 3.5 to 6 in . long and 65 to $1 \cdot 25 \mathrm{in}$. wide. Spikes terminal and leaf-opposed, very short, bracteate, not exceeding 75 in . in length. Flovers 35 in . long, laxly scurfypubescent like the bracts and ovaries; floral bract ovate-lanceolate, equalling the short sessile ovary. S'pals sub equal, lanceolate, acuminate, sub-connivent. Petals as long as the sepals, the midrib on the outer surface stout, falcately ovate-lanceolate. Lip narrowly oblong, tapering to the apex, concave, adnate to the footless column, as long as the lateral sepals, bi-gibbous at the base, without side lobes, its apex decurved; upper surface with intramarginal ridges about the middle. Column stout, the clinandrium broadly triangular. Antier fleshy; pollinia two, narrowly elliptic, the caudicle rather short and pubescent, the gland small. Hook. fil. Fl. Br. Ind. VI, 93. T. assamica, Blume Fl. Javæ, Orchid. 104, t. 41.

Sikkim, at Sembree, elevation 1,000 feet; in flower during November; Pantling No. 180. Sylhet, Assam and Burmah.

The flowers are white, faintly tinged with pale yellow. The anther is of a deep yellow.

Platz 366.-Tropidia curculigioides, Lindl. Parts of a plant, of natural size. Fig. 1 floral bract, ovary and flower, seen from the side, 2 apex of ovary, column with anther in situ, and lip, side viece, 3 lip, 4 apex of ovary, column and anther, 5 anther, 6 pollinia; all enlarged.

## 78. Herpysma, Lindl.

A terrestrial herb with leafy succulent stem, decumbent at the base. Leaves membranous, elliptic or ovate-lanceolate, petioled; the sheaths tubular, hyaline. Flowers crowded in a short sub-sessile raceme. Sepals sub-equal, free, puberulous, ovate-oblong, the dorsal forming a hood with the oblong petals. Lip adnate to the apex and sides of the column, its base with a long narrowly cylindric spur bifid at the apex and without calli in its interior. Column short, without appendages; the rostellum short, erect, bifid. Anther erect, narrow, 2-celled; pollinia two, narrow, elongate, bipartite at the apex only, each attached to a narrow tapering gland. Stigma one, anticous. A single species.

Herpysma longicaulis, Lindl. in Wall. Cat. 7389; in Bot. Reg. under t. 1618.

Stem, including the decumbent part, 9 to 15 in . long and from $\cdot 2$ to 25 in . thick, the part under the leaves bearing pale truncate pubescent unequal membranous sheaths. Leaves ovate-lanceolate or narrowly-elliptic, tapering to each end, 2 to 3.5 in . long and 75 to 1.5 in . broad. Petiole about 25 in ., its sheath 1 in . or more in length. Raceme pubescent, 1 to $1 \cdot 25 \mathrm{in}$. long, sessile. Flowers about $\cdot 5 \mathrm{in}$. long, their ovaries longer; floral bract large, oblong-lanceolate, obtuse, nerved, exceeding the ovary. Lip oblong, deflexed from the middle, with two rounded toothed erect basal lobes; the apical lobe sub-quadrate, its apex with a broad blunt apiculus; the disc with two flattish calli about the middle and a lamella between them extending to the tip; the spur neasly as long as the ovary and parallel to it. Column short, contracted below the broad pulvinate central stigma. Pollinia elongated, each inserted at the base within a horn-like process ending in a gland, pollen-grains flattened. Lindl. Gen. and Spec. Orch., 506 ; in Journ. Linn. Soc. I, 178, 190 ; Hook. fil. Fl. Br. Ind. VI, 98 ; in Ann. Roy. Bot. Gard. Calc., Vol. V, 59, t. 88.

Sikkim, above Sureil, at elevations from 3,000 to 5,000 feet; Hooker; Pantling No. 240 ; in flower during August and September. Nepal; Wallich. Khasia Hills, alt. 4,500 feet; C. B. Clarke. Daphla Hills; Lister.

The flowers of this are white, the dorsal sepal and petals having the upper part of the midrib orange-red or pink, and the lateral sepals being tipped with the same colour.

[^10]
## 79. Physurus, Richard.

Terrestrial leafy herbs, with succulent stems decumbent at the base. Leares thickly membranous, ovate or lanceolate, the petioles broad and sheathing at the base. Howers in pedunculate spikes. Sepals free, the dorsal smaller than the two lateral and, with the petals, forming a hood. Lip attached to the base of the column without any claw, erect, produced downwards into a bifid spur parallel with the owary and extending beyond the bases of the sepals, its interior without calli; apical lobe short, broad, recurved. Culumn very short, without appendages. Anther 2-celled. Pollinia two, clavate, bipartite. Stigma single, anticous. Species about 50 , Asiatic and American.

## Physurus herpysmordes, King and Pantling in Journ. As. Soc. Beng, Vol. LXV, Pt. 2, 124.

Whole plant 8 to 10 in . high; the stem about $\therefore 5 \mathrm{in}$. thick at the base, leafy and glabrous, the peduncle pubescent and bracteolate. Leaves three or four, obliquely ovate, acute, tapering below to the channelled sheathing petiole, 5 - to 7 -nerved; length 25 to 4 in., breadth $1 \cdot 25$ to 1.75 in., petiole $1 \cdot 25 \mathrm{in}$. Bracts of the peduncle unequal, nearly 1 in . long, lanceolate, acuminate, adpressed. Raceme abrupt, 2 in. or less in length, pubescent; foral bract finely acuminate, slightly longer than the ovary. Flowers (to the tip of the spur) about $\cdot 75 \mathrm{in}$. long. Sepals oblong-lanceolate, 3 -nerved, sparsely pubescent, spreading, $\cdot 4$ in long. Petals linear, dilated towards their cohering apices, 1 -nerved. Lip adpressed to the column, oblong, 5 -nerved; the terminal lobe small, transversely oblong, entire, deflexed; the side lobes near the base, erect; sub-truncate; the spur shorter than the ovary, wide, slightly inflated below and bifid at the apex. Anther lanceolate. Column with a deep clinandrium. Pollinia clavate, the gland linear.

British Bhotan, above Engo; elevation 5,000 feet; in flower during April; Pantling No. 255.

This somewhat resembles P. Blumei, Lindl., but has a shorter and less pubescent inforescence, longer bracts and larger flowers. The leaves have also twice as many nerves. The sepals and petals of this are of a pale reddish-brown, and the lip is white just as in P. Blumei. Only two specimens of it have been collected as yet.

Plate 368 - Pligsurus herpysmoides, King and Pantling. Fig. 1 a flower, 2 ovary, column and lip, 3 the petals, 4 the lip, 5 column and spur, 6 under surface of anther, 7 pollinia; all enlargod.

## 80. Spiranthes, Rich

Terrestrial herbs with tuberous or fibrous roots, Stem leafy. Leaves (in the Indian species) linear. Flowers small, secund, in a spiral spike. Sepals sub-equal, free, or sometimes cohering with the petals to form an erect hood, the lateral pair gibbous at the base. Lip erect, entire or 3-lobed, the base concave but neither saccate nor spurred, the dise bearing lamellæ or calli. Column short, terete. Stigma single, broad, anticous; rostellum erect, obtuse or elongate and bifid; anther erect, 2 -celled; pollinia four, united in pairs, sessile on a small gland. Species about 80 , temperate and tropical; only one Indian.

Whole plant 6 to 18 in . high. Stem stout or slender, roots tuberous. Leaves four or five, alternate, clustered near the base of the stem, linear, shortly sheathing, acute or a cuminate, sometimes oblanceolate, 1.5 to 4 in . long and 25 in . or less broad. Stem with a few distant sheathing bracts $\cdot 5 \mathrm{in}$. long. Spikes 3 to 6 in . long; the rachis glandular-pubescent. Flowers in a spiral, crowded, $\cdot 1$ to $\cdot 2$ in. long; floral bract ovate, longer than the sessile ovary. Sepals sub-equal, ovate-oblong with broad bases, the apices acute and reflexed. Petals smaller than the sepals, linear, obtuse, the apices reflexed. Lip oblong, dilated at base and apex, the base sub-saccate, bi-glandular; the apex sub-quadrate, truncate, erose, the margins undulate. Pollinix cohering, clavate. Capsule fusiform, ridged, pubescent, 25 in. long. Lindl. Gen. and Spec. Orch., 464 ; in Journ. Linn. Soc. I, 178 ; Dalz. and Gibs. Bomb. Fl., 270; A. Rich. in Ann. Sc. Nat., ser. 2, XV, 78 ; Hook. fil. Fl. Br. Ind. VI, 102. S. flexuosa and S. parvifora, Lindl. in Bot. Reg. under t. 823. S. ameena, Bunge Enum. Pl. China, 63. S. Novec Zelandicce, Hook. Handb. Fl. New Zeal., 243. Neottia australis, R. Br. Prod. 319; Don Prod. Fl. Nep. 27. N. crispata, Blume Bijdr., 406. N. fexuosa and N. parvifora, Smith in Rees' Cyclop. N. sinensiz, Pers. Syn. II, 511. N. amœena, Bieb. Fl. Taur. Cauc. III, 606. Gyrostachys australis, Blume Fl. Jav: 107, t. 37, 38. Spiranthes, Griff. Notul. III, 384; Ic. Plant. Asiat., t. 348.

Sikkim; common from 2,000 to 8,000 feet; in flower during April and May and also during August and September; Pantling No. 107. Throughout the mountainous parts of India at suitable altitudes. Distrib. Affghanistan, Northern Asia, China, Java, Australia and New Zealand.

The flowers produced in spring are white; those appearing in autumn are often pink.
Plate 369.-Spiranthes australis, Lindl. A plant in flower and fruit, of natural size. Fig. 1 bract, ovary and flower, 2 column with anther in situ, and lip, seen from the side, 3 lip, upper surface, 4 front view of the apex of ovary and column, showing the rostellum ( $r$ ), stigma ( $s$ ), pollinia ( $p$ ), and anther (a), 5 profile view of the foregoing, 6 anther, 7 front and back views of the pollinia; all enlarged.

## 81. Goodyera, R. Brown.

Terrestrial leafy herbs. Stem decumbent below, erect above. Leaves usually rather thick, with wide sheaths and usually with petioles also. Flowers small, numerous, in terminal, sometimes secund, spikes or racemes. Sepals sub-equal, often pubescent outside; the dorsal concave and, with the petals, forming a hood over the column; the lateral pair free, sub-connivent or spreading. Lip attached to the base of the column, entire, saccate or cymbiform at the base; the apical lobe small, usually acute and decurved; the basal sac with setre calli or ridges inside, rarely smooth. Column short, the rostellum projecting. Anther usually pyriform, with a long erect beak; pollinia 2 , ( 4 in G. grandis) clavate, sessile on a large or small gland. Stigma undivided, anticous. Species about 36 ; temperate and tropical Europe, Asia, N. America, N. Caledonia and the Mascarene Islands.

Column without any callus or process on its face.
Sac of lip quite smooth within, globular, not projecting


## 1. Goodyera repens, Brown in Ait. Hort. Kew., ed. 2, V, 198.

Height of whole plant 4 to 8 in . Stem glabrous, leafy below and bracteate above, gradually passing into the longer and pubescent peduncle. Leaves ovate-elliptic to elliptic, sub-acute, the peduncle sheathing in the lower half; length of blade 5 to 1 in., breadth $\cdot 35$ to $\cdot 45 \mathrm{in}$. ; bracts in the upper part of the stem and on the peduncle linear, convolute, about 5 in . long. Raceme sub-secund, 1 to 2 in . long, its rachis and the bracts and ovaries sparsely pubescent or sometimes sub-glabrous. Flowers globular, pointed, $\cdot 15$ in. in diam. ; floral bract linear-lanceolate, longer than the ovary. Sepals sub-equal, ovate, sub-acute, connivent. Petals about as long as the sepals, obliquely cuneate-oblong, falcately acute at the apex, the edges slightly erose-dentate. Lip about as long as the sepals, saccate at the base; the apical lobe short, oblong-ovate, sub-acute, concave, its edges somewhat undulate; the sac naked within. Column short, without processes; the stigma orbicular, rostellum short. Anther obovate, beaked; pollinia clavate, sessile on the large oblong-quadrate gland. Lindl. Gen. and Spec. Orch. 492 ; in Journ. Linn. Soc. I, 183 ; Reichb. Ic. Pl. German, XIII, 1555, t. 482 ; Ledeb. Fl. Ross. IV, 86; Boiss. Fl. Orient. V, 90 ; Hook. fil. Fl. Br. Ind. VI, 111. G. marginata, Lindl, in Wall. Cat. 7394 ; Gen. and Spec. Orch., 493; in Journ. Linn. Soc. I, 183. Satyrium repens, Linn. Sp. Pl. 1339.

Sikkim, at elevations from 8,000 to 11,000 feet, common; in flower during July and August; Pantling No. 277. Westward along the Himalaya to Simla, Distrib. Europe, N. Asia and N. America.

The flowers are white flushed with brownish-pink. The leaves are green, beautifully reticulated with white.

Plate 370.-Goodyera repens, Brown. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 the same in profile, but with the sepals and petals removed, 3 the petals, 4 lip, 5 upper part of ovary and front of column, showing the stigma and end of the rostellum, 6 anther, 7 pollinia; all enlarged.

## 2. Goodyera fusca, Lindl. in Wall. Cat., 7395; Hook. fil. Ic. Plantar. t. 2181.

Whole plant 9 to 12 in . high. Stem short, glabrous, with the leaves clustered near the base and bearing upwards large oblong acute bracts 75 to 1 in. long. Leaves thick, ovate, sub-acute, 5 -nerved, the veins anastomosing, the edges sub-revolute; length of blade 1 to 1.5 in .; the petiole about one-third shorter, broad, sheathing widely at the base. Peduncle longer than the stem, pubescent. Raceme many-flowered, not secund, the rachis bracts and ovaries pubescent; floral bract ovate-oblong, sub-acute, longer than the ovary. Sepals sub-equal, oblong, sub-acute, connivent. Petals linear-oblong, falcate, sub-acute. Lip as long as the sepals, with a deep sub-globose sac at the base, exserted beyond the bases of the sepals, smooth within, suddenly contracted in front into the linear beaked dellexed apical lobe. Column very short; the stigma broad, orbicular, convex. Anther convex, shortly apiculate but not beaked; pollinia broadly ovoid, sessile on the orbicular gland. Hook. fil Fl. Br. Ind. VI, 112. Aetheria fusca, Lindl. Gen. and Spec. Orch. 491; in Journ. Liun. Soc. I, 184. Cystorchis fusca, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 599.

Sikkim, the Lachong valley, at an elevation of about 12,000 feet; in flower during August; Pantling No. 411. Gharwal; Duthie.

The flowers are white, the apex of the lip being green and its sac flushed with pinkish-yellow.

Plate 371.-Goodyera fussa, Lindl. A plant, of natural size. Fig. 1 ovary, floral bract and flower, 2 apes of ovary, column with anther in situ, and lip, in profile, 3 the petals, 4 lip, 5 front view of apes of ovary and column, showing the polliniar gland ( $p g$ ) and stigma (s), 6 empty anther, 7 pollinia; all enlurged.

## 3. Goodyera vittata, Benth. ex Hook. fil. Fl. Br. Ind. VI, 113.

Height of whole plant 4 to 8 in., everywhere glabrous or nearly so. Stem stout, enveloped in the long tubular leaf-sheaths. Leaves rather thick, ovate-lanceolate, acute, 1 to 2 in . long and 6 to 9 in . broad; petiole $\cdot 6$ to 8 in . long, consisting mostly of sheath. Peduncle only 1 to 1.5 in . long, bearing several narrowly lanceolate acuminate imbricate bracts. Raceme 2 to 3 in . long, secund, crowded, usually glabrous, sometimes sparsely hairy. Flowers • 35 in. long, horizontal; floral bract lanceolate, acuminate, slightly longer than the ovary. Sepals sub-equal, oblong-ovate, acute. Petals narrowly oblong-ovate, cohering by their inner edges for half their length. Lip longer than the sepals, with an elongate sac at the base setose inside, tapering to the oblong-lanceolate sub-acute recurved bilamellate apical lobe. Column short, stout. Anther with its beak acuminate and upturned; pollinia stoutly clavate, conjoined, tapering to a pseudo-caudicle and attached to an elongate gland; rostellum long, erect. Stigma large. Hook. fil. Ic. Plantar., t. 2185; Hook. fil. in Ann. Bot. Gard. Calc. 61, t. 92. Georchis vittata, Lindl. in Journ. Linn. Soc. I, 184.

Sikkim, at elevations of 6,000 to 10,000 feet; Hooker, Anderson. Lachong Valley, elevation 7,000 feet; in flower from July to September; Pantling No. 410.

The flowers are pink, a colour which passes into white at the bases of the sepals and petals. The leaves on the upper surface are green with a broad silvery band along the midrib; on the lower surface they are more or less suffused with purple.

Plate 372.-Goodyera vittata, Benth. A plant, of natural size. Fig. 1 a flower with its ovary and bract, 2 profile view of column and lip, showing the anther in situ with its upturned beak, 3 the petals, 4 the lip, 5 column showing the anther behind, the rostellum at the apex and the stigma in front, 6 anther, 7 pollinia; all enlarged.

## 4. Goodyera Hemsleyana, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 342.

Height of entire plant 6 to 10 in ., of which 3 in . are spike. Stem enveloped in leafsheaths; roots few, thick. Leaves three to five, scattered, unequal, broadly ovate, acute, glabrous like the stem, dark green with white nerves, 8 to $1 \cdot 8 \mathrm{in}$. long and $\cdot 5$ to 1 in . broad. Peduncle shorter than the raceme, pubescent. Raceme 1 to 1.5 in . long, pubescent. Flowers sub-secund, 5 in. long; the bract lanceolate, exceeding the ovary. Sepals 3 -nerved, the lateral pair ovate-acuminate, the dorsal oblong-lanceolate and clothed externally with long sparse hairs. Petals oblong-lanceolate, falcate, 3-nerved. Lip oblong with a sharp tooth at each side of the mouth of the sub-saccate base; the apical lobe oblong, entire, obtuse, with scabrid disc, the sac setose within. Pollinia elongate-obovate, with a short caudicle and a long narrow lanceolate pointed gland.

Sikkim, on Senchal ; elevation 7,000 feet; flowering in July; Pantling No. 215.
The flowers of this are white, the sepals being tipped with pink. This differs from G. vittata, Benth. notably by its laxly hairy sepals and by the scabrid dise of the lip. It is dedicated to Mr. W. B. Hemsley, F.R.S., formerly Assistant for India, now Principal Assistant, Herbarium, Royal Gardens, Kew.

Plate 373.-Goodyera Homsleyana, King and Pantling. A plant, of natural size. Fig. 1 profile view of flower, ovary and bract, profile of column and lip, part of ovary, column and lip, from the side, 3 lip, 4 and 5 posterior and anterior surfaces of column, 6 pollinia; all enlargud.

## 5. Goodyera foliosa, Benth. ex Hook. fil. Fl. Br. Ind. VI, 113.

Whole plant 6 to 12 in . high. Stem decumbent at the base. Leaves 3 - to 5 -nerved, distant, ovate-lanceolate, acute, somewhat oblique, narrowed to the base, the edges undulate; length 2.5 to 3.5 in ., breadth 75 to 1.65 ; petiole 1 in . long, slightly expanded into a short sheath at the base. Peduncle only 1 to 2 in. long, pubescent in its upper part like the floral bracts and bearing several lanceolate sheaths with tubular bases and acuminate apices, Raceme 1.5 to 3 in . long, its rachis and the bracts and ovaries glandular-pubescent. Flowers numerous, rather crowded, much exceeded by the lanceolate acuminate 3 -nerved floral bracts. Sepals sub-equal, ovate-oblong, sub-acute, connivent, connate at the base. Petals obliquely rhomboid, with acute apices and longclawed bases. Lip as long as the sepals, the base with a sub-globular sac hispid within and contracted into the oblong sub-acute apical lobe. Column and rostellum rather long. Anther erect, oblanceolate; pollinia narrowly clavate, vertically grooved, united at the lower end and sessile on a long oblanceolate gland. Stigma rotund, concave. Hook. fil. Fl. Br. Ind. VI, 113 ; Ann. Bot. Gard. Cale., vol. V, 61, t. 91. Georchis foliosa, Lindl. Gen. and Spec. Orch., 496. Goodyera sp. Griff. Itin. Not. 36, No. 591; Notul. III, 396, No. 11 ; Ic. Pl. Asiat. $3 \pm 6$, fig. 1.

Sikkim, at elevations of 5,000 to 6,000 feet, Hooker; on Senchal as high as 7,000 feet; in flower during October and November; Pantling No. 5. Assam, Naga and Khasia Hills, ascending to 5,000 feet. Burma; Griffith. Perak at 7,000 feet; Wray.

The sepals are pinkish or orange-coloured externally with pale edges, and the petals are pale pink. The sac of the lip is yellow and its apical lobe is orange and white, the column being white and the anther yellow. The floral bracts and leaves are green, the latter with three silver lines.

Plate 374.-Goodyera foliosa, Benth. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 apex of ovary, column with anther in situ, and lip, in profile, 3 lip, 4 the petals, 6 view of the back of the column, showing the anther in situ, 5 front of the same, showing the rostellum and stigma, 7 pollinia; all enlargod.

## 6. Goodiera procera, Hook. Exot. Flora, t. 39.

Whole plant 10 to 30 in. high. Stem glabrous, stout, enveloped in the wide lax sheaths of leaves or of fallen leaves. Leaves on long petioles, narrowly elliptic or ovateelliptic, tapering to each end, acute or acuminate; the petiole stout, broadly sheathing in its lower half; length of blade 3 to 6 in., breadth 75 to 1.75 in ; petiole 1.5 to 3 in . Peduncle shorter than the stem, glabrous below, pubescent above, bearing several lanceolate acuminate bracts. Raceme with a pubescent rachis 3 to 8 in. long, manyand densely-flowered. Flowers sub-globose, $\cdot 2 \mathrm{in}$. in diam. across the tips of the pieces of the perianth; floral bract ovate-lanceolate, acuminate, pubescent at the edges, equalling the glabrous ovary in length. Sepals sub-equal, broadly ovate, obtuse, sub-connivent, glabrous. Petals cuneately obovate, clawed. Lip slightly longer than the sepals, with a large saccate base and a small decurved entire triangular acute apical lobe; the interior of the basal sac with two rows of long teeth on the sides and an oblong callus at the apex of each row. Column very short, with a transverse depression below the broad anticous stigma. Anther broadly pyriform, obtuse; pollinia clavate-cylindric, sessile on the small oblong gland. Lindl. Gen. and Spec. Orch. 493; in Journ. Linn. Soc. I, 183; Don Prod. Fl. Nep., 28; Wight Ic. t. 1729; Hook. fil. Fl. Br. Ind. VI, 111. G. carnea, A. Rich. in Ann. Sc. Nat. ser. 2, XV, 80. Cionisaccus lanceolatus, Breda Orch. Kuhl et Hassk., t. 1. Cordylestylis foliosa, Falconer in Hook. Journ. Bot. IV (1842), 75. Neottia procera, Ker in Bot. Reg., t. 639.

Sikkim, common at elevations of 1,000 to 4,000 feet; Pantling No. 67 ; in flower in May. Eastward to Bhotan and westward to Nepal. Assam, Sylhet, Khasia and Naga Hills, Nilgiri Hills and Western Gháts, Ceylon. Distrib.-Java, China.

The flowers are white, faintly tinged with green, and the bracts are green.
Plate 378.-Goodyera procera, Hook. Outline of an entire plant, much reduced in size. Leaf and inflorescence, of natural size. Fig. 1 bract, ovary and flower, 2 apex of ovary, column with anther in situ and lip, side view, 3 the petals, 4 interior of the sac of the lip to show the teeth and calli, 5 front view of the apex of the ovary and of the column, showing the stigma and anther, 6 anther, 7 pollinia; all enlarged.

## 7. Goodyera hispids, Lindl. in Journ. Linn. Soc. I, 183.

Whole plant 4 to 6 in . high. Stem enveloped in the leaf-sheaths. Leaves ellipticlanceolate, acute, somewhat oblique, especially at the base; length 1 to 1.5 in ., breadth $\cdot 4$ to 65 in.; petiole none; sheath about 4 in., very broad. Peduncle short, pubescent and bearing several short pubescent bracts with broad convolute bases and acuminate
apices. Raceme slightly twisted; the rachis bracts and ovaries covered with long thin sub-hispid hairs. Flowers numerous, rather crowded, ovoid, $\cdot 15 \mathrm{in}$. in diam.; floral bract lanceolate, acuminate, brown, conspicuous, longer than the almost sessile ovary. Sepals sub-equal, broadly elliptic, concave, obtuse, densely covered with minute glandular hairs, overlapping by their edges, the apices slightly expanded. Petals as long as the sepals, sigmoidly lanceolate, sub-acute. Lip slightly shorter than the sepals, with a sub-globose sac at the base with many setæ inside it, passing gradually into the oblong, sub-acute, almost horizontal, non-lamellate apical lobe. Column short, with a long beaked rostellum. Anther pyriform, depressed, with a long beak; pollinia narrowly clavate, bipartite, conjoined by their inner edges and inserted on a large oblong gland. Hook. fil. Ic. Plantar. t. 2186 ; Fl. Br. Ind. VI, 114.

Sikkim, at Kali Jhora in the valley of the Teesta, at an elevation of about 1,000 feet; in flower during September; Pantling No. 190. Khasia Hills; at Cherrapunji, elevation 4,000 feet, Hooker.

The sepals are olivaceous green, their tips being white; the petals and lip are of a dirty white. The bracts and rachis are brown, a colour which, in the stem, passes into brownish-purple. The leaves are green, flushed with pink towards the edges and beautifully reticulated with pure white.

Plate 375.-Goodyora hispida, Lindl. A plant, of natural size. Fig. 1 bract, ovary, and flower, front viex, 2 apex of ovary, bract and flower, in profile, 3 the petals, 4 the flower with the dorsal sepals and petals removed, looked at from above, 5 side view of the apex of the ovary, column with anther in situ, and lip, 6 longitudinal section of the lip to show the setre in the interior of the sac, 8 pollinia; all enlargod.
8. Goodyera secundiflora, Griff. Notul. III, 393; Ic. Pl. As. 347, fig. 2.

Height of whole plant 6 to 12 in., slender, completely enveloped in the loose sheathing leaf-petioles, the upper part bearing long tubular acute bracts. Leaves few, scattered, ovate-lanceolate to elliptic-acute, the base rounded or narrowed into the stout sheathing petiole; length 1.5 to 3.5 in., breadth 75 to 1.25 in.; petiole 75 to 1 in.; peduncle pubescent, bearing several bracts like those of the stem. Raceme with its rachis and the floral bracts and ovaries densely glandular-pubescent or almost tomentose, manyflowered. Flowers broadly ovoid, 35 in . long; floral bract shorter than or equal to the ovary. Sepals sub-acute, ovate, the dorsal narrower; the lateral pair sub-gibbous, spreading, sub-acute. Petals falcately oblanceolate, the apex obliquely beaked, crenate on the outer margin. Lip sub-globularly saccate at the base, the sac with slender setæ inside; the apical lobe ovate, acute, concave, its dise with two thick lamellæ. Columa with a short rostellum; anther pyriform, the beak long; pollinia two, narrowly clavate, bipartite and attached to a long very narrow dark brown gland. stigma orbicular. Lindl. in Journ. Linn. Soc. I, 182; Hook. fil. Fl. Br. Ind. VI, 113.

Sikkim, at Labba, elevation 6,000 feet; in flower during September to January; Pantling No. 292. Khasia Hills, elevation 4,000 to 5,000 feet; Griffith. Munipur; Watt. Distrib. China.

The parts of the flower are yellowish-pink, except the lip, which is white tipped with green. The leaves are pale green, mottled with a darker tint of the same colour.

Prate 376.-Goodyera secundiffora, Lindl. A plant, of natural sizc. Fig 1 bract, ovary and flower, 2 apex of ovary, column with anther in situ, and lip, side vieco, 3 the petals, 4 the lip, seon from abore, 5 apex of ovary and the front of the column, showing the rostellum and stigma, 6 anther, 7 pollinia; all enlarged.

## 9. Goodyera fumata, Thwaites Enum. PI. Ceyl., 314.

Whole plant about 3 to 4 feet high. Stem stout, 5 in. thick, glabrous. Leaves obliquely oblong-elliptic, tapering to the acuminate apex and the long narrow base, 6 to 10 in . long and 1.75 to 4 in . broad; the petiole 1.25 to 2 in . long, sheathing widely in its lower part. Peduncle slender, glandular-pubescent. Raceme 8 to 10 in . long, its rachis and the bracts and ovaries glandular-pubescent, rather densely-flowered. Flowers 5 in. long; floral bract linear-lanceolate, acuminate, one-third to one-half as long as the cylindric twisted ovary. Sepals unequal, pubescent outside; the dorsal ovate, acute; the lateral pair rather narrower and with reflexed apices, wide-spreading. Petals linear-oblanceolate, acute, entire, shorter and much narrower than the sepals, adpressed to the dorsal sepal. Lip with an elongate saccate base (rhomboidal when spread out), abruptly contracted into the linear revolute apical lobe; the interior of the sac setose. Column long, clavate, the rostellum rather short. Anther depressed, shortly beaked; pollinia narrow, sessile on the minute quadrate gland. Hook. fil. Fl. Br. Ind. VI, 111.

Sikkim, at Rungbee, elevation 6,000 feet; in flower during March; Pantling No. 467 ; a rare plant. Ceylon; Thwaites.

The colour of the sepals and petals is pale green, and that of the lip and column pale brown.

Plate 377.-Goodyera fumata, Thwaites. Fig. 1 a flower, 2 profile view of floral bract, stalked ovary, column with anther in situ, and lip, 3 the lip with its apex flattened out, 4 column with the anther in situ and the stigma, 5 an empty anther, 6 pollinia; all enlarged.

## 10. Goodyera grandis, new species.

Height of the whole plant 15 to 20 inches, the stem forming three-fourths of the whole, leafy below, bracteate above. Leaves obliquely elliptic, sub-acute, 3 -nerved, 3 to 4 in . long and 1.5 to 2 in . broad; petiole channelled, much dilated and tubular at the base, 2 to 2.5 in . long; bracts in the upper part of the stem about three, unequal, lanceolate, acuminate, tubular at the base, 1 to 1.35 in . long. Peduncle about 2.5 in . long, pubescent. Raceme rather densely-flowered, twice as long as the peduncle. Flowers $\cdot 7$ in. across; floral bract lanceolate, longer than the sessile pubescent ovary, glabrous but with ciliate margins. Sepals unequal, thinly pubescent externally; the dorsal oblongelliptic, blunt, somewhat fleshy, forming a hood with the spathulate petals; lateral sepals broadly lanceolate, wide-spreading. Lip fleshy, shorter than the column and adnate to its base, sub-globosely saccate, setose within; the apical lobe small, narrowly ovate, reflexed and adpressed to the under side of the sac. Column with a pointed apex and with a clavate callus extending from the stigma to the base of the lip. Anther dorsal, 2-celled; pollinia four, clavate, united in pairs to a single narrowly elliptic g'and. Hylophila? hetcrioides, King and Pantling MSS.

Sikkim, at Rumtek in the valley of the Teesta, at an elevation of 4,000 feet; in flower during August; Pantling No. 460.

The flowers of this are of a dull red. This species in general appearance much resembles $G$. foliosa, Benth., but has shorter floral bracts. The details of the flowers of the two are also different. This, however, differs from all the species of the genus described in the present work by the clavate callosity on the anterior surface of the column below the stigma.

Plate 379.-Goodyera grandis, King and Pantling. Part of a plant, of natural size. Fig. 1 a flower, 2 floral bract, ovary, column and lip, in profile, 3 lip, showing the setæ inside, 4 front of column, showing the base of the lip with a few of its contained setro, the clavate process below the stigma and the rostellum, 5 the petals, 6 anther, 7 pollinia; all enlarged.

## 82. Zeuxine, Lindl,

Terrestrial herbs with succulent glabrous stems, decumbent at the base. Leaves membranous, sometimes withered at flowering-time. Flowers small, in racemes or spikes. Sepals sub-equal; the dorsal concave and forming a hood with the petals; the lateral pair free. Lip adnate to the base of the column, cymbiform or saccate; the apical lobe shortly clawed or sessile, divided into two oblong sub-quadrate more or less truncate diverging lobules, or entire, or with narrow decurved lobules; the sac at the base with calli or laminæ inside. Column very short, its anterior surface with lamellar or conical processes. Stigmas two, lateral, distant (united into a narrow band in Z. pulchra). Anther membranous, sometimes ridged, its cells contiguous; pollinia pyriform, attached by an oblong gland to the erect rostellum. Species about 15, natives of tropical Asia and Africa.

Sepals free.
Stigmas united to form a narrow anticous band . . . . . . . . 1. Z. pulchra. Stigmas two, distant, lateral.

Leaves linear, sessile ; apieal lobe of lip sub-orbicular, erose . . . 2. Z. sulcata. Leaves ovate, ovate-lanceolate or oblong-lanceolate.

Apical lobe of lip not 2-lobulate, its margins introflexed . . 3. Z. goodyeroides.
Apical lobe of lip with two narrow decurved lobules . . . 4. Z. abbreviata.
Apical lobe of lip with two broad oblong or sub-quadrate * diverging lobules.

Petals dimidiately rotund, abruptly apiculate.
Leaves oblong-lanceolate, blackish-purple; sepals acute; column with large lamellate processes
5. Z. glandulosa.

Leaves ovate-lanceolate, green or green suffused with silvery grey; sepals blunt; column with medium lamellar processes
6. Z. nerrosa.

Petals narrowly oblong, blunt 7. Z. flava.

Petals oblong, not falcate, acute; sepals, petals, bract and ovary pubescent.
Leaves ovate-lanceolate; column with two large vertical processes as long as and beneath the horizontal arms of the rostellum
8. Z. affinis.

Leaves narrowly ovate; column with oblique processes much shorter than the linear arms of the rostellum .
9. Z. reflexa.

Sepals connate into a tube in their lower half.
Apical lobes of lip short, truncate, diverging
10. Z. pumila.

Apical lobes of lip long, narrow, pointing forwards
11. Z. Franchetiana.

1. Zeuxine pulchra, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 127.

Height of the whole plant about 6 or 8 inches. Stem 1.5 to 2.5 in. long. Leaves three or four, rather crowded, ovate, sub-acute, coriaceous; length about 1 in., breadth $\cdot 65$ to $\cdot 75$ in.; the petiole short, broad and sheathing at the base. Peduncle of the spike 3 in. long, covered with sparse flexuose white hairs and bearing two sheathing acute bracts about 35 in . long. Spike under 1 in . long, 2 - to 3 -flowered; floral bract lanceolate, membranous, sparsely pubescent, shorter than the pubescent ovary. Flowers about 35 in. long. Sepals ovate-lanceolate, all free, spreading and pubescent outside. Petals obliquely lanceolate, acute, curved, spreading. Lip longer than the sepals, the basal part cymbiformly saccate, having a single pair of teeth situated at the margin near the base and two calli within the sac; the terminal lobe deeply divided into two large divergent cuneate-subquadrate lobules erose on the outer margin. Column with eight tooth-like erect processes in front; stigmas united to form a narrow band across the column.

Sikkim, Lachoong Valley, 7,500 feet elevation; flowering in August; Pantling No. 412.

Only two specimens have as yet beec gathered of this plant. The dorsal sepal does not cohere with the petals, and the stigmas are united to form an anticous band; but in all other respects this has the characters of the other species of the genus to which we have referred it.

The colour of the sepals and petals is pale brown, the lower part of the lip being yellow and its apical lobes white. The leaves are of a blackish-purple on the upper surface, the midrib being white.

Plate 380.-Zeuxine pulohra, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 the petals, 3 upper surface of lip, 4 posterior surface of the column, showing the anther in situ, 5 front of the column, showing the united stigmas (s) and the processes, 6 lower surface of empty anther; all enlarged.

## 2. Zeuxine sulcata, Lindl. Gen. and Spec. Orch., 485.

Whole plant 2 to 10 in. Stem passing into the peduncle and, like it, glabrous. Leaves linear, acuminate, clasping, sessile on the hyaline truncate sheaths, gradually passing into linear bracts upwards. Raceme 5 to 2 in. long, densely-flowered, nearly glabrous; floral bract ovate-lanceolate, acuminate, much longer than the ovary. Sepals unequal; the dorsal the broader, concave, ovate; the lateral pair obliquely lanceolate, connivent. Petals, like the lateral sepals, falcately oblong, blunt, united with the dorsal sepal to form a hood over the column. Lip as long as the sepals, with a small cymbiform sac at its base bearing inside two inward-pointing teeth, and two narrow lamellæ near the midrib; apical lobe short, sub-quadrate, entire and with a fleshy convexity situated within the outer angles Column very short, with two wings at its apex covering the anther; arms of rostellum short, stout, parallel. Anther depressed, very shortly beaked, covered by the wings of the column ; pollinia clavate, sessile on an oblong gland. Lindl. in Journ. Linn. Soc. I, 186 ; Griff. Notul. III, 396 ; Ic. Plant. Asiat., t. 349 ; Blume Flora Javæ, Orchid. 55 ; Miquel Fl. Ind. Bat. III, 723; Hook. fil. Fl. Br. Ind VI, 106. Zeu.xine bracteata, Z. Urevifolia and Z. robusta, Wight Ic. 1724 bis, 1725, 1726. Z. membranacea, Lindl. Gen, and Spec. Oroh. 486 ; in Journ Linn. Soc. I, 186; Blume Orchid. Flor. Javæ, 56.
Z. Tripleura, Lindl. in Journ. Linn. Soc. I, 186. Z. integerrima, Lindl. Gen. and Spec. Orch. 486; Blume Fl. Javæ, Orchid. 55, t. 19, and 23 C.; Miq. Fl. Ind. Bat. III, 723. Z. emarginata, Lindl. Gen. and Spec. Orch. 185. Z. procumbens, Blume Fl. Jav. 56, t. 22, f. 3 and t. 23 B. Tripleura pallida, Lindl. in Wall. Cat., 7391; Gen. and Spec. Orch. 452. Adenostylis emarginata and A. integerrima, Blume Bijdr. 414, t. 17. Pterygodium sulcatum, Roxb. Fl. Ind. III, 452.

Sikkim, at the base of the hills; in flower during January; Pantling No. 438. Throughout the whole of India in grassy places on the plains and at low elevations on the hills. Also in Ceylon, China, Java, the Philippines and in Affghanistan.

The flowers are white or pink, the lip being purple at the base and yellow at the apex. A variable plant, in some parts of India assuming a tall slender habit and sometimes attaining a height of 16 or 18 inches. In one form the flowers are larger than in the type, the lip is blunt and white at the base. In another form the lip is altogether white.

Plate 381.-Zouxine sulcata, Lindl. A plant, of natural size. Fig. 1 a flower and its bract, 2 petals, 3 lip, seen from above, 4 apex of ovary and column, side view, showing the membranous dorsal columnar wings (w) covering the anther, the stigmas (s) and the lip ( $l$ ), 5 front view of the column, showing the bifid rostellum $(r)$, the polliniar gland (g), stigma (s) and the dorsal wings of the column $\left(w^{\prime}\right), 6$ anther, under surface, 7 pollinia, upper and lower surfaces; all ontargod.

## 3. Zeuxine goodyeroides, Lindl. Gen. and Spec. Orch., 486.

Plant 4 to 9 in . high, the stem forming about one-third of the whole and bearing two to four oblong-ovate acute leaves with short petioles passing into coloured sheaths at the base, 1 to 1.25 in . long and $\cdot 65$ to $\cdot 75 \mathrm{in}$. broad. Peduncle laxly-pubescent and bearing one or two linear-lanceolate bracts. Raceme 1 to 2 in . long, laxly-flowered, its rachis with a few hairs. Flowers 25 in . long; floral bract almost equalling the ovary in length, ovate, acuminate. Sepals unequal; the dorsal ovate, acute; the lateral pair narrowly lanceolate, spreading, green. Petals falcate, sub-acute, connivent. Lip saccately cymbiform, the apical lobe small and with introflexed margins, the sac bidentate within. Column short, broad, marginally winged below. Anther beaked ; pollinia clavate, attached to a broad caudicle with revolute margins about equal in length to themselves, the gland oblong-quadrate. Stigmas oval, lying on each side of the anther. Hook. fil. Fl. Br. Ind. VI, 107; Ic. Plantar., t. 2172 ; Ann. Bot. Gard., Calc. V, 60, t. 90. Monochilus goodyeroides and M. galeatus, Lindl. in Journ. Linn. Soc. I, 187.

Sikkim, at elevations of about 6,000 feet; in flower during September and October; Pantling No. 189. Assam, Burma.

The flowers are pink passing into white, except the lateral sepals which are often green. The floral bract is pink, and the leaves are velvety green with a pure white line along the midrib.

Plate 382-Zouxine goodyeroides, Lindl. A plant, of natural size. Fig. 1 a flower, 2 the petals, 3 lip, 4 posterior surface of the column, showing the anther in situ, 5 front of the column, 6 under surface of anther, 7 pollinia; all enlarged.
4. Zeuxine abbreviata, Hook. fil. Fl. Br. Ind. VI, 109.

Whole plant about 12 in . high. Stem glabrous, with a few seattered hyaline sheaths. Leaves four or five, unequal, lanceolate, on long peticles with broad sheathing
hyaline bases; length of blade 1.5 to 1.75 in., breadth 5 to 6 in.; petiole and sheath about 1 in . Peduncle about as long as the stem, with one or two short tubular sheaths, puberulous. Raceme 2 to 3 in . long, sparsely-flowered, the rachis puberulous. Flowers sub-globular, $\cdot 2$ inches long; floral bract broadly-lanceolate, acuminate, as long as the stout ovary. Sepals sub-equal, ovate, acute. Petals broader, obliquely ovate, acute. Lip longer than the sepals, saccate at the base, the sac with two lamellæ towards the midrib and a large callus on each side behind the lamellæ; the anterior part tapering to the decurved 2-lobulate apex; the lobules obliquely ovate, sub-acute. Column short and thick, with two vertical fleshy plates each divided into rectangular membranous wings below, rostellum short. Anther ovate, obtuse; pollinia clavate, the apices emarginate and the surfaces vertically grooved, sub-sessile on a narrowly elliptic gland. Hook. fil. Ic. Plantar. t. 2178. Aetheria abbreviata, Lindl. in Wall. Cat. 7385 ; Gen. and Spec. Orch., 491. Etaeria lanceolata, Reichb. fil. in Trans. Linn. Soc. XXX, 142. Dossinia lanceolata, Lindl. in Journ. Linn. Soc. I, 186.

Bhotan, in the Dooars at Ambiok, elevation about 4,000 feet; in flower during September; Pantling No. 346. Nepal; Wallich. Khasia Hills, at elevations from 4,000 to 5,000 feet; Hooker.

The sepals are pale brown and the petals pure white; the anterior part of the lip is also white, but the basal portion as well as the anther are pale yellow; at the base of the column are two brown spots.

Plate 383.-Zeuxine ablreviata, Benth. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 apex of ovary, column with anther in situ, lip and stigma, 3 petals, 4 section of lip showing one of the basal calli and one of the lamellre ( $l$, 5 apex of ovary, showing the column, rostellum $(r)$, and stigma ( 8 ), 6 pollinia; all enlarged.

## 5. Zeuxine glandulosa, new species.

Whole plant 6 to 9 in . high. Stem bearing a few lax hyaline sheaths. Leaves oblong-lanceolate, acute, with a short petiole expanding into a wide hyaline sheath; length of blade 1 to 1.5 in., breadth 25 to $\cdot 35$ in. Peduncle short, pubescent, bearing two lanceolate glabrous bracts. Raceme about 1 in . long, densely glandu'ar-pubescent. Flowers ' 2 in. across; floral bract broadly ovate, bluntly acuminate, shorter than or equal to the densely glandular-pubescent ovary. Sepals connivent, ovate, acute, sub-equal, sparsely glandular-pubescent, the dorsal very concave. Petals sub-rotundly dimidiate, sub-oblique, each with a long terminal apiculus. Lip as long as the sepals, widely saccate at the base, the interior of the sac with a row of three lamellar calli on each side and an incurved conical tooth on each margin. Column with very large lamellate processes having their apices projecting forward, incurved, and touching; rostellum broad, projecting; pollinia pyriform, bifid and deeply grooved, attached to a large oblong elliptic gland having a small viscid area on its under surface. Stigmas two, small, narrowly oblong, situated near the base of the rostellum.

Bhotan Dooar near the Jaldacca river, at an elevation of about 2,000 feet; in flower during March; Pantling No. 434.

The prevailing colour in the flowers of this is olivaceous green, the column and the central contracted part of the lip being white.

This species is allied to $Z$. nervosa, Benth., but differs from that in having smaller leaves of a blackish-purple colour, shorter peduncle and raceme, and smaller flowers.

Moreover the columnar processes are different in shape from those of $Z$. nervosa. The specific name glandulosa is given to this on account of the large quantity of glandular hair on the inflorescence.

Plate 38t.-Zeuxine glandulosa, King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 bract, ovary, column with anther in situ, and lip, 3 petals, 4 lip, 5 section of the lip to show the three calli on one side of the sac and the conical process on its edge, 6 apex of ovary, column showing the rostellum ( $r$ ), columnar calli ( $c$ ), anther (a) and stigma ( $(8)$; all onlarged.

## 6. Zeuxire nervosa, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 600.

Whole plant 6 to 9 in . long, the stem glabrous and bearing near the ground one or two wide truncate scarious sheaths, and higher up two or three obliquely ovate-lanceolate acute leaves 1 to 25 in . long and 65 to 1 in . broad; their petioles about $\cdot 75 \mathrm{in}$,, expanding at the base into broad hyaline sheaths. Peduncle and rachis of raceme with sparse flexuose hairs, the former with one or two lanceolate acuminate bracts. Raceme laxly 3 - to 8 -flowered, about 1 to 1.5 in . long; floral bract ovate, acute, scarious, somewhat longer than the ovary, puberulous. Sepals ovate, blunt, the dorsal very concave, the lateral pair wide-spreading. Petals sub-rotund, dimidiate, abruptly apiculate at one side. Lip longer than the sepals, the base saccately cymbiform, the sac with three small parallel calfi on each side of the interior near the base; apical lobe divided into two sub-quadrate spreading lobules. Column very short; the rostellum 2 -lobed, very broad at the apex, and with a pair of rather small converging processes underneath; pollinia obovoid, bifid, attached to a broad oblong caudicle; the gland large, transparent, the adhesive portion being lanceolate and opaque. Stigmas two, minute, each situated within an angle of the lobed rostellum. Hook. fil. Fl. Br. Ind. VI, 108; Ic. Plantar. t. 2175. Monochilus nervosum, Wall. in Lindl. Gen. and Spec. Orch., 487; Lindl. in Journ. Linn. Soc. I, 187. Etaeria nervosa, Lindl. in Wall. Cat. 7381.

Sikkim; Hooker. Bhotan, at Kumai near the Jaldacca river, at an elevation of about 2,000 feet; Pantling No. 307; in flower during April. Cachar, Sylhet, Assam; Wallich, Mann, Clarke and others.

The sepals are green, the petals white, and the lobes of the lip yellow.
The leaves are green suffused with silvery grey, or green with a broad grey band along the midrib.

Plate 385.-Zeuxine nervosa, Benth. A plant, of natural size. Fig. 1 bract, ovary and flower, side vien, 2 half profile view of column, lip and stigma (s), 3 lip, 4 petals, 5 longitudinal section of the base of the lip to show the triple callus of one side of it, 6 apes of the ovary and the column, showing the anther (a), the stigma of one side (s), the rostellum ( $r$ ), a lateral lobe of the column (l) the pair of eonverging ealli (c), and the base of the lip after the anterion portion has been cut away (b l); all enlarged.

## 7. Zecxine flava, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 600.

Height of the whole plant 6 to 10 in ; the stem about one-third of the whole, with two or three sheaths at the base and three or four leaves higher up. Leaves ovate or ovate-lanceolate with inflated hyaline sheaths, clustered at the top of the stem near the peduncle, withered at flowering time, 1.25 in . long and 5 in . broad. Peduncle rather Ionger than the stem, pubescent and bearing two or three distant linear lanceolate bracts

5 in. long; raceme much shorter than the peduncle, sparsely flowered. Flower - 15 in. long; bract lanceolate, as long as or longer than the stout ovary, sparsely villose. Sepals unequal, ovate-oblong, with a few lax hairs, the dorsal large and very concave, the lateral pair rather smaller. Petals narrowly oblong-elliptic. Lip longer than the sepals, cymbiform at the base and with two oblong calli enclosed in its folds; the anterior lobe with two sub-quadrate oblique diverging terminal lobules. Column short, stout, its apex curved forwards so as to make the anther horizontal, rostellum long; pollinia clavate; gland ob-clavate, transparent. Stigmas small, elliptic, one at each side of the anther. Capsule tumid, narrowly elliptic, ridged, $\cdot 3 \mathrm{in}$. long. Hook. fil. Fl. Br. Ind. VI, 108; Ic. Plantar., t. 2176. Monochilus flavum, Wall. in Lindl. Gen. and Spec. Orch., 487; in Journ. Linn. Soc. I, 187. Etceria flava, Lindl. in Wall. Cat. 7380 A. B.

Sikkim, at the foot of the range and ascending to 3,000 feet; in flower during May and June; Pantling No. 109. Westward to Nepal; Wallich. Assam; Griffith. Tenasserim; Helfer. Ceylon, Central Province, at 3,000 feet; Thwaites No. 3120. Distrib. Java, Borneo.

The ovary and sepals of this are of a dull grayish olivaceous tint; the petals and column are white, the latter tinged with brown; the posterior half of the lip is dull pink, the anterior half being yellow. The anther is pink.

Plate 386.-Zouxine flava, Benth. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 column and lip, 3 lip, 4 profile of column, showing the stigma (s), anther (a), side of the rostellum $(c)$, and polliniar gland $(r), 5$ column, seen from above, 6 front of column, 7 pollinia; all enlarged.

## 8. Zeuxine affinis, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 600.

Height of entire plant 6 to 12 in . Stem stout, bearing several lax hyaline sheaths. Peduncle as long as or longer than the stem, with scattered slender hairs and two distant sheathing acuminate membranous bracts 25 in. long. Leaves ovate-lanceolate, about 1.5 in. long, with short slender petioles and large hyaline sheaths. Racems 1 to 3 in . long. Flowers '25 in. long; floral bract broadly lanceolate, pubescent, nearly as long as the ovary. Sepals unequal, ovate-lanceolate, sub-connivent, laxly hairy. Petals smaller than the sepals, sub-obliquely elliptic. Lip with a cymbiform saccate base bearing two stout teeth at the point of insertion on the column; the apical lobe with two oblong recurved divergent truncate lobules. Column very short, with two large vertical processes beneath the two horizontally projecting lobes of the rostellum. Stigmas large, horizontal, elliptic, one lying behind each arm of the rostellum. Pollinia clavate, sub-sessile on the narrowly elliptic gland; capsule elliptic, narrow, 3 in. long. Hook. fil. Fl. Br. Ind. VI, 108; Ic. Plantar., t. 2177. Monochilus affine, Lindl. Gen. and Spec. Orch. 487 (excl. habitat Courtallam). Etceria affinis, Lindl. in Wall. Cat. 7383. E. Jlava, Wall. Cat. 7380C. Atheria mollis, Lindl. in Journ. Linn. Soc. I, 184.

Sikkim, in the Rungeet Valley, at an elevation of about 1,500 feet; Pantling No. 309 ; flowering in April. Bhotan Duars; Pantling No. 309; Haines, No. 603. Griffith, No. 5351 (Kew Distrib.). Khasia Hills; Clarke, No. 45314, Collett. Tenasserim; Wallich. Penang; Maingay.

The floral bract and the ovary and sepals are green, the petals whitish green and the lip yellow; the column is white, but the anther is pink. At the time of flowering the leaves are usually brown.

Plafe 387,-Zeuxine affinis, Benth. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 petals, 3 lip, 4 side view of column and lip, the anther ( $a$ ), the two arms of the rostellum ( $r$ ), a stigma ( $s$ ), 5 stigma $(s)$, gland of the pollinia (g), the columnar processes below the rostellum (c), the two arms of the rostellum $(r)$, the anther (a), 6 lower surface of anther, 7 pollinia; all enlarged.

## 9. Zeuxine reflexa, nem species.

Whole plant 7 to 9 in. high. Stem about 3 in. thick, succulent, bearing a few lax byaline sheaths. Leaves narrowly ovate, acute, with a short petiole expanding into a wide hyaline sheath, withered at flowering time; length 1 to $1 \cdot 25 \mathrm{in}$. Peduncle about as long as the stem, with long lax hairs and one or two short lanceolate bracts. Flowers ' 25 in. long; floral bract lanceolate, nearly as long as the ovary. Sepals subequal, ovate-lanceolate, concave, laxly pubescent externally. Petals lanceolate, blunt. Lip longer than the sepals, saccate at the base, the interior of the sac with a single laminar callus at each side; apical lobe with two diverging oblong-quadrate lobules and a minute apiculus at the apex of the sinus between them. Column short, its processes obliquely oblong, horizontal, shorter than the linear arms of the rostellum, its anterior face concave. Anther elongate; pallinia obliquely clavate-ablong, sessile on the narrowly elliptic gland.

Sikkim, at Mungpoo, elevation 3,500 feet; in flower during April; Pantling No. 361 ,

The colour of the sopals is green and that of the petals white; the limb of the lip is yellow and its sac white.

This is allied to $Z$. afinis, but has a different column; the processes in this being horizontal while in that they are vertical. The apical lobules of the lip are also larger in Z. affinis.

Plate 388.-Zouxine refloxa, King and Pantling. A plant, of natural sizo. Fig. 1 bract, ovary and flower, 2 profile of column and lip, one of the stigmas (s), 3 petals, 4 lip, 5 apex of ovary and column showing anther (a), stigma (s), columnar processes (c p), rostellum $(r)$ and gland of pollinia ( $p \mathrm{~g}$ ), 6 under surface of empty anther, 7 pollinia; all onlargod.

## 10. Zeuxine pemila, King and Pantling.

Height of whole plant 3 to 5 inches. Stem decumbent at the base, erect upwards, stout for the size of the plant. Leaves rather thick, ovate, acute, the edges undulate; length -35 to $\cdot 7 \mathrm{in}$.; petiole 3 to $\cdot 4 \mathrm{in}$. long, expanding to a broad stem-clasping base. Peduncle only about 1 in . long, pubescent, bearing a single lanceolate acuminate bract tubular at the base. Flowers two to four, not crowded, sessile, broad at the base, -35 in. long; foral bract broad, sub-acute, shorter than the sessile ovary. Sopals cohering, sub-equal, ovate; the dorsal concave, with an obtuse recurved tip; the lateral pair with very broad oblique bases, sub-acute. Petals as long as the sepals, oblanceolate-oblong, their apices abruptly and bluntly apiculate, erose. Lip longer than the sepals, with a wide shallow sac at the base having a large callus in its interior at each side; the claw in front of the sac long and narrow, convolute; apical lobe divided into two broad diverging obliquely-oblong lobules. Column short, thick, with a pair of small oblong processes near the middle in front. Anther fleshy, with a thick blunt lip. Stigmas large,
sub-rotund, inserted at the sides of the gland of the pollinia; pollinia obovoid-clavate, sessile on the pentagonal gland. Odontochitus pumilus, Hook. fil. Ic. Plant. t. 2163; Hook. fil. Fl. Br. Ind. VI, 99. Cheirostylis pusilla, (in part) Lindl. in Journ. Linn. Soc. I, 188 (not of Gen. and Spec. Orch.).

Sikkim, at Tendong, at elevations of about 6,000 feet; in flower during July; Thomson, Hooker, King, Pantling No. 162.

The flowers are pure white with a tinge of green on the claw of the lip.
Plate 389.-Zeuxine pumila, King and Pantling. A plant, of natural sizo. Fig. 1 bract, ovary and flower, 2 the petals, 3 the column and lip, as seen from above, also the stigmas ( 8 ), 4 the foregoing in profile, a stigma $(s), 5$ seotion of the base of the lip, showing one of the calli on its side within, 6 column showing anther (a), gland of pollinia (g), stigmas (s), and columnar processes (c $c$ ) , 7 anther, 8 pollinia; all enlarged.

## 11. Zeuxine Franchetiana, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 341.

Height of the whole plant 6 to 9 in. Roots short, tubercular. Stem 6 to 9 in. long, the nodes slightly swollen. Leaves few, scattered, glabrous, linear-lanceolate and much reduced in the flowering plant; in the young plant 25 to 35 in . long, ovate and shortly petiolate. Raceme less than 1 im . long, pubescent, 1- to 2 -flowered. Flowers $\cdot 25$ to $\cdot 3$ in. long; floral bract ovate, shorter than the ovary. Sepals oblong, curved, connate for one-third their length; the dorsal concave, shorter than the lateral pair. Petals broad, sub-quadrate, with an oblique midrib. Lip slightly exceeding the sepals, abruptly deflexed from the saccate base ; the limb very shortly clawed, deeply divided into two linear obliquely sub-acute divergent lobules separated by a wide sinus. Column with two pyriform processes immediately beneath the rostellum. Anther-beak decurved. Pollinia sub-ovate, divergent when released from the anther; the caudicle acuminate and the gland oblong.

Sikkim, abnve Sureil; elevation 6,500 feet; flowering in August; Pantling No. 338.
A very distinct species named in honour of M. Franchet, the distinguished French botanist who has so successfully elaborated the extraordinarily rich collections made by the Abbé Delavay in the highlands of south-western China. This species is intermediate between Cheirostylis and Zeuxine. It resembles Cheirostylis in having a connate perianth, but the column is rather that of Zeuxine.

The flowers are white with a dash of green near the base of the lip.
Plate 398.-Zeuxine Franchetiana, King and Pantling. Two plants in flower, and the upper part of the stems of two in leaf, of natural size. Fig. 1 floral bract, ovary and flower, 2 apex of ovary, column with anther in situ, stigma (s) and lip, seen from the side, 3 the petals, 4 lip, 5 section of lip to show the interior of the basal sac, 6 and 7 side and frout views of the column with the columnar processes ( $c \quad p$ ), stigma ( $s$ ) and rostellum ( $r$ ), 8 anther, 9 pollinia; all enlarged.

## 83. Anœestochilus, Blume.

Terrestrial herbs with succulent stems decumbent at the base and with stout hairy roots. Leaves thick, ovate or lanceolate, with petioles sheathed at the base; peduncle and rachis of spike or raceme glandular-pubescent. Sopals free, unequal ; the dorsal smaller, ovate, and with the beaked petals forming a hood over the column; the
lateral pair free or united at the base, spreading, larger than the dorsal. Lip adnate to the end of the column by a long toothed or pectinate rarely entire claw, saccate or spurred at the base, the sac produced beyond the bases of the sepals or quite covered by them, its interior with two tooth-like or laminar calli; terminal lobe with two large diverging oblong or sub-quadrate usually truncate lobules. Column short, with appendages in front. Anther 2-celled; rostellum twisted; pollinia two and bifid, rarely four, clavate, lamellate, narrowed into pseudo-caudicles, or attached to true caudicles and inserted on a narrow gland. Stigmas usually two, situated one at each side of the rostellum, or united into a transverse band on the column beneath it, rarely single and undivided. Species about forty; natives of India, and of the Malayan and Pacific Islands.

The genus Ancectochilus was founded by Blume in 1825. The same author, in 1858, instituted his genus Odontochilus, separating it from Ancectochilus on account of the shorter sao of its lip and of its being concealed by the bases of the sepals; and also because of the more developed columnar processes. Lindley had, in 1840, founded his genus Hamaria, which he differentiated from Ancectochilus chiefly by the claw of the lip being entire and by its sae being hidden by the bases of the petals. These distinctions appear to be insufficient to justify generic rank; and as Sir Joseph Hooker, in a note under Odontochilus Clarkei, in his Ioones Plantarum (t. 2168), gives it as his opinion that Odontochilus and Anectochilus should be united, we now venture, not only to carry out the union, but also to include Hamaria. We feel the more justified in doing this, since dissection of living flowers of several of the species included in Odontochilus as it stood, discloses divergencies in the stigmatic character which appear to us of more importance than those depended upon for the separation of the three genera just mentioned. In the genus thus constituted the pollen-masses taper into long caudicle-like prolongations by which they are attached to the gland. These pseudo-caudicles are composed of lamelliform grains connected to each other by elastic threads.

Stigmas two, distinct and situated one on each side of the rostellum. Spur or sae of lip conical and projecting beyond the bases of the sepals, not septate, the contained calli oblong.

Claw of lip with long fimbriate teeth; petals with long narrow curved beaks

1. A. Roxburghii.

Claw of lip with short teeth; petals with short broad beaks . . . 2. A. Sikkimonsis.
Stigmas two, united by their inner margins and forming a transverse band across the front of the column below the rostellum.

Claw of lip deeply toothed or fimbriate.
Sac of lip covered by the generally united bases of the sepals, globose, didymous, septate and with a usually recurved conical spur-like callus in each chamber
Sac of lip oblong, parallel with the ovary, not bifd, containing two sub-quadrate lamellar calli
3. A. lancoolatus.
4. A. grandiflorus.

Sac of lip globose, shortly bifd, containing two short conical teeth
5. A. Ehcosii.

Claw of lip not toothed
6. A. crispus.

Stigma one, undivided, occupying the front of the column below the rostellum and above the columnar processes
7. A. tortus.

1. Angetocimlus Roxburghir, Lindl. in Wall. Cat. 7387; Gen. and Spec. Orch., 499.

Height of the entire plant not exceeding 12 inches, half being stem and half inflorescence. Leaves ovate or ovate-oblong, acute; the petioles short and somewhat
expanded at the base, glabrous like the stem. Peduncle glandular-pubescent, bearing three to five seattered oblong sheathing bracts with acuminate apices. Raceme much shorter than the peduncle, bearing two to five resupinate flowers about 8 in . long; foral bract half as long as the sessile cylindrie ovary, glandular-hairy like the ovary. Sepals unequal; the dorsal broadly ovate, acuminate, its apex shortly reeurved; the lateral pair oblong, acute, all glandular-hairy. Petals smaller than the sepals, obliquely oblanceolate with hooked apices. Base of lip adpressed to the face of the column and with two ealli; claw with seven or eight pairs of slender unequal horizontal fimbrix; terminal lobes linear-oblong, blunt, widespreading, recurved. Appendages on the front of the column large, parallel, extending from the ovate fleshy rostellum to the spur. Stigmas two, elliptic, small. Spur as long as the lateral sepals, tapering to the minutely bilobed apex, and having two large wart-like processes inside. Anther acuminate; pollinia four, elavate, in two pairs united at their bases and both attached to a lanceolate gland. Blume Floræ Javæ, Orchid., 41, t. 12 B, fig. 2; Hook. fil. Fl. Br. Ind. VI, 95, Chrysobaphus Roxburghii, Wall. Tent. Fl. Nep., 37, t. 27.

Sikkim, in the bottoms of tropical valleys and along the base of the range; in flower during November; Pantling No. 6. Westward to Kalka and eastward to Bhotan; also in Assam, Sylhet and Munipur.

The sepals and petals are of a very pale pink, almost white, the lip being pure white. The leaves have a velvety lustre and are purplish-red with golden reticulations; in the mid-area of the leaf the red passes into golden or greenish-yellow tinged with pink.

Plate 390.-Aneitochilus Roxjurghii, Lindl. A plant in flower, of natural sze. Fig. 1 a flower, 2 bract, sessile ovary, column, stigma (s), spur and lip, in profile, 3 the petals, 4 front view of the column and spur, the anterior wall of the latter having been removed to show the two wart-like processes in its interior, also the rostellum ( $r$ ) and the stigmas (s), 5 empty anther, 6 pollinia; all enlarged.

## 2. Axæзтосhilus Sikkimensis, King and Pantling Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 124.

Whole plant 6 to 9 in. high. Stem procumbent and about 25 in, thick near the base, with four or five leaves, glabrous. Leaves elliptic-ovate, acute, narrowed to the broadly sheathing petiole; length 2 to 2.5 in., breadth 1 to 1.35 in.; petiole 65 in.; peduncle of the raceme glandular-pubescent and with several distant sheathing acuminate bracts $\cdot 5 \mathrm{in}$. long. Raceme 1.75 to $2 \cdot 25 \mathrm{in}$. long, glandular-pubescent; floral bract lanceolate, shorter than the ovaries. Flowers $\cdot 6 \mathrm{in}$. long. Dorsal sepal oblong, blunt, concave; lateral pair oblong, acute, spreading. Petals dimidiate, straight along the inner margin, dilated upwards along the outer, and broadly beaked near the apex. Lip with two terminal divergent obliquely cuneate lobes; the claw with four pairs of short forward-pointing teeth. Spur short, pouch-like, bifid, the calli within it ovoid. Column with two parallel raised lines below the large ovate rostellum resting on a large forcipate process, beneath which again are two flat converging calli. Pollinia flattened, curved, oblong, sub-equal in length; the gland embraced by the united bases of the pseudo-caudieles.

Sikkim, at 3,000 to 5,000 feet elevation; not uncommon ; flowering in September; Pantling No. 285.

The sepals are olive-green and white; the lip is white, the teeth of the claw being green, as are also the column and spur. The upper surface of the leaves is of a very dark red colour with a velvety sheen and veined with golden yellow, the lower surface is of a uniform dull red.

This differs from A. Roxburghiï (which it resembles in leaves) in its smaller flowers, differently shaped petals and pollinia, also in the terminal lobes of the lip. and in the teeth of the claw which in this are much smaller. Its nearest ally as regards floral structure is, however, A. Grifithii, Hook. fil., a species of the Naga Hills, which has green leaves without reticulations, and a more distinctly winged claw with larger teeth and a longer spur.

Plate 391.-Anectochilus Sikkimensis, King and Pantling. A plant, of natural sizo. Fig. 1 a flower, 2 bract, ovary, column and lip, in profle, 3 front of column and portion of the spur with the anterior wall cut away to show the two calli, 4 petals, 5 lower surface of anther, 6 pollinia; all onlargys.

## 3. Angectochilus lanceolatus, Lindl. Gen. and Spec. Orch. 499.

Whole plant 9 to 12 in . high. Stems glabrous, decumbent at the base and with a few annular thickenings, Leaves ovate or ovate-lanceolate, acute or sub-acute, narrowed to the base, 1.25 to 2.25 in . long; petiole 75 to 1 in ., with a wide tubular or sheathing base. Peduncle short, pubescent, and bearing one or two ovatelanceolate acuminate sheaths, tubular at the base and pubescent. Raceme longer than the peduncle, laxly many-flowered, the rachis pubescent. Flovers about 75 in . long; floral bract ovate-lanceolate, acuminate, sub-glabrous, as long as the glabrous ovary. Sepals unequal; the dorsal ovate, acute; the lateral pair larger, ovate-oblong, 1 -nerved, obtuse, spreading. Petals as large as the dorsal sepal and, with it, forming a hood over the column, dimidiately reniform, acuminate. Lip with a globose didymous basal sac containing two long spur-like processes ; the claw with seven or eight pairs of oblique unequal coarse teeth; the apical lobe with two diverging oblong obliquely truncate lobules, the sinus between them broad and minutely apiculate at its apex. Column very short, thick, with two obtusely triangular processes; rostellum broad. Anther with an oblique recurved beak; pollinia obovoid, united through a sigmoid pseudo-caudicle to the small oblong gland ; the pollen grains cuneiform. Stigmas two, large, lateral. Lindl. in Journ. Linn. Soc. I, 179. A. luteus, LindI. 1. c. 179. Odontochilus lanceolatus, Benth. in Gen. Plantar. III, 601 ; Hook. fil. Fl. Br. Ind. VI, 101; in Ann. Bot. Gard. Cale. V, 59, t. 89. O. favus (error for O. luteus), Benth. Gen. Plantar. III, 598.

Sikkim, at elevations of from 5,000 to 6,000 feet; Griffith (Kew Distrib. No. 5345); Clarke, Gammie, Prain, King, Pantling No. 196 and 461. Yoksum at 7,000 feet; Pantling No. 461; in flower during July, August and September. Khasia Hills; Griffth (Kew Distrib. No. 5352).

The sepals and petals are of a pa'e green, the dorsal sepal being tinged with brown; the lip is of a brilliant yellow and the anther is pink. The leaves are green with three bright white nerves.

Plate 392.-Ancetochilus lanceolatus, Lindl. A plant, of natural sisc. Fig. 1 a flower, scen from alore, 2 side view of floral bract and ovary, column with anther in situ, and base of lip, 3 seetion o preceding, showing the septum and one of the two spur-like calli inside the sac of the lip, 4 front of the column, slowing the anther (a), gland of the pollinia ( $g$ ), a stigma ( $s$ ), columnar proeessee ( $p$ ), ard portion of the sac (c), 5 pollinia; all enlarged.

## 4. Ancectochilus grandiflorus, Lindl. in Journ. Linn. Soc. 1, 179.

Whole plant 12 to 18 in . high; the stem decumbent at the base, succulent, 35 in . thick, glabrous; the roots stout and vary hairy. Leaves elliptic or elliptic-rotund, sometimes oblique, sub-acute, many-nerved, narrowed to the long stout petiole; length $2 \cdot 75$ to 3.75 in ., breadth 1.5 to 2 in.; petiole 1.4 to 1.75 in . Peduncle 2 to 2.5 in . long, sparsely pubescent, and with two or three broad sheathing ovate bracts. Raceme longer than the peduncle, laxly many-flowered, the rachis laxly pubescent. Flowers .75 in . long; floral bract ovate-lanceolate, convolute, glabrescent, about half as long as the glabrous ovary. Sepals unequal, glabrous; the dorsal ovate, concave; the lateral pair slightly larger, spreading, oblong. somewhat falcate, sub-acute, coanate with each other at the base and with the sac of the lip. Petals about as large as the dorsal sepal, falcately oblanceolate, bluntly acuminate. Lip with a rather long oblong horizontal sac or spur at the base decurrent on the ovary; the claw long and with distant and unequal teeth on each side; apical lobe with two oblong diverging lobules with truncate erose apices; the sinus very wide and with a minute apiculus at its apex; the sac with a lateral sub-quadrate apiculate eallus on each side in its interior. Column short, with two narrow appendages; rostellum large, broad, bifid. Anther much pointed; pollinia clavate, compressed, the apices emarginate, united below and joined directly to the small gland by a long pseudocaudicle. Stigmas two, coajoined, anticous. Olontochilus grandiflorus, Benth. in Gen. Plantar. III, 598; Hook. fil. Fl. Br. Ind. VI, 100.

Sikkim, at elevations of from 4,000 to 6,000 feet; Hooker; at Tendong, Pantling No. 325 ; in flower during July. Khasia Hills; Hooker and Thomson.

The sepals and potals are pale green, mottled with white and tippod with pink. The lip is white, the teeth of the claw being green and the sac being flushed with yellow; the column is green bolow and pink above. The leaves on both surfaces are pure green. The flowers at the middle of the raceme are occasionally the first to open, expansion proceeding upwards and downwards simultaneously as shown in the plate.

Plate 393.—Ancestochilus grandiflorus, Lindl. A plant, of natural size. Fig. 1 a flower, scen from aboce, 2 apex of ovary, spur of lip, column and anther, scen from the side, the stigma $(s)$, the rostellum and the gland of the pollinia ( $g$ ), 3 front of column with the transverse united stigmas and the gland of the pollinia $(g), 4$ the petals, 5 section of column and spur, showing one of the calli in the interior of the latter, 6 pollinia; all enlarged.

## 5. Angectochilus Elwesir, King and Pantling.

Whole plant 8 to 10 in . high. Stem rather stout, decumbent at the base, glabrous. Leaves six or seven, ovate, acute, narrowed at the base, 3 -nerved, the margins hyaline, length 1.25 to 1.75 in.; petiole about $\cdot 5$ in., expanded at the base. Peduncle shorter than the stem, clothed with long soft glandular hairs and bearing several lanceolate acuminate bracts. Raceme shorter than the peduncle and, like it and the floral bracts and ovaries, glandular-hairy. Flowers two or three, about 1 in. long; floral bract lanceolate, as long as the ovary. Sspals unequal, the dorsal ovate-cordate, sub-acute; the lateral pair much larger, broadly oblong, sub-falcate, blunt, diverging. Petals broadly oblong, falcate, acute, about as long as the dorsal but much shorter than the lateral sspa's, 1-nerved, and with a few long hairs outside. The basal sac of the lip shallow, shortly bifid, and containing within it two conical
calli; the claw narrow and bearing about six pairs of coarse teeth on each side; the apical lobe divided by a broad deep sinus into two diverging obliquely-oblong or sub-quadrate truncate undulate lobules. Column stout with two parallel appendages in the neck of the spur. Anther beaked; pollinia ob'ique, unequal, clavate but flattened, pseudo-caudicle short; gland situated on one side of the twisted beak of the anther. Stigmas confluent in front of the column. Odontochilus Elwesii, Clarke ex Hook, fil. Fl. Br. Ind. VI, 100 ; Hook. fil. Ic. Plantar., t. 2167.

Sikkim, at Choongthang, Tendong, Pankasari, \&c., at elevations of from about 3,000 to 6,000 feet; Clarke, King, Pantling No. 22t; in flower during July and August. Khasia Hills, at Shillong; Clarke. Naga Hills, at Kohima; Prain No. 17.

There is some variation in the colouring of the flowers and leaves of this species. The common form in Sikkim has the sepals green with white midribs and brown tips, and the petals white, also tipped with brown. The lip is white, but the teeth of the claw are brown and the basal sac is green. The leaves are of a uniform brown, as also is the axis. Dr. Prain, who made careful notes on the plant as it grows at Kohima in the Naga Hills, describes the sepals as coloured like those of the Sikkim plant; the petals being green and the claw of lip yellow for the most part, but having a red central line and its teeth being greenish-yellow, the apical lobules being white. The leaves he describes as olive green on the upper surface and coppery on the lower.

Plate 394.-Ancestochilus E'vesii, King and Pantling. A plant, of natural sizs Fig. 1 the sepals and petals separated, 2 the lip with its sae and the apex of the ovary and column, scen from above, 3 anterior surface of column and apex of ovary; portion of the sac of the lip, the anterior part having been removed so as to show one of the teeth within it and the columnar appendages, also the gland of the pollinia (g), 4 anther with the pollinia in situ and polliniar gland (g), 5 empty anther, 6 pollinia with gland (g), 7 the base of the pollinia to show the relation of the gland (g); all enlarged.

## 6. Anactochilus crispus, Lindl. in Journ. Linn. Soc. I, 180.

Whole plant 5 to 8 inches high. Stem decumbent at the base, slender. Leaves fow, ovate, acute, the edges minutely undulate, length $\cdot 5$ to $\cdot 75 \mathrm{in}$.; petiole $\cdot 35$ to $\cdot 65$ in long, dilated at the base. Peduncle much shorter than the stem, pubescent and with one or two pubescent lanceolate sheaths with acuminate apices and tubular bases. Spike 4 - to 8 -flowered. Flowers 7 in. long; floral bract pubescent, lanceolate, about as long as the glabrous ovary. Sepals unequal, pubescent; the dorsal convex, its apex upturned; the lateral pair longer, spreading, oblong, with obliquely sub-acute apices. Petals triangular-falcate, conniving under the dorsal sepal. Lip deflexed from the base with a small globular sac at the base connected with the apical lobe by a long narrow untoothed claw; the apical lobe sub-rotund, divided by a shallow sinus into two broad lobules, the edges undulate and minutely crenulate or dentate, the interior of the sac with two large sub-quadrate erose lamellæ. Column and rostellar arms short. Anther broad, with a narrow pointed beak; pollinia sub-globose; the pseudo-caudicle large, broad, and composed of cohering imbricating scales without elastic threads; gland small, quadrate. Stigmas anticous and parallel. Olontochilus crispus, Hook, fil. Fl. Br. Ind. VI, 99; Hook. fil. Ic. Plant., t. 2164.

Sikkim, on Mahalderam peak, at an elevation of about 6,000 feet; in flower during September; Pantling No. 294. Khasia hills at 5,000 feet; Clarke.

Ann. Roy. Bot. Gard, Calcetta, Vol. VIII.

The sepals are green, the petals and lip being white, the latter tinged with yollow on the sac. This has the toothless lip-claw of Zeuxine conjoined with the psoudocaudicular pollinia and twisted rostellum so characteristic of Anœectochilus.

Plate 395.-Ancectoclitus crispus, Lindl. A plant, of natural size. Fig. 1 a flower, 2 floral braet, ovary, column and base of lip, 3 the petals, 4 apex of ovary, and front of column, showing the two contiguous antieous stigmas (s), 5 interior of the sac of the lip, showing the calli in the interior, 6 anther, 7 pollinia; all enlarged.

## 7. Anectochilus tortus, King and Pantling.

Whole plant 6 or 7 in. high. Stem decumbent at the base, stout, bearing four or five leaves. Leaves green, 3-nerved, ovate to ovate-lanceolate, acute, slightly oblique, narrowed at the base into the channelled sheathing petiole; length about 2 in., breadth 75 to 1 in.; petiole 75 in . Peduncle of the raceme pubessent and bearing a solitary acuminate pubescent bract. Spike about 1.5 in . long, 3 - to 6 -flowered; floral bract lanceolate, acuminate, thinly pubescent, equalling the ovary. Flowers 75 in. long. Dorsal sepal broadly ovate, concave, forming with the petals a hood over the column; the lateral pair oblong. blunt and spreading, all pubescent outside. Petals falcately rhomboid, sub-acuminate. Lip with a short sub-globose saccate base, a long toothed claw, and a much twisted apical lobe deeply divided into two sub-quadrate slightly divergent irregularly crenate lobules the upper margins of which are connivent; the sac containing two approximate stout up-turned teeth; the claw with nine unequal teeth on each margin. Column with two small approximate up-turned teeth below the entire anticous stigma; arms of the rostellum large, winged, bidentate. Pollinia in sub-equal pais, united midway into a pseudo-caudicle; the gland small, ovate, lateral. Odontochilus tortus, King and Pantling in Journ. As. Soc. Beng. LXV, Pt. 2, 125.

Bhotan, at Kumai near the Jaldacca river, elevation about 4,000 feet; flowering in December; Pantling No. 354.

The nearest ally of this species is undoubtedly 0 . Elwesii, Clarke; but that species has very dark purple leaves, smaller than those of this and thicker in texture. O. Elvesii besides has a longer more pubescent peduncle than this which never bears more than three flowers. Moreover the lip of 0 . Elwesii is not twisted, and its claw has only seven pairs of teeth, while the sac of the lip is bilobed and the column has large processes. The colour of the sepals and petals of this is green, the lip being white and the anther pale brown.

Plate 396. - Ancestochilus tortus. - King and Pantling. A plant, of natural size. Fig. 1 a flower, 2 profile view of apes of ovary, column with anther in situ, and the saceate base of the lip, showing the polliniar gland $(g)$ and one of the stigmas $s), 3$ front view of the column, showing the polliniar gland $(g)$ and the stigma ( $s$ ), 4 vertical section of the preceding, showing the callus on one side of the interior of the sae of the lip, 5 petals, 6 pollinia; all enlarged.

## 84. Cheirostylis, Blume.

Terrestrial herbs with stems decumbent and succulent at the base. Leaves membranous. Flowers few, racemose. Sepals united in their lower half into a ventricose tube. Petals shorter than the sepals. Lip saccate or cymbiform at the base, the sac with enclosed calli or setæ; the anterior lobe clawed, bilobulate or fimbriate. Columni
short, with two long fleshy appendages in front, rostellum two-cleft. Stiymas two, lateral. Anther erect, its cells short; pollinia two, bipartite, inserted by a short caudicle on an oblong gland. Species about 12, Indian and Malayan.

## 1. Cheirostylis Griffithir, Lindl. in Journ. Linn. Soc. I, 188.

Whole plant 4 to 7 inches high. Stem succulent, decumbent below, glabrous, bearing some scarious sheaths. Leaves withered at flowering time, ovate, sub-acute, the bases cuneate; petioles short, expanding into wide hyaline sheaths; length of blade 75 to 1 in ., breadth ' 5 to 6 in . Peduncle as long as the stem but more slender, pubescent, and bearing several loose acuminate scarious sheaths more than 5 in . long. Flowers one or two at the apex of the peduncle, 75 in . long, (excluding the pubescent tumid ovary); floral bract lanceolate, acuminate, shorter or longer than the ovary. Sopals connate to the middle into a tube, pubescent especially towards the base; the free points acute, spreading. Petals narrowly oblong, falcate, acute, shorter than the sepals. Lip with an elongate concave base slightly saccate underneath its attachment to the column, the sac with two parallel rows of short glandular setæ within it ; apical lobe of the lip orbicular, its edges coarsely fimbriate. Column elongate, with two linear erect processes equal in length to the spathulate arms of the rostellum and covering the gland of the pollinia. Hook. fil. Fl. Br. Ind. VI, 105. Goonyera, No. 9, Griff. Notul. III, 393.

Bhotan, on low hills near the Jaldacca river; elevation 4,000 feet; in flower during December; Pantling No. 353.

Khasia Hills; Lobb, Clarke. Burma, in Pegu; Kurz No. 355; in Tenasserim; Parish. The flowers are pure white throughout.
Plate 397.-Cheirostylis Griffithit, Lindl. A plant, of natural sise. Fig. 1 a flower, side viso, 2 floral bract, ovary, column with anther in situ, lip and stigma (s), seen from the side, 3 lip, upper surface, 4 petals, 5 apex of ovary, column with its processes ( $c p$ ), one of which is bent down to show its outline, gland of pollinia $(g)$ and stigma $(s), 6$ empty anther, 7 pollinia and gland, side view; all enlargod.

## 85. Hetæria, Blume.

Terrestrial herbs with the characters of Goodyera but the flower everted so that the lip is superior. Lip adnate to the column. Stigmas two, lateral. Species about 13, Indian.

Heteria rubens, Benth. in Benth. and Hook. fil. Gen. Plantar. III, 603.
Whole plant 10 to 18 in . high, about half being leaf-bearing stem and glabrous; the rest peduncle, puberulous, and bearing a few scattered lanceolate acuminate sheaths with a terminal raceme. Leaves ovate to elliptic, somewhat oblique, sub-acute, 3 to 45 in. long and 1.75 to 2 in . broad, 5 -nerved. Raceme 3 or 4 in . long, many-flowered, its rachis densely glandular-pubescent. Flowers -3 in . long; foral bract lanceolate, acuminate, shorter than the glandular-tomentose cylindric ovary. Sepals broadly ovate. Petals hammer-shaped, clawed, gibbous on one side. Lip short, sub-hemispheric, with a small transverse, sometimes bifid, terminal lobe and a slightly carunculate callus on each side towards the base within. Column very short, with two small wings in front. Anther ovate-cordate, convex; pollinia clavate, pyriform, longitudinally grooved, attached by the short thin caudicle to the small sub-quad.ate gland. Hook. fil. F1.

Br. Ind. VI, 115. Rhamphidia rubens, Lind. in Journ. Linn. Soc. I, 182. Cerochilus rubens, Lindl. in Gard. Chron. 1854, 87. Goodyera No. 4, Griff. Notul. III, 390.

Sikkim, at elevations of from 1,500 to 3,000 feet, common; in flower during January and February; Pantling No. 202. Assam; G. Mann. Chittagong; Lister. Burma; Griffith (Kew Distrib. Nos. 5341 and 5342).

The sepals and petals are green tipped with pink, the lip green tipped with white, and the column yellowish-pink. The ovaries are of a dull dark purple, and the floral bracts of a pale bright purple or red. The leaves are green.

Plate 399.-Heteria rubens, Benth. A plant, of natural size. Fig. 1 floral bract, ovary and flower, 2 floral bract, ovary and column, showing the anther (a), stigma (s), and lip ( $l$, 3 lip, 4 apex of column showing the polliniar gland ( $p g$ ) and stigma ( $s$ ), 5 pollinia, 6 a part of the peduncle showing the glandular hairs; all enlarged.

## Tribe VI.-OPHRYDEAE.

Anther-cells sessile on the column, anticous or posticous, discrete or contiguous, but always distinct, parallel or diverging, often with tubes from their bases, each with a staminode on its outer surface; pollinia two, rarely four, usually with caudicles and always with glands; the glands naked or enclosed in the same pouch or in two distinct pouches. Stigmas two, distinct or conjoined below the anther-cells; pollen granular or sectile, not waxy.

> Anther-cells anticous, lip with a single spur.
> Flowers in spikes or racemes, small or mediocre; the sepals larger than the petals.
> Lip with a long spur.
> Flowers pink or purple, sometimes white; anther-cells without tubes; polliniar glands often in a pouch . . . 86. Orchis.
> Flowers green or yellowish-green, rarely white; anthercells often with long tubes; polliniar glands naked (except in $H$. pseudophrys)
> 87. Habenaria.
> Lip with no spur or with a very inconspicuous short suborbicular spur; flowers green; anther-cells with long tubes; polliniar glands naked . . . . . . . . . . . . . 88. Herminium.
> Flowers solitary, large; the sepals smaller than the petals . . . 89. Diplomeris.
> Anther-cells posticous or sub-anticous; lip with two spurs . . . . . 90. Satyrium.

## 86. Orchis, Linn.

Terrestrial erect leafy herbs with oblong or digitately lobed tubers, or with fleshy fibrous roots. Leaves sheathing, not plicate. Flowers medium-sized, usually pink or purple, rarely white, not green, in spikes or racemes; the floral bract small, or foliaceous and exceeding the flower. Sepals sub-equal, the dorsal conniving to form a hood with the petals, the lateral pair spreading. Petals like the sepals or smaller. Lip adnate to the base of the column, spreading or pendulous, entire or 3 -lobed, rarely 4 - or 5 -lobed, always spurred. Column very short. Anther-cells two, anticous, parallel, contiguous, without tubes; pollinia usually attached to caudicles; glands two, distinct or united,
lying in a common pouch, or naked. Staminodes rugulose, attached to the outer surfaces of the anther-cells or to the column by their sides. Stigmas united into a transverse band lying across the column for its whole breadth, or distinct and at the margins of the column (0. habenarioides). Species about 80; natives of Europe, temperate parts of Asia and Africa, also of Madagascar.

A genus very closely allied to Herminium and Hubenaria, and senior to both in order of publication, seeing that the name was adopted from Tournefort by Linnæus; while Herminium originated with Linnæus, and Habenaria was not published by Willdenow until 1805. For convenience for study, and with the view of avoiding a formidable increase to the already almost insupportable burden of synonymy, we propose to leave the genera as they are. Herminium and Hubenaria are at present kept out of Orchis by characters founded on the colour of their flowers, which is either green or greenish-yellow (white in a few species of Hubenaria), while the flowers of Orchis are mostly pink or purple. In Herminium and Habenaria the anther-cells have tubes which are absent in Orchis. In other respects the characters of the three gerera are substantially the same. The minute saceate form of the spur (when a spur is present at all) serves to some extent as a character to keep Horminium distinet from Orchis and Habenaria, in both of which a spur is largely developed. In Herminium the glands of the pollinia are invariably naked, and in all the Indian species of Habenaria (with the solitary exception of H. pseudophrys) these glands are also naked; whereas, in the majority of the purple-flowered species ranked under Orchis, the two polliniar glands rest within a common pouch. Ophrys (also a Linnean genus) is closely allied to Orchis, but is distinguished from the latter by the absence of a spur and also by the presence, on the upper surface of the convex lip, of calli and other processes of which there is no trace in the flat lip of Orchis. In three of the four species of Orchis described in this book the stigmas are united, but in $O$. spathulata they are distinct.

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Stigmas distinct.
    Lip without side lobes.
        Apical lobe of lip rounded, entire . . . . . . . . . 1. O. spathulata.
Stigmas united.
    Apical lobe of lip with three shallow crenations . . . . . . 2. O. habenarioides.
    Lip 3 -lobed, the lobes sub-equal . . . . . . . . . . . 3. O. Chusua.
    Smaller in all its parts, the lobes much shallower . . . 3. " (var. nana).
    Lip with large oblong truncate side lobes; the apical lobe with
        two truncate lobules almost as large as the side lobes . . . 4. O. pulerula.
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## 1. Orchis spathulata, Reichb. fil.

Whole plant 2 to 8 inches high. Stem proceeding from a thin rhizome, with one or two lax tubular blunt sheaths at its base. Leaf solitary from very near the base, (rarely a second from the middle of the stem) narrowly elliptic, blunt, tapering into a petiole of varying length; length of blade 1 to 3 in ., breadth 4 to 1 in ., the petiole about the same length; stem above the leaf elongate, naked, slender, angled. Spike short, 1- to 4 -flowered. Flowers nearly 5 in . across (vertically); floral bract longer than the flower, foliaceous, lanceolate, sub-acute. Sepals unequal, the dorsal ovate, obtuse, conniving with the petals to form a hood; the lateral pair as long, oblong, sub-acute, spreading. Petals broadly elliptic, falcate, tapering slightly to the obtuse oblique apex, somewhat shorter than the sepals. Lip as long as the sepals, broadly elliptic, obtuse at base and apex, the edges sub-undulate; the upper surface slightly pubescent, with numerous shallow vertical grooves running from base to near the apex, and with a slightly thickened area in front of the entrance to the spur; spur about half as long as the ovary,
straight, vertieal, eylindric, tapering slightly to the tip. Pollinia pyriform; the caudicles short, tapering; the glands elliptic, lying concealed in the rostellar pouch, or naked, (the rostellar pouch being rudimentary). Staminodes rather small, rugulose, broadly elliptie, lying opposite the bases of the anther-cells. Stigmas distinct, elliptic, widened at the lower end attached to the margins of the column interior to the staminodes. Hook fil. Ic. Plantar., t. 2197 A ; Fl. Br. Ind. VI, 127. Gymuadenia spathulata, Lindl. Gen. and Spes. Orch. 280.

Sikkim, at Gnatong, elevation 11,000 feet; on the Sin-ga-le-la range, elevation 12,000 feet; in flower during July; Pantling Nos. 327 and 382. Lachung; Hooker, G. Gammie, Nos. 210, 776. Chumbi; King's Collectors. Gharwal-Himalaya; Duthie Nos. 194 and 515.

In this species the stigmas (unlike those of typical Orchis) are distinct and situate on the margins of the column, thus affording a connecting link with Habenaria in which distinct stigmas are common.

The colour of the flowars is white or purple. In some specimens the polliniar glands are covered by the single rostellar pouch characteristic of the genus Orchis; but in a large proportion of specimens the glands are practically naked, the rostellar pouch being quite rudimentary and lying behind and beneath the glands.

Plate 400.-Orchis spathulata, Reiehb. fil. A plant, of natural sizo. Fig. 1 bract, ovary and flower, 2 ovary, column and lip, in profle, 3 lip, 4 the petals, 5 and 6 two views of the column-fig. 5 showing the lateral stigmas $(s)$, the polliniar glands $(p g)$ naked, (the rostella being very small, rudimentary, and lying below and behind the glands and not covering them in front); fig. 6 showing the polliniar glands in a single rostellar pouch ( $r$ ), the lateral stigmas ( $s$ ), and one of the staminodes $(8 m)$; the base of the lip ( $l$ ) is also shown-7 pollinia; all enlarged.

## 2. Orchis habenarioides, King and Pantling.

Height of entire plant 12 to 20 inches. Stems clothed at the base with unequal tubular sub-acute wide-mouthed sheaths, tuber digitate. Leaves four or five, scattered along the stem, sessile, elliptic-oblong to linear-obloag, sub-acute, slightly narrowed to the rather long sheath; length 2 to 5 in ., breadth 75 to 1.25 in .; stem above the leaves short and bearing two or three lanceolate spreading bracts. Spike 1.5 to 2.5 in . long, densely-flowered, cylindric. Flowers - 25 in . across; floral bract herbaceous, lanceolate, aeuminate, longer than the shortly-beaked curved ovary. Sepals sub-equal, puberulous, broadly ovate; the dorsal forming a hood with the petals; the lateral pair spreading, their apices acute and somewhat reflexed. Petals nearly as long as the sepals, obliquely ovate-rotund, cut away near the broad base at the inner side, the apex minutely apiculate. Lip broadly oblong, the base truncate and adnate to the base of the column, the apex broad with a very shallow central lobe, the upper surface quite smooth; spar as long as the ovary, eurved, slightly clavate, laterally compressed, puberulous inside. Column short, broad. Anther-cells parallel, not far distant from each other ; pollinia broadly elliptie, somewhat oblique, very obtuse at the apex; the caudicles short, stout, tapering, without pouches; glands oblong, the free ends truncate, the lower attached to the caudicle nad embedded in the stigma. Staminodes large, sub-orbicular; rugulose, lying at the sides of the candicles. Stigmas conjoined into a narrow band running beneath the orifice of the spur transversely from side to side of the column, and becoming wider opposite
that orifice. Gymnadenia cylindrostachya, Lindl. in Wall. Cat. 7056; Gen. and Spec. Orch., 278. G. orchidis and G. violacea, Lindl. Gen. and Spec. 1. e. Platanthera orchidis, Lindl. in Wall. Cat. 7039A. Habenaria orchidis, Hook. fil. Fl. Br. Ind. VI; 142.

Sikkim, on the Sin-ga-le-la range and in the Lachong Valley. at elevations of about 12,000 feet; in flower during August; Pantling No. 404. Bhotan in the Chumbi Valley; King's Collector. Nepal; Wallich. Kashmir; Clarke No. 29239. Pangi; Stolickza.

The colour of the flowers is pinkish or violet, but occasionally they appear to be pure white. This plant is to some extent variable, and was described from imperfect herbarium material under three specific names by Lindley, but always under the genus Gymnadenia. It had originally been referred by him in Wallich's Catalogue (No. 7039) to Platanthera. But the latter genus was by Lindley himself finally considered as inseparable from Gymnadenia. In dealing, in the Flora of British India, with the three Himalayan species of Gymnadenia described by Lindley, Sir Joseph Hooker transfers G. spathulata and G. Chusua to Orchis, but he transfers G. orchidis (and the two which he reduces to it) to Habenaria, with the remark that, as a Habenaria, it forms a very anomalous member of the section (Platyglossa) where he places it. Believing that this plant is really more of an Orchis than of a IIabenaria, we have ventured to transfer it to the former. We are keenly alive to the fact that the line of demarcation between the two genera is a very uncertain one; and we think it advisable to give considerable weight to the colour of the flower, which in this plant is pink or purple (the prevailing colour in Orchis), whereas in the undoubted Indian species of IIabenaria the flowers are usually of some shade of green or of greenish-yellow, even white itself being uncommon.

Plate 401.-Orchis habonarioiles, King and Pantling. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 column showing the anther-cells, pollinia and their caudicles and glands ( $p$ g) in situ, staminodes (s), stigma (b), and mouth of spur (c), 3 petals, 4 lip, 5 section of sfur, 6 pollinia; all enlargol.

## 3. Orchis Chusua, Don Prod. Fl. Nep. 23.

Entire plant from 4 to 10 in. high; tuber small, elliptic, entire. Stem with two unequal tubular blunt sheaths at the base. Leaves one or two, wide apart on the stem, narrowly oblong, acute, not narrowed to the sheathing base; length 1.5 to 3 in ., breadth $\cdot 2$ to $\cdot 3$ in ; the second leaf, when present, much smaller than the first; stem above the leaves short, naked. Spike 1 to 1.75 in. long, 3 - to 6 -flowered, secund. Flowers $\cdot 6$ in. to .75 in . across (vertically); floral brait foliaceous, lanceolate, as long as the fusiform ovary Sepals oblong, blunt, the dorsal resting on the parallel petals; the lateral pair recurved. Petals broadly ovoid, dimidiate, sub-acute, the bases truncate. Lip deep'y 3 -lobed; the lobes equal, oblong, biunt, the lateral ones diverging; spzr eylindrie, slightly clavate, as long as and adpressed to the straight ovary. Column short. Anther-cells parallel, lying close together; pollinia ovoid-globose, narrowed very little to the long tapering caudicle; the glands small, ovate-oblique, each lying in a small pouch. Staminodes large, rugulose, ovate, pinted, attached outside the bases of the anther-cells. Stigmas conjoined into a large concave surface under the anther-cells. Hook. fil. Fl. Br. Ind. VI, 127. Gymnadenia Chusua, Lindl. in Wall. Cat. 7058; Gen. and Spec. Orch. 280. G. puberula, Liudl. in Wall. Cat, 7059.

Sikkim, at elevations of 10,000 to 13,000 feet; Hooker and others; on the Sin-ga-le-la range and at Tallum Sam-dong in the Lachen valley, at similar elevations, Pantling No. 458; in flower during Ju'y and August. Nepal; Wallich. Kamaon; Duthie. Also in Eastern Tibet; M. Soulie No. 210.

The colour of the flowers is dark purple.
We have retained this plant in the genus Orchis, in spite of its having the separate pouch to each gland which is supposed to be characteristic of Ophrys, while in Orchis there is supposed to be only a single pouch for the two glands. In some species of Orchis, however, there is no pouch whatever; and in 0 . spathulata, Reichb. fil., specimens are common in which the pouch is developed, while in others it is so rudimentary as to leave the glands practically naked. The character founded on a pouch appears thus to be untrustworthy. We prefer, therefore, to give more weight to characters derived from structures other than those we would otherwise have relied upon and to put this plant into Orchis rather than into Ophrys, because (a) of the presence of a well-developed spur equalling the ovary in length [there being no spur whatever in typical Ophrys, and only a very short one in a single species ( 0 . tabanifera, Willd.), which has been referred to that genus]; (b) of the entire absence of calli or other appendages on the flat lip (the lip of Ophrys being usually convex with reflexed margins, and bearing calli or other processes on its upper surface); (c) of the total absence of hairs on all parts of the flower (the petals and lip of many species of Ophrys being pubescent); and, finally, because of the absence in the column of this plant of an apical process to the clinandrium. The specimen figured on Plate 400 represents a large form of the species which is quite common. Growing side by side with it is a dwarf form which, except in siza, differs little from the larger one. Between the two there are numerous gradations. To this dwarf form we have given the varietal name nana, and of it we also give a figure.

Var. nana. Whole plant 2 to 3 in . high; differing from the larger form in its much smaller size, in having only a single leaf, in the middle lobe of the lip being less deeply lobed, and in the spur being somewhat compressed. Pantling No. 326.

Plate 402.-Orchis Chusua, Don. Two plants, of natural sizs. Fig. 1 a flower, front vieno, 2 bract, ovary, column and lip, seen from the sile, 3 the petals, 4 section of spur, 5 apex of ovary and column, showing the anther cells with the reoeptacles of the glands of the pollinia $(r)$, the staminodes and the stigma (s), 6 pollinia; all enlarged.

Plate 402 bis.-Orchis Chusu, Don, var. nana, King and Pantling. Three entire plants, of natural size. Fig. 1 a flower, front vien, 2 side view of ovary, column, spur and lip, 3 petals, 4 section of spur, 5 column showing the anther, pouched rostellum $(r)$ and stigna ( $s$ ), 6 pollinia-all enlarged; 7 tuber at base of stem; of natural sise.

## 4. Orchis puberula, new species.

Whole plant not more than six inches high, slender. Leaf solitary, linear, acute, not tapered to the base, 2 to 3 in . long and about $\cdot 12 \mathrm{in}$. broad. Spike terminal, peduncled, 2- to 3 -flowered. Flowers two or three, about 35 in . long; bract lanceolate, half as long as the stalked ovary. Spals strongly keeled, puberulous externally; all (but especially the ovate dorsal one) concave; the lateral pair narrower than the dorsal. Petals lanceolate, falcate, sub-acuminate, not united into a hood with the
dorsal. Lip about twice as long as the sepals, much decurved, the lateral lobes broadly oblong with truncate apices; the terminal lobe divided into two truncate lobules almost as large as the side lobes; the whole upper surface puberulous; spur half as long as and lying parallel to the ovary, cylindric, sub-acute. Anther with parallel cells ; pollinia sub-obovoid, the caudicles clavate; the glands small, nearly naked, their lower halves being only partly covered by the small tongue-like rostellar pouch. Staminodes elongate.

Sikkim, in the Lachong valley, at 10,000 feet; flowering in July; Pantling No. 478.
This species resembles the small forms of 0 . Chusua, Don, but has puberulous strongly-keeled sepals and a very puberulous practically 4-lobed lip; the flowers are white.

Plate 403.-Orchis pulorula, King and Pantling. Three plants, of natural size. Fig. 1 side view of a bract, ovary and flower, 2 lip, 3 column, showing the anthers and almost naked polliniar glands, the staminodes and the stigma (s), 4 pollinia; all enlarged.

## 87. Habenaria, Willd.

Terrestrial leafy herbs with undivided or lobed tubers or fleshy root-fibres. Leaves not plaited, their bases sheathing. Flowers in racemes or spikes. Sepals sub-equal, the dorsal often connivent with the petals to form a hood over the column; the lateral pair spreading, reflexed or deflexed, or sometimes erect. Petals smaller or larger than the sepals, entire or 2 -cleft. Lip adnate to the base of the column, entire, 3 -lobed or 3 -partite, its base spurred. Anther-cells adnate to the front of the short usually broad column, discrete, rarely touching, parallel or divergent below, their bases often prolonged into tubes containing the caudicles. Staminodes rugulose, lying one on the outer side of each anther-cell. Pollinia two, clavate or pyriform, usually grooved, sometimes 2-partite; caudicles long, short or absent; glands exposed, flat and discoid, or elliptic or globular, or elongate with truncate ends [conjoined and overlapped by processes of the rostellum (?) in $H$. secundiflora]. Stigmas two, distant from each other or conjoined to form a belt across the face of the column. Species about 400 ; cosmopolitan, temperate and tropical.

A genus which should certainly be reduced to the older Linnæan genus of Herminiun were it not for the upsetting of synonymy which this wou'd involve. The older genus consists of about 13 species; Habenaria contains about 400! Moreover the distinctions between Habenaraa and Orclis are also mostly arbitrary; and, were mere consistency the only object, Orchis (a genus of Tournefort) would swallow up not only Herminium and Habenaria, but also Diplomoris and Hemipilia. Genera are after all little more than conveniences for facilitating study, and there seems no necessity for applying the Draconian principles of Kuntze at the expense of much discomfort to the students of this beautiful family. We have arranged the species in the sections adopted by Sir J. D. Hooker in his admirable account of the genus in the Flora of British India.

Sect. I.-ATr.-Petals bipartite; lip 3 -lobed or 3 -partite.

Lip hastately 3 -partite, the lower lobe of the petals short Segments of the lip and of the sepals filiform, and the apices of all the sepals with long filiform tails

1. $\boldsymbol{H}$. stenopetala.
2. H. stenopetala, var. polytricha.

Sect. II.-Platyglossa.-Petals entire. Lip 3-lobed or 3-partite, the side lobes broad, the apical lobes narrow.
Side lobes of lip cuneate or rounded, the edges fimbriate or crenate

## 2. H. geniculata.

Side lobes of the lip deeply pectinate.
Leaves linear-lanceolate, acuminate; sepals unequal, the lateral pair erect, with recurved apices; petals narrowly oblong, falcate, ciliate, not dilated at the base; spur slightly longer than the ovary
3. H. pectinata.

Leaves narrowly elliptic; sepals narrowly elliptic-oblong; the lateral pair sub-falcate, horizontal, ciliolate; petals much dilated at the base on the outer side, the inner surface pubescent; spur much longer than the ovary

Sect. III.-Trimeroglossa.-Petals entire. Lip 3-partite, the side-lobes very narrow, usually filiform.
Stigmas conjoined beneath the orifice of the spur, obovoid with a bifid apex
5. H. Aitchisoni.

Stigmas separated from each other and lying at the sides of or above the entrance to the spur.

Lip hastately 3 -partite, the side lobes horizontal; spur shorter than the sepals and much shorter than the ovary, clavate or fusiform
Segments of the lip all pointing forwards, the lateral diverging, curved, longer than the stouter straight middle segment; spur very slender, not clavate or bulbous, much longer than the ovary
Segments of the lip all pointing forwards, the lateral shorter than the flexuose central segment; spur half as long as the ovary, its apex globose or clavate

Sect. IV.-Hologlossa.-Petals entire. Lip narrow, entire or with minute basal lobes.

* Stigmas conjoined, but not forming a band across the column.

Staminodes much shorter than the anther-cells; pollinia grooved but not divided; flowers not secund.

Conjoined stigmas forming a small transversely elliptic body situated between the polliniar glands and above the orifice of the spur; lip lanceolate, 3 -nerved, quite entire
Conjoined stigmas forming an elliptic rotund vertically grooved mass below the orifice of the spur; staminodes obovoid, transverse
Conjoined stigmas forming a large globose mass above the orifice of the spur; staminodes ovoid-globose
10. H. Bakeriana.
11. H. juncea.

Staminodes as long as the anther-cells and parallel with them; pollinia divided to the base; stigma forming an entire ovate area situated immediately below the polliniar glands
** Conjoined stigmas forming a band extending across the whole breadth of the column.

Pollinia without caudicles; sepals and petals comnivent
9. H. stenantha.
-
12. H. urceolata.
13. H. nenatocaulon.

Pollinia with long caudicles; lip narrowly oblong, tapering, acuminate.

Lip not bent near the apex; lateral sepals much convolute, reflexed; floral bracts much longer than the flower, recurved
14. H. Sikkimensis.

Lip bent just below the apex; lateral sepals reflexed but not convolute; floral bracts not much longer than the flower, not decurved
15. H. Dyeriana.
** Stigmas two, quite distinct.
Spur shorter than the sepals and much shorter than the ovary.
Lip oblong-lanceolate, deflexed from the base, blunt, fleshy, with two minute horizontal side lobes near the base; spur compressed from front to back; sepals and petals all connivent to form a hood

16. H. Biermfiniana.

Lip linear, obtuse, straight, with a transverse callus on the upper surface near the base, but with no side lobes; spur laterally compressed; lateral sapals reflexed 1\%. H. densa.

Spur much longer than the sepals and also longer than the ovary.
Pollinia sessile on a long narrow gland truncate at each end.
Leaves two, narrowly elliptic, acute; lip fleshy, oblonglanceolate, deflexed ; staminodes smooth, ovate, falcate, pointed; stigmas broadly oblong, curved, situated at the sides of the orifice of the spur
18. H. leptocaulon.

Leaf solitary, oblong-oblanceolate, blunt; lip lanceolate, not deflexed; staminodes large, globose, rugulose; stigmas orbicular-ovoid projecting
19. H. oligantha.

Pollinia with caudicles and small elliptic or elliptio-rotund glands.
Lip tapering slightly to the apex, almost terete; petals bluntly caudate-acuminate
20. H. latelabris.

Lip fleshy, cylindric; petals bluntly acuminate, not caudate
21. H. Cumminsiana.

Sect. V.-Pbristylus.-Petals entire, sometimes broader than the lateral sepals, and often fleshy; lip little or sometimes not at all longer than the sopals, 3 -lobed in its anterior half; spur shorter than the sepals and much shorter than the ovary, often wide or globular.
Stigmas conjoined into a narrow reniform horizontal band; spur horizontal, cylindric
22. II. albo-marginata.

Stigmas distinct.
Leaves several.
Spur fusiform, lateral sepals spreading
23. H. Parishii.

Spur ovoid, constricted at the neck; lateral sopals pointed
upwards
24. H. tentaculata.

Axn. Roy, Bot. Gard., Calcutta, Vol. VIII.

Leaf solitary.
Spur sub-cylindric, 2 -ribbed inside; lateral sepals pointed

$$
\begin{aligned}
& \text { upwards . . . . . . . . . . . . . . . 25. H. fallax. } \\
& \text { Spur globular. } \\
& \text { Flowers } 75 \text { in. across at the mouth .... . . . 26. H. constricta. } \\
& \text { Flowers not exceeding } 35 \text { in. across at the mouth. }
\end{aligned}
$$

Lip flat, not gibbous at the base, but with a shallow basal concavity on its nearly flat upper surface ; flowers about 35 in . across

2Y. H. goodyeroides.
Lip gibbous at the base and with a horizontally oblong callus near its base; flowers scarcely 25 in. in diam.
27. IH. goodyeroides,
var. affinis.
Lip concave, without any calli; flowers about $\cdot 15$ in. across.

> Anthers not at all covered by the side-wings of the column; polliniar glands not in pouches . . . . Prainii. Anthers partly covered by the side-wings of the column; each of the polliniar glands in a pouch . . . . . . . . . . 29. H. pseudophrys.

Sect. VI.-Dipxla.-Glands of pollinia conjoined into a single body, bifid at each end and covered by two flaps of tissue ; flowers secund
30. H. secundiflora.

1. Habenaria stenopetala, Lindl. Gen. and Spec. Orch., 324.

Height of the whole plant one to three and a half feet; basal third of the stem clothed with closely-fitting sheaths. Leaves distributed over the upper two-thirds of the stem, membranous, oblong-lanceolate or ovate-lanceolate, acute, the edges undulate, the base usually broad (rarely narrowed) amplexicaul or sheathing, sessile; length 3 to 8 in ., breadth 1.25 to 2.75 in .; the part of the stem above the leaves and below the raceme with lanceolate acuminate bract-like leaves much smaller than those of the middle-stem. Raceme 4 to 9 in. long, crowded. Flowers about 1 in. in diam.; floral bract lanceolate, acuminate, about as long as the slender stalked ovary. Sepals subequal, oblong-lanceolate, acuminate, spreading or reflexed. Petals shorter than the sepals, linear, produced as a wing downwards a little below the point of insertion lip as long as the petals, hastately 3 -partite; the segments narrow, fleshy, the central segment horizontal, the basal pair sometimes as long as the central, but usually shorter; spur as long as the stalked ovary, slender, vertically compressed, 2-ridged, up-turned. Column stout. Anther-cells rather distant, parallel, narraw, erect, their tubes long; pollinia oblong, their caudicles slender and twice as long as themselves, the glands minute. Staminodes ovate, rugulose, situated externally to the anther-cell and stigma on each side. Stigmas two, oblong, with slightly divergent blunt apices, situated below the anthers and at the margins of the mouth of the spur. Capsule linear-oblong. Hook. fil. Fl. Br. Ind, VI, 134 ; Ann. Bot. Gard. Calc. V, t. 95; Kräntzlin in Engl. Bot. Jahrb., XVI, 162.

Sikkim, at elevations of from 2,000 to 6,000 feet; in flower from August to October; Pantling No. 57. Westward to Gharwal. Upper Assam, Bengal.

The colour of the lip is brown, but that of the other pieces of the perianth is pale green.

Var. polytricya, Hook. fil. Ann. Bot. Gard. Calc. V, 64, t. 96. Spiles short ( 2 to 3 in . long). Sepals and petals produced into long capillary tails; the dorsal sepal 1.25 in. long, its base gibbous, its long tail curving over the column ; the lateral pair shorter, deflexed on the ovary, their tails up-turned. Petals each consisting of two capillary segments of about equal length, one ascending, the other descending, and both flexuose. Lip of three curved deflexed segments like those of the petals; the compressed spur triangular in section.

Sikkim, at elevations of about 5,000 feet; in flower during August and September; Pantling No. 415.

The flowers are pale green in colour in all their parts.
Plate 404.-Habenaria stenopotala, Lindl. Part of a plant, of natural size; an entire plant, reduced in size. Fig. 1 a flower, the basal lobe of a petal ( $p$ ), 2 apex of ovary and column, showing the rostellum ( $r$ ), pollen glands ( $p g$ ), stigma ( $s$ ), the mouth of the spur ( $g$ ), 3 petals, 4 lip, 5 section of spur, 6 pollinia; all enlargod.

Plate 404 bis.-Habenaria stenopotala, Lindl., var. polytricha, Hook. fil. Parts of a plant, of natural size. Fig. 1 a flower and its bract, 2 apex of ovary, column showing the 2-lobed stigma (8) (the pollinia absent), 3 the petals, 4 section of the spur, 5 pollinia; all onlarged.

## 2. Habenaria geniculata, Don Prodr., 25.

Height of plant 12 to 30 in . Tubers ellipsoid, pubescent. Lower part of stem sheathed, middle paxt leafy, upper part bracteate. Leaves oblong-elliptic, acute, 5 - to 7 -nerved, the base narrowed into a long tubular sheath; length 2 to 4.5 in .; the bracts lanceolate, acuminate, becoming narrower upwards, 1.5 to 1 in . long. Spike 2 to 4 in. long, rather laxly-flowered. Flowers 8 to 1 in. across; floral bract lanceolate, acuminate, as long as the shortly beaked fusiform ribbed ovary. Sepals sub-equal, broadly ovate, acute, spreading, the lateral pair sub-erect. Petals narrowly oblong, sub-acute, curved inwards, shorter than the sepals. Lip as long as the sepals, variable in breadth, sub-orbicular or broadly obcordate, with large cuneate or rounded, fimbriate or crenate side lobes, and a small, much shorter, oblong entire apical lobe ; spur infundibuliform at the base, slender, laterally compressed, geniculate, sub-clavate below the knee, longer than the shortly-stalked beaked ovary. Anther-cells broad, distant, divaricate, their tubes elongated and curved inwards. Staminodes sub-globular, tuberculate, situated on the sides of the anther. Pollinia two, broadly ovate in general outline, compressed, each consisting of two thin granular plates attached to a stout incurved caudicle triquetous above and tapering to the small hemispheric gland. Stigmas two, sub-cylindric-clavate, falcate, rather blunt, the entrance to the spur lying between their bases ; infertile stigma forming a low broad fleshy arch between the anther-cells. Capsule shortly pedicelled, fusiform, ribbed, the apex beaked, 1 in. long. Lindl. Gen. and Spec. Orch. 324 ; Hook, fil. Fl. Br. Ind. VI, 138; in Ann. Roy. Bot. Gard. Calc. V, 65, t. 98 ; Kräntzlin in Engl. Bot. Jahrb. XVI, 198. Platanthera geniculata, Lindl.
in Wall. Cat. 70t2. IIabenaria, Griff. Notul. III, 406 ; Itin. Notes 31, No. 495; Ie. Pl. Asiat., t. 340.

Sikkim, at elevations of from 2,500 to 5,000 feet, common ; Pantling No. 97. Westward to Nepal. Also in the Khasia and Naga Hills, and in Burma.

The flowers of this are white and the bracts green. The pollinia, as has been above indicated, are composed of two thin flat granular plates (of pollen masses) so closely adherent to each other that it is impossible to detach the one plate from the other. Kräntzlin (Engl. Bot. Jahrb. XVI, 199) reduces to this Platanthera dentata, Lindl. Gen. and Spec. Orch., 296. (Orchis de.itata, Swartz Act. Holm. 1800, p. 207; Willd. Sp. Pl., Vol. IV, 42.)

Mr. Pantling, who has collected this species very largely, finds that a form of it with spurless flowers is very common (see Figs. 4 and 5 of the plate). The flowers of this form have moreover an entire lanceolate lip, as though the side lobes on a lip of the usual form had been removed. The two stigmas in this variety are also united, whereas in the normal flower they are separated by the area in the centre of which lies the orifice of the spur. Except for these differences the plant in every way resembles the typical form.

Var. ecalcarata. Spurless; stigmas united; lip lanceolate-oblong.
Plate 405.-Habenaria geniculatn, Don. Parts of a plant, of natural size. Fig. 1, column showing the pollen ehambers and their staminodes, rostellum, stigmas (s) and mouth of the spur, 2 section of spur, 3 pollinia, 4 flower of var. ecalcarata, showing the oblong, lanceolate lip ( $b$, and united stigmas ( $s$ ), 5 floral bract, ovary and remains of the flower of the spurless variety; all enlurgel.

## 3. Habenaria pectinata, Don Prod. Fl. Nep., 24.

Whole plant 12 to 30 in.; lower part of stem stout and bearing long tubular clasping sheaths with acute apices. Leaves distributed in the upper part of the stem, sessile, linear-lanceolate, acuminate, strongly 3 -nerved, the bases broad and sheathing or stem-clasping; length 4 to 7 in ., breadth at the middle 5 to $\cdot 8 \mathrm{in}$.; those nearest to the raceme much smaller. Raceme 3 to 6 in . long. Flowers $1 \cdot 25$ to $1 \cdot 5 \mathrm{in}$. in diam.; foral bract linear-lanceolate, longer than the sub-sessile ovary. Sepals unequal; the dorsal lanceolate, erect, the lateral pair rather wider, sub-falcate, acute, erect, with recurved apices. Petals forming a hood with the dorsal sepal, narrowly oblong, falcate, acute or obtuse, the outer margins shortly ciliolate. Lip as long as the sepals, deeply 3 -lobed; the middle lobe linear; the side-lobes rather longer, deeply pectinate on the outer margin; spur laterally compressed, rather longer than the ovary, sigmoid or geniculate, dilated at the apex. Anther-cells divergent, their lobes very long; pollinia narrowly elliptic, grooved, their caudicles as long as themselves, slender, curved, the glands discoid, minute. Stigmas linear, divergent, situated on the sides of two thin elongate distant sub-horizoatal processes. Capsule almost sessile, fusiform, thickly ribbed. Wall. Cat., 7029 A. and B. in part; Lindl. Gen. and Spec. Orch., 321; Hook. fil. Flis Br. Ind. VI, 137. II. pectinata and I. arietina, Hook. fil., Kräntzlin in Engl. Bot. Jahrb. XVI, 193. II. Gerardiana, Wall. Cat., 7031. II. ensifolia, Lindl. in Wall. Cat. 7030; Lindl. Gen. and Spec. Orch., 321. Orchis pectinata, Smith Exot. Bot., t. 99.

The dorsal sepal and petals are greenish-white, the lateral sepals dark green, and the lip white.

Sikkim, at Namgah, elevation 5,000 feet; in flower during August; Pantling No. 177. Westwards along the range to Simla, at elevations of 5,000 to 8,000 feet. Khasia Hills.

Plate 406.-Habenaria pectinata, Don. Parts of a plant, of natural size. Fig. 1 a flower, 2 apex of ovary and column, showing the stigmas ( $s$ ), anther with its elongated processes, and the mouth of the spur $(c), 3$ the petals, 4 section of spur, 5 pollinia; all enlarged.

## 4. Habenaria arietina, Hook. fil. Fl. Br. Ind. VI, 138.

Habit and general appearance of $I I$. pectinata, but the leaves much broader, narrowly elliptic, acute or shortly acuminate; the raceme 5 to 8 in . long. Sepals narrowly oblong-elliptic; the lateral pair sub-falcate, ciliolate. Petals much dilated at the base externally, bluntly acuminate, puberulous, erect and adpressed to the dorsal sepal. Lip as in. $H$. pectinata, but the side lobes with fewer teeth; spur laterally compressed, much longer than the ovary; pollinia broader than in II. pectinata, and more distinctly grooved. Hook. fil. in Ann. Bot. Gard. Calc. V, 6t, t. 97. II. pectinata, Lindl. (not of Wallich) Gen. and Spec. Orch. 341; Wall. Cat. 7029, B. (in part) and C.

Sikkim, at Tumlong above Pemiongchi, Re-chi-la; at elevations of 6,000 to 9,000 feet; in flower during July and August; Pantling No. 333. Westward along the range to Simla. Khasia Hills, at elevations from 5,000 to 6,000 feet.

The flowers of this are green throughout. As in the case of II. pectinata, specimens dry black, and the two species are so similar that Wallich issued both under the same number (7029); while Lindley, in describing H. pectinata in his Genera and Species of Orchids, gave, as has been pointed out by Sir Joseph Hooker in his Flora of British India, Don's name pectinata to the wrong plant. Kräntzlin does not admit this as a species, but reduces it to H. pectinata.

Plate 407.-Habenaria arietinn, Hook. fil. Part of a plant, of natural sieo. Fig. 1 a flower, 2 column showing the anthers, staminodes, and stigmas $(s), 3$ section of spur, 4 pollinia; all onlargad.
5. Habenaria Aitchisoni, Reichb. fil. in Trans. Linn. Soc., Ser. 2, Bot. III, 114 ; Boiso. Fl. Orient. Suppl. 370, var. Josephi, Hook. fil. Fl. Br. Ind. VI, 152.
Height of the whole plant about 5 in.; tuber large, irregularly ellipsoid, hairy. Leaves two, sessile, orbicular, cuspidate, opposite and rising about 1 in . from the base of the stem. Peduncle glandular-pubescent, longer than the stem or the raceme, ebracteate. Raceme 1.5 to 2 in. long, 4 - to 6 -flowered, the rachis glandular-pubescent. Flower 65 in. in diam.; floral bract linear-lanceolate, shorter than the slender-stalked glandulose ovary. Sepals sub-equal; the dorsal ovate, acute, forming a hood with the broadly lanceolate acuminate petals; lateral sepals wide-spreading, acute. Lip divided to the base into three linear lobes, the middle one straight, the lateral pair longer and with recurved tips; spur curved forward, clavate towards the apex, as long as the short curved ovary. Column short, stout. Anther-cells parallel, separated from each other by an area with the mouth of the spur in the middle; pollinia globular-ovoid; tho
caudicles short, rather stout; the glands large, thick, diseoid, lying close under the mouth of the spur; staminodes elongate, lying at the side of the anther. Stigmas united below the mouth of the spur, obovoid with a bifid apex; infertile stigma forming a thickened rim above the mouth of the spur. Hook. fil. Fl. Br. Ind. VI, 152; Kräntzlin in Engl. Bot. Jahrb. XVI, 15t. H. brachyphylla, Aitch. and Hemsl. in Journ. Linn. Soc. XIX, 118 (not of Krüntzlin). H. Josephi, Reichb. fil. in Trans. Linn. Soc. 1. c. 114.

Sikkim, in the Lachen Valley, at elevations of 10,000 to 11,000 feet; in flower during July; Pantling No. 398. Westward to Kashmir, at rather lower elevations. Also in Affghanistan, Kuram Valley.

The colour of the flowers is greenish.
Prate 408.-Habenaria Aitchisoni, Reiehb. fil, var. Josephi, Hook. fil. A plant, of natural size. Fig. 1 a flower with part of its ovary, 2 floral bract, ovary, column and lip with its spur, in profile, 3 the petals, 4 section of spur near the tip, 5 front view of the column, showing the base of the lip, the conjoined stigmas (s), the staminodes (b), the glands of the pollinia ( $p g$ ), and the mouth of the spur (c), 6 front and side views of pollinia and their appendages ; all enlarged.

## 6. Habenaria aristata, Hook. fil. Fl. Br. Ind. VI, 158.

Whole plant 12 to 20 in . high, tubers oblong. Stem very slender, with many clasping blunt sheaths in its lower fourth, its next fourth leafy and the upper half bracteate. Leaves three to five, unequal, the middle ones the largest, elliptic-lanceolate, acute, slightly narrowed to the shortly-sheathed base; length 2 to 4 in., breadth .5 to $\cdot 75$ in.; bracts tubular, lanceolate, acute, diminishing in size upwards, 1.5 to 5 in . long. Spike narrow, 2 to 8 in . long, many- but laxly-flowered. Flowers about 5 in. in diam. at the mouth; floral bract broadly lanceolate, acuminate, as long as the erect sessile shortly-beaked ovary. Sepals sub-equal, linear, obtuse; the lateral pair turned upwards and slightly spreading. Petals conniving with the dorsal sepal to form a hood, falcately ovate-lanceolate, sub-acute, their bases oblique. Lip slightly longer than the sepals, hastately tripartite; the middle segment linear, obtuse, shorter than the filiform lateral horizontally spreading lobes; spur variable, shorter than the sepals and much shorter than the ovary, clavate or fusiform, curved. Column very short, depressed. Anther-cells small, parallel, tubes none; pollinia small, obovoid, longer than the oblique caudicles; gland sub-rotund, minute. Stigmas two, narrowly oblong, situate at the sides of the mouth of the spur ; staminodes on the ridges above the stigmas. Capsule fusiform. Peristylus aristatus, Lindl. Gen. and Spec. Orch. 300; Thwaites' Enum. Pl. Ceyl. 310 (in part, excl. syn.). P. exilis, Wight Ic., t. 1693.

Sikkim, at Labba, Choongthang, Tumlong and Pashating; elevations 6,000 to 7,000 feet; in flower during August; Pantling No. 176. Khasia Hills, at elevations of 4,000 to 5,000 feet; Hooker and Thomson. Ceylon, at Newera Elia, elevation 6,000 feet; Thwaites.

The colour is green throughout.
Platr 409.-Habenaria aristata, Hook. fil. A plant, of natural sise. Fig. 1, floral braet, ovary and flower, 2 column showing the back of the anther and the stigmas (s), 3 the petals, 4 section of the spur, 5 pollinia; all cnlarged.

## 7. Habenaria furcifera, Lindl. Gen and Spec. Orch, 319.

Whole plant 10 to 18 inches high. Stem sheathing near the base, the leaves crowded below the middle, the upper part bracteate. Leaves narrowly elliptic, acute, slightly narrowed to the sheathing base; length 2.5 to 4.5 in ., breadth 9 to 1.35 in .; bracts lanceolate, acuminate, diminishing upward, $1 \cdot 2$ to 8 in . long. Raceme 5 to 7 in. long, many- but laxly-flowered. Flowers 5 in . in diam. (from base to apex); floral bract linear-lanceolate, acuminate, scarcely so long as the shortly-stalked ovary. Sepals unequal; the dorsal concave, ovate-oblong, obtuse; the lateral pair rather shorter, broadly lanceolate, somewhat falcate, acute or acuminate, spreading. Petals as long as the dorsal sepal, oblong, slightly retuse, forming with the dorsal sepal a hood over the column. Lip longer than the sepals, divided to the base into three segments; the lateral segments filiform, curved, diverging, longer than the stouter blunt middle one; spur longer than the ovary, very slender, laterally compressed, curved towards the apex. Anther-cells touching, their tubes rather short, diverging; pollinia falcately ovoid, almost as long as their slender slightly-curved caudicles; glands narrowly oblong; staminodes rather large, broadly oblong, situated at the side below the anther-cells. Stigmas two elliptic, blunt, one at each side of the entrance to the spur, the infertile stigma forming a thickened rim at the upper part of that orifice. Capsule fusiform, turgid, decurved, with thick ribs and a short beak. Hook. fil. Fl. Br. Ind. VI, 149 ; Kräntzlin in Engl. Bot. Jahrb. XVI, 161. H. hamigera, Griff. in Calc. Journ. Nat. Hist. IV, 380, t. 20. H. tenuicornis, Wall. MSS.

Sikkim, below Mim, at an elevation of about 3,000 feet; in flower during July and August; Pantling No. 335. Westward to Gharwal. Also in Bhotan, Assam, Eastern Bengal and Orissa.

The colour of the flower is green.
Plate 410.-Halenaria furcifera, Lindl. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 column showing the stigmas $(x)$, glands of pollinia ( $p g$ ), rostellum ( $r$ ), callus overhanging the entrance to the spur $(c), 3$ lip, 4 the petals, 5 section of the spur near the lip, 6 pollinia; all enlargod.

## 8. Habenaria malleifera, Hook. fil. Fl. Br. Ind. VI, 143.

Whole plant 15 to 24 in . high. Stem sheathed in its lower fourth; the second fourth leaf-bearing; the upper part bracteate, triquetrous, the angles fimbriate. Leaves narrowly elliptic, acute or sub-acute, the base narrowed to the wide short sheath; bracts lanceolate, acuminate, diminishing in size upwards, 2.5 to 1.25 in . long. Spike 4 to 10 in. long, lax, tristichous, its rachis ribbed and with flattened laciniate hair like processes on the edges. Flowers about 6 in . in diam. ; floral bract broadly lanceolate, shortly acuminate, equalling or exceeding in length the sessile beaked ovary, ciliolate; ovary ciliolate on the ridges; its beak long, slender. Sepals unequal; the dorsal orbicular, hooded, incumbent on the column; the lateral pair larger, gibbously triangular, oblong, blunt, reflexed. Petals much smaller, triangular, sub-acute. Lip longer than the sepals, divided to the base into three filiform segments, the middle one usually the longest and the most flexuose. Spur about half as long as the ovary, bent from the middle, its apex globose or clavate. Column very short. Anther recumbent, with very long spreading tubes, the staminodes adnate to its sides; pollinia sub-elliptic, grooved, the
caudicles long, straight, triquetrous, dilated at the apex and each ending below in a minute ovate gland. Stigmas two, elliptic-globose, lying close together above the entrance to the spur. Kräntzlin in Engl. Bot. Jahrb. XVI, 168.

Sikkim, at elevations of about 5,000 or 6,000 feet; in flower during August and September; King, Pantling No. 182. Khasia Hills at 5,000 feet; Lobb, Hooker filius and Thomson.

The flowers are pale green.
Plate 411.-Habenaria malleifera, Hook. fil. Parts of an entire plant; of natural siso. Fig. 1, floral braot, ovary and flower, the stigmas (s), 2 the petals, 3 upper part and beak of ovary, column with the anthers, the lip and its spur, in proflc, 4 pollinia; all enlarged.

## 9. Habenaria stenantha, Hook. fil. Fl. Br. Ind. VI, 153.

Height of plant 12 to 24 in., with no tuber, but the roots thick and fleshy. Stem stout and sheathed at the base. Leaves about three or four, the lowest usually the largest, 4 to 9 in . long, oblong-lanceolate to oblongoblanceolate, acute or subacute, very little narrowed to the long sheathing base; the upper part of the stem with narrowly lanceolate acuminate bracts $\cdot 4$ to 75 in. long, diminishing upwards. Spike 5 to 9 in. long, laxly-flowered. Flowers • 65 to 8 in . across; floral bract linearlanceolate, as long as the shortly-stalked ovary in the lower flowers, but shorter in the upper. Sepals unequal; the dorsal concave, broadly ovate, blunt, erect; the lateral pair smaller, ovate-elliptic, sub-acute, reflexed, all 3 -nerved. Petals longer than the dorsal sepal, linear, blunt, 1 -nerved, erect. Lip longer than the sepals, lanceolate, blunt, entire, 3 -nerved; spur slender, cylindric, widening a little towards the tip, curving, loager than the rather straight slender beakless ovary. Anther-cells converging at the apex; the staminodes elongate; anther-tubes none; pollinia broadly elliptic-clavate, faintly grooved, their caudicles rather short; the glands very large, elongate, situated at the sides of the entrance to the spur and reaching to the stigma. Stigmas conjoined into a small transversely-oblong mass situated on the upper margin of the entrance to the spur.

Sikkim, at elevations from 8,000 to 12,000 feet; Hooker, Thomson, Clarke, Gammie and others; in flower from July to September; Pantling No. 233. Chumbi (in Tibet), King's Collectors.

The sepals and petals of this are green and the lip is yellowish. It closely resembles $H$. latilabris, but has differently shaped erect petals and a very different column, the stigma being single and transverse. The staminodes, too, differ in shape from those of $H$. latilabris, and the gland very notably so.

Plate 412.-Habenaria stenantha, Hook. fil. A plant, of natural sise. Fig. 1 sepals and petals, separated, 2 ovary and flower, seen from the side, 3 lip, 4 column showing the anther-cells and staminodes, glands of the pollinia $(p g)$ and stigma (s), 5 pollinia; all enlarged.

## 10. Habenaria Bakeriana, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 132.

Height of the whole plant 9 to 18 inches. Stem about -25 in. thick at the base, and with one or more sub-acute convolute sheaths. Leaves several, scattered,
sessile; the lower one oblong, sub-acute, with the base broad and sheathing, 3 to 5 in. long; the upper three or four linear-lanceolate, diminishing in size upwards. Spike 4 to 7 in. long, laxly-flowered; floral bract linear-laneeolate, much longer than the slender sessile ovary. Flowers 8 or 9 in . long to the tip of the spur. Sepals oblongovate, the dorsal sepal conniving with the petals and forming a hood over the column, the lateral pair reflexed. Petals about as long as the sepals, broadly ovate, oblique, sub-acute, the bases broad. Lip fleshy, oblong, blunt, slightly broader towards the base, entire, equalling the lateral sepals in length; spur slender, twice as long as the ovary and curved forwards, cylindric. Column stout. Anther-cells close together, parallel, without tubes; pollinia elliptic, slightly clavate, without caudicles, attached obliquely to an elongate narrow gland truncate at each end; staminodes obovate, lying transversely below the anther (their broad ends directed outwards), above the conjoined stigmas and opposite the opening into the spur. Stigmas conjoined to form a bi-lobed broadly elliptic mass under the orifice of the spur and between the narrow ends of the staminodes.

Sikkim, in the Lachen Valley, at an elevation of 9,000 feet; Sin-ga-le-la Range at elevations of 10,000 to 12,000 feet; in flower in July; Pantling No. 401.

This species resembles $H$. leptocaulon, Hook. fil., but has a broader lip, a longer more curved spur, and coherent stigmas. It has also larger floral bracts and broader leaves. We have dedicated the species to Mr. J. G. Baker, F.R.S., Conservator of the Herbarium of the Royal Gardens, Kew. The colour of its flowers is green.

Plate 413.-Habenaria Bakeriana, King and Pantling. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 apex of ovary and column, showing the anthers, staminodes (a), stigma (s) and the entrance to the spur (c), 3 the petals, 4 the lip, 5 section of spur, 6 pollinia; all enlarged.

## 11. Habenaria junce., King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 132.

A slender plant about 12 in . high. Leaf solitary from near the base of the stem, from 1.5 to 2.5 in . long and .65 in . broad, narrowly oblong, acute, tapering from below the middle to the narrowed sheathing base, the stem above the leaf (peduncle of the spike) with two distant lanceolate bracts about 75 in long. Spike 2 to 4 in. long, few-flowered. Flowers $\cdot 1 \mathrm{in}$. long; the floral bract equalling or exceeding the slender shortly stalked and slightly beaked ovary. Sepals ovate-lanceolate, acute, the dorsal broader than the lateral slightly spreading pair. Petals narrowly oblong, tapering to the rather blunt and slightly incurved apex. Limb of lip as long as the sepals, ovate-lanceolate, sub-acute, quite entire; the spur shorter than the limb, vertically compressed, slightly curved and sub-clavate. Column with its summit beaked and over-hanging the stigma; anther-cells close together, parallel, without tubes; staminodes large, ovoid-globose, lying by the sides of the orifice of the spur. Stigmas conjoined into a single large sub-globose mass lying above the entrance to the spur.

Sikkim, Lachen and Lachoong Valleys, Gnatong and Sin-ga-le-la; at elevations of 11,000 to 12,000 feet; in flower in August; Pantling No. 406.

This is near $H$. nematacaulon, Hook. fil.; but that species has the lip superior, the ovary leing twisted to the extent of one complete spiral. It has been found
impossible to remove from flowers preserved in fluid the pollinia intact. No description of them is therefore given.

Plate 414.-Habenaria juncea, King and Pantling. A plant, of natural sise. Fig 1 bract, ovary and flower, 2 apex of ovary and column, showing the over-arching summit of the latter, the anthercolls ( $\left.\begin{array}{l}a \\ c\end{array}\right)$, staminodes (b), and conjoined stigmas $(s), 3$ the petals, 4 lip, 5 section of spur; all enlarged.
12. Habenarta urceolata, Clarke in Journ. Linn. Soc. XXV, 73, t. 30.

Whole plant 2 to 6 in . high; the tubers narrowly oblong. Stem slender, curved, with a single sheath at the base. Leaf usually solitary, rising rather below the middle of the stem, narrowly elliptic-oblong, obtuse or sub-acute, tapering to the long narrow tubular sheath; length $1 \cdot 25$ to 3.5 in ., breadth $\cdot 25$ to 85 in .; peduncle of the raceme with several remote bracts, sometimes one of them leaf-like. Raceme 65 to 2 in . long, decurved, rather laxly-flowered, secund. Flowers narrowly campanulate, longer than the ovaries ( 3 in . long); floral bract linear-lanceolate, erect, longer than the shortly-staiked tumid ovary. Sepals sub-equal, all erect, not spreading; the dorsal elliptic, blunt, not connivent with the petals; the lateral pair oblong, sub-acute. Petals as long as the sepals, free, oblong, blunt, tapering slightly to the base, somewhat falcate. Lip about as long as the petals and sepals, decurved beyond the middle, oblong, slightly concave, minutely hispid near the base, tapering and becoming thicker towards the blunt apex; spur shorter than the sepals, narrowly ellipsoid, constricted near the neck. Column elongate, the apex pointed. Anther-cells close together but not touching, long, parallel; pollinia ellipsoid, each consisting of a pair of flattened masses composed of large granules, the caudicles very short; the glands elliptic, acute at one end; staminodes long, filiform, lying parallel to the anther-cells and exceeding them in length, their apices free. Stigmas conjoined, large, occupying the whole of the anterior surface of the column below the glands of the pollinia. Hook. fil. FI. Br. Ind. VI, 165. Diphylax urceolata, Hook. fil. Ic. Plantar., t. 1865.

Sikkim, at Yak-la, elevation 10,000 feet, Clarke. At Naoura, on the Nepal frontier, elevation 12,000 feet, King's Collectors. Cho-la; G. Gammie, No. 1294. Chumbi; King's Collectors. Ti-am-phung and Re-chi-la, 9,000 feet; Pantling No. 347.

The flowers are white.
Plate 415.-Habenaria urceolata, Clarke. An entire plant, of natural siz?. Fig. 1 bract, ovary and flower, 2 apex of ovary, part of spur and column, showing the anther-cells, polliniar glands ( $g$ ), s aminodes (a), and stigma (s), 2 ovary, spur and base of flower, side viev, 4 the petals, 5 lip, C section of spur, 7 pollinia; all enlarged.

## 13. Habenarta nematocaulon, Hook. fil. Fl. Br. Ind. VI, 154.

Whole plant 2.5 to 9 in. high; tuber narrowly oblong, obtuse. Stem slender, with a short tubular sheath 5 in . long at the base, and not far above it a single elliptic leaf with a blunt or sub-acute apex and narrowed shortly sheathing base, $\cdot 75$ to 1.75 in . long and $\cdot 25$ to $\cdot 75 \mathrm{in}$. broad ; the stem above the leaf long, and bearing one to three linear-lanceolate bracts diminishing upwards from 5 to $\cdot 25$ in. iu length. Spike 5 to $1 \cdot 5 \mathrm{in}$. long, slender, rather densely-flowered. Flowers small, about $\cdot 15 \mathrm{in}$. across; floral bract linear, obtuse, longer than the erect, cylindric,
beakless, completely twisted ovary. Sepais sub equal, linear-lanceolate, obtuse, connivent. Petals about as long but broader, triangular-lanceolate, obtusely acuminate, falcate. Lip not fleshy, as long as the sepals and petals, oblong-lanceolate, obtuse, entire; spur much shorter than the lip (usually less than half as long), slightly curved, stout, compressed from front to back. Column very short. Anther-cells short, broad, parallel, touching, without tubes; poilinia narrowly elliptic, grooved, without caudicles; the glands small, oblique, elliptic, situated far inside and placed near the margin of the two large conjoined stigmatic lobes above the mouth of the spur. Capsule sessile, erect, fusiform, - 35 in. long.

Sikkim, on Re-chi-la, elevation 9,000 feet; in flower during August; Pantling No. 341 ; also collected by Hooker, Clarke and King's Collectors at Ling-too and Gun-tok at elevations of about 10,000 feet.

The colour of the flowers is white.
Peate 416.-Habenarin nematocaulon, Hook. fil. A plant, of natural sizo. Fig. 1 bract, ovary, and flower, side vien, 2 apex of ovary and column, showing the anther-cells and the glands of the pollinia ( $p g$ ), stigmas ( $s$ ), 3 the petals, 4 lip, 5 section of spur, 6 pollinia; all enlargod.
14. Habenaria Sikmimensis, Hook. fil. Fl. Br. Ind. VI, 155.

Height of entire plant 10 to 12 inches. Stem short, bearing one or two rather wide blunt sheaths at the base, and two unequal, remote, narrowly elliptic-oblong sub-acute or acute leaves narrowed to the sheathing base, 25 to 4 in . long and 5 to 1.25 in . broad, the upper the smaller of the two. Raceme elongate, laxly-flowered. Flowers $\cdot 5$ in. across at the mouth; floral bract large, foliaceous, linear, acuminate, .5 to 2.5 in . long, the lower ones revolute and many times longer than the short pedicelled and abruptly-beaked ovary. Sepals unequal; the dorsal elongate-triangular, with a broad base and sub-acute apex; the lateral pair nearly twice as long, linearlanceolate, acute, strongly revolute. Petals reflexed, as long as the lateral sepals, falcately lanceolate, cordate-acuminate, the apices rather blunt. Lip membranous, lanceolate, straight, caudate-acuminate, entire; spur much longer than the ovary, cylindric, boldly curved, the mouth infundibuliform, the apical half quadrate in section. Anther-cells pyriform, discrete, converging at the apex, their tubes long; pollinia elliptic, with blunt ends, vertically grooved, shorter than the compressed curved caudicles; the glands broadly ovate. Stigmas large, united above the mouth of the spur, bordered above by a narrow belt. Staminodes elongate, narrow, parallel to the tubes of the anther-cells.

Sikkim, on Sinchal, elevation 8,000 feet; Thomson; Ling-too and Ze-lep-la. King's Collectors. Sin-ga-le-la, and in the Lachoong valley at elevations of about 12,000 feet; in flower during August and September; Pantling No. 421.

The colour of the flowers is green.
Plate 417.-Halenaria Sikkimensis, Hook. fil. A plant, of natural sizc. Fig. 1 flower, 2 stalked ovary, column and lip, in profile, 3 sepals, petals and lip flattened out, 4 column showing the anthers with their tubes and polliniar glands, the united stigmas (s), staminodes, and the entrance to the spur, 5 pollinia, 6 section of spur; all onlarged.

## 15. Habenarta Dyeriana, King and Pantling in Journ. As. Soc. Beng, Vol. LXV, Pt. 2, 133.

A slender plant not exceeding 12 inches in height. Stem at its base with a sheathing blunt oblanceolate bract 1 in . long. Leaves three or four, sessile, 1 to 1.75 in . long, seattered along the stem at distant intervals and becoming smaller upwards, the uppermost bract-like, all more or less oblong-lanceolate with sub-acute apices and broad sheathing bases. Spike 3 to 4 in . long, laxly-flowered. Flower (including the spur) 5 to 6 in. long; bract foliaceous, diminishing upwards, ovate-lanceolate, as long as or exceeding the sessile scabrid slenderly-beaked ovary. Dorsal sepal ovate-lanceo'ate; the lateral pair narrowly oblong, blunt, reflexed. Petals erect, lanceolate, sub-acute, with very oblique bases, slightly undulate on their inner margins. Lip rather fleshy, convex, straight, deflexed, a little longer than the lateral sepals, narrowly oblong-triangular, with two small rounded auricles near its base, the margins in its lower half obscurely waved and with a short abrupt bend quite at the apex. Spur slender, incurved, equal to or slightly longer than the ovary, slightly compressed laterally. Column short and broad. Anther-celis distant, clavate, their tubes rather long and cuived inwards; pollinicu ovoid; their caudicles long, slender; the glands small, discoid; staminodes large, smooth, cylindric, situated vertically by the outer sides of the anther-cells. Stigmas conjoined into a transversely oblong broad band lying above the entrance to the spur and between the glands of the pollinia, the upper margin of the conjoined stigmas bordered by a narrow band.

Sikkim, in the Lachen valley, elevation 11,000 feet; in flower during August; Pantling No. 407.

The colour of the flowers is green.
A very distinct species belonging to the section H, loglossa. The floral bracts are leaf-like and gradually decrease in size upwards. The size and position of the very large stigma stretching across the wide column almost to its edges, and situated above the opening of the spur, are good distinguishing marks of this species. It is dedicated to Mr. W. T. Thiselton-Dyer, F.R.S., C.M.G., C.I.E., Director of the Royal Garden, Kew.

Plate 418.-Habenaria Dyeriana, King and Pantling. A plant, of natural sise. Fig. 1 bract, ovary and flower, 2 column showing the anther-cells and the glands of the pollinia ( $p g$ ), the staminodes (b), the conjoined stigmas (s), and the mouth of the spur (c), 3 bract, ovary and spur, in profile, 4 the petals and lip, separated and spread out, 5 section of spur, 6 pollinia; all enlarged.
16. Habenaria Biermanntana, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 343.
Height of plant 9 to 15 in .; tubers cylindric-ovoid, 125 in . long, sparsely hairy. Stem rather stout, with one or two wide-mouthed sheaths near the base. Leaves four or five, cauline, scattered, amplexicaul, lanceolate, acute, boldly nerved, 2 to 3 in . long; stem above the leaves with a lanceolate bract. Spike 4 in . long, rather sparsely-flowered; bract linear-lanceolate, acuminate, exceeding the sessile and scarcely beaked ovary. Flowers $\cdot 3$ in. long. Sepals and petals sub-equal; sepals ovate-lanceolate, with oblique bases, concave, sub-acute, cohering and, with the triangular-lanceolate petals, forming a hood from the base of which the lip and spur project. Lip fleshy, much decurved, linear-oblong, tapering slightly to the obtuse apex, with minute and tooth-like side lobes;
spur about as long as the lip, curved, sub-clavate, dorsally compressed Column arching over the entrance to the spur, very short. Anther-cells nearly parallel; pollinia broadly pyriform, longer than the curved stout caudicles, glands oblong; staminodes oblong, attached externally to the anther-cells. Stigmas two, small, oblong, lying at each side of the entrance to the spur.

Sikkim, on Sinchal, at an elevation of 8,000 feet; Sin-ga-le-la, elevation 10,000 feet; flowering in July; Pantling No. 332.

A very distinct species; dedicated to the memory of the late Adolf Biermann, for many years resident on the Government Cinchona Plantation in Sikkim, and who died as Curator of the Botanic Garden, Calcutta,

Plate 419.-Habenaria Biermanniana, King and Pantling. An entire plant, of natural size. Fig. 1 bract, ovary and flower, 2 column showing the back of the anther-cells, the staminodes, stigmas (s), entrance to the spur and the base of the lip, 3 lip, 4 the petals, 5 section of spur, taken from its widest part, 6 pollinia; all enlarged.

## 17. Habenaria densa, Wall. in Lindl. Gen. and Spec. Orch., 326.

Stem 12 to 30 inches, Tubers oblong. Stem clothed in its lower part with long loose blunt sheaths. Leaves three to five, narrowly elliptic, acute, tapering very little to the long sheath; length 2.5 to 4 in., breadth 75 to 1.5 in . Peduncle of the spike 6 to 18 inches long, bearing a few linear-lanceolate bracts, diminishing in size upwards. Spike 6 to 12 or even 18 in . long; its rachis short, rather densely flowered. Flowers $\cdot 35$ in. across; floral bract lanceolate, acuminate, ciliolate, longer than the tumid shortlybeaked curved short ovary. Sepals sub-equal, thick, ciliolate, elliptic-oblong, obtuse, the dorsal erect and concave; the lateral pair narrower, reflexed. Petals nearly as long as the sepals, elliptic-oblong, with oblique bases and blunt apices, the exposed margin fleshy, that overlapped by the dorsal sepal thin. Lip as long as the sepals, linear, obtuse, with a transverse callus at its base close to the column; spur clavate, half as long as the ovary, pendulous, compressed laterally. Column short, broad. Anthercells distant, parallel, without tubes; staminodes large, consisting of two united elongate processes; the upper pair rough and parallel to the lower halves of the anther-cells; the lower pair smooth, their apices converging inwards below the stigmas and almost meeting over the base of the lip; pollinia elliptic, tapering very little to the base, the caudicles short; the glands oblong, situated at the sides of the opening into the spur. Stigmas two, small, sub-orbicular, convex, lying between the glands of the pollinia and the staminodes. Hook. fil. Fl. Br. Ind. VI, 153 ; Kräntzlin in Engl. Bot. Jahrb. XVI, 216. Platanthera densa, Lindl. in Wall. Cat. 7046. P. clavigera, Lindl. Gen. and Spec Orch., 289.

Sikkim, in the Lachong valley and on the Sing-ga-le-la range, at elevations of from 8,000 to 12,000 feet; in flower during July and August; Hooker, Gammie, Pantling No. 413. Westward along the range to Simla; also in Chumbi in western Bhotan.

The colour of the flowers is green throughout.
Plate 420.-Habenaria densa, Wall. A plant, of natural size. Fig. 1 a flower, 2 profile view of bract, sessile ovary, column and lip with its spur, 3 the petals, 4 lip, 5 column showing the callus (a) at the base of the lip where the latter joins the column, the stigmas $(s)$, staminodes $(t)$, and entrance to the spur ( $m$ ), 6 section of spur, 7 apex of the same, 8 pollinia; all enlarged.
18. Habenaria leptocaulon, Hook. fil. Fl. Br. Ind. VI, 154.

Whole plant 8 to 16 inches high. Stem slender, sheathed in the lower third. Leaves two, unequal, remote, the lower and larger narrowly elliptic, acute, much narrowed from below the middle to the long narrow sheath; length from 2 to 5 in., breadth about 75 in . or less; the upper linear-lanceolate, acuminate, sheathing at the base, half as long as the lower; stem above the leaves bearing two or three remote lanceolate acuminate unequal bracts 75 to 1 in . long. Spike 1 to 3 in. long, few-flowered, lax. Flowers about '5 in. across (vertically); floral bract lanceolate, shorter than or equal to the slender curved grooved beakless erect ovary. Sepals sub-equal, oblong-elliptic, acute; the dorsal connivent with the petals, the lateral pair reflexed. Petals broader than the sepals, fleshy, lanceolate from a broad truncate base, sub-acute, falcate. Lip fleshy, longer than the sepals and petals, oblong-lanceolate, obtuse, entire, deflexed; spur much longer than the ovary, cylindric, slightly dilated towards the base and more so towards the apex, somewhat curved, minutely hispid inside. Column rather long. Anther-cells slightly separated, quite parallel; pollinia elliptic, tapering to both base and apex, each obliquely sessile on an elongate gland, truncate at both ends. Staminodes smooth, ovate, falcate, pointed, situated outside the bases of the anther-cells. Stigmas two, broadly oblong, somewhat curved, situated one on each side of the wide entrance to the spur.

Sikkim, in the Lachong valley, at elevations of from 9,000 to 11,000 feet; G. Gammie, Pantling No. 422; in flower during July and September.

The colour of the flowers is green throughout.

Plate 421.-Habenaria leptocaulon, Hook. fil. A plant, of natural size. Fig. 1 ovary and flower, 2 bract, ovary, column and lip, in profile, 3 column showing the anthers, staminodes and stigmas $(s)$, 4 the petals, 5 section of the spur, 6 pollinia; all enlarged.

## 19. Habenaria oligantha, Hook fil. Fl. Br. Ind. VI, 154.

Plant varying in height from 3 to 12 inches. Stem slender, sheathed at the base, tubers narrowly fusiform. Leaf usually solitary, oblong-oblanceolate, obtuse or acute, narrowed to the shortly sheathed base; length 1 to 4.5 in., breadth 35 to 1.5 in . Stem above the leaf and below the raceme with at least one linear-lanceolate acuminate bract, ridged. Spike 1.5 to 4 in. long, laxly-flowered. Flowers $\cdot 4$ in. across at the mouth (vertically); floral bracts linear-lanceolate, acuminate, herbaceous, the lower much longer than the flowers, the upper sub-equal to them. Sepals thin, their edges minutely ciliolate, sub-equal, elliptic-oblong, sub-acute; the dorsal sepal and petals connivent to form a hood, the lateral pair reflexed. Petals fleshy like the lip, as long as the sepals, ovate with broad truncate bases and somewhat gibbous at one side, sub-acute. Lip longer than the sepals and petals, ovate-lanceolate, blunt, entire, its margins slightly upturned near the base; spur about as long as the ovary, cylindric, with two faint ridges externally, slightly wider towards the apex, its interior shortly hispid. Column broad at the base, tapering upwards. Anther-cells discrete, parallel, without tubes; pollinia clavate, sessile, the glands as long as the pollinia, narrow, truncate at each end ; staminodes large, globose; stigmas two, globose, pointed.

Sikkim, in the Lachen valley, elevation about 10,000 to 12,000 feet; at Na-toot, Na-tong and Jongri; in flower from July to September; Pantling No. 328.

The colour of the flowers is green.
Plate 422.-Habenaria oligantha, Hook. fil. A plant, of natural size. Fig. 1 bract, ovary and flower, side viec, 2 column, showing the anther-cells, polliniar glands, staminodes, and stigmas (s) at the entrance to the spur, 3 lip, 4 the petals, 5 section of spur at its thickest part, 6 pollinia; alb enlarged.

## 20. Habenaria latilabris, Hook. fil. Fl. Br. Ind. VI, 153.

Height of whole plant 8 to 18 in . high; tubers fusiform. Stem naked near the base. Leaves about five; the middle two 2 to 4 in. long, elliptic-oblong, acute; the lower and upper smaller and more acute; all broad and sheathing at the base; bract below the raceme lanceolate, acuminate, nearly 1 in . long. Spike 3 to 10 in . long, laxly-flowered, its peduncle short. Flowers $\cdot 4$ to 5 in. across; floral bract lanceolate, acuminate, somewhat longer than the ovary. Sepals unequal, glabrous or ciliolate; the dorsal concave, broadly ovate, orbicular or oblong; the lateral pair narrower, ovate or ovate-lanceolate, sub-acute, reflexed. Petals as long as the lateral sepals, spreading, fleshy, with broad triangular bases and bluntly acuminate apices, varying to lanceolate or linear, gibbous at the base on one side. Lip longer than the petals, sub-terete or linear-oblong, tapering slightly to the apex, entire, the base with a short broad claw; the spur slender, cylindric, laterally compressed, curved, longer than the curved slightly beaked ovary. Column short. Anther-cells parallel, distant, each with a sub-globular rugulose staminode on its outer side near the base; the tubes short, curved forwards; pollinia pyriform, tapering into short stout caudicles; the glands small, elliptic. Stigmas two, oblong, blunt, separated by the entrance into the spur. Capsule sessile, fusiform, shortly beaked, curved. Hook. fil. in Ann. Bot. Gard. Calc. V, 66, t. 100. Platanthera acuminata, Lindl. in Wall. Cat. No. 7040; Gen. and Spec. Orchid, 289. P. latilabris, Lindl. Gen. and Spec. Orch., 289. P. orchidis, Wall. Cat. 7039B.

Sikkim, in the Lachoong and Lachen valleys; on the Sin-ga-le-la range at elevations of 8,000 to $\mathbf{1 0 , 0 0 0}$ feet; in flower from July to September, common; Pantling No. 331. Westward along the chain to Kashmir. In Dehra Dun; King, Hope.

The sepals of this plant in Sikkim are green, as is the bract; and the petals and lip are of a greenish-yellow. The species is a very common and variable one. In the north-west Himalaya the leaves are occasionally almost orbicular; the lip varies in width from linear to lanceolate but its edges are always reflexed. A small form is common in Sikkim.

Plate 423.-Habenaria latilabris, Hook. fil. A plant, of natural sizo. Fig 1 ovary, bract and flower, seen from the side, 2 column showing the anthers and staminodes, polliniar glands, stigmas $(8)$, and entrance to spur, 3 lip, 4 the petals, 5 section of spur, 6 pollinia; all enlarged.
21. Habenaria Cumminsiana, King and Pantling in Journ. As. Soc. Beng., Vol. LXIV, Pt. 2, 343.

Height of plant 6 to 9 in .; tubers oblong. Leaves two to four, unequal, inserted on the lower part of the stem, with a lanceolate bract a little below the spike, broadly
elliptic to lanceolate, rather thick, 2 to 3 in . long and 1 to 1.5 in . broad. Peduncle of the spike angled. Spike 1.25 to 3 in . long, rather densely-flowered; bract longer than the slender beaked ovary, its edges ciliolate. Flowers 75 in across. Dorsal sepal ovate, $\cdot 25 \mathrm{in}$. long; the lateral pair narrower, wide-spreading, their edges ciliolate, $\cdot 4$ in. long. Petals fleshy, slightly exceeding the dorsal sepal and with it forming a hood, triangular, blunt, sub-falcate, the inner edge irregularly crenate near the base, the outer edge entire, the apex sub-acute, the base truncate. Lip very fleshy, without side lobes, longer than the lateral sepals, almost cylindric, abruptly deflexed from the thin flattened base (? claw), the surface of the cylindric part slightly carunculate; spur slender, curved, longer than the ovary, slightly compressed laterally, pubescent inside. Column very short; anther-cells distant, the space between them wide, smooth; pollinia cylindric, slightly clavate, rather longer than their stout caudicles and attached to them nearly at a right angle; glands small, sub-rotund. Stigmas two, large, parallel, oblong, situate below and by the side of the entrance to the spur, tapering at their upper ends; the edges of the stigmas and half the mouth of the spur margined by a distinct fleshy belt.

Sikkim, at Gnatong, elevation 11,000 feet; in flower during July; Cummins; Lachoong Valley, Pantling No. 329.

The flowers are green throughout. This species was first collected by Dr. H. A. Cummins, Surgeon to a detachment of troops stationed for some time near the Tibet frontier, an ardent botanist and excellent collector, to whom we have dedicated it. It is allied to H. pachycaulon, Hook. fil., but is perfectly distinct.

Plate 424.-Habenaria Cumminsiana, King and Pantling. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 column showing the anthers, polliniar glands, staminodes, stigmas ( $s$ ), and the entrance to the spur, 3 lip, 4 petals, 5 section of spur, 6 pollinia; all enlarged.

## 22. Habenaria albo-marginata, new species.

Height of entire plant not exceeding 8 inches; tuber depressed-globular. Stem rather stout, bearing a wide-mouthed tubular sheath at the base. Leaves two, remote, unequal, orbicular-elliptic to oblong, blunt, only slightly contracted at the base to the rather long tubular sheath; length 1 to 1.75 in., breadth 75 to 1 in .; peduncle of the spike stout, short, ebracteate. Spike 1 to 1.5 in . long, 8- to 10 -flowered. Flowers 25 in . across at the mouth, expanding from above downwards; bract of the lowest flower occasionally large, foliaceous, lanceolate, spreading, about 8 in . long; those of the other flowers minute, triangular, only $\cdot 06 \mathrm{in}$. long; the ovary sessile, tumid near the base, the apex with a stout curved beak. Sepals similar, spreading, broadly elliptic-ovate, blunt. Petals shorter than the sepals, sub-rotund, concave, not connivent with the dorsal sepal. Lip fleshy, slightly shorter than the sepals, broadly oblong, deeply 3 -fid; the central lobe longer than the lateral pair, oblong, tapering to the blunt apex; the lateral lobes much shorter, parallel, oblong, slightly falcate; spur cylindric, slightly depressed from front to back, tapering very slightly at the apex, straight, horizontal, shorter than the ovary. Column very short. Anther-cells touching by their apices, the bases divergent; pollinia clavate-elliptic, with oblique apices, the caudicles short and stout; the glands minute, broadly elliptic, attached laterally. Staminodes large, rugulose, sub-globular, lying external to the anther-cells. Stigmas united into a narrowly reniform horizontal band lying between the anther-cells and above the mouth of the spur.

Sikkim, near Jongri, elevation about 13,000 feet; in flower during June; Pantling No. 450 .

The sepals are green with white margins, the other parts of the flower being white. The centrifugal inflorescence is a very unusual feature in a Habenaria.

Plate 425.-Habenaria albo-marginata, King and Pantling. An entire plant, of natural size. Fig. 1 apex of ovary and flower, 2 floral bract, ovary, column and lip, in profile, 3 the petals and lip separated, 4 apex of ovary and column, showing anther-cells, pollinia and their glands, staminodes (a), stigma ( 8 ) and mouth of spur (c), 5 section of spur, 6 pollinia; all enlarged.

## 23. Habenarta Parishit, Hook. fil. Fl. Br. Ind. VI, 161.

Whole plant 12 to 18 in . high; tuber ellipsoid, hairy, the stem close above it bearing many fibrous roots. Stem clothed in its stout lower part with wide, lax, blunt sheaths. Leaves four or five in a whorl at the summit of the stem, ovate-elliptic, acute, narrowed to the broad short sheaths, 2.5 to 5 in . long and 1 to 1.75 in . broad; peduncle of the spike slender, bearing a few distant lanceolate acuminate bracts. Spike narrow, 4 to 8 in . long, many-flowered. Flowers not crowded, horizontal, 25 in . in diam. at the mouth; floral bract lanceolate, shortly acuminate, longer or shorter than the erect sessile ovary. Sepals rather unequal; the dorsal larger than the narrowly oblong obtuse spreading lateral pair. Petals larger than the sepals, broadly ovate, sub-acute. Lip slightly longer than the petals, shortly 3 -lobed beyond the middle, curved and the apex deflexed; the side lobes triangular, acute, their apices directed forwards; apical lobe oblong, tapering to the obtuse point; spur shorter than the sepals, straight, widely fusiform. Anther-cells almost touching by their parallel inner margins, without tubes; pollinia pyriform, with very short caudicles, attached laterally to the small oblong glands; staminodes large, rugulose, situated by the sides of the anther-cells. Stigmas two, irregularly oblong, curved, lying below the anther-cells and touching by their inner edges. Capsule tumid, falcate, broadly ridged, 35 in. long. Peristylus Parishii, Hook. fil.; Reichb. fil. in Trans. Linn. Soc. XXX, 139. II. verticillata, King and Pantling MSS.

Sikkim, at Silake, elevation 2,000 feet; in flower during June; Griffith (Kew Distrib. No. 5305), King, Pantling No. 156. Upper Burma at Meiktela; collectors of Bot. Gard., Calcutta. At Moulmein; Parish. S. Andaman Island; Kurz, King's collectors.

The sepals are brown tinged with olive green, and the petals and lip are olive green. This appears to be the same as Griffith's specimen from Bhotan, (No. 28 in the Kew Herbarium). The lip of this is sigmoidly curved (as is shown in Fig. 2 of our Plate;, whereas in H. goodyeroides, Don, which is probably its nearest ally, the lip is flat with an oblong depression in front of the minute opening into the spur. The spur of H. goodyeroides is moreover globular, whereas the spur of this is fusiform. There are considerable differences also in the columns of the two, as will be at once seen by comparing the figures numbered 2 in our plates of each. The flowers of this are green and inodorous, whereas the flowers of $H$. goodyeroides are cream-coloured or white and fragrant. An allied species is also II. constricta.

Plate 426.-Habenaria Parishii, Reichb. fil. A plant, of natural size. Fig. 1 bract, ovary, and flower, 2 bract, ovary, column and lip, in profile, 3 apex of ovary and column, showing anther-cells and polliniar glands, staminodes, and stigmas, 4 pollinia, frout and side viecs; all enlarged.
ann. Roy. Bot Gard., Calouita, Vol. VIH.

## 24. Habenarta tentaculata, Reichb. fil. Otia, p. 34 ; Trans. Linn. Soc. XXX, 139.

Whole plant 6 to 18 in. high; the tuber obliquely ellipsoid. Stem with a single wide blunt sheath at its base. Leaves two or three, often unequal, borne close together near the base of the stem, oblong-elliptic or linear-oblong, sub-acute or acute, slightly narrowed to the short sheath; length 2 to 4 in ., breadth $\cdot 5$ to 1.25 in .; peduncle of the spike naked except for a few scattered linear-lanceolate bracts about 5 in . long. Spike very narrow, 1.25 to 6 in . long, laxly-flowered. Flowers scarcely broader than the apices of the long erect ovaries, $\cdot 15 \mathrm{in}$. across at the mouth; floral bract lanceolate, acuminate, rather shorter than the sessile ovary. Sepals unequal; the dorsal ovate-oblong, obtuse, conniving with the petals to form a hood; the lateral pair narrowly oblong, obtuse, erect. Petals ovate, acute, their bases oblique. Lip longer than the lateral sepals, deflexed from the middle; the lower half broadly oblong and having a transverse callus at the base; the apical half 3 -lobed, the middle or apical lobe shorter and broader than the lateral, oblong, blunt; the lateral lobes linear, falcate, their apices diverging; spur small, ovoid, much contracted at the neck, shorter than the sepals, smooth within. Column depressed. Anther-cells discrete, their tubes short; pollinica pyriform, the caudicles half as long, tapering to the minute narrowly oblong dark red glands; staminodes large, diverging. Stigmas two, triangular, lying by the sides of the mouth of the spur, their apices diverging. Kräntzlin in Engl. Bot. Jahrb. XVI, 160. H. lacertifera, Benth. Fl. Hong-Kong, 362 ; Hook. fil. Fl. Br. Ind. VI, 163. Caeloglossum lacertiferum and C. acuminatum, Lindl. Gen. and Spec. Orch. 302. Peristylus chloranthus, Lindl. in Kew Journ. Bot. VII (1855), 37. Gymnadenia (?) tenuiflora, Lindl. in Wall. Cat. 7055. Charadoplectron Spiranthes, Schauer in Pl. Meyen., (Act. Leopold.), 436, t. 13, C. ?

Sikkim. Guru Bathan (1,500 feet ?); in flower during August; Pantling No. 345. Khasia Hills; Hooker, Mann, Gellatly. Naga Hills; Prain Nos. 43, 64; also in Tenasserim, Tavoy and Penang; Wallich. Distrib.-Hong-Kong.

The colour is green throughout.
A widely distributed species varying as to its lip, which is said to be in some specimens only obtusely 3 -toothed, while in others it is deeply tripartite and the side lobes are long and resemble tentacles. The fiowers are very small and the material in collections is scanty. We have followed Kräntzlin in adopting Reichenbach's name for this rather than Bentham's, as the former is the older. For the Sikkim form of the plant it is, however, very inappropriate, as no part of the flower suggests tentacles. It appears to be in Hong-Kong only that plants are found with much elongated side lobes to the lip, and it was for these that Lindley suggested the name Glossula tentaculata (Bot. Reg., t. 862). This is allied to H. aristata, Hook. fil., but is distinguished from that species by having its leaves radical and not scattered along the stem, and by having flowers only about one-third as large. In H. aristata, moreover, the lip is narrowed at the base and has linear horizontal side lobes; whereas in this the lip is broad at the base and is divided near the middle into three linear lobes, all of which are decurved,

Plate 427.-Habenaria tentaculata, Reichb. fil. A plant, of natural sise. Fig. 1 bract, ovary and flower, 2 apex of ovary, base of the lip and column showing the anther-cells (a), a staminode (s e), a stigma ( 8 ), and the callus at the base of the lip (c), 3 the petals, 4 pollinia; all enlarged.

## 25. Habenaria fallax, King and Pantling.

Whole plant 4 to 12 in.; tubers small, ellipsoid. Stem 1 to 2 in . long, with two tubular blunt sheaths at the base. Leaf solitary (in Sikkim specimens), narrowly elliptic, acute, tapering slightly to the short sheath; length 1.5 to 6 in., breadth 45 to $\cdot 75$ in.; peduncle of spike long, with a single linear lanceolate acuminate bract. Spike 1.5 to 4 in . long, rather laxly-flowered. Flowers (to the end of the lip) 35 in . at the mouth; floral bract lanceolate, shorter than or as long as the slightly decurved ovary. Sepals sub-equal, oblong or ovate-lanceolate, the dorsal connivent with the petals to form a hood; the lateral pair erect, non-connivent, but not spreading. Petals varying in size, oblong, blunt. Lip not much longer than the sepals, rather fleshy, hastately 3 -lobed from about the middle; the apical lobe oblong, obtuse, deflexed, longer than the two oblong blunt slightly diverging side lobes; the base truncate and with a saccate spur much shorter than the sepals, 2 -ribbed in the interior. Column rather long. Anther-cells discrete, parallel, without tubes; pollinia clavate, the caudicles short, stout, tapering to the small cordate glands; staminodes small, attached about the middle of the outer surfaces of the anther-cells. Stigmas two, transversely oblong, touching by their ends and forming a band across the column below the anther-cells. Herminium fallax, Lindl. in Wall. Cat. 7412; Hook. fil. Ic. Plant., t. 2198; Fl. Br. Ind. VI, 129. Peristylus fallax, Lindl. Gen, and Spec. Orch., 298. Cybele, Falc. in Lindl. Veg. Kingd., 193c ; C. alpina, Falc. MSS.

Sikizim, at elevations of 10,000 to 12,000 feet; in the Lachen and Lachoong valleys, at Gnatong; Hooker, Pantling Nos. 174 and 426; in flower during July. Kamaon, on Liria-Kanta; Davidson. At Ralam; Strachey and Winterbottam,

The flowers are green throughout. Lindley at first named this Herminium, but he subsequently transferred it into his genus Peristylus which has since been reduced to Habenaria. We think it ought to be in Habenaria, having a very distinct wide spur and a lip much resembling those of other species in the section Peristylus, in which we have therefore placed it. Specimens from the western Himalaya have often two leaves which are sub-opposite.

Plate 428.-Habenaria fallax, King and Pantling. A flant, of natural size. Fig. 1 a flower, 2 ovary, column with anther-cells in situ, and lip, in profito, 3 section of spur, 4 pollinia; all enlarged.
26. Habenaria constricta, Wall. ex Hook, fil. Fl. Br. Ind. VI, 161.

Whole plant 20 to 30 in . high; tuber oblong, hairy. Stem stout, clothed at the base with wide blunt sheaths. Leaves five or six in a whorl about the summit of the stem, ovate-elliptic, acute or acuminate, much narrowed to the long stem-clasping sheath; length 3 to 7 in., breadth 1.25 to 3.5 in.; stem above the leaves with a few linear-lanceolate acuminate bracts, 1.25 to .5 in. long, diminishing upwards. Spike broadly cylindric, 5 to 9 in . long, many- and densely-flowered. Flowers $\cdot 75$ to $\cdot 9 \mathrm{in}$. across, horizontal; floral bract erect, lanceolate, acuminate, as long as or longer than the erect shortly beaked ovary. Sepals sub-equal, ciliolate, oblong, obtuse, the dorsal conduplicate; the lateral pair with involute margins, spreading. Petals larger than the sepals, obliquely ovate, lanceolate, rather bluntly acuminate, their bases oblique, somewhat gibbous on the lower side, spreading upwards in front of the dorsal sepal and not
conniving with it to form a hood. Lip as long as the patals, oblong, deeply 3 -lobad in its anterior half; th3 middle lob3 shorter than the side lobas, oblong, tapering to a blunt point; the lateral lobas linear, slightly falcate, their apices slightly diverging; spur broadly globular, very short, much shorter than the sepals, slightly compressed vertically. Columin very short and broad. Anther-cells rather close together, but not touching, without tubes; pollinia oblong-obovoid, their caudicles short, taparing to the oblong-elliptic gland; staminodes oblong with blunt ends, situated externally to the anther-cells. Stigmas two, obovate-oblong, diverging outwards from near the polliniar glands. Platanthera constricta, Lindl. in Wall. Cat. 7043. H. goodyeroides, Don in Wall. Cat. 7066B. Herminium constrictum, Lindl. in Bot. Reg. under t. 1449. Peristylus constrictus, Lindl. Gen. and Spec. Orch., 300. Orchis leucantha, Herb. Ham.

Sikkim, at Brip, 1,500 feet; King. Valley of the Teesta, at Sivoke, elevation 1,000 feet; in flower during June and July; Pantling No. 447. Khasia Hills, elevation 2,000 to 4,000 feet; Lobb, Griffith (Kew Distrib. No. 5305), Mann. Assam; Jenkins, Masters, Simons. Chittagong; Wallich. Bürma (Tenasserim); Helfer (Kew Distrib.) No. 5357, Falconer, Brandis, Kurz, Scott. Upper Burma, at Maymyo; Calcutta Bot. Gard. Collectors No. 124.

The colour of the sepals is pale brown and that of the petals and lip pure white, the spur of the latter being green.

The suppressed stigma in this species is bifid, and a polliniar gland is attached to each half of it.

Plate 429.-Habenaria constricta, Hook. fil. A plant, of natural siss. Fig. 1 a flower, 2 apes of . ovary and column with the globose spur of the lip still attached, showing the anther-eells with their polliniar glands $(p g)$, the staminodes $(c)$, the stigmas $(s)$, and the entrance to the spur $(r), 3$ the lip flattened out, 4 bract, ovary, column and spur, side viev, 5 seetion of spur, 6 pollinia; all enlarged.

## 27. Habenarta goodyeroides, Don Prod. Fl. Nep., 25.

Height of entire plant 12 to 24 in , the tubers ellipsoid or oblong, hairy. Stem clothed at the base with lax rather blunt sheaths. Leaves close together a little below the summit of the stem but not whorled, sub-coriaceous, ovate or ovate-elliptic, acute, slightly narrowed to the shortly sheathing base; somewhat pale on the under surface when dry; length 2 to 4 in., breadth 1.25 to 2 in .; peduncle of the spike naked, except for one or two lanceolate acuminate bracts about $\cdot 5$ in. long. Spike 4 to 8 in. long, many- and densely-flowered. Flowers $\cdot 3 \mathrm{in}$. in diam. at the mouth; floral bract narrowly lanceolate, acuminate, about as long as the sessile ovary. Sepals unequal; the dorsal broadly ovate-lanceolate, concave, conniving with the petals to form a hood; the lateral pair oblong, involute, all apiculate. Petals as long as the sepals, trapeziform, blunt. Lip longer than the petals, in general outline broadly triangular, but the sides rounded; the anterior third 3 -lobed; the middle lobs broad, tapering to the blunt apex; the side lobes linear-oblong, falcate, their apices acute and diverging, slightly longer than the middle lobe; spur short, sub-globular, saccate, much shorter than the sepals; the upper surface of the lip with an oblong speckled nectar-secreting depression at the base in front of the minute opening into the spur. Column short, broad. Anther-cells parallel, separated by a narrow space, without tubes; pollinia broadly pyriform, the caudicles very short, the glands small, obovoid. Staminodes large, oblong, at right angles to the anther, but directed outwards. Stigmas two, beneath and parallel to the staminodes,
oblong with expanded apices, large. Hook. fil. Fl. Br. Ind. VI, 161 (in part). H. ornithoides, Wall. MSS. ?Peristylus grandis, Blume Bijdr. 405. Herminium goodyeroides, Lindl. in Wall. Cat. 7066A (in part).

Sikkim, at Mungpoo, elevation 3,000 feet; at Sivoke, 1,000 feet; Pantling No. 231, Anderson No. 1197; in flower from May to July. Nepal; Wallich (at Puspulnath in August). Behar (on Parisnath); T. Anderson. Gharwal, at Mussourie; King. Manipur; Watt 6928. Khasia Hills; Hooker and Thomson, G. Mann, Nos. $\frac{14}{1886}$ and $\frac{38}{1885}$ and 377. Assam; Fisher.

The flowers are sweetly-scented, and they are white or cream-coloured, the sepals being tinged with brown. The infertile stigma in this species also is bifid.

Var. affinis, Lindl., Gen. and Spec. Orch., 300. At least a third smaller than the typical form in all its parts; with a rather longer lip, gibbous at the base, and with broader side lobes. Habenaria affinis, Don Prod. Fl. Nep. 25. H. goodyeroides, in Hook. fil. Fl. Br. Ind., 161. H. sacculata, Wall. MSS. Peristylus goodyeroides, Lindl. Gen. and Spec. Orch., 299; Royle Illust. Him. Bot., t. 87, fig. 2.

Sikkim, in the western part of the province, at an elevation of 2,000 feet; in flower during June; Pantling No. 453. Nepal; Wallich (at Toka in flower during July) Cat. 7066A. Gharwal; Royle, King. Khasia Hills; Clarke No. 44420; Mann, Nos. 5, 13. Naga Hills; Prain No. 66.

The flowers are usually of the same colour as in the typical form, but occasionally they appear to be more green.

This species and the variety given above were originally described as species by D. Don on specimens which existed in the herbarium of Daniel Bourke Lambert. The original specimens have, however, been lost, and the oldest specimens known to botanists are those which were issued by Wallich as No. 7066A. of his distribution and catalogue ( 7066 B is another species, viz., H. constricta). In making his distribution of the orchids of the Wallichian Herbarium, Lindley overlooked Don's $H$. affine, and he distributed both it and $H$. goodyeroides under the name Peristylus goodyeroides. Wallich, however, when he collected the plants which Lindley ultimately distributed as 7066 A , recognised that they were different. To one set of these, collected in July 1821 at Toka, he gave the MSS. name Halenaria sacculata, Wall. To the other, collected at Puspulnath in August of the same year, he gave the name Habenaria ornithoides, Wall. A very careful examination of the Wallichian sheets numbered 7066 A as they exist in the type set at the Linnæan Society's rooms, in the Herbarium at Kew, and in that at Calcutta, was made by Dr. D. Prain, Curator of the Calcutta Herbarium, whose note on the subject we here reproduce, on account both of its excellence botanically, and of the curious piece of herbarium history which it puts on record. The note is as follows:-
"As I discovered when I consulted the type Herbarium at the Linnæan Society, No. 7063B is really $H$. constricta, Hook. fil. But 7066A turns out, as I had suspected, to be a mélango of two gatherings. One of these was got at Toka in July 1821, and in the field Dr. Wallich named it Halenaria sacculata; the other was got at Puspulnath, August 1821, and Dr. Wallich named it H. ornithoides. Clearly he thought the two different when he gathered them. Both were, however, distributed together when his Herbarfum was issued. Luckily for us we have both plants at Calcutta, so that we are in a position to clear up the matter thoroughly. At Kew there is only the August gathering; in Herbarium Lirdley, on the other land, there is only the July gathering of 7066.
"Lindley has in Herb. Linn. Soc. named the whole of 7066A (both gatherings) and B as well, Peristylus goodyeroides with his own hand. But he had been more careful with the other specimens; for, on Sir William Hooker's (now Herb. Kew.) example of 7066A from Puspulnath, he wrote only Peristylus; and on a specimen of the same thing which he got from Wallich, but which is not numbered, he again has written only Peristylus. It is only on his own example of Wall. Cat. 7066 A , (whieh is the Toka plant, H. sacculata, Wall.), that Lindley has written Peristylus goodyeroides in full; and the only other place where he has done so (except in Herb. Linn. Soc., which he has clearly examined carelessly and rapidly) is on the original draving of Royle Ill. 87, fig. 2.
"But at this point our troubles recommence. We have to decide whether Peristylus goodyeroides, Lindley, is the same as Habenaria goodyeroides, Don (Prodromus Florce Nepalensis, 25). Don published this book from the collections of Buchanan-Hamilton and of Wallich in the Herbarium of Mr. Lambert. But these plants of Wallich's did not form any part of the Wallichian Herbarium which was distributed with numbers; they were in fact sent direct by Dr. Wallich to Mr. Lambert years before Dr. Wallich went home with his big Herbarium. When Mr. Lambert died, his collections were sold. I have seen the auctioneer's list. Most of his fine things from South America, Australia, etc., fetched high prices; some were bought for the British Museum, some for Sir W. Hooker, some for Paris, some for Berlin, ete, etc. But all the bundles 'Nepal Plants-Wallich' went cheap, ( $2 / 6,5 /, 6 / 6$ per lot and so on). Not one of the great botanists wanted them; and every single bundle was bought by Mr. Pamplin, the book-seller, for practically the merest trifle. Yet the botanists made a great blunder, for these very bundles contained all the types of Mr. David Don's new species of the Prodromus Florce Nepalensis. Mr. Lambert's sale took place after the distribution of Dr. Wallich's great herbarium, and no doubt everybody concerned thought he already possessed everything that could be in Lambert's bundles, and that all the names would be the same as on the distributed sheets. As to the first idea, no doubt they were right; as to the second, the less said the better.
"Mr. Pamplin found his speculation a mistake; cheaply as he bought the plants, no one ever wanted to purchase them; and when he gave up business 30 years ago, his Nepalese specimens were, I understand, thrown aside as rubbish. Anyhow I cannot trace them; and there is no specimen of Habenaria goodyeroides named by Don either at Kew, the British Museum, in the Herbarium Drake at Paris, or Herbarium De Candolle at Geneva-four of the most likely places to find one.
"After the break-up of Mr. Lambert's collection, Mr. Don was Keeper of the Linnæan Society's Herbarium, and he had gone over the whole of Wallich's Herbarium, and named with his own hand the specimens there of his Prodromus species; but, just as luck would have it, not the orchids; these he naturally and properly left entirely to Professor Lindley.
"If Don had only described one Hlbenaria of the section Peristylus, it would have been an easy matter for us. But he described two. And so it just comes to this: Don saw that Wallich's first impression was right, that the Toka gathering and the Puspulnath one were distinct, and he describes them as different species accordingly.
"Now we know that Wallich collected only tioo forms of Peristylus in Nepal, and that these two are distributed together under 7066A; we may, therefore, satisfactorily conclude that these two are just the ones that Don deals with.
"Of their differences we can only say that broadly his H. goodyeroides is bigger than his H. affinis, and that the colour of the flowers of his $H$. goodyeroides is like that of $H$. allida, viz., 'green.' There is no doubt, therefore, that it is with the plant described by Sir Joseph Hooker (exeluding some of the synonyms) that Don's plant agrees best. The smaller plant which is K. and P's. No. 453 becomes then (if we are satisfied that it is equal to $H$. sxcculata, Wall. Cat. 7066 A ., Toka, and equal to Peristylus goodyeroides of Royle) Habenaria affinis, Don."

Plate 430-Habenaria goodyeroides, Don. A plant, of natural size. Fig. 1 ovary and flower, 2 column with the sae of the lip attached, showing the anthers with the glands of their pollinia ( $p g$ ), the staminodes $(c)$, the opening into the spur $(r)$, and the stigmas : $(s), 3$ lip, 4 bract, ovary, column and spur of lip, in profie, 5 section of spur, 6 pollinia; all enlarged.

Platr 430 bis.-Habenaria goodyeroides, Don, var. affinis, Lindl. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 apex of ovary and column (with the sac of the lip still attached), showing the anther-cells and polliniar glands ( $p g$ ), staminodes (c), stigmas ( $s$ ) and opening into the spur ( $r$ ) , 3 lip , 4 bract, ovary, column and spur of lip, in profile, 5 section of spur, 6 pollinia; all enlarged.

## 28. Habenaria Pratnir, Hook. fil. Fl. Br. Ind. VI, 159.

Height of entire plant 12 to 18 in.; tubers irregularly ellipsoid. Stem with several wide-mouthed blunt sheaths near the base. Leaves three to five, about the middle of the stem, unequal, oblong or ovate-oblong, acute or sub-acute, slightly narrowed to the widely sheathing base, the middle ones the largest; length 1.5 to 2.5 in., breadth 5 to 1 in . Upper part of stem naked, except for one or two lanceolate bracts about 5 in . long. Spike narrow, 1.5 to 3.5 in . long, with numerous rather crowded flowers about $\cdot 15 \mathrm{in}$. in diam. at the mouth ; floral bract lanceolate, acuminate, erect, longer than the sessile erect ovary. Sepals sub-equal, elliptic, sub-acute, not spreading, the dorsal very concave and the lateral pair more or less so. Petals fleshy, somewhat shorter than the sepals, broadly ovate-elliptic, gibbous at the middle on the inner edges, the apex obtuse, the base obliquely cut away on the inner side. Lip slightly longer than the sepals, with a small globose sac at the base, concave, 3 -lobed; the side lobes short, oblong, their apices blunt, pointing forwards; the apical lobe broadly oblong, blunt. Column short and broad. Anther-cells parallel, without tubes; pollinia obovoid, their caudicles slender and short; the glands orbicular, minute; staminodes large, sub-orbicular, situated at the sides of the anther-cells; infertile stigma large, with two broad lobes, a polliniar gland resting on each. Stigmas two, oblong-orbicular, situated below the staminodes.

Sikkim, at Mungpo, elevation 3,500 feet; in flower during August; Pantling No. 167. Assam; at Kohima in the Naga Hills; Prain. Cachar; Prazer. Upper Burma; collectors of Calcutta Bot. Garden.

The colour of the flowers is brownish-green.
Plate 431.-Habenaria Praini", Hook. fil. A plant, of natural sizo. Fig. 1 bract, ovary and flower, 2 apex of ovary and column, showing the basal sac of the lip (a) still attached to the column, and the entrance to the former ( $\mu$ ), the 2-lobed infertile stigma $(r)$, the stigmas $(s)$, the staminodes $(g)$, and the pollinia with their caudicles and glands, 3 the petals, 4 lip, 5 section of spur, 6 pollinia; all enlarged.

> 29. Habenaria pseudophrys, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 133.

Height of entire plant 18 to 28 in . Tubers irregularly oblong, hairy. Stem with three or four long convolute acuminate sheaths in its lower part, each from 1 to 1.5 in . long. Leaves about four in number, scattered, distant, the lower from 1 to 2 in . long, the upper 3 in . long; all elliptic-oblong, acnte, with broad sheathing bases; the peduncle with three or four scattered lanceolate acuminate bracts $\cdot 5$ to -75 in . long. Spike 3 or 4 in . long; the floral bracts lanceolate, equalling or longer than the sessile shortlybeaked ovaries. Flowers 15 in . across. Sepals petals and lip connivent. Dorsal sepal broadly elliptic, oblong; the lateral pair oblong, all sub-acute. Petals shorter than the
sepals, broadly elliptic, sub-acute, the bases oblique. Lip equalling the sepals in legnth, oblong, concave, the margins entire, the apex 3 -lobed; side lobes narrowly triangular, pointed forwards, very near the small triangular blunt terminal lobe. Spur small, globular, slightly compressed vertically. Column broad, with two unequal triangular incurved wings (?staminodes) along its outer edges. Anther-cells close together, parallel; the pollinia broadly oyoid, each with a short caudicle and a discoid gland lodged in a pouch. Stigma large, extending on each side of the pouches and of the minute mouth of the spur, and concealed partly by the incurved wings of the column.

Sikkim, at Choong-thang, elevation 5,500 feet; in flower during July; Pantling No. 424.

In externals this species resembles H. Prainii, Hook. fil., with which it was at first confused. It is, however, perfectly distinct. This plant has the facies of a Habenaria, but the glands and the bases of the caudicles of the pollinia rest in twin pouches, after the manner of Ophrys.

Plate 432.-Hibenaria psewlophrys, King and Pantling. An entire plant, of natural size. Fig. 1 part of ovary and the flower, 2 bract, ovary, column and lip, in profile, 3 the petals, 4 lip, 5 apex of ovary, spur of lip and column, the latter with its lateral wings (? staminodes), the anther-cells, polliniar glands in their pouches $(p r)$, stigma $(s)$, and entrance to the spur (e); all enlarged.

## 30. Habevaria secundiflora, Hook. fil. Ic. Plantar., t. 232.

Whole plant 4 to 10 in . high; tubers ellipsoid. Stem with a few small sheaths at the base. Leaves two or three, remote, linear-oblong to linear, acute, scarcely narrowed to the tubular sheath; length 2 to 5 in., breadth 2 to 5 in.; peduncle short, bearing two or three linear-acuminate bracts 35 to 65 in. long. Raceme $1 \cdot 5$ to 5 in . long. Flowers rather crowded, secund, ${ }^{*} 35 \mathrm{in}$. long; floral bract lanceolate, acuminate, the edges cilioate, the lower much longer than the curved tamid almost sessile ovary. Sepals sub-equal, lanceolate. Petals narrower, linear, sub-acute, falcate, minutely papillose like the lip, connivent with the three sepals to form a hood over the column. lip as long as the sepals, deflexed, triangular-obiong in general outline; the apical half the widest, 3 -lobed; its middle lobule the largest, oblong, acute; the lateral lobules triangular, not diverging; spur shorter than the ovary or sepals, narrowly funnel-shaped, blunt. Column rather long, infundibuliform. Anther-cells parallel, touching; pollinia oblongobovoid, tapering to the short stout caudicles; the glands large, lanceolate, acuminate, united along their inner edges for half their length. Staminodes oblong, rugulose. Infertile stigma erect, large, 2 -lobed, each lobe falcately oblanceo'ate and forming a flap covering the base of the anther. Fertile stigmas conjoined, transversely oblong, forming a horizontal band below the infertile one. Hook: fil. Fl. Br. Ind. VI, 165.

Sikkim, in the Lachoong Valley, at elevations of from 9,000 to 11,000 feet; G. Gammie, Pantling No. 419 ; in the Chumbi Valley (in Bhotan), King's Collectors ; in flower during August and September. Kamaon Himalaya, near Sora; Duthie No. 3421.

The colour of the flowers is pink.
This species resembles $H$. urceolata in having united stigmas and secund inflorescence, but it differs from $H$. urceolata in having all its perianth, except the lip, connivent to form a hood over the column, which in this, moreover, is blunt instead of acute. And
in its united polliniar glands this differs not only from II. urceolata, but from every species of Habenaria described in this work.

Platb 433.-Habenaria seeundiflora, Hook. fil. An entire plant, of natural size. Fig. 1 a flower, 2 bract, ovary and flower, in profile, 3 the petals, 4 lip, 5 column showing the anther-cells, staminodes ( $c$ ); infertile stigma $(r)$, polliniar glands $(p q)$, and stigma ( $s$ ), 6 section of spur, 7 pollinia; all enlarged.

## 88. Herminium, Linn.

Erect terrestrial tuberous rooted herbs of small size. Leaves solitary or few, cauline or radical, sheathing at the base. Flowers in spikes, green. Sepals sub-equal, free, or the dorsal conniving with the petals to form a hood, the lateral pair spreading. Petals usually smaller than the sepals, connivent or spreading, sometimes fleshy, always entire. Lip adnate to the base of the column, as long as or longer than the sepals, often fleshy, broad or narrow, entire or 3 - or 5 -fid, the base concave or very shortly saccate, the upper surface sometimes with calli or pits near the base. Column very short; anther-cells adnate to its face, parallel, or slightly divergent below; pollinia two, the caudicles usually short or sometimes absent; the glands small and orbicular or elliptic, or large hollow and horn-like. Staminodes two, rugulose, attached outside the anther-cells. Stigmas two, distant or conjoined. Species 13, all Indian and all montane or alpine.

Herminium is distinguished from Halenaria chiefly by the absence of a spur or by its small size when present; as also by the small size of the plants. All the species have green flowers,

Lip much longer than broad, not fleshy.
Lip oblong, deeply 3 -lobed near the apex; pollinia pyriform; their caudicles very short, slender

1. II. angustifolium.

Lip 5 -lobed, the basal lobes always minute, the lateral lobes near the apex sometimes elongate; pollinia ovoid, their caudicles short, stout
2. H. quinquelolum.

Lip 3 -lobed, the lateral lobes near the base and very minute; pollinia wedge-shaped, sessile
3. H. Joffreyanum.

Lip not lobed; uarrowly oblong-triangular.
Lip broad at the base and with two deep oval pits; pollinia sessile
4. II. pugionifor me.

Lip not pitted at the base.
Column with two pits, not winged; pollinia with caudicles
5. H. gracile.

Column winged in its lower half
6. II. angustilabre.

Lip not much longer than broad, fleshy.
Lip triangularly ovate-lanceolate, blunt, the basal half broad, and with long narrow crenulate side lobes; the upper surface with two minute calli near the orifice of the spur; polliniar glands large and horn-like
7. II. conges'um.

## Lip not lobed.

Lip broadly ovate, shortly and bluntly acuminate, the edges sub-crenulate, the base with a semi-lunar pit 'and two thickened lines; polliniar glands horn like, large . Lip ovate-orbicular, gibbous towards the base, with no calli or pits on its upper surface
8. H. JLsopli.
9. H. orliculare,

1. Herminium angustifolium, Benth. MSS. ex Hook. fil. Fl. Br. Ind. VI, 129.
Whole plant 10 to 30 in . high; tubers small, oblong or ellipsoid. Stem clothed in its lower part with tubular acute sheaths. Leaves two or three, long, linear, acuminate, not narrowed to the long sheath; length 2 to 10 in ., breadth $\cdot 15$ to $\cdot 5 \mathrm{in}$. Stem above the leaves short, usually bearing a linear acuminate bract. Spike cylindric, narrow, 2.5 to 10 in . long, many-flowered. Flowers (to the end of the lip) about 3 in . long, crowded ; floral bract linear-lanceolate, acuminate, shorter than or as long as the ovary. Sepals sub-equal, oblong, obtuse, the dorsal connivent with the petals to form a hood over the column, the lateral pair spreading. Petals as long as the sepals, but very narrowly linear. Lip much longer than the sepals, deflexed from the base, oblong in general outline; the lower half minutely auriculate and with a small concavity at the base ; the anterior half trifid at its apex, the middle lobe very short; the side lobes long, filiform, curved. Anther-cells parallel, close together; pollinia pyriform, with rather blunt bases and very short slender caudicles; glands small, discoid; staminodes large. Stimas two, transversely oblong, lying close together end to end below the anther-cells. Aceras angustifolia, Lindl. in Wall. Cat. 7061; Gen. and Spec. Orch. 282; Bot. Reg. under t. 1525 ; in Journ. Linn. Soc. III, 43; Royle Ill. Bot. Him. t. 87; Wight Ic. t. 1691. H. longicruris, Wright in Mem. Acad. Philad., Ser. 2, VI, 141. Thisbe, Falc. in Lindl. Veg. Kingd. 183c (name only).

Sikkim, common at elevations of from 4,500 to 9,000 feet or upwards; in flower during July and August ; Pantling No. 44. Westwards along the chain to Gharwal. Bhotan, Khasia Hills, Naga Hills, Tenass rrim. Distrib -China, Japan, Manchuria.

The flowers are of a uniform green colour.
Plate 434.-Herminium angustifolium, Benth. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 upper part of ovary, column with anther in situ and lip, 3 apex of column and base of lip, anther-cells with the pollinia and their appendages, staminodes and stigmas, 4 pollinia; all enlarged.

## 2. Herminium quinquelobum, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 130.

Entire height of the plant 4 to 12 in .; tubers oblong, undivided, about 1 in . long. Lower part of stem enveloped in two long convolute sheaths. Leaves two, rising from about the middle of the stem, linear-oblong, sub-acute, 6 or 7 in . long and 5 to $\cdot 6 \mathrm{in}$. broad; stem above the leaves with a single linear bract 1.5 in . long. Spike 1.5 to 4 in . long, rather laxly-flowered. Flowers ' 25 in. across to end of lip; the floral bract lanceolate, as long as the shortly-beaked ovary. Sepals sub-equal, free, ovate-oblong, sub acute, spreading. Petals linear-acuminate, spreading and, like the sepals, 1 -nerved. Lip longer than the sepals, oblong with small triangular basal auricles besides lateral lobes and a contracted triangular acuminate terminal lobe; the lateral lobes near the apex, and sometimes elongate. Column broad. Anther-cells discrete, parallel; pollinia broadly ovoid, blunt at each end, the caudicles short and stout, the glands discoid. Staminodes oblong. Stigmas two, transversely oblong, lying between the polliniar glands und the concavity of the lip, their ends close together but not united.

Sikkim, at Tendong, elevation 7,000 feet; in flower during August; Pantling No. 339. Also at Tankra, elevation 9,500 feet; G. Gammie. Sinchal; King. Darjeeling; Clarke, Thomson.

A species like $H$. angustifolium, Benth., in general appearance; but the flowers have a totally different lip and the sepals are spreading and free, those of $H$. angustifolium being connivent. This has been named from its 5 -lobed lip. Its flowers are green.

Plate 430.-Herminium quinquelobum, King and Pantling. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 pollinia, of natural size.

## 3. Herminium Jaffreyanum, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 130.

Entire plant 4 to 8 in . high; the tuber ellipsoidal. Stem with one or two short convolute sheaths near the base. Leaves two, about an inch apart, from near the middle of the stem, narrowly oblong, acute, broad and sheathing at the base, 4 to 4.5 in. long and 3 to 5 in. broad; stem above the leaves with a linear acuminate bract 1.5 in. long. Spike 1.5 to 3 in . long, densely-flowered; the floral bract lanceolate, about as long as the ovary. Flowers 15 in across. Sepals broadly ovate-elliptic, blunt, concave, spreading slightly. Petals spreading, narrowly oblong, obtuse, longer than the sepals, 1-nerved. Lip flat, narrowly oblong-triangular from a broad base; basal lobes very small, short, rounded; the terminal lobe elongate, tapering to the blunt apex. Column short, broad. Anther-cells discrete, parallel; pollinia wedge-shaped, without caudicles; stigmas united, transversely oblong.

Sikkim, common at elevations of from 8,000 to 10,000 feet; in flower during August; Pantling No. 237.

In externals this resembles II. angustifolium, Benth., with which indeed it has been confounded. It has, however, very different sepals and lip. This also resembles II. gramineum, Lindl., which, however, has only a single leaf; the lip of $H$. gramineum, moreover, is ovate-acuminate and concave, and its flowers have longer and more subulate bracts. This also resembles $H$. quinquelobum, King and Pantling, but has sessile pollinia and a different lip. The flowers are green.

Plate 436.-Herminium Jaffeyanum, King and Pantling. A plant, of natural sizo. Fig. 1 a flower, 2 pollinia; all enlargod.
4. Herminium pugioniforme, Lindl. MSS. ex. Hook. fil. Fl. Br. Ind. VI, 130.

Height of entire plant 2 to 7 in.; tuber small, globular. Stem with one or two minute sheaths at the base. Leaf solitary, sub-radical, oblong-oblanceolate, sub-acute or obtuse, slightly narrowed to the very short sheath; length 65 to 1 in., breadth .35 to .5 in .; stem above the leaf elongate, naked. Spike 35 to 1.75 in . long, laxly-flowered. Flowers minute, only about 05 in. across; floral bract broadly ovate, shorter than the tumid ovary. Sepals unequal; the dorsal broadly ovate, forming a hood over the column with the petals; the lateral pair rather longer than the dorsal, falcately oblong, obtuse. Petals concave, rotund, their edges crenulate. Lip as long as the lateral sepals; the base much expanded, fleshy and excavated into two deep oval parallel pits; the anterior part linear-oblong sub-terete. Anther-cells discrete, their apices touching, their tubes diverging; pollinia elliptic, slightly clavate, tapering somewhat (without having definite caudicles) to the elliptic glands; staminodes oblong with obtuse ends. Stigmas conjoined, lying ketween the polliniar glands.

Sikkim, on Sin-ga-le-la, at an elevation of about 12,000 feet; in flower during July; Pantling No. 374 ; also in the Gharwal-Himalaya; Duthie No. 517.

The colour of the flowers is green.
Plate 437-Herminium pugioniforme, Lind. Three plants, of nutural sizo. Fig. 1 bract, ovary and flower, 2 apex of ovary, with column and lip showing the anther-cells (a), the tubes and glands of their pollinia ( $p \mathrm{~g}$ ), and the staminodes ( $s$ ); all enlarged.
5. Herminium gracile, King and Pantling in Journ. Linn. Soc., Vol. LXV, Pt. 2, 131.

Height of entire plant 4 to 7 in. Stem anglef, with one or two blunt wide sheaths near its base. Leaf solitary, ovate, obovate, oblanceolate or elliptic with a short sheathing petiole, blunt or sub-acute; length 5 to 1.5 in., breadth ' 5 to 6.65 in .; petiole $\cdot 1$ in. Peduncle naked; spike $\cdot 5$ to 1.5 in . long, sparsely-flowered. Flowers $\cdot 1$ in. long, their bracts lanceolate, as long as the pedicel of the tumid ovary. Dorsal sepal broadly ovate, obtuse, concave; the lateral pair concave at the apex, oblong, blunt, deflexed. Petals broadly oblong, very concave, as large as the dorsal sepal and with it forming a hood over the column. Lip narrowly oblong-triangular, its base continuous with the column, not lobed, the apex sub-acute, bent about the middle, the basal half directed downwards and the apical half forwards. Column hooded, the third or modified stigma occupying a large transverse area above the two fertile stigmas. Anther-cells distant, each having a depressed elliptic fertile stigma on its inner side; pollinia broadly ovoid, their caudicles bent at a right angle, and each a tached to a small brown gland; staminodes small, oblong, attached to the fertile anthers near their caudicles at the outer sides.

Sikkim, in the Lachen valley, at an elevation of about 11,000 feet; in flower in July; Pantling No. 397.

This species has a superficial resemblance to $H$. orbiculare, Hook. fil. The flower in that species has, however, a lip with a short spur, and the column is very simple; whereas in this plant there is no trace of spur, and the structure of the column is very complicated.

Plate 438-Horminium gracile, King and Pantling. Two plants, of natural size. Fig. 1 front view of a flower, 2 front view of bract, ovary, column and lip (the latter fluttened out), showing the third or infertile stigma (a), anther-cells (b), polliniar gland (p.g), staminode (s), the fertile stigmas (b), 3 the petals, 4 pollinia; all enlarged.

## 6. Herminium angustilabre, King and Pantling in Journ. As. Soc. Beng., Vol. LXV, Pt. 2, 131.

Height of the whole plant 3 or 4 inches. Stem angled. Leaf solitary near the base of the stem, sessile, elliptic, obtuse, 65 in . long and 35 to $\cdot 45 \mathrm{in}$. broad, the part of the stem above the leaf with two linear-lanceolate acuminate bracts 5 in. long. Spike $\cdot 75$ to 1 in. long. Flowers 1 in. across; floral bract acuminate, longer than the sessile beaked ovary. Dorsal sepal broadly ovate, acute, concave, curved forwards; lateral sepals and peta's sub-equal, narrowly oblong, the former deflexed. Lip slightly exceeding the lateral sepals, linear, deHexed, sub-acute, entire. Column winged in its
lower half. Anther-cells small, distant, parallel. Stigmas conjoined, forming a transverse band across the column.

Sikkim, at Ling-tu and Sin-ga-le-la, at elevations of 11,000 to 12,000 feet; in flower during July; Pantling No. 375.

The colour is green throughout.
Plate 439.-Herminium angustilabre, King and Pantling. Three plants, of natural size. Fig 1 a flower, 2 bract, ovary, column and lip, in profile, 3 apex of ovary, base of the lip and the column, the latter bearing the anther-cells and stigma, 4 sepals and petals, separated; all enlargod.

## 7. Herminium congestum, Lindl. in Wall. Cat. No. 7068 ; Gen. and Spec. Orch., 305.

Entire plant 3 to 7 in. in height; tuber ovoid-globose, hairy. Stem with one or two short blunt wide sheaths at the base. Leaves two or three, rising close together near the base, narrowly oblong-elliptic, sometimes slightly oblanceolate, sub-acute or obtuse, slightly narrowed to the usually short sheath; length $1 \cdot 25$ to 4 in., breadth 3 to $\cdot 65 \mathrm{in}$. ; stem above the leaves with a single linear bract, often naked. Spike narrow, $\cdot 5$ to 2.5 in. long, many-flowered. Flowers 15 in. across, drooping (from the curving of the ovary); floral bract ovate, acute, very much shorter than the beaked ovary. Sepals sub-equal, olutuse; the dorsal broadly ovate; the lateral narrower, oblong, subacute, slightly spreading. Petals as long as the sepals or a little longer, obliquely triangular-lanceolate, acute. Lip longer than the sepals, fleshy, triangularly ovatelanceolate, blunt, the base triangular; sides lobes very narrow, crenulate, the apical lobe quite entire, the upper surface with two small calli at the mouth of the minute globose saccate spur; pollinia broadly ellipsoid with blunt ends, the caudicles very short; the glands oblique, horn-like; staminodes oblong with tapering ends. Stigmas two, situated behind the caudicles of the pollinia and above the entrance to the minute sac-like spur. Capsule 25 in . long. Lindl. in Journ. Linn Soc. III, 43; Hook. fil. FI. Br. Ind. VI, 130. H. unalaschcense, Reichb. fil. Ic. Fl. Germ XIII, 107, t. 418. H. Schischmareffiana, Chamiss. in Linnæa, III, 29. Platanthera Schischmareffiana, Lindl. Gen. and Spec. Orch., 286. Neottia, mácrophylla, Don Prodr. 27. Spiranthes macrophylla, and S. vinalaschcensis, Spreng. Syst. III, 708.

Sikkim, common at elevations between 10,000 and 12,500 feet; in flower during July and August; Pantling No. 384. Westward to Nepal. Distrib. Aleutian Islands.

The colour of the flowers is green.
Platr 440.-Herminium congestum, Lindl. A plant, of natural siso. Fig. 1 a flower, 2 minute bract, beaked ovary, column and lip with its minute globular spur, 3 lip, upper surface, 4 the petals, 5 column, showing the anther-cells, polliniar glands ( $p g$ ), staminodes ( $s$ ), and the orifice of the spur ( $e_{i}$, 6 pollinia; all enlarged.
8. Herminium Josephi, Reichb. fil. in Fiora LV (1872), 276.

Entire plant 4 to 10 in. in height; tuber sub-globose. Stem with a lax blunt sheath at the base. Leaves two, from near the base, sub-opposite (sometimes only one), narrowly elliptic-oblong, acute, narrowed to the long sheath. Peduncle of spike naked. Spike

1 to 2 (rarely 2.5) in. long, rather densely-flowered. Flowers $\cdot 35$ in. across; floral bract oblong, sub-acute, smaller than the shortly-beaked ovary. Sepals unequal, the dorsal broadly ovate-elliptic with blunt apex and broad truncate base; the lateral pair longer, oblong, tapering to the sub-acute apex, faleate, sub-erect, not spreading. Petals trian-gular-lanceolate, sub-acute, longer than the sepals, and conniving with them into a hood. Lip flat, fleshy, rather longer than the lateral sepals, shortly and broadly clawed, broadly ovate, shortly and abruptly acuminate, the edges sub-crenulate but not lobed; the upper surface with a small semi-lunar pit at the base near the column and two inclined plates (with their margins touching) extending from it to beyond the middle. Column very broad at the base, tapering upwards. Anther-cells touching by their apices, their bases diverging, tubes none. Pollinia ellipsoid, blunt at both ends, deeply 2 -cleft, each inserted by a very short flat elastic caudicle into a large curved horn-like hollow gland. Staminodes oblong. Stigmas two, oblong, obtuse, transverse, lying above the orifice of the spur, their inner ends separated by the base of a large triangular hastately-lobed space lying between the anther-cells. Hook. fil. Fl. Br. Ind. VI, 129. H. grandiflorum, Lindl. MSS. in. Herb. Hook. fil. and T. Thons.

Sikkim, in the Lachen Valley; also in the Chumbi Valley in Bhotan ; at elevations of from 11,000 to 12,000 feet; Pantling No. 381 ; also on the Cho-la and Pan-ka-la; in flower during June and July.

The flowers are green throughout. The transverse lobes of the hastate space between the anther-cells may represent the rostellum, but the nature of the rostellum in this genus, as in Habenaria, appears to be at present so obscure that we prefer to describe nothing under the name of rostellum.

Plate 441.-Herminium Josephi, Reiehb. fil. A plant, of natural size. Fig. 1 a flower, 2 column with the base of the lip still attached, anther-eells (empty) (a), staminodes (b), stigmas (s), entrance to spur ( $g$ ), triangular hastate space between the anther-eells ( $r$ ), 3 sepals and petals, detached and spread out, 4 bract, beaked ovary and bases of perianth, 5 lip, upper surface, 6 pollinia; all enlargod.

## 9. Herminium orbiculare, Hook. fil. Ie. Plantar., t. 2199B.

Whole plant 3 to 6 in . high; tuber thin and elongate. Leaves variable, all radical or all cauline, or scattered, or sometimes obsolete, elliptic-oblong with white reticulations, or linear-oblaneeolate and entirely green, sessile or with a rather long sheath; length $\cdot 5$ to 85 in., breadth $\cdot 15$ to $\cdot 4 \mathrm{in}$. Peduncle of spike slender, elongate, bearing a few distant subulate bracts about $\cdot 25$ in. long; spike $\cdot 5$ to 1 in . long, rather densely-flowered. Flowers about $\cdot 1 \mathrm{in}$. across (to end of lip); floral bract oblung-lanceolate, blunt, shorter than the sessile somewhat tumid oblique ovary. Sepals sub-equal, oblong, blunt, the dorsal broader than the lateral pair. Petals shorter than the sepals, sub-orbicular, elliptic, blunt. Lip slightly longer than the sepals, ovate-orbicular, entire, blunt, gibbous towards the base, slightly concave, minutely glandulose near the thickened apex; spur minute, cylindric, with a thick ridge inside on its posterior surface. Anther-cells parallel; pollinia broadly ovate, the caudicles very short; glands smail, orbicular. Stigmas conjoined under the anther-cells. Hook. fil. Fl. Br. Ind. VI, 130.

Sikkim, in the Sin-ga-le-la range, elevation about 12,000 feet; in flower during July; Pantling No. 348. Chumbi valley in Bhotan. Lachong valley; Go Gammie No. 1031. Esa-naugi in Nepal.

The colour is green throughout.
Plate 442.-Herminium orliculare, Hook. fil. A plant, of natural size. Fig. 1 bract, ovary and flower, 2 apex of ovary and column, showing the pollinia in situ and the stigma, 3 the petals, 4 lip, 5 section of spur, 6 pollinia; all enlarged.

## 89. Diplomeris, Don.

Small terrestrial deciduous herbs, with or without tubers. Leaves few, large, oblong or ensiform, hairy or glabrous. Flowers one or two, large. Sepals sub-equal, free, lanceolate, spreading. Petals much larger than the sepals. Lip adnate to the base of the column by a long claw, its limb spreading, very broad, entire or minutely 3 -lobed at the apex, with a long spur. Column very short; infertile stigma large, erect, membranous, standing in front of the anther-cells. Anther-cells parallel, with very long tubes extending horizontally forwards by the sides of the column and projecting in front of it; pollinia sub-cylindric, curved; the caudicles very long, cylindric, curved; glands minute, discoid. Stigmas two, much elongate, oblong, parallel, projecting downwards and forwards above the claw of the lip. Species two, both Indian.

## Diplomeris hirsuta, Lindl. Gen. and Spec. Orch., 331.

Tuber globose; stem very short, 1 -flowered. Leaf solitary (with sometimes the rudiment of a second), radical, pendulous, oblong, sub-acute, the base minutely cordate, sessile, bearing stiff scattered hairs on both surfaces; length 2 to $3 \cdot 5 \mathrm{in}$., breadth 75 to 1.15 in. Flower 1.25 to 2 in . long and $\cdot 9 \mathrm{in}$. to 1.4 in . across in front; floral bract ovate, acute, sparsely pubescent like the ribbed ovary. Sepals ovate-oblong, sub-acute, much smaller than the petals. Petals orbicular-reniform, the apex slightly acute. Lip somewhat longer than the sepals, sub-orbicular, abruptly clawed at the base; the apex broad, emarginate, mucronate in the sinus from the projection of the thick midrib; upper surface smooth, the midrib broad and somewhat thickened; spur infundibuliform at the mouth, otherwise cylindric, slightly compressed, curved, pubescent inside, three or four times as long as the ovary. Column short; the infertile stigma very large, thin, erect, ovate-rotund with irregularly lobed edges, its surface concave. Anther-cells lying one on each side of and behind the imperfect stigma, triangular, with very long horizontal forward-pointing tubes; staminodes small, oblong, rugulose, each borne at the lower part of the outer surface of the anther-cell; pollinia cylindric, blunt, curved; the caudicles very long and curved; glands small, discoid. Fertile stigmas two, oblong, blunt, lying parallel to and connate with each other by their inner edges below the orifice of the spur and overhanging the claw of the lip. Hook. fil. Fl. Br. Ind VI, 167. Diplochilus hirsuta, Lindl. in Wall. Cat. 7065; in Bot. Reg. under t. 1499.

Sikkim, in the valley of the Teesta, at elevations of about 1,000 to 1,400 feet; on sandstone rocks; in flower from June to August; Pantling No. 184. Bhotan; Lister, Gammie. Nepal; Wallich.

The flowers are pure white and are very beautiful. Morphologically they are of extreme interest because in them a theory of the structure of the flower of Ophrydex,* suggested with various degrees of distinctness in the different species of Habenaria, is indicated with comparative clearness. The superior (sterile) stigma stands quite separate from the other two (fertile) stigmas, and equally so from the anther-cells. It forms a large smooth concave erect termination to the column, while the two other stigmas form two elongate parallel processes overhanging the claw of the lip, conjoined by their edges in the lower half, but with their anterior halves free and curved downwards. At each side of and behind the infertile stigma lies a triangular anther-cell, bearing on its exterior surface the staminode which, on this theory, is regarded as the rudiment of its second cell. The tubes of the perfect cells pass horizontally outside and along the sides of the infertile stigma and project horizontally far beyond it, each containing a caudicle which bears on its extremity the viscid gland. This gland is quite unconnected with the walls of the tube. From these structural arrangements the following conclusions are by this theory deduced: (a) that in Diplomeris there are two anthers, one placed on each side of the posterior or infertile stigma; (b) that the staminode represents the second cell of each anther; (c) that the viscid glands of the pollinia are not, in the expanded flower, connected with the infertile stigma.

Plate 443.-Diplomiris hirsuta, Lindl. Four entire plants growing on a stone, of natural size. Fig. 1 profile view of bract, ovary, base of lip ( $l$ ) and spur, and the column showing the superior (infertile) stigma $(r)$, perfect stigmas ( $s$ ), anther-cells $(a c)$ and their polliniar glands ( $p g), 2$ front view of the base of the lip $(l)$, imperfect stigma $(r)$, perfect stigmas $(s)$, polliniar glands $(p g)$ and orifice of the spur $(c)$, 3 section of spur, 4 pollipia; all enlarged.

## 90. Satyrium, Swartz.

Terrestrial leafy erect herbs with undivided tubers. Leaves (in the Indian species) large, flaccidly membranous, with wide sheaths (orbicular in the S. Indian specimens). Flowers in dense spikes. Sepals and petals sub-similar, free, spreading or reflexed. Lip superior, (from the ovary not being twisted), adnate to the base of the column, erect, broad, hood-shaped, 2 -spurred (in the Indian species) or 2 -saccate. Column much arched, terete. Stigma single, large, convex or concave, borne on the upper lobe of the column. Anther-cells dorsal or lateral (lateral in the Indian species), tumid, sub-parallel, their tubes at a lower level than the stigma, pointing forward; pollinia two, the caudicles curved, ending in two large naked (sometimes connate) glands; species mostly African, only a few Asiatic.

## Satyrium nepalense, Don Prodr. Fl. Nep. 26.

Whole plant 20 to 30 in . high ; tuber ellipsoidal, bearing stolons each with a small tuber at its end. Stem glabrous, sheathed near the base; upwards bearing two or three leaves and, above these, several sub-tubular, lanceolate-oblong, acute or acuminate bracts. Leaves somewhat fleshy, narrowly elliptic, sub-acute, the bases broad and sheathing; length 4 to 10 in., breadth $1 \cdot 5$ to 3.5 in . Spike 2 to 6 in . long. Flowers 3 in. in diam. at the mouth; floral bract oblong-lanceolate, acuminate, deflexed, much longer than the flower and turgid ovary. Sepals linear-oblong, obtuse, ciliolate, recurved. Petals narrower than the sepals, entire, obtuse. Lip superior, broadly-oblong, hooded, strongly

[^11]keeled on the back; spurs varying in thickness and length, usually twice as long as the ovary (quite short in var. ciliata). Column curved, contracted at the base, expanded at the apex. Stigma projecting forwards above the anther, convex, anticous. Anthercells turgid, distant from each other, sub-parallel on the sides of the column at a lower level than the stigma; pollinia two, pyriform, bipartite, each ending rather abruptly in a slender curved caudicle directed downwards and forwards, and terminated by a thick discoid gland. Staminodes rugulose, hemispheric, situated on the upper sides of the anther-cells; rostellum broadly and bluntly triangular, having the anther-cells at its upper corners. Lindl. Gen. and Spec. Orch. 340 ; in Journ. Linn. Soc. III, 44; Wight Ic. t. 929 ; Bot. Mag., t. 6625 ; Wall. Cat. 7025 ; Hook. fil. Fl. Br. Ind. VI, 168, S. Perrottectianum, A. Rich. in Ann. Sc. Nat., Ser. 2, XV, 76, t. 53; Wight Ie. t. 1716. S. albiflorum. A. Rich. 1. e.; Wight Ic. t. 1717. S. pallidum, A. Rich. 1. c.

Sikkim and Bhotan, very common at elevations of from 8,000 to 10,000 feet; in flower during September and October; Pantling No. 464. Distributed westwards along the range to Kashmir, where it descends to 4,000 feet; Khasia Hills, about 6,000 feet; the hill ranges of Southern India; Upper Burma.

Var. ciliata; whole plant under a foot in height; spurs of lip shorter than the boldly ciliate sepals; petals erose; stigma convex, over-arching, hispid; rostellum truncate; caudicles exceeding in length the cleft pollinia. S. ciliatum, Lindl, Gen. and Spec. l. c. 341 .

In Sikkim and Bhotan at the same elevations as the typical form and growing intermixed with it; Pantling No. 297.

The usual colour of the flowers is rose-pink, but occasionally it is pure white. The flowers smell faintly of musk. In the Nilgiri and other of the hill ranges of Southern India a form occurs with a much shorter and very densely-flowered spike and with broad radical leaves. This has been separated off as a variety under the name Wightiana. It is never found in Sikkim, where the variety named ciliata is very common.

Plate 444.-Satyrium nepalense, Don. Parts of a plant, of natural size. Fig. 1 a flower with its deflexed bract, 2 view of the back of a flower showing the two spurs, 3 apex of ovary and column, seen from the front (the sepals and petals having been removed), showing the anther and the glands of its pollinia, the stigma ( $s$ ), and the rostellum $(r), 4$ pollinia; all enlarged.

Plate 444 bis.-Satyrium nepalense, Don, var. ciliata. An entire plant, of natural size. Fig. 1 a flower with its bract, front view, 2 flower and ovary, back viev, 3 apex of ovary and column, the two petals $(p l)$ and the dorsal sepal $(s l)$ in position, the rostellum $(r)$, anther-cells ( $p$ ), gland of a pollen-mass $(g)$, stigma (s), and staminode (c), 4 pollinia; all enlarged.

## Tribe VII.-CYPRIPEDIEAE.

Perfect anthers two, one on each side of the conjoined stigmas. Staminode single, large, fleshy; lip large, saccate.

## 91. Cypripedium, Linn.

Terrestrial herbs, stemless or with a leafy annual stem. Leaves coriaceous, ever green, smooth and often coloured; or membranous, deciduous and plicate. Flovers large,
usually solitary (rarely in pairs), borne on a scape or at the apex of the leafy stem. Sepals spreading, valvate or imbricate in æstivation, the dorsal large, erect; the lateral pair smaller, narrower, and usually connate under and behind the lip. Petals free, varying in shape; often very long. Lip sessile with small narrow auricle-like often inflexed side lobes and a large inflated saccate mid-lobe. Column short, terete; anthers two, sub-globose, the cells parallel, contiguous, pollen viscid or glutinous. Stigma forming a convex often rugulose dise, deflexed and hidden by the large disciform fleshy staminode. Ovary 1-celled. Species about 80 ; temperate and tropical Asia and America, also in Europe.

Scb-genvs I.-Paphiopedilum.-Stemless; leaves perennial, coriaceous, ever-
green, crowded near the ground, often coloured; flower
solitary on a long seape; perianth deciduous; sepals
imbricate in æstivation, the dorsal infolding the lateral
pair . . . . . . . . . . . . . . . . . 1. C. venustum.
Sub-genus II.-Eu-cypripedium.-Leaves membranous, plicate, deciduous, borne on a more or less elongated annual stem; flowers at the apex of the stem, usually solitary, marcescent; sepals valvate in æstivation.

Leaves two, opposite
2. C. elegans.

Leaves more than two, alternate.
Floral bract cymbiform, opening of the spur oblong; staminode deeply cordate at the base, the auricles angled, its upper surface with a vertical ridge
3. C. tiketicum.

Floral bract flat, opening of the spur irregularly orbicular, not oblong; staminodes shortly cordate at the base, the auricles rounded, the upper surface not ridged
4. C. himzlaicum.

## 1. Cypripedium venustum, Wall. in Bot. Mag., t. 2129; Cat. 7023.

Leaves five to seven, elliptic-oblong, somewhat loriform, acute and minutely bifid at the apex, dark green, marbled with pale green above and dull purple beneath, thick in texture, sheathing at the base; length 4 to 10 in ., breadth 1 to 2 in . Peduncle nearly twice as long as the leaves, terete, puberulous, usually only 1 -flowered (sometimes 2 -flowered). Flower 2 to 2.5 in . in diam.; floral bract oblong, acute, tubular, only half as long as the ribbed ovary. Sepals imbricate in æstivation, the dorsal broadly ovate or cordate, acute, erect, somewhat concave; the lateral pair much narrower, lanceolate, united under the lip. Petals longer than the dorsal sepal and lip, spreading horizontally, linear sub-spathulate, the lower edge rounded, the upper reflexed near the apex, the edges ciliate except at the reflexed part, the inner surface with seven parallel nerves, sparsely warted and pubescent. Lip longer than the dorsal sepal, sub-cylindric, the edges of its mouth reflexed. Staminode broadly semi-lunar, notched at the middle of the upper edge. Lindl. Gen. and Spec. Orch. 530 ; Hook. Exot. Flor., t. 35 ; Bot. Mag., t. 2129; Bot. Reg., t. 788; Reichb. Fl. Exot. 100; Lodd. Bot. Cab., 585 ; Warner Sel. Orch. II, t. 24; Veitch Man. 53 ; Hook. fil. Fl. Br. Ind. VI, 173. Kräntzlin Orch. Gen. et Spec. I, 86. C. pardinum, Reichb. fil. in Gard. Chron. (1869), 554; and 1887, I, 382, fig. 76 (var. pardina).

Sikkim, in tropical valleys ascending to 4,000 feet; flowering during February and March; Pantling No. 253.

The dorsal sepal is white with dark green vertical stripes; the petals are green and purplish with a few black spots; the lip is yellowish-green flushed with pink and beautifully reticulated with green; the inflexed lateral edges which partially close the mouth are yellow.

Plate 445.-Cypripedium venustum, Wall. A plant, of natural size. Fig. 1 front view of the staminode and stigma, 2 profile view of the same; both enlarged.
2. Cypripedium elegans, Reichb. fil. in Flora 1886, 560.

Height of the entire plant not exceeding 4 in . Stem and peduncle pubescent, the former bearing at the base a lax tubular acute sheath, and at the apex a pair of opposite almost orbicular, sessile, puberulous, plicate leaves from $1 \cdot 25$ to 1.5 in . in diam. Scape shorter than the leaves, bearing a single flower 1 in . in diam. vertically at the mouth and 65 in . horizontally; floral bract 75 in . long, ovate-lanceolate, puberulous, much longer than the short ovary and equalling the flower. Dorsal sepal narrowly ovate; the lateral pair united under the lip to form a body wider than the dorsal sepal. Petals lanceolate, concave, spreading slightly, but their apices curving slightly inwards. Lip shorter than the sepals, depressed, the sides abruptly infolded, the upper surface with three parallel crenulate wavy ridges proceeding from the mouth to the apex and uniting there, the apical part of the cavity of the lip with a fleshy plate extending from the upper to the lower wall and dividing it into two loculi. Staminode transversely eliptic. Stigma pyriform in outline, hispid. Hook. fil. Fl. Br. Ind. VI, 169. Franchet Cypriped. Asie Occ. et Orient., 15; Kräntzlin Orch. Gen. et Spec. I, 30.

Sikkim, in the Lachen Valley, elevation 10,000 feet; in flower during July; Pantling No. 387.

The colour of the flowers is brownish, with darker lines of the same colour.
Plate 446.-Cypripedium elegans, Reichb. fil. Two plants, of natural size. Fig. 1 front view of the lip, 2 vertical section of the lip to show one of the inflexed sides and the partition which divides the apical portion into two imperfect chambers, 3 front view of staminode and anthers, 4 profile view of the same; all enlarged.

## 3. Cypripedium tibeticum, King ex Rolfe in Journ. Linn. Soc. XXIX, 320.

Height of entire plant not exceeding 12 in . Stem sheathed at the base by two or three very unequal, wide, sheathing, sub-acute bracts. Leaves three, close together on the stem above the basal bracts, alternate, broadly ovate, sub-acute, sessile, sheathed, puberu'ous; length 125 to 1.75 in ., breadth 85 to $1 \cdot 5 \mathrm{in}$. Peduncle slightly longer than the stem, puberulous, ebracteate, 1 -flowered. Flower 2 in. in diam.; floral bract large, elliptic, cymbiform, sub-acute, ribbed and puberulous, about 2 in . long. Dorsal sepal elliptic, tapering to each end, the apex acute, 7 -nerved; the lateral pair lanceolate, connate under the lip except at the apex. Petals narrowly elliptic, sub-acute, as long as the dorsal sepal. Lip longer than the sepals, very large,
ventricose, much inflated, not depressed, prominently nerved, the edges of the mouth coarsely crenulate. Staminode broadly and bluntly ovate, angled at the base. Franchet Cypriped. Asie Occ. et Orient., p. 10 (1894). C. macranthon, var. ventricosa, (not of Swartz or Carriere); Hook. fil. Fl. Br. Ind. VI, 170. C. macranthos, Sw., var. tibeticum, Kräntzlin Orch. Gen. et Spec. I, 26.

Sikkim, in the Lachen Valley, at an elevation of about 10,000 feet; in flower during July; Pantling No. 386.

The colour of the flowers is brownish, the lip being flushed near its mouth with bright purple.

Plate 447.-Cypripedium tibeticum, King. Two plants, of natural size. Fig. 1 front view of staminode, 2 profile view of anther, staminode and stigma; both enlarged.
4. Cypripedium hmalaicum, Rolfe in Journ. Linn. Soc. XXIX, 319.

Height of plant 8 to 12 in . Stem clothed at the base by three or four unequal, lax, tubular, acute sheaths, $\cdot 5$ to 1.75 in . long. Leaves three, unequal, the lowest the smallest, scattered, from oblong-elliptic to broadly-elliptic, acute, slightly narrowed to the sheathing base, puberulous; length of the larger leaves 2.5 to 3.5 in ., breadth 1 to 2 in ., the lower leaf only 1.5 to 2 in . long and less than 5 in . broad; upper part of the stem 3 to 5 in . long, pubescent, bearing at its apex a single flower $2 \cdot 5 \mathrm{in}$. in diam. vertically, and less than 2 in . horizontally; floral bract narrowlyelliptic, acute, slightly concave, longer than the flower, many-nerved, 2 in. long. Dorsal sepal broadly ovate, acute, somewhat concave, the lateral pair slightly longer but only one-third as wide, connate under the lip. Petals spreading, narrowly oblong, sub-acute, longer than the dorsal sepal. Lip pendent, sub-cylindrically ventricose, many-nerved; the mouth wide, crenate. Staminode broadly ovate, blunt, slightly cordate at the base. C. macranthon, Hook. fil. Fl. Br. Ind. VI, 170, in part (not of Swartz). C. macranthos, Sw., var. limalaicum, Kräntzlin Orch. Gen. et Spec. I, 26.

Bhotan, in the Chumbi Valley, at an elevation of about 12,000 feet; in flower during July. Lachen Valley, alt. 10,000 to 12,000 feet; Pantling No. 373.

The colour of the flower is brownish, the lip having a strong tinge of purple.
Plate 448.-Cypripedium himalaicum, Rolfe. Two plants, of natural size. Fig. 1 front view of staminode, 2 profile view of staminode, anther and stigma; both enlarged.

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OBERONIA AURICULATA, King \& Pantling:



OBERONIA PYRULIFERA, Lindi. Lithi by A. C. Mukerjei.




Lith: by K. D. Chendra



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## ID










2

LIPARIS LONGIPES, Lindivar. SPATHULATA, Ridl.

$\overbrace{5}^{419}$

Orchids of the Sikkim-Himalaya.


Drawn by E. Pantling.



(V)


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## K





0900




Ann. Foy; Bot. Gard Calcutta, Vol \&


Drawn by R. Pantling








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Ann. Roy. Bot. Garden, Caloutta, Vol. 8, PIATE 66.







## 2 <br> 3












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Lithe by Now Chitra Silpi Ce



Lith: by Chitra Silpi Ce





## 8




CIRRHOPETALUM CORNUTUM, Linds.





Lith by Chitre Silpi Cf



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7

Lithe by New Chites Silpi Ca.






[^0]:    Sikkim

[^1]:    Thls species was collected by ons of $\mathrm{us}^{2}$ in the Runjeet valley in 1879, but has not since boen met with in

[^2]:    * Orchids of South Africa, and Orchids of the Cape Peninsula.
    $\dagger$ I have examined many flowers and drawings of species of Ophrydeae in the hope of finding a species in which the infertile cells or staminodes are attached on the inner sides of the fertile cells. But the only case in which I have found such an appearance is in Mr. Bolus's drawing of Pterygodium carnosum, Lindl. (Orchids of the Cape Peninsula, t. 12, fig. 5). If the structures there represented as ovjid rugulose bodies really are staminedis, the fact affords a strong confirmation of my theory.

[^3]:    A genus of about 100 species; inhabitants of both temperate and tropical regions; numerous in British India-chiefly on the lower slopes of the various mountain ranges.

    In many species the pseudo-bulb is cylindric, and in such it is usually described as stem. In many also the young leaves and inflorescence are produced on a new growth rising from the base of the pseudo-bulb formed during the previous year; the new growth itself, after flowering and shedding its leaves, becoming the pseudo-bulb of next year. This is the case in all the Indian members of the section Mollifolice. In other species both leaves and inflorescence are produced at the apex of previously formed pseudo-bulbs. The latter, as well as the arrangement first described, obtains in the group Coriifolice.

[^4]:    * Lip abruptly deflesed from the very base, flat.

    Leaf solitary.
    Lip more or less deltoid, its apex very broad

    1. L. cordifolia.

    Lip more or less broadly elliptic or ovate, narrowed to the apex
    2. L. Gamblei.

[^5]:    Edges of lip laciniate, anther tuberculate, flowers pubescent

    1. P. fibuliformis.

    Edges of lip entire, anther smooth, flowers glabrous
    2. P. Meirax.

[^6]:    Racemes erect, shorter than the leaves, 4- to 6-flowered; flowers white, apical lobe of lip reniform

    1. P. Parishii.

    Racemes pendulous, as long as the leaves, many-flowered, flowers
    yellow, apical lobe of lip saggittate
    2. P. Mınnü.

[^7]:    Ans. Rey. Bot, Gard., Calcutta, Vor. VIII.

[^8]:    Cavity of spur occluded by two calli, the dorsal one divided at the apex into two scale-like plates.

    Leaves semi-terete, channelled in front, their apices acute and sub-spinous

    1. C. armigerum.

    Leaves flat but keeled.
    Spur widely saccate, not dilated at the apex; apical lobe of lip triangular-hastate, its apex narrow and bifid; apices of leaves acute
    2. C. brecipes.

    Spur infundibuliform, dilated and notched at the apex; apical lobe of lip thick, triangular-ovate, acute, entire; apices of leaves broad, obliquely bifid
    3. C. spicatum.

[^9]:    Leaves terete.
    Lip jointed to the foot of the column

    1. S. appendiculatus.
    Lip adnate to the broad foot of the column
    2. S. filiformis.

    ## Leaves flat.

    Leaves 8 to 12 in . long; flowers in panicles; foot of column very short. 3. S. pallidus.
    Leaves $2 \cdot 5$ to 4 in . long; flowers in racemes, column with no foot . . 4. S. secundus.

[^10]:    Plate 367.-Horpysma longicaulis, Lind1. A plant, of natural size. Fig. 1 floral bract and flower, 2 ovary, column with the anther in situ, the lip and its spur, scen from the side, 3 upper surface of lip, 4 view of the back of the eolumn, the anther being in situ, 5 under surface of, anther, 6 pollinia; all enlarged.

[^11]:    * See introduction.

