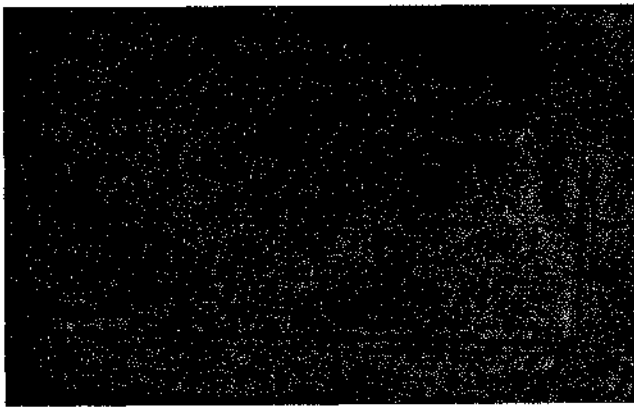
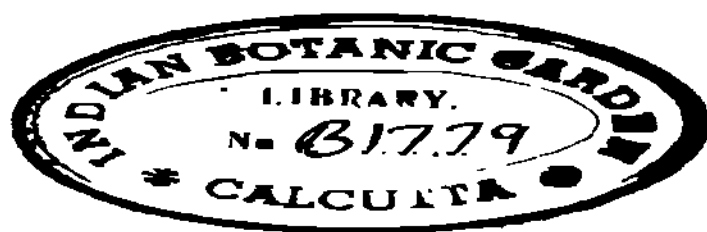


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ANNALS
OF THE
ROYAL BOTANIC GARDEN, CALCUTTA.

Vol. III.

1. THE SPECIES OF PEDICULARIS OF THE INDIAN EMPIRE AND ITS FRONTIERS, BY D. PRAIN, M.B, F.R.S.E, CURATOR OF THE HERBARIUM.
2. THE MAGNOLIACE.E OF BRITISH INDIA, BY G. KING, M.B, LL.D.,
F.R.S., C.I.E., SUPERINTENDENT OF THE GARDEN.
3. AN ACCOUNT OF THE GENUS GOMPHOSTEMMA, BY D. PRAIN.
4. THE SPECIES OF MYRISTICA OF BRITISH INDIA, BY G. KING.



CALCUTTA:
Printed at thp Bengal Secretariat PI-BSS.
1801.

ANNALS
OF THE
ROYAL BOTANIC GARDEN, CALCUTTA.



Vol. III.

TO THE HONOURABLE

Sir Charles James Bluff,

K.C.S.I., LL.B.,

LIEUTENANT-GOVERNOR OF BENGAL,

THIS ATTEMPT TO DESCRIBE AND ILLUSTRATE PART OF THE FLORA OF BRITISH INDIA,

WHICH THE LIBERALITY OF HIS GOVERNMENT

HAS MADE IT POSSIBLE TO PUBLISH,

IS MOST RESPECTFULLY DEDICATED

BY HIS OBEDIENT AND GRATEFUL SERVANT

GEORGE KING.

ROYAL BOTANIC GARDEN, CALCUTTA,

July 1891.

THE
SPECIES OF PEDICULAEIS
OF THE
INDIAN EMPIRE AND ITS FRONTIERS.



BT

DAYID PRAIN,

Curator of the Herbarium, Royal Botanic Garden, Calcutta;
Surgeon, Indian Medical Service.



CALCUTTA:
Printed at the Bengal' Secretariat Press.
1890.

PREFACE.

THIS paper consists of descriptions of Indian species of *Pedicularis*, preceded by a synopsis of the genus in which the probable natural position of the Indian species is shewn,

The area dealt with is not the India of political geography, but an extended *botanical* India, which includes mediatorial provinces like Kashmir, Sikkim, and Manipury and independent ones like Nepal and Ceylon. Within its boundary line, however, there is occasionally only a part of what appears to be a natural phytogeographical district. Where this happens all the species hitherto reported from the district are accounted for; the expression "Indian Frontiers" has been introduced into the title to indicate the fact: species that are confined to districts which lie wholly outside the area dealt with in the *Flora of British India* have been omitted.

Dr. KING, Superintendent of the Botanic Garden, directed me in 1885 to examine the material of this genus brought to Calcutta by collectors in Chumbi and in Sikkim, and to arrange the species in accordance with Sir J. D. HOOKER'S article "PEDICULARIS" in the *Flora of British India* (vol. iv, pp. 306—317). During this examination some novelties were detected—the number of these has since 1885 increased materially—and among them were certain forms that appeared to clear up some difficulties in the systematic disposition of the genus. Owing to this fact and to recent additions of territory to the Empire, a more extended examination of the genus was undertaken, and in conducting it the excellent revision of Asiatic species by Mr. MAXIMOWICZ, published in 1877 and supplemented in 1881, was taken as a foundation. This examination was carried on during intervals between official duties, and was not yet completed when I became aware, in 1887, that Mr. MAXIMOWICZ was engaged in revising the genus anew. The Indian material already systematised was then sent to Mr. MAXIMOWICZ, but that author very strongly deprecated the intention that was formed of suspending the examination; on the contrary, he urged the continuation of the study of the Indian species, and it is to his generosity in supplying material for comparison to the Calcutta Herbarium, and his kindness in making comparisons at St Petersburg when material could not be spared, that the completion of the paper now is largely due. But I am similarly deeply indebted to the DIRECTOR of the Royal Gardens, KEW, for comparisons made in Kew Herbarium by the staff in 1885 and in 1887, as well as by Dr. KING when he was in England in

188B. During the whole of the investigation, too, Dr. KING has taken the warmest interest in its progress, giving the benefit of his advice at almost every step—much to the advantage of the enquiry itself.

Mr. DUTHIE, Director of the Botanical Department of Northern India, very kindly placed the material of the genus preserved in the Saharanpur Herbarium at my disposal for purposes of study. Without this assistance the investigation of Western Himalayan forms must have been far less satisfactory. Dr. GARDKE of Berlin, whom I consulted regarding some species collected by Dr. Hoffmeister and described by Dr. Klotzsch, generously responded by sending authentic specimens of these to Calcutta. Mr. D. B. CLARKE with equal generosity sent specimens of the *Pedimhres* of his Manipur journey, and Mr. T. B. WATT kindly volunteered the use of the material of the genus contained in his private herbarium.

I am moreover greatly indebted to Dr. LANGE of Copenhagen, to Mr. HEMSLEY of London, and to Dr. TRAIL of Aberdeen for being so good as to verify for me references to works that could not be obtained in Calcutta.

* The assistance of all these gentlemen I desire gratefully to acknowledge.

DAVID PRAIN.

HERBARIUM, ROYAL BOTANIC GARDEN, CALCUTTA;

1st January 1899.

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PART I-INTRODTJCTOEY.

THE SPECIES OF PEDICULARIS

OF THE
INDIAN EMPIRE AND ITS DEPENDENCIES.

CHAPTER I.—HISTORICAL.

THE Scrophulariaceous genus PEDICULARIS, which Tournefort¹ had already (in 170D) almost exactly limited, was defined by Linnaeus² in 1737. In 1753 Linnaeus³ described 14 species, and in 1757* two more. Willdenow⁵ in 1800 recognised 34 species, and Steven,⁵ who prepared a monograph of the genus in 1823, diagnosed 49. Bunge⁷ in 184B enumerated 99 species; in the same year Bentham⁹ distinguished 109. Bentham and Hooker⁹ found in 1876 that the total had exceeded 129, while Maximowicz¹¹ in 1881 brought the total up to 153. But in 1888 Maximowicz¹¹ has had to account for 25D species, and the total has now reached 2BI. Moreover, when the area still to be investigated is considered, it is certain that many separable forms are yet unreported. M. Franchet¹² indeed has already intimated the existence of some of these.

The arrangement of Linnaeus was followed by Willdenow, but Steven, finding it altogether inadequate, elaborated a system the value of which is best appreciated from the fact that although the number of species now known is five times what it was in 1823, subsequent monographers have been able to follow in its author's footsteps. The best systems, those of Bentham and of Maximowicz, are certainly very different from that of Steven, but the modifications are more due to development than to reconstruction. The principle underlying this development has been the recognition and definition of subordinate sections or series consisting of naturally allied forms. Initiated by Bentham, who recognised 18 of these, it has been extended by Maximowicz who separated 20 such series in 1877 and 28 in 1888. And this principle, as the present synopsis shows, appears capable of still further extension.

¹ *Inst. Bot. Herbar.* p. 171, t. 77.

⁵ *Sen. Plantar.* n. 745.

¹ *Species Plantar.* 1807.

⁴ *Mantissa Plantar.* 88.

* *Species Plantar.* iii, 202.

⁵ *Mem. Soc. Mote.* ri, 55.

⁷ *Bull. Phys. Math. Ac. Petersb.* i, 3B9.

⁸ *DC. Prodr.* x, 580.

⁹ *Genera Plantarum* li, 579.

¹⁰ *Mel. Biol.* x, 80, and xi, 278.

¹¹ *Mel. Biol.* xii, 919.

¹² *Bull. Soc. Bot. de France* vol. xxxvi, *Rev. Bibliograph.* 56, in footnote (2); see also below, footnote (1), p. 58.

CHAPTER II.—MDRPHDLGDY.

THE species of *Pedicularis* are semi-parasitic or rarely (*P. fragilis*) semi-saprophytic. The difference from a physiological point of view is more one of degree than of kind, and even where specifically constant the latter condition may be regarded as an accident due to environment. It must, moreover, be rare since few species affect localities favourable for the condition.

A few species appear to be truly annual. But the majority of those that have been described as annual or apparently annual are now known to possess perennial rootstocks. In a few of the Indian species the evidence is inconclusive or there is no evidence yet available, but in the majority there is either presumptive evidence from the nature of the rhizome itself, or else direct proof that the species is perennial from the presence in the same specimen of stems belonging to two flowering seasons. The following table shows the extent and the nature of this evidence in a compact form:—

TABLE I.—*Habit of Indian Pediculars.*

Presumably annual.	Presumably perennial.	Certainly perennial.	Evidence still incomplete for
<i>P. bella.</i> <i>earnosa.</i> <i>Collettii.</i> <i>confertiflora.</i> <i>corymbosa.</i> <i>gracilis,</i> <i>guinea.</i> <i>lyrata.</i> <i>megalantha.</i> <i>mosensis.</i> <i>Perrottetii.</i> <i>pseudogaloides.</i> <i>tibetica.</i> <i>zeylanica.</i>	<i>alaschanica.</i> <i>albiflora.</i> <i>bicornuta.</i> <i>brevifolia.</i> <i>Clarkii.</i> <i>denudata.</i> <i>epiphytoides.</i> <i>filixiosa.</i> <i>fragilis.</i> <i>gibberula.</i> <i>Heydei.</i> <i>instar.</i> <i>Kingii.</i> <i>longiflora.</i> <i>microcalyx.</i> <i>Diontophora.</i> <i>Pantlingii.</i> <i>pinnatifida.</i> <i>Prainiana.</i> <i>Przewalskii.</i> <i>Hegelians.</i> <i>robusta.</i> <i>tenuicaulis.</i> <i>thunbergii.</i> <i>trichoglossa.</i>	<i>chilanthifolia.</i> <i>chumbica.</i> <i>condita.</i> <i>Daltoni.</i> <i>dolioborrhiza.</i> <i>ElwBahii.</i> <i>exceles.</i> <i>furfuracea.</i> <i>Qarokeana.</i> <i>globifera.</i> <i>integrifolia.</i> <i>lachenoglossa.</i> <i>macrantha.</i> <i>nypalensis.</i> <i>Dedsri.</i> <i>Daphniphylla.</i> <i>pon-BDta.</i> <i>pyrenantha.</i> <i>pyramidata.</i> <i>rhinanthoides.</i> <i>Eoylei.</i> <i>schizorhyncha.</i> <i>Scullyana.</i> <i>fiiphanantha.</i> <i>Wauichii.</i>	<i>cumptoniifolia.</i> <i>curvipis.</i> <i>flagellaris.</i> <i>Gammiciana.</i> <i>OlivBriana.</i>
	All in this column possess distinct rootstocks, mostly crowned with membranous scales.	If all in this column there exist specimens at Calcutta with stems of two different seasons attached to the rootstock.	

In those species that appear to be annual the root is woody, the rootlets being either all fibrous [*P. bella*, *lyrata*], or some of these towards the point being tuberous [*P. carnosa*, *corymbose**, *zeylanica*], the main root in this latter group being premorse. In perennial species the rhizome may be woody with fibrous rootlets only (*P. ezcelsa*, *brevifolia*, *instar*), with fibrous and tuberous rootlets intermixed (*P. furfuracea*, *microcalyz*, *porrecta*), or with tuberous rootlets only (*P. Heydei*, *tenuicaulis*). More usually the rhizome is thick and fleshy—cactoid—and may either be without rootlets (*P. trichoglossa*, *Clarkei*), may give off fibrous rootlets [*P. Royhi*, *lachnoglossa*], or give off tuberous rootlets (*P. mavrantha*, *pymantha*). The rhizome may be erect or horizontal, and when erect is often branched downwards [*P. Daltoni*, *alaschanica*], but rarely upwards (*P. Wallichii*); when horizontal it very often branches in the direction of growth [*P. odoniophora*, *gibbera*, *Regeliana*]. The erect rhizome is usually underground or has only the crown projecting above the surface; the horizontal is generally slender and creeps along the surface, only rarely being cactoid (*P. Orlarkei*, *Prainiana*, *trichoglossa*), and then deeply buried. Thick fleshy rhizomes usually, woody rootstocks rarely, have a crown of membranous scales. These when the rhizome is erect are crowded and sheath the base of the stem; when it is horizontal they are separated by internodes. They vary from large ovate [*P. pymantha*, *dolichorrhiza*], or long lanceolate [*P. schisorrhyncha*, *lachnoglossa*], to exceedingly minute [*P. trichoglossa*]. Flagella occasionally arise from their axils [*P. Kingii*], and in the species with cactoid underground rootstocks the flagella pass directly to the surface of the soil, giving off immediately below it collars of fibrous rootlets and being continued above into relatively thick stems. And unless specimens are available in which the connection of these flagella with their rootstock remains intact, these species [*P. trichoglossa*, *Orlarkei*, *Prainiana*] may readily be mistaken for plants of annual habit.

A small but distinct group of nearly allied forms [*P. Regeliana*, *Artselaeri*, *acaulis*] is stemless; elsewhere in the genus there is a distinct stem—sometimes very short (*P. bella*, *lyrata*, *nepalensis*, *Przewalskii*), but ordinarily more or less elongated, and in two Indian species [*P. ezcelsa*, *dolichorrhiza*], at times exceeding a metre in height—hollow and round, usually smooth, though occasionally grooved [*P. Orlarkei*], or 2—4-angled, the angles rarely being almost winged (*P. rex*). The thickness varies from that of a crow-quill (*P. tenuicaulis*) to that of the little finger [*P. ezcelsa*]. The stem is usually simple; when branched the branches, like the leaves, may be alternate [*P. carnosa*], opposite (*P. flezuosa*), or whorled (*P. pectinata*). The branches may be fastigate [*P. Oolthii*], or spreading (*P. tenuirostris*), and simple or, rarely, branched a second time [*P. gracilis*]. Branching at the base [*P. alaschanica*, *confertiflora*, *cheilanthifolia*, *Roy lei*] is not unusual, but branching higher up is exceptional as regards Indian species, though occasionally such branching may occur owing to injury to the upper part of the stem in species not normally characterised by a branching habit.

The stem and branches may be glabrous, but are more often variously hirsute or pilose; not infrequently where the leaves are verticillate the stem is 2—5-fariously hairy, the lines of hairs being determined by the number of leaves in a whorl.

At the base of the stem there is a circle of radical leaves; these usually disappear when the root or rootstock is woody and the rootlets are fibrous, but persist where the rootlets are tuberous or the rhizome is cactoid. And in those species where the rootlets are sometimes fibrous, sometimes tuberous, the radical leaves correspondingly sometimes are evanescent and sometimes persist. At the same time a few annual species have a ring of radical leaves (*P. bella*), while some species with thickened rhizomes may lose

them (*P. Wallichii*). And in the species with thickened underground rhizomes that emit fibrous rootlets and are prolonged upwards into apparently annual stems (*P. trichoylossa*, *Clarkei*, *Pramiam*) the radical leaves are evanescent. The cauline leaves may be in number, and then may resemble the radical leaves (*P. Wallichii*) be markedly unlike them (*P. lachnoglossa*). But usually the cauline leaves are somewhat numerous, differing from the radical leaves mainly in being more petioled or altogether sessile and in having smaller lamina. The transition as a rule is gradual where the species has alternate leaves, more abrupt if the leaves are alternate (P. *lack-* *Zla*) gradual where they are whorled (*P. rex*). The length of the petiole is very variable, sometimes it is slightly winged [*P. almchanim*] very rarely much expanded so that adjacent petioles become connate in a membranous ochreate sheath [*P. rex*]. Very often the cauline leaves are sessile; the radical leaves may also be sessile (*P. Clarkei*), but this is extremely rare. In alternate-leaved species the lamina is usually lanceolate, less often ovate (*P. Collettii*), while in species with opposite or whorled leaves the lamina is often ovate than lanceolate (*P. Heydei*). Though the margin is sometimes no more than crenate (*P. & A. carnosa*) it is never in Indian species quite entire: more generally the lamina is pinnatifid to partite; often it is twice pinnate, sometimes even thrice divided [*P. exceha*, *Kingii*]. The extent of division diminishes as the lamina itself decreases in size towards the apex of the stem.

The floral leaves may be only distinguishable, if distinguishable at all, from the cauline in size, in which case the flowers are merely axillary (*P. fnigilin*, *flexuosa*, *gihbera*). This is most usual in species with verticillate leaves. These floral leaves are then generally smaller than the cauline; sometimes, however (*P. flezuosa*), they are of the same size, rarely (*P. dmudata*) the lower floral leaves are distinctly larger. But at times in verticillate-leaved species, and usually in those with alternate leaves, the floral leaves are modified into distinct bracts. In a few cases the transition to the bract region is sudden (*P. excelsa*) as a rule it is gradual, and the lowest flowers occur in the axils of what are only smaller cauline leaves. Bracts vary from ovate to lanceolate, with margins serrate throughout [*P. lavhnhghssa*], serrate only at the apex (*P. trhhoghssa*), or entire [*P. tenuirosiris*]; are usually sessile and represent only a modified lamina, but are sometimes distinctly petioled (*P. excelsa*), and occasionally represent mainly a modified petiole with only the rudiment of a lamina left at the tip (*P. Oederi*).

The flowers may be sessile or sub-sessile and the inflorescence sub-capitate or subspicate, or distinctly pedicelled and the inflorescence racemose. When this is accompanied by a loosely branching stem (*P. gracilis*, *Kingii*) the inflorescence becomes paniculate. When pedicels are present the flowers are usually erect; sometimes [*P. curvipes*, *rempinata*] they are deflexed.

The flowers as a rule open centripetally, but it is by no means unusual for those in the lower axils to open later than the rest, as exceptions (*P. dolichorrhiza*, *villosa*), or as a rule (SIPHONANTILE generally). In the former case it is clearly not an instance of centrifugal opening; in the latter it is by no means certain. The condition is constant among the SIPHONANTILE, and the evidence from herbarium material will be examined in connection with the subject of estivation, but careful field observation is necessary in order to clear up the point. There are, however, frequent examples in high Alpine

^J The leaves in two species—both American (*P. angustifolia*, *Homlii*)—are undivided.

specimens of an exceptional, but yet distinct, centrifugal opening (*P. cheilanthifolia*), and a centrifugal inflorescence is constantly present in, and is highly characteristic of, the Arctic group *Hirsute*.

The calyx consists of a tube which may be ovate (*P. Elwesii*) campanulate [*P. gruina*], cylindric [*P. Perrottetii*], or subinflated [*P. Wallichii*], and of teeth which may be minute (*P. comptonicefolia*), but are generally distinct, and then are either oblong or triangular with a broad base, or ovate with a narrow base. The tube varies in consistence from thinly membranous [*P. rex*] or membranous (*P. fragilis*), to herbaceous [*P. gracilis*], or thickly herbaceous [*P. lella*], and may sometimes even be sub-coriaceous (*P. integrifolia*). In a few cases tube and teeth are of the same consistence. As a rule in calyces with wide-based teeth the margin, and in those with narrow-based teeth the whole tooth, is of firmer consistence than the tube.

The tube is always longitudinally nerved; five strong main nerves pass upwards into the calyx teeth with usually five slender intermediate nerves that fork near the limbus into marginal nervules for two adjacent teeth. As a rare occurrence these secondary nerves may all be absent, but as a rule where the upper tooth is weak the upper main nerve is of the same thickness as the adjacent secondary nerves, while when the upper tooth altogether disappears and the calyx is 2-dentate, these adjacent secondary nerves are not traceable, and the posterior nerve may either pass entirely into one lateral tooth (*P. rex*), or more usually may fork into the two lateral teeth (*P. carnososa*). The longitudinal nerves may be unbranched (*P. rex*) but usually those that pass directly into the teeth give off lateral nervules that may be confined to the teeth only [*P. verticillata*], or extend throughout the upper third or half of the tube (the most usual condition, sometimes even to the base of the tube (*P. dolivherrhiza*)). The normal number of teeth is five but the upper tooth, except in a small number of species with triangular teeth, is distinctly smaller and less incised than the other four. Of the remainder the two nearer the upper tooth are almost always distinctly larger than the anterior pair. But often there are only three teeth [*P. siphonantha*, *longiflora*] in which case the two lateral pairs are confluent, and sometimes only two (*P. carnososa*, *Collettii*, *curvipes*) from the further abortion of the naturally weaker upper tooth, or very rarely [as in the already quoted case of *P. rex*] from the absorption of the upper tooth in DUB or other of the lateral ones. The lateral nervules of triangular or oblong teeth anastomose with the marginal branches derived from the forking secondary nerves; the lateral nervules of narrow-based ovate teeth are disposed like the nerves of a small leaf or bract. The length of the teeth relatively to the calyx tube may vary considerably in the same species (*P. bicornuta*), but the proportions of the teeth to each other remain very constant. But it has to be noted that in normally 5-toothed species the lateral pairs of teeth on one side or on both may be conjoined (*P. Elwesii*, *megalantha*) while similarly the lateral teeth of normally 3- or 2-toothed species [*P. carnososa*, *longiflora*] may on one side or on both be divided. Besides being toothed, the limbus is usually cleft in front, occasionally to the base [*P. rex*] sometimes 1/2 to 1/3 of its depth (*P. Ulwesii*, *furfuracea*), but usually only from 1/4 to 1/2, and occasionally the limbus is not perceptibly cleft (*P. gracilis*, *gruina*). In 2-dentate species it is cleft also, though less extensively, behind. The margins of lanceolate or oblong teeth may be entire, or serrate at the apex only (*P. Oederi*), or throughout (*P. Cforkei*) those of ovate teeth are always dentate or incised, the segments not infrequently being mucronate. These dentations may be erect, or deflexed at the tip only, or altogether, and sometimes the whole tooth is deflexed. These conditions give

rise to an appearance often described as crenate. A truly crenate margin (*P. Uollettii*) is exceedingly rare.

The disc is not enlarged at all in many species, but in the larger moiety it is slightly enlarged anteriorly. This enlargement is not as a rule conspicuous, though in the Indian species (*P. rex*) it projects as an almost vertical process from two-thirds to quite as long as the ovary, and protrudes in front between the margins of the completely cleft calyx.

The corolla consists of a tube, sometimes of uniform calibre but usually expanded upwards, whereon the stamens are inserted. The limbus is divided into a patent 3-fid lip (*labium*) below and a compressed hood (*gaka*) enclosing the style and stamens and prolonged or not into a beak (*Rostrum*) above. Its aestivation is that characteristic of the EUPHRASIES. The midlobe of the lip is outermost in the bud, the hood is inmost, and where the lip is large enough to cover the hood completely, the left lateral lobe overlaps the right. The beak, when present, is somewhat variably disposed. The tube sometimes even shorter than the calyx, usually equals or somewhat exceeds it, and at times as in most SIPHONANTILE and some RHYNDHOLDPH*) it is long and slender and much exceeds the calyx. Even when ultimately longest it is late of development, the hood and lip, as well as the anthers and ovary, attaining almost their full size before it begins to elongate. In young buds of all species the filaments are inserted close to the base and where no great elongation takes place the staminal insertion is not carried a great distance up the tube, very frequently only to a point opposite the top of the ovary. In a few cases (*P. Kani*) not quite so far. The same condition is met with in those cases where the elongation of the tube takes place chiefly in the portion below the staminal insertion and the limbus (*P. corymbosa*, *pectinate*, *gruina*). Where "otherwise" the hand, the elongation is uniform throughout the tube we obtain the following among DRTHORBYNCH* (but also very common in other sections) of 7.1 *? the middle of the tube, while in those cases where $T \approx 2 \times T^{TM}$ between the staminal insertion and the base of the tube we obtain $T^{staminal} \approx 7$ at the top of the tube—a condition that characterises the LZZ^1

The amount of elongation varies considerably, as the subjoined table shows and does not therefore afford a reliable diagnostic character, but the portion that elongates is always the same, and therefore supplies a character of the greatest value.

TABLE II.—*Variation in length of Corolla tube in Indian species of § SIPHDNANTHJE,*

I.	II.		III.	IV.		V.
SIPHDNANTHJE.	LIMITS OF VARIATION IN THE SPECIES—		Number of separate gatherings.	LIMITS OF VARIATION IN INDIVIDUAL SPECIMENS—		Localities of the specimens in column IV.
	Df corolla tube	Df calyx.		Or corolla tube.	Df calyx.	
1. Eusiphonanthus.						
P. bicDrnuta ...	IB—25 mm.	15—19 mm.	22	21—2B mm.	IB mm.	Pangi.
elephantoideB ...	IB mm.	14·5 mm.	1	IB mm.	14·5 mm.	Kashmir.
loDgiflora ...	33—74 mm.	ID—11 mm.	32 j	42—55 mm.	ID mm.	Alpine Sikkim.
megalantha ...	21—94 mm.	15—2 D mm.	33	40—54 mm.	ID·5 mm.	Dhumbi.
rhinanthoides ...	14—27 mm.	11—13 mm.	21	44—52 mm.	16 mm.	Buck-cheem, Chumbi.
siphonantha ...	22—6 D mm.	9—ID mm.	6B	14—21 mm.	12·5 mm.	Pant ^{hi} .
				24—29 mm.	95 mm.	Lebang Pass in Sa-
						maon.
bella ...	25—3B mm.	15 mm.	6	3D—33 mm.	15 mm.	Dhum-la-ree.
Przewalskii ...	28—34 mm.	ID—J2 mm.	3	2B—3D mm.	ID mm.	Phari.
2. Macranthus.						
Daltoni ...	17—23 mm.	12 mm.	7	1B—2D mm.	12 mm.	Donkia-la.
Elweaii ...	13—15 mm.	11—17 mm.	ID	ID 13 mm.	11 mm.	Phari.
Grarckeana ...	IB—28 mm.	14—17 mm.	7	IB—19 mm.	IB mm.	Tan-ka-la. ¹
macranbha ...	ID—13 mm.	13 mm.	B	11—13 mm.	13 mm.	Nampa Gradh in W.
						Nepal.
nepalensis ...	21—2fi mm.	14 mm.	1	21—25 mm.	14 mm.	Hogling in E. Nepal.
robusta ...	11—12 mm.	11—12 mm.	3	11 mm.	11 mm.	Alpine Sikkim.
Scully ana ...	2 J-22 mm.	IB—19 mm.	5	2D—22 mm.	18·5 mm.	Jongri.
3. Gryorrhynchus.						
integrifolia ...	17—24 mm.	12—13 mm.	4	17—21 mm.	13 mm.	Phari.

The figures in column III indicate the number of gatherings from which the measurements given in column II are taken; to give the number of specimens measured in every case seems unnecessary. Measurements Df DVer 2D0 specimens of *P. siphonantha* have been made, and measurements Df 23 specimens of *P. nepalensis*. The only species in the list whereof the measurements must be considered inconclusive is *P. elepkantoides*, of which but one gathering containing only two specimens has been available. The localities in column V are thus 9 of the individual specimens whose measurements are given in column IV.

This table has been limited to § SIPHDNANTHJE because this is the section of which an elongated tube is most characteristic and is the one in which most use has been made of its morphological index—the relative length of calyx and corolla tubes. The table shows that the character is too variable to be capable of other than a very general application.

The morphological index of the portion of tube that elongates—the point of insertion of the stamens—affords, on the other hand, a character of high diagnostic value. When the staminal insertion is carried to the apex of the tube, the calibre is uniform throughout; when not carried so far, the tube, as a rule, enlarges slightly upwards from this point. This enlargement takes place even among SIPHONANTHA in those species where the staminal insertion is some distance below the apex (*P. macrantha*, *Scullyana*, *Daltoni*). But there are many species, more particularly among ORTHORRHYNDALE, where the staminal insertion is at the middle of the tube (*P. Jlezuosa*, *chumbica*), and some both amongst ORTHORRHYNCEAE (*P. pzctinata*) and amongst RHYNDHLOPILE (*P. gruina*), where the staminal insertion is opposite the top of the ovary, yet with the tube cylindric throughout or only very slightly enlarged at the apex. The contrary condition,

however, nowhere prevails: the portion of tube between the staminal insertion and the base, whether short or long, is of uniform calibre. The staminal insertion in *P. pedznata* is at the base of a transverse indentation of the tube, but this arrangement occurs nowhere else, and is absent from the very nearly allied *P. pyramidata*.

The tube in SIPHONANTQ*; and in ORTHORRHYNIDILE is straight, but in many RHYNDHDLPH* and in most BIDENTAT* it is curved, the concavity being anterior. In ANODDNT* it is very frequently angularly bent either within the tube or opposite the hmbus of the calyx. In some cases this infraction is absent, and the tube may be straight [*P. Kingii*] or incurved [*P. p/cnantha*]. The amount of infraction varies somewhat, but the situation of the angle is constant for individual species.

The lip is always 3-lobed, and usually is rounded in front, very rarely narrowing gradually from a wide base. In ANODONT^E and BIDENTATJE the lip is stipitate, the base bluntly erect and 2-cristate above, and the lobes usually too small to envelope the hood in the bud. Even when sufficiently large to do so, they are early deflected and permit the hood to appear. In SIPHONANTHJB and ORTHORRHYNDEUE the lip is sessile, the lateral lobes overlapping in the bud and quite covering the hood, while the base is narrow and uncrested. In RHYNDHDLPH^E the lip may be stipitate with a wide base and with distinct crests (*P. Colhitii*, *eeylanica*), with a narrow base and then with only rudimentary folds near the base of the lobes [*P. Olarkei*, *Prainiana*], or without folds (*P. lachnoglossa*); or it may be sessile (*P. carnosa*, *gruina*) and without folds. The lobes are usually rounded, with the margin entire, or with the midlobe (*P. siphonantha*), or all three [*P. longipra*] truncate, but are sometimes ovate (*P. corymbosa*), or obovate (*P. Perrottetii*). When rounded the midlobe is as a rule somewhat narrower than the lateral lobes; when ovate or obovate the lobes are nearly always equal in size. In a few cases [*P. Kiruii*, *fratilis*] the lateral lobes are narrower than the central; in these instances the midlobe is rounded while the lateral lobes are ovate. The margin is often ciliate, a character which is extremely constant in individual species.

The hood consists of two distinct portions—a basal continuous with the tube and an upper which encloses the anthers. The basal part is always of the same consistence as the tube and generally of the same width, is always erect and generally of the same length as the upper portion, though it may be distinctly longer (*P. schizorrhyncha*), or may, on the other hand, be almost absent (*P. excelsa*). The margin is usually distinctly thickened, sometimes sinuate [*P. longiflora*, *furfuracea*], sometimes toothed (*P. siphonantha*, *odontophora*), and sometimes replicate (*P. Oederi*, *pynanthu*). The upper part or hood proper is, except in ANODDNT^E, of firmer consistence, and is generally a little wider than the basal portion. In ANODONTJE it is erect and continuous with the base; in BIDENTATJE, in most RHYNDHDLPHJE, and in SIPHONANTH^E it is curved; while in ORTHORRHYNCH*: it is angularly bent. The margin in ANODDNT^E and in some RHYNDHDLPH^E is entire. It is toothed only at the lower angle (*P. Regeliana*); in BIDENTAT-E it is toothed immediately below the apex; while in most RHYNDHDLPH^E and in all save one species of the LONGIRDSIRES it is prolonged at the apex into a distinct beak. The beak, like the tube, is late of development, and though discernible in the bud, it is impossible to say from its condition whether it will remain rudimentary (*P. ghibifera*), become short and thick [*P. alaschanica*], slender and falcate (*P. gruina*), straight [*P. flexuosa*], flexuous (*P. pectinata*), or circinnate (*P. siphonantha*). Neither the absolute length of beak nor the relative lengths of beak and lip or of beak and hood afford reliable characters in diagnosis. The apex of the beak may be entire, emarginate, or deeply bifid, and this condition, which

is evident in the very youngest bud, is of high diagnostic value. The aestivation of the beak appears to afford important evidence as to the structural affinities of species. Owing to the lateness of development of the beak, young buds afford less information than might be expected. But the interpretation of the conditions is materially assisted by various accidental circumstances. In the SIPHDNANTHÆ the flowers in the axils of the lower bracts, if they open at all, open later than those higher up. These lower unopened flowers are not, however, necessarily undeveloped; on the contrary, the beak elongates till it attains its full size and the tube also elongates and lies in zig-zag folds imprisoned in the lower portion of the calyx-cup. Only careful study in the field can determine whether we have here a mere case of centrifugal opening or a condition akin to cleistogamy. The morphological aspect of the arrangement is, however, as interesting as the biological, and, so far as the beak is concerned, admits of the following definition:—

Axis of beak parallel to median line of lip with direction reversed, since the dorsal entire aspect of the beak is apposed to the lip, and the apex is directed to the throat of the corolla. It may be expressed by the notation $\begin{matrix} R \\ \text{---} \end{matrix} \begin{matrix} \text{---} \\ \text{---} \end{matrix} \begin{matrix} \text{---} \\ \text{---} \end{matrix}$ (the arrow R standing for the beak, the arrow L representing the lip). In all DRTHDRRHYNCHÆ an opposite condition prevails. It is seen in its simplest form in species where beak and lip are of the same length (*P. gracilis*, *flexuosa*), but is equally evident in species with long flexuous beaks (*P. pectinata*, *pyramidata*), and may be defined as follows:—*Axis of beak parallel to median line of lip with direction the same*, since the ventral divided aspect of the beak is apposed to the lip, and the apex is directed to the margin of its middle lobe. The notation here would be $\begin{matrix} \text{---} \\ \text{---} \end{matrix} \begin{matrix} \text{---} \\ \text{---} \end{matrix} \begin{matrix} \text{---} \\ \text{---} \end{matrix}$ [R as before representing the beak and L the lip]

It is not easy to imagine a condition intermediate between two such opposite arrangements, but it is interesting to find that in most of the beaked RHYNCHDLOPHÆ a condition exists of which the two arrangements already described might be equally well derivatives. It may be stated thus:—*Axis of beak perpendicular to median line of lip with direction at right angles*, since the ventral divided aspect of the beak is directed towards the throat of the corolla, and the apex is apposed to the middle of the lip. This condition

may be symbolized as $\begin{matrix} R \\ \text{---} \end{matrix} \begin{matrix} \text{---} \\ \text{---} \end{matrix}$ (where R is again the beak, L the lip).

THE correlation of beak and tube deserves notice. In those species where the beak is pronounced the corolla tube tends to become of uniform calibre, in those species where the corolla tube is infundibuliform there is no beak. This is made more striking owing to the fact that in the SIPHONANTHÆ, of which a tube with uniform calibre is highly characteristic, species which have a short beak (*P. macrantha*, *robusta*) have also a slightly widened tube, and in the highly natural groups, so common amongst RHYNCHDLOPHÆ of which some members possess while others are without beaks, the beaked forms (*P. carnosa*, *gruina*, *pohjphylla*) have almost uniform tubes, while the corresponding beakless ones (*P. zeylanica*, *Henryi*, *tenuiseuta*) have them infundibuliform. The lip also is involved in this alteration; as the beak elongates and the tube constricts its base shortens, its crests disappear, and its lobes enlarge. Inside the tube in front it is usual to find in short-beaked species a number of long hairs; these may be confined to the lower part of the tube (*P. zeylanica*), or extend to the base of the lip (*P. rex*). This condition tends to disappear when the corolla tube is contracted, as it is in long beaked species.

whole lip downwards, and at the same time towards the side on which the overlapping, and therefore most easily displaced, lateral lobe lies. This being usually the left side, the thrust of the beak is downwards and towards the left. But there is thus an equal and opposite counterthrust upwards and to the right acting upon the hood. And since the basal portion of the hood is of a more delicate texture than either the hood proper or the lip, the chief result is a certain amount of twisting to the right at that place as the point of least resistance. But although this is one, it is not the only, and indeed can scarcely be the usual, explanation of dextrorse twisting.

Other notable means of attaining the same result occur among the *SIPHODANTHES*. In *P. megalantha*, the lateral lobe of the lip overlapped by the other grows more slowly.¹ This prevents the growth of the hood in an erect position. Being thus deflected in the unexpanded flower, the hood retains this attitude when the flower opens. Sometimes the apex of the beak remains permanently entangled in this dwarfed lateral lobe. The apex of the beak also becomes averted from the lip by the unequal development of the margin and of the rest of the hood. Not infrequently (*P. Elwesii*) the margin grows most rapidly, and thus, by throwing back the dorsum of the hood, at the same time tilts the apex of the beak upwards and away from the lip. More remarkable still is the arrangement that occurs in *P. bicornuta*. Here the growth of the margin of the hood is arrested while that of the rest proceeds. The result is exactly what is seen when the string that closes the mouth of a canvas money-bag is tightened. The basal portion of the hood, especially in the vicinity of the margin, is thrown into many plaits and folds, and these now deflect, now reverse, now invert the upper portion—thus every time removing the tip of the beak, and with it the stigma, from the neighbourhood of the lip.

The colour of the corolla varies from a pale or rose pink (*P. furfuracea*) to dark purple (*P. integrifolia*); or from green (*P. fragilis*) or dirty white (*P. pycnantha*), to yellow [*P. Scullyana*], • *EL* few species are pure white [*P. albiflora*]. Stated in the most general terms, the colour is either some shade of red or some shade of yellow, corollas of both types giving rise, either as sports or permanently, to white. At the same time a species may be red in one locality and yellow in another (*P. myriophylla*, *megalantha*, *altaica*), but this is not very usual.

Red is slightly the more common of the two, 151 of the species, or 57·8 per cent, of the whole, being of this colour. There is, besides, a marked association of red colour with the character of opposite leaves, and an equally marked association with the presence of a beak. These correlations with structure are, however, probably indirect, and depend rather on geographical distribution. The subjoined table exhibits the facts of the case more compactly (the colour of four species being doubtful):—

TABLE III.—*Relation of Colour of Corolla to Structure.*

Colour of Corolla.				Pink, red, or purple.		Green, yellow, white, or doubtful.	
A.—Irrespective of structural characters				151	57·8%	110	42·27,
B.—In species with—							
1. Alternate leaves	...	...	...	88	52 %	83	48 7/8
2. Opposite leaves	...	...	...	63	70 7/10	27	30 7/8
D.—In species with—							
1. Beaked corolla	...	...	...	93	70 7/10	39	30 7/8
2. Beakless	...	...	...	58	45 7/10	71	55 7/8

¹ This condition has also been noticed by Mr. Maximovicz [*Mel. Bhl.* xii, 777] as conversely affecting the position of the lip itself.

Yellow corollas frequently show streaks (*P. striata*) or patches (*P. Oederi*) of red. These streaks are often confined to the lip or occur on lip and tube; the patches are usually restricted to the hood. Even when in general terms these markings are specifically constant (*P. Oederi*), they may be altogether absent (VAR. *heteroglossa*), or may involve the whole corolla (VAR. *rubra*). But similar markings not infrequently appear as sports on corollas that are normally concolorous. Thus *P. hingiflora* in the Eastern Himalaya has sometimes a dark red hood and beak, while both in Sikkim and in Northern Tibet it may have a purple lunule on each side of the central line of its usually concolorous lip. On the other hand, this species sometimes occurs with corollas uniformly white, and in this case it might easily be mistaken for *P. siphmantha* (which also at times has white corollas), if too great reliance were placed on characters of colour or attention not directed to the other diagnostic characters.

The variation of colour in normally red corollas differs somewhat, and consists of the appearance of a greater or less amount of white. This white may appear in blotches (*P. furfuracea*, *siphmantha*) but this is somewhat rare; and if so, these are confined to the tube and the lip. The usual variation is that the tube, the base of the hood, and the centre of the lip become uniformly white, the lobes of the lip, the hood proper, and the beak remaining red (*P. vonfertiflora*, *seylanica*). In some species indeed this disposition of colour is the normal one (*P. carnosus*, *corymbosa*, *odontophora*), while, generally speaking the tube in red corollas is paler in tint than are the lobes of the lip, and these in turn are paler than the hood. Finally, species with normally red corollas may have pure white flowers (*P. siphmantha*), while species whose affinities are clearly with groups in which red corollas normally prevail [*P. albipra* amongst the *Rostratae*] may have white flowers only.

The staminal insertion has been already discussed. The filaments are narrow and ligulate with a mesial main nerve, and occasionally (*P. bicornuta*, *chaphunhides*) with wavy margins. The filaments elongate considerably in those species where the staminal insertion is not carried upwards by the elongating tube. Both pairs of filaments may be hirsute and equally so, or with the posterior pair less densely hairy than the anterior; or only the anterior pair may be hirsute, the posterior pair being glabrous. On the other hand, all may be glabrous, but in no instance do we find the posterior pair hirsute while the anterior pair are glabrous. The hairs may prevail throughout the filament; more usually they are confined to the upper portion, and may involve the connective. Sometimes, besides being hairy above, they are villous at the point of insertion (*P. pectinata*), and, very rarely, are villous only at the point of insertion but glabrous elsewhere (*P. Uolhtii*). The staminal hairs are very early formed, and are present in the youngest buds, and this condition affords one of the most constant and most useful diagnostic characters of the genus. The anthers are free and are usually obtuse, but may be sharply tailed (*P. Kingii*), and as a rule lie horizontally. They may, however, have the tails inclined slightly upwards, and oftener still slightly downwards, only very rarely (*P. Perrotiana*) are the long axes of the anthers vertical.

The ovary is ovate or lanceolate, usually slightly curved, and always with two locules. The placentas are double and vertical, and are confined to the lower third or fourth of the transverse septum. The ovules are amphitropous with usually a short funicle, are normally some multiple of four, there being two rows on each placenta and vary from 4 in each locule (*P. gibbera*) to 56 in each locule (*P. nymphaea*). The style at first erect, curves backwards to approach the tube at the level of the limbus of the

calyx. Beyond this point it follows the curvature in succession of the tube, of the hood, and, if it be present, of the beak. As a rule the style is of uniform thickness, but in one species (*P. superba*) it increases in thickness towards the stigma.¹ The stigma is sub-capitate, generally (though rarely very far) exerted, but sometimes distinctly included (*P. lachnoglossa*). The enlarging fertilised ovary detaches the corolla from the disc and at the samB time splits the tube upwards from the base in the middle line behind. It is rare, however, for the corolla to be immediately caducous (*P. excelsa*) as a rule it becomes gradually extruded by the elongating capsule till the base is clear above the mouth of the calyx tube. Then as a rule it either falls off or is blown away, but it is by no means unusual to find the tip of a ripened and dehiscing capsule still crowned by a withered corolla.

The capsule varies a good deal in the genus as a whole, but is very constant in size and form within specific limits and often throughout natural groups of species. The relative length of capsule and calyx affords a more useful character than that of calyx and corolla tube. This is not alone because the capsule is much more constant than the corolla tube, which is, as has been seen, rather variable, but because the teeth, to which the variation of the calyx is principally confined, usually become in the fruit shrivelled and less conspicuous, and because the enlarging capsule by expanding the calyx tube renders the limbus more easily discernible between the bases of the teeth. The usual shapes of capsule are lanceolate or ovate-lanceolate, rarely sub-rhomboid (*P. rex*), and in these cases with the apex oblique and in front of the middle line; not infrequently, however, the capsule may be ovate [*P. trichoglossa*, *P. pycnantha*], or rarely sub-globular [*P. fragilis*], and in these cases with the apex erect and central. Its surface is smooth and variously reticulated, and (except in *P. fragilis*, where the capsule is transparent and almost herbaceous) its walls are of a firm consistence; it varies in colour (in herbarium specimens) from pale tan to black. The capsule is persistent, being always found attached to the stems of a former season where these happen to be collected. The dehiscence is loculicidal, but is confined to the upper third of the anterior and the upper half of the posterior suture, the valves nearly always remaining coherent (even in specimens showing stems of a second season) from the base to opposite the upper limit of the phloemal surfaces.

The seeds vary greatly throughout the genus in number, size, shape, colour, and surface markings; in individual species, on the other hand, these characters are very constant. In number they vary from 3—4 in each locule [*P. gibbera*] to 18 or 20 (*P. dolivhorrhiza*); in size from 6 X 8 mm. (*P. fragilis*) to 12 X 17 mm. (*P. carnosa*) to 35 X 25 mm. (*P. Vlarkei*) or 4.25 X 2.5 mm. (*P. pycnantha*) in shape from spherical (*P. fragilis*), ellipsoid [*P. Clarkei*], egg-shaped and narrower at the lower extremity (*P. hngiflora*), egg-shaped and narrower towards the apex (*P. gibbera*), to nearly fusiform [*P. curvipes*]. In transverse section the seeds are usually rounded or didymous, rarely triquetrous (*P. schizorrhyncha*). The hilum is indicated by a furrow, the upper portion of which is often filled by a spongy crest which, though of different appearance and lighter colour, is in reality only a modified portion of the testa developed from the coats of the ovule where these surround the micropyle. At the lower extremity of the seed there is also in many species what appears to be a distinct process. But this also merely consists of testa, not even modified, and has no special structure. It is most obvious where the testa is thin and closely adpressed to the albumen, and is not visible at all if

¹ Maximowicz, *Mel. Biol.* ii B74.

the testa is very lax. In colour the testa varies from black (*P. furfaracea*), slate grey (*P. gibbem*), dark brown (*P. rhinanthoides*), or rusty brown (*P. sipkonantha*), to pale tawny (*P. mtgalantha*), or pale straw colour (*P. Oederi*). But colour is not, and will probably never become, a character of great practical value in distinguishing the seeds of different species of *Pedicularis*, because the differences are so often mere variations of shade not equally appreciated by all observers; because these shades appear to become lighter as the seeds ripen; and finally, because there is no guarantee that the seeds are not, sometimes at least, altered in colour while the specimens are being dried. The most useful characters afforded by the seeds are those derived from the nature and the markings of the testa. Sometimes this is thin and closely adpressed to the albumen (*P. longiflora*), and then the surface is only marked by slight longitudinal striae; at other times it is much more extensive, the albumen not nearly filling it, and is then lax and deeply pitted. All possible intermediate conditions occur, and these are best expressed in terms of the pitting which results, and which is the most prominent feature of the seed.¹ There is in most cases a distinct appearance of longitudinal ridging that runs meridionally from apex to base. The ridges are only an accentuation of the condition producing the striation that exists when the testa is closely adpressed to the albumen, but in addition to this the furrows between are crossed by transverse ridglets that complete the periphery of the characteristic pits. Where these transverse ridglets are narrower and less in relief than the meridional ridges—and this is the usual condition—a pitted and furrowed appearance goes together. But where the transverse ridges equal the meridional ones in width and height, a net-like appearance is imparted to the testa, and this becomes more and more apparent when the testa is obviously more extensive in relation to the albumen [*P. brevifolia*, *denudata*]. The periphery of the pits becomes irregularly hexagonal and the surface assumes a honeycombed appearance. As a rule, the markings are uniform throughout the testa but sometimes (*P. pedinata*, *emptoniasfolia*, *dolichorrhiza*) the funicular aspect of the seed is irregularly (and generally very irregularly) honeycombed, while the remainder of the surface is ridged and pitted in a regular manner. And sometimes where the testa is very loose, the ridged arrangement still persists (*P. ahschanm*) and produces a rilled appearance; the meridional gill-like ridges have transverse pit-forming ridglets on both

the upper portion of its mass. Usually the embryo is from one-fourth to one-half the length of the albumen, rarely (*P. pycnantha*) exceeding one-half. The radicle points upwards; the semi-cylindrical cotyledons in the opposite direction.

CHAPTER XI—DIAGNOSIS AND CLASSIFICATION OF SPECIES

IN diagnosing the species of *Pedicularis*, characters afforded by the seed have a relatively small value. This is partly because habit varies so much in individual species, partly because quite distinct species vary so much in the appearance of habit. This identity is not shown by the seed alone, as is the case with *P. lackneri*, *P. megahnta* and *P. Mm*, but extends to floral characters, and this to

¹ Cf. plate 36 and plate 37 for examples of the conditions detailed in the text.

such an extent that at length only a single character may be left whereby a diagnosis between two, sometimes even more than two, species can be effected. Only a few of the many examples of this need be mentioned:—*P. Oederi* can only be diagnosed from *P. flammea* (unless seeds be available) by the hairs on its anterior filaments; *P. Vlarhei* from *P. PrawiKWiJunlBSS* the colour of the flower be noted) by the presence of a beak to the corolla; *P. corymbosa* from *P. crenata* on the one hand by the absence of a beak, and from *P. seylanica* on the other by the much longer hood; *P. rhinanthoides* from *P. siphonantha* by its calyx being 5- not 3-toothed and by the apex of the beak of its corolla being entire; while *P. siphonantha* itself is only with certainty separable from *P. longiflora* (if the colour of the corolla is not noted) by the absence of hairs from its posterior filaments and the presence of a distinct tooth on the margin of the hood. Careful analysis of the floral structure in every gathering is therefore absolutely essential for accurate diagnosis. ^

The opposite condition, with considerable difference of habit and great similarity of floral structure, is rare in this genus. Still instances do occur, and those of *P. pymantha* and *P. Oederi*, *P. ghibifera* and *P. anas*, *P. Gammieana* and *P. binaria*, *P. Uullettii* and *P. zeyhmha*, may be mentioned. The calyx affords less useful characters than the corolla or the stamens, partly for the reason given above, partly because it is somewhat more variable within specific limits. There do, however, occur instances where calycine characters are of high value. One of these, pointed out by Sir J. D. Hooker, is the case of *P. Eiwesii*. Another excellent example is furnished by *P. Pantlingii*, which is at once distinguished from the otherwise very similar *P. furfuracea* by its uncleft calyx. A parallel instance among European species is the case of *P. foliosa* and *P. sumana*.

The same thing is true of the gynecium, less, however, because of the constancy of its characters than because its modifications are usually accompanied by greater differences in the other parts of the flower. This remains largely true of the fruit. There are indeed some instances where the capsule or the seeds afford excellent diagnostic characters:—the seeds of *P. flammea*, as Dr. Lange has pointed out, are as distinguishable from those of *P. Oederi* as are the stamens; the characters of the seeds of *P. Roylei* make it impossible to merge that plant in *P. verticillata* as Mr. Bentham proposes, whatever elasticity be given to the limits of the Linnean species; and *P. Wallichii* differs even more markedly from *P. asplenifolia*, to which Mr. Bentham has referred it, by its capsule and its seeds than by its habit and its flowers. Another case where the evidence from the fruit is unmistakeable is *P. longiflora*^ which cannot be confounded with *P. siphonantha* at the same stage even if the habit, leaves, locality, date of collection, and collector be identical, owing to a double curvature of the lower edge of its capsule which the capsule of *P. siphonantha* wants, and to the absence of that pitting of the testa which the seeds of *P. siphonantha* exhibit. But the general rule is the reverse of this; where there is identity of habit between two or more species accompanied by a greater or less repetition of floral characters, the condition is even more marked in the capsule and the pedicel in the calyx. Among the most striking examples of this are *P. carnsa*, *P. corymbosa*, and *P. zetlamca*, the capsules and styles of which are practically indistinguishable; *J. jwiti/iafa*, *I**, *jtyramnfata*, and *P. fawiro-rfm* afford an equally instructive instance.

It is then sufficiently clear that in this genus only floral characters can be relied on in diagnosing nearly allied forms, and repeated and careful analysis of the flowers in Jar* suites of specimens is necessary for a just appreciation of the limits of species even if

a course without explaining fully, as is done in the notes following the individual specific descriptions, the reasons for adopting the view that is here published. The non-application of the canon affects, but only slightly, the numbers and proportions in the distribution tables so far as the European province is concerned, since for it the recent clear and careful account of the European species by Herr Steininger has been closely followed, and since that author separates as species forms that are capable of differentiation only by characters that a wider study of Siberian, Chinese, and Himalayan ones shows to be variable within the limits of the genus. For example, *P. lusitanica* is specifically separable from *P. sylvatica* only by relative characters, and by the present canon can only be a variety of the latter; and *P. Friderici-Augusti*, which Daniel¹ declares to be the same species as *P. petiolaris*, is kept apart by Steininger² (who cannot understand why this reduction should be proposed) only by two or three vague differences of habit and by the different colour of corolla, which last, though certainly a striking character, has not always a really diagnostic value, as the evidence of *P. megalantha* and some other species very distinctly shows.

But, as Sir J. D. Hooker has clearly shown,³ species are by no means units of equal value. This is especially true of the "species" of *Pedicularis*, however rigid be the canons applied in defining them. Clearly species that differ from each other so little as does *P. carnosa* from *P. corymbosa*, or *P. Ularkei* from *P. Prainiana*, or *P. polyphylla* from *P. tenuisecta*—the first of each of these pairs has a beaked, the other a beakless corolla, while the members of each pair agree so closely as to habit, calyx, capsule, and seeds that the verbal description of all these characters has in both to be identical—are more closely related to each other than species like *P. Oederi* and *P. pymantha* which with very similar coralline characters differ in habit so fundamentally that the first has alternate leaves with a continuous spiral centrifugal inflorescence, the other * opposite leaves with an interrupted verticillate centripetal spike.

In *Pedicularis*, as in *Thalictrum*, in *Rubus* and in *Saxifrage* this arrangement of the separable forms in evidently natural groups is a characteristic feature. And it is probable that these groups, rather than the forms here termed "species," constitute the natural units of the genus. It is therefore of some importance to recognise and define the limits of these groups, since otherwise a system of classification might be adopted that in its application divorced naturally allied forms. The evidence as to the composition of these natural "groups" is in many respects the converse of that which enables us to define "species." In such groups forms that agree in the greatest possible number of characters are brought together; consequently the characters that prove least reliable in specific diagnosis are those that are of greatest value in distinguishing them. Habit, calyx, and capsule now give useful characters; and it is as indicative of affinity between allied species rather than as diagnostic of separable ones that seed-characters are chiefly

¹ Camel in *Parlatore, Flor. Ital.*, vol. vi, p. 437.

² Steiner in *Uhlworm und Bekrens, Botan. Centralb. Jatt*, xxix, p. 315. Herr Steininger's diagnosis is as follows: "P. *petiolaris* is separable from P. *Friderici-Augusti* by its oblique rootstock with stouter roots, its stem which is never glabrous, and has few leaves unevenly disposed, but mostly near the base of the spike, by its differently-shaped bracts which are longer than the calyx, by the colour of the corolla, etc." The writer adds:—"It is very difficult to conceive how it is possible for Daruel to propose the union of this species with P. *Friderici-Augusti*." But for those who have examined large suites of undoubtedly conspecific Siberian and Himalayan forms, the difficulty will be to conceive how with these characters alone it is possible to propose that these two forms are to be looked on as separable specifically.

³ Hooker: *Introductory Essay to Flora of Tasmania*, p. v; also *Outlines of the Distribution of Arctic Plants*, *Trans. Linn. Soc.*, vol. xxiii, p. 279.

valuable. The common forms of these groups do not shade into each other in *Pedicularis* so gradually as they do in the other genera alluded to, so that there is less tendency on the part of authors to reduce species prematurely than there is to treat intermediate forms, that are probably quite stable, as hybrids*.

The arrangement of groups in higher subdivisions^{^TM*} of Bentham, *Series* of Maximowicz—is a still more difficult matter, but the greatest difficulty of all is experienced in determining what are the approximately natural primary divisions. Thunberg and Willdenow arranged their species according to characters derived from habit, while Steven, experiencing the inadequacy of such characters as the number of species increased, relied, in defining five of his primary divisions, viz. *Personates*, *Yuccifolies*, *Rostrate*, *Bicuspidate*, and *Udentulce*, on characters derived from the structure of the corolla, only one of his divisions, *Verticillate*, being, as its name indicates, based on a character derived from habit. It is somewhat curious that while the other four tribes have been recast and modified so that only the outline of one (*Rostrate*) has been retained, and not one of them even in name continues as a primary division, the *Verticillate* have continued in every subsequent revision of the genus to hold primary rank and to retain the original or an equivalent name.

The time appears to have now come for the abandonment of this last Stevenian section, for though the primary division based on the constant possession or the reverse of whorled or opposite leaves is a highly natural one, and gives rise to two subdivisions, viz.—

- 1) opposite-leaved species, forming 35·7 per cent, of the whole, and
- 2) alternate-leaved species, forming 54·3 per cent, of the whole,

this is only one step towards subdividing the genus, and we have to seek in floral structure the evidence necessary to ensure further subdivision. The most striking floral character undoubtedly is the presence or absence of a beak to the corolla. When, however, we enquire what relationship this bears to a division based on phyllotaxy, we find it one of practical indifference, as the appended table shows :—

TABLE IV.—*General relationship of phyllotaxis to floral structure.*

Species with					Corollas beaked.	Corollas beakless.
leaves alternate	...	...	...	...	45 per cent.	55 per cent.
„ opposite	...	...	...	...	55 „	45 „

The cleavage plane indicated by phyllotaxis is thus at right angles to that indicated by floral structure; and when on further subdividing the genus according to floral characters it is found that there is not a single type of corolla amongst alternate-leaved species that is without a parallel amongst opposite-leaved ones it becomes evident that phyllotaxis and floral structure cannot both continue to be employed to indicate subdivisions of

i Steining in *Uhhorn, Bot. Centralblatt*, xxx, p. 22, who clearly shows the hybrid character of several separable European forms, treats *P. atrovirens* in this fashion, and considers it equal to *P. incarnata* X *recutita*. That it is the intermediate form in that group to which the presumed parents belong is certain; that it is a hybrid is, I believe, doubtless. In this case, too, Herr Steining does not advance any direct proof of his contention.

equal rank. The question is which of the two is to be abandoned as the primary character. And the answer seems clear; phyllotaxis in future, except in the formation of artificial keys to species, must take a subordinate position. The reasons for this view are the following. In the first place the proportion of beaked to beakless corollas —

Corollas beaked	...	...	...	...	494 per DBnt. of this whole,
„ without beaks	...	...	...	...	5D 5 „ „

shows that this character, while quite as natural as the phyllotactic one, divides the genus much more evenly. Again, both the beaked and beakless divisions may be further subdivided by floral characters, while a primary division by phyllotaxis once effected leads to nothing beyond. Finally, a subdivision based on floral structure may be hoped to throw light on the developmental history of the genus: one based on habit cannot do so, or can only do so indirectly.

At first sight it would appear that the most natural as well as most simple method of subdividing the genus must be into—

- (1) groups wherein the corolla is beaked ;
- (2) „ „ „ is not beaked.

But the occurrence of groups that are in the highest degree and in the most obvious manner natural, such as the *Acaules*, *Eecutitce*, *Carnosce*, *Tristes*, and many more, which nevertheless within their particular limits exhibit a transition from a beakless to a beaked condition as complete as that shown by the genus as a whole, makes the recognition of an intermediate subdivision absolutely necessary. By recognising this we obtain three divisions, clearly not quite natural in their limits, and therefore not deserving to be called sub-genera, but apparently in accordance with the genealogical arrangement of the groups, and so possessing the advantage of being capable of a serial disposition. Arranged so as to pass progressively from the more to the less specialised groups, these are :—

Division I.—LDNGIRDSTRES;—Corolla tube straight, slender, uniform ; lip large, sessile, more delicate in texture than the firm, long-beaked hood.

II.—ADUNCJE;—Corolla tube curved, cylindric, slightly enlarged towards the top; lip sessile Dr stipitate, more delicate in texture than the beaked or beakless hood.

III.— ERDSTRES;—Corolla tube infract, infundibuliform; lip stipitate, base erect, 2-cristate above, lobes patent of same texture as beakless hood.

But this arrangement, while it accords with facts of structure, implies a simplicity of natural disposition that a closer study of these facts dispels.

Thus the division LDNGIRDSTRES contains two highly natural sections:—

§ SIPHONANTHE ; corolla tube usually much elongated; filaments inserted between middle and top of tube and usually just below the apex; beak in bud circinnate, with dorsal aspect apposed to median line of lip and apex directed to throat of corolla.

§§ ORTHORHYNDHJE ; corolla tube much shorter; filaments inserted at or below middle of tube; beak in bud straight or flexuous, with ventral aspect apposed to median line of lip and apex directed to edge of midlobe.

Similarly the ADUNDE consist of two natural sections: —

§§§ RHYNCHOLPH*; corolla lip sessile or stipitate with usually rudimentary crests; filaments inserted at or below middle of tube; beak in bud falcate, with apex apposed to median line of lip; hood sometimes beakless.

§§§§ BIDENTATJE; corolla lip stipitate, base erect, 2-cristate above; filaments inserted opposite top of ovary; hood beakless or shortly wide-beaked, always 2-dentate immediately below the apex.

The EBOSIRES constitute a single large section containing the whole of the forma with corollas showing what appears to be the most archaic type of structure,—

§§§§§ ANODONTJE; filaments inserted opposite top of ovary; hood erect, beakless or with very short rudimentary beak, edentulous or only toothed at the lower angle and with apex always rounded.

The natural disposition of these sections is not one of sequence. So far as SIPHONANTHE and ORTHORHYNCILE are concerned, the evidence of this is direct and abundant. Conditions intermediate between the types of beak aestivation in these do not only do not exist, but are hardly conceivable, and they cannot have well descended from the one to the other. On the other hand, the type of beak activation in RHYNCHOLPH* is precisely that which is capable of being modified in either of the directions assumed in the other two types, and as a matter of fact the RHYNCHOLPH* include groups of species that are indicative of such transition. Thus the *Oliganthæ* are clearly transitions to SIPHOSANTHE; the *Myriophyllæ* to OETHORHYNCH*.

In the same way, while there is abundant evidence among the ANODONT* of transition to BIDENTATJE-P. *Langsdorfii*, P. *collate*, P. *fragilis* may be quoted as KAMP— and the evidence of transition from ANODONT* to RHYNCHOLOPILE is overwhelming—witness the groups *Carnosa*, *Fhgellares*, *Tristes*, *Recutitæ*, and others—there is no good evidence of transition from BIDENTATE to RHYNCHOLOPILE. On this point, in fact, there is not the positive structural evidence which is to be obtained regarding SIPHONANTH* and OETHORHYNCH* that such transition is impossible. In the light, however, of the great body of direct evidence of transition from ANODONT* both to RHYNCHOLPH* and to BIDENTAT*, and of the absence of evidence of any direct connection between RHYNCHOLPH* and BIDENTAT*, we are justified in assuming that both RHYNCHOLPH* and BIDENTAT* are derived immediately from AMODOKA. In any case we are not entitled to accord to the BIDENTAT* a position intermediate between ANODONT* and RHYNCHOLPH*.

¹ The chief evidence that has been advanced is the connection between P. *fragilis* and P. *collate*. But this evidence is entirely flimsy. The connection between P. *fragilis* and P. *collate* is a matter of fact, not of principle.

² The conclusion to which the consideration of the distribution leads is that the BIDENTAT* are of more recent origin than the RHYNCHOLPH*. And if this conclusion be justified (the evidence on which it rests is to be found below—p. 53), it furnishes the direct proof necessary for the establishment of the hypothesis here advanced.

The following diagram assists the eye in appreciating the natural relationship of these sections:—

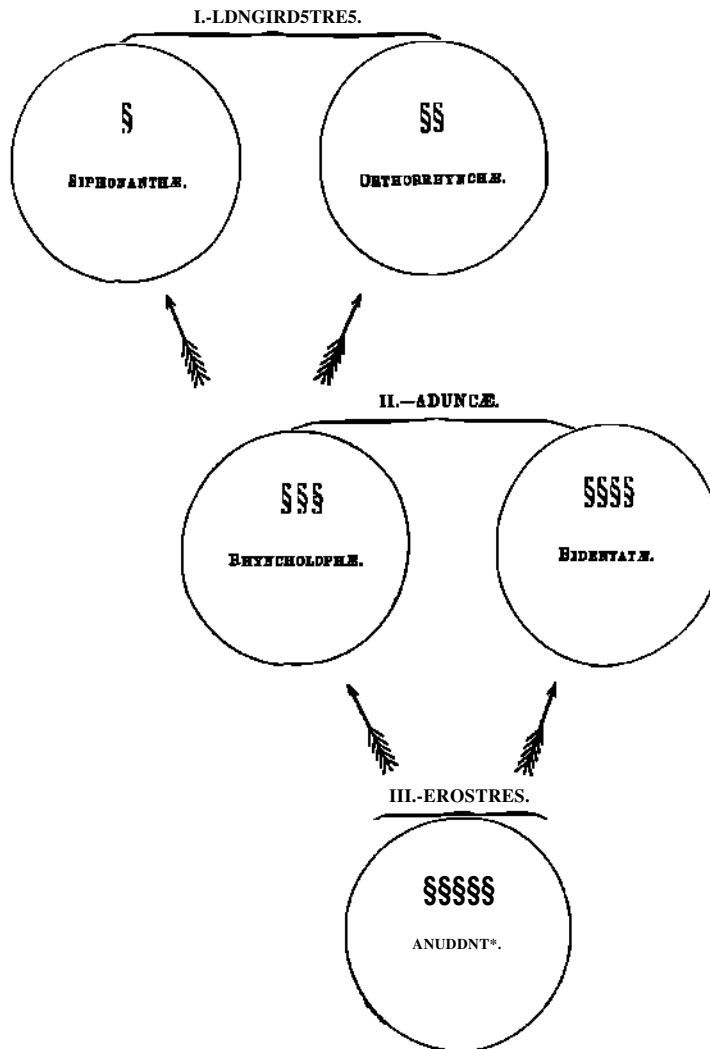


DIAGRAM 1.

Quasi-natural sections of genus
*J*edicularis* genealogically disposed.

The system now proposed is after all a simplification at the expense of some natural affinities. But it is offered as an approximation to a natural disposition that at the same time possesses the compactness requisite in a systematic arrangement.

The relation that this system bears to that of Mr. Maximowicz remains to be noticed. Both attempt to do what it is perhaps impossible with this genus to succeed in doing—to show compactly the natural disposition of its component groups. And the subjoined table shows that the two systems are practically identical.

TABLE V.—Comparison of the system of Mr. Maximowicz with that now proposed.

System of Mr. Maximowicz.	Present system.
Tribe I.—LONGIROSTRES.	Division I.—LOWGIROSTRES.
1. SiphonanthusB.	§ Siphonanthse.
2. Longirostres verticillataB.	§§ Orthorrhynchse.
Tribe II.—KHYNCHDLOPILB.	Division II.—ADUNC^.
Tribe III.—VERTIGILLATJE.	§§§ RhyncholophaB.
Tribe IV.—BIDENTATJE.	§§§§ Bidenta.
Tribe V.—ANODONTJE.	Division III.—EROSTRES.
	§§§§§ Anodontae.

The tribe LONGIROSTRES of the first column is almost the exact equivalent of the division of the same name even in its subdivisions, for the section SIPHONANTILE of the major portion of Mr. Maximowicz' sub-tribe of the same name with a few opposite or whorled-leaved species that have circinnate beaks, while the ORTHORRHYNCHJE is exactly equal to the sub-tribe LONGIROSTRES VERTICILLATJE for which a new descriptive name is proposed in order to indicate that here it is accorded sectional rank. The tribes RHYNCHOLOPHJE and BIDENTAT* are here treated as sections belonging to one division, since they occupy the same position as regards each other that the sections SIPHONANTILE and ORTHORRHYNCHJE mutually occupy, and together bear the same relation to ANODONT* that the SIPHONANTILE and ORTHORRHYNCHJE together bear to RHYNCHOLOPHJE. Finally, the tribe ANODONT* is practically the equivalent of the division EROSTRES, the latter, however, including in its single section ANODONT* not merely the alternate-leaved species that constitute the ANODONTJE of Mr. Maximowicz, but the majority of the species contained in the tribe VERTICILLATJE. Practically, therefore, the only great alteration in the system now proposed is the suppression of the tribe VERTICILLATJE. The reasons for so doing have been already given, and the act is only an extension to the rest of the genus of the treatment that Mr. Maximowicz has already shown to be necessary for the verticillate Longirostres. The destination of the series that constitute the artificial tribe VERTICILLATE is as follows.—Myriophylloide to § RHYNCHOLOPHJE; Platyrhynchz, Superb^ and Lyrate to § BIDENTAT*; Cheilanthesifolia, Verticillate and Caucasicoe to § ANODONTJE.

CHAPTER IV.—GEOGRAPHICAL DISTRIBUTION.

THE genus is restricted to the NORTHERN FLORA, and its species are almost entirely confined to the area inhabited by its Arctic-Alpine secondary Flora, although a few are extended in, or even confined to, the areas marked by the Northern Temperate-intermediate

secondary Flora} But the number of these species is so small, and the areas affected by them are so evidently only the temperate complements of adjacent Arctic or Alpine areas, that it does not become necessary to recognise for the genus any temperate provinces.* For this reason, and with the exception of the northern *Vircumpohr* province itself, the various provinces are indicated by the mountain systems and differentiated by the intervening seas and plains of the northern hemisphere.

The evidence from the distribution of any single large genus being the converse of that from the composition of local floras, an attempt is now to be made to estimate the value of such evidence by delimiting the various *Arctic-Alpine* provinces from their species of *Pedicularis* alone.³ Its application requires the recognition of eight provinces, the names and limits of which are given below. Each province is expressed in terms of its "endemic percentage," such districts as increase this factor being added together, such as diminish it being removed. Thus in the delimitation of the Circumpolar province it is found to be necessary to add to it the peninsulas of Kamtschatka and Alaska, which appear to be natural districts and seem conjointly to form a natural division. The alternatives open are to unite both to America, to Japan, or to Siberia; to unite only Alaska to America and to apportion Kamtschatka either to Japan or to Siberia; or, finally, to look upon the two as forming a province apart. The last is an inadmissible course, since their removal from the Circumpolar province decreases its endemic percentage. If both, or if Alaska only, be united to America, the endemic percentage both of the Circumpolar province and of America is diminished by the act, and a similar result also happens if both, or if Kamtschatka only, be united either to Japan or to Siberia. It is probably not altogether an accident that the Northern Summer Isothermal of 15°D. — the best graphic index of the temperature conditions that chiefly affect circumpolar vegetation (mean annual temperature being obviously of very subordinate importance) — should coincide so exactly with the distribution of circumpolar *Pedimlares*. But although this coincidence occurs, and although this Isothermal is therefore employed as the most-convenient expression of the boundary of the Circumpolar province, it is to be distinctly remembered that the existence of this line is not a factor in the process of reasoning whereby the actual delimitation is effected. Similarly neither phyaigographical features nor climatic conditions have been used in the delimitation of the other seven provinces, since it is plain that without a rigid adherence to evidence derived from morphology alone in the definition of biological areas, the ultimate comparison of biological with physiographical and meteorological facts becomes a process of circular reasoning.

The Circumpolar province is bounded by the Northern Summer Isothermal of 15°D. and borders successively on the European, Siberian, Japanese, and American provinces. It contains 20 species, 10 of the whole; of these 10 are endemic, and one other is represented only by an endemic variety: — the endemic percentage is thus 52½.

¹ Thiselton-Dyer: *Lecture on Plant-distribution as a field for geographical research*, 1878, pp. 12–13, where and in the subsequent pages a most excellent working system of Phytogeography is outlined.

² It seems advisable to avoid the use of the term *Kegion*, as this word has unfortunately become stereotyped in England and in Germany to indicate areas of different value, and because there is no special aptness in the English or the Serai an employment of the word.

³ Mr. Maximowicz says the time has not yet arrived for a final discussion of the distribution of this genus (*ML BhL* xii, 783). This is quite true; still our knowledge of six of the provinces is certainly fairly complete, and of the remaining two (Tibeto-China and Himalaya) probably fairly representative (see footnote 1, p. 58).

The European province, indicated by the Pyrenees, Alps, and Carpathians, extends northward to the lowlands of Scandinavia and eastward to the Volga. To the south it includes the mountain systems of the three Mediterranean peninsulas. It is bounded on the north by the Circumpolar, on the east by the Siberian, on the south-east by the Caucasian provinces. It contains 40 species, 1/3 of the whole; of these 34, or 85 per cent., are endemic.

The mountain-system lying north-east of the great Central Asian desert indicates the Siberio-Turkestan province. Besides the several sections of this system—the Tianshan, Alatau, Altai, Sajon, Baikal, and Jablonoi ranges—the province includes the plains of Turkestan and Siberia to the west and north, and of Yarkand (East Turkestan), Soongaria, Northern Mongolia, and Mandshuria to the south and east of them while on the extreme east it includes Saghalien. In the east it thus is in contact with the Japanese province, to the north it passes into the Circumpolar, to the west into the European, to the south-west into the Caucasian, and then for a short distance into the Himalayan provinces. It is separated from the Chinese province on the south by the desert of Gobi. It has already yielded 50 species, about 1/3 of the whole; of these 32 are endemic, and one other is represented only by an endemic variety:—the endemic percentage is thus 55.

The islands forming the empire of Japan constitute the Japanese province. It has but slight connection on the west with the Chinese, on the north-west with the Siberian, and on the north with the Circumpolar provinces. It possesses eight species, of which four are endemic, two others are represented only by endemic varieties while of still another, which extends to Japan from Siberia and China in its typical condition Japan possesses an endemic variety. The eighth species, moreover, *cf. Maxim., Mel. Bid. xii 892*) has only recently been reported from the extreme south of China, and the Chinese plant is by no means positively identified by Mr. Maximowicz with the Japanese species. The endemic percentage is 66.7.

The United States, Mexico, and, finally, a small isolated Andean district in New Grenada. It passes on the north into the Circumpolar province. There have been reported for it 24 species, about 1/3 of the whole; of these 21, or 87.5 per cent., are endemic.

The Caucasian province includes the Caucasus, extends north to the Kuban and Kuma rivers—or to 45° N. Lat. between the Euxine and the Caspian—and, through the intervening Armenian highlands, south-west to the Taurus and Asia Minor, the Elburz and Persia. It has but slight connection with the European province to the west, along the north-east it passes into the Siberio-Turkestan and on the south into the Himalayan provinces. It contains 15 species, 1/3 of the whole; of these 10, or 66.7 per cent., are endemic.

The Chinese province is indicated by the Kuen-lun, Nan-shan, and Pelin. It extends northwards to the desert of Gobi, which separates it from the Siberian region, and southwards through the intervening tableland of Tibet to the Indus, the Sando and the Yang-tse-kiang rivers, passing, however, into the Himalayan province!

• *P. lata* Stsv., having been collected in Southern Ural, between that and the Volga, and the *D. pnetz* (MaAm., *Id. Biol.* xii, SOB), and *P. resupinata* (Linn., *Id. c. x.*, 1877). it becomes necessary to remove these districts from Europe. Linn. is, as Blüth has shown, an migrant species in the Bx, BmB, ZLZ, Zi, tuem to Siberia. *P. sylvatica* in Asia.

• If the identification referred to above is not sustained, this percentage becomes 79.1.

To the east there is a slight connection with Japan. This province has already yielded 49 species, or about $\frac{1}{2}$ of the whole; of these 35, or 71 $\frac{1}{4}$ per cent., are endemic.

The remaining province, the Himalayan, is indicated by the Hindu-Kush, Karakoram, Himalaya, Yunnan, and Nan-ling (southern Nan-shan) ranges, including also the isolated mountain system of the Western Peninsula and the various parallel ranges of the Eastern Peninsula that pass northwards into Yunnan. It meets with the Caucasian and Siberio-Turkestan provinces on the extreme west, and is bounded by the Chinese province on the north. It has already yielded 101 species, of which 90, or 89 $\frac{1}{2}$ per cent., are endemic. These provinces are shown on the accompanying map, whilst the subjoined table shows the facts of *Pedicularis* distribution within them more compactly:—

TABLE VI.—*Distribution of the genus Pedicularis.*

PROVINCE.					Total number of species.	Number of species endemic.	Percentage endemic.
Circumpolar	...	...	...	...	20	11*	55
European	...	...	...	...	40	34	85
Siberia-Turkestan	...	...	...	...	50	32	64
Japanese	...	...	...	...	8		56
American	...	...	...	...	24	21	87
Caucasian	...	...	...	...	15	11	73
Chinese	...	...	...	...	49	35	71
Himalayan	...	...	...	...	101	90	89

The endemic percentages of these provinces seem to indicate very fairly the amount of their isolation. Thus the Circumpolar province, which has the lowest percentage, is in the first place central in situation; its climatic conditions of necessity pass most gradually into those of the adjacent areas, and probably also most closely resemble those under which the genus was evolved; it is nowhere separated from these areas by wide seas or rainless deserts; on the contrary, it possesses organic physiographical connections with each in turn. It is connected with Europe by the Scandinavian Alps, with Western Siberia by the Ural Mountains, with the Siberia-Turkestan mountain system by the Stanovoi range, with Japan by the Kamtschatka hills and the Kurile islands, with America by the Rocky Mountains. And in the cases especially of the Siberia-Turkestan and of the American provinces, these connections provide still an unbroken continuity of *Alpine-Arctic* climatic conditions.

It is instructive to consider the effects of ignoring the existence of this Circumpolar province, and of parcelling it out among the adjacent provinces. Thus if the most specious, because apparently most natural, annexation of all is made and the circumpolar species occurring in Arctic America are considered along with species of the true American province the total number of American species is raised to 31. But only 2 of

3. The *South Indian* division.—Small and isolated, this embraces Southern India and Ceylon, and contains two species which are both endemic.¹

The facts are shown more succinctly in tabular form :—

TABLE VII.—*Distribution of Himalayan Pediculars.*

DIVISION.					Total number of speciBS.	Number of species endemic.	Percentage endemic.
True Himalayan : Emodic (of Sohiiw)	...	...	...	...	51	43	7D-5
Indo-Chinese	...	...	...	...	47	35	744
South Indian	...	...	...	...	2	2	1DD-

The EMDDIC division of the Himalayan province admits of convenient subdivision at the valley of the Karnalli in Nepal into an eastern and a western half. This river, whose course almost exactly coincides with 81°5' E. Long, [a line midway between the eastern and western limits of the division), takes rise from the southern aspect of the ridffe that parts the inner Himalayan waters that flow west to the Sutlej and Indus from those that flow east to the Sanpo and Brahmaputra. The western half contains 23 species, of which 7, or 3D'4 per cent., are endemic. It contains, however, 3 others that extend from Persia, Turkestan or Tibet, but do not reach the eastern half, so that as against the latter the western contains 1D, or 43'5 per cent., of peculiar species. The eastern half is twice as rich, yielding 49 species, of which 32, or 653 per cent., are endemic. There are 5 others that extend from Tibet or Indo-Dhina without reaching the western half so that as against the western the eastern half contains 38, or 775 per cent., of peculiar species. No such subdivision of the Indo-Chinese division is yet evident, although, as will presently appear, certain districts are distinctly discernible in it; nor is there any subdivision possible in the South Indian division, the most remarkable feature of which is that its species show greater affinities to Indo-Chinese than to Emodic (truly Himalayan) species.

In considering now the evidence as affecting the Himalayan districts, it must be recollected that too little is really known of Himalayan botany to admit of other than merely approximate results being stated. For while the Western Himalaya has, except for a limited area (Kafiristan) near the Indus, been fairly thoroughly investigated, the Eastern Himalaya, except for a very small section near the centre (Sikkim-Dhumbi), is still unexplored.

The *Trans-Indus*¹ district comprises the Hindu-Rush and Karakorara [Mustagii) ranges with the highlands of Afghanistan. It is physiographically united to the Panjab Himalaya on the south-east, to the Kuen-lun (Chinese) on the east, to the Tianshan (Siberio-Turkestan) on the north, and much less distinctly to the Persian highlands on the west.

¹ It is necessary to point out here that in admitting this *South Indian Division* within the HIMALAYAN PBDVINDE, the one that regulates the recognition of provinces from statistics is violated. The annexation of the *Andean Division* cannot be a PBDVINDE in another instance of the same violation. It is indeed extremely probable that both South India and the Northern Andes are entitled to actual provincial rank, but the number of species they contain (two in the first and the second) is so small that it is more convenient to treat them along with the nearest adjacent provinces, only calling attention in passing to the fact that the annexation is an intentional divergence from a rule that everywhere else has been rigidly observed.

² Trans-Indus from the Indian (not European) point of view.

It contains 13 species, of which none are endemic. Two species pass into Persia, six into Siberia-Turkestan, six into Tibet-China, while all extend to the Panjab Himalaya. The facts are more easily presented in tabular form:—

TABLE VIII.—*Table of distribution for the Trans-Indus District.*

SPEDIBS.			Diatributsi to Persia.	TD SibBrio-Turkestan.	TD Tibeto-China.	TD Panjab Himalaya.
1. P. biDomuta,	...	...	...	...	...	1
2. cheilaDthifolia	...	...	...	1	1	1
3. dDliohorrhiza	...	...	...	1	1	1
4. gracilia	...	...	...	...	...	1
5. longiflora	...	...	...	1	1	1
5. mollis	...	...	...	...	...	1
7. pec tin at a	...	...	...	...	...	1
8. pycnantha	...	...	1	1	...	1
9. pyramiata	...	...	...	...	...	1
10. rhiDanthoileB	...	...	...	1	1	1
11. siptiDLantha	...	...	1	...	1	1
12. tBnuirDsLris	...	...	...	...	...	1
13. Oederi	...	...	1	1	1	1
Totala			2	6	5	13
Percentage			153	4B-1	4BI	1DOD

The district of the *Panjab Himalaya* comprises the country the Sutlej, and is physiographically joined to the Trans-Indus district on the north-west and north, to the Tibeto-Chinese province on the north-east, and to the Kamaon district on the east. It contains 20 species of which 13 are endemic, 13 district, 7 to the Trans-Indus district, 12 to Kamaon, 12 to the Trans-Indus district, but do not reach this district, but do not cross the Indus.

TABLE IX.—*Table of distribution for the Panjab Himalaya.*

SPECIES.			Endemic.	Trans-Indus.	Tibeto-Chinese.	Kumaon.
1.	<i>P. bicornuta</i>	...	...	1	...	1
2.	<i>brBvifolia</i>	...	...	...	...	1
3.	<i>carnosa</i>	...	...	...	...	1
4.	<i>cheilanthifolia</i>	...	...	1	1	...
5.	<i>fulchDrrhiza</i>	...	...	1	1	...
6.	<i>Blephantuiles</i>	...	1	...	...	...
7.	<i>gracilis</i>	...	...	1	...	1
8.	<i>HeyiUi</i>	...	1	...	...	...
9.	<i>longiflDra</i>	...	...	1	1	1
10.	<i>mBgalantha</i>	...	...	...	...	1
11.	<i>mollis</i>	...	...	1	...	1
12.	<i>pectinata</i>	...	...	1	...	1
13.	<i>pDrrBcta</i>	...	...	...	...	1
14.	<i>pycnantha</i>	...	...	1	...	...
15.	<i>pyTamilata</i>	...	...	1	...	...
15.	<i>rhinanthDides</i>	...	...	1	1	1
17.	<i>Roylei</i>	...	...	...	1	1
16.	<i>aiptonantha</i>	...	...	1	1	1
19.	<i>tBnuirDstris</i>	...	...	1	...	1
20.	<i>Oeleri</i>	...	...	1	1	1
Totals			2	13	7	14
Percentage			10-0	55-0	35-0	70-0

The *Kumaon* district extends from the Sutlej to the Karnali, passing into the Panjab Himalaya on the west, into Tibet on the north, and into Nepal on the east. It contains 17 species, of which 2 are endemic, 14 pass into the Panjab Himalaya, 5 into Tibet, and 7 into Nepal. There are, however, 5 others which, though not yet reported from Nepal, occur both in Kumaon and in Sikkim, so that altogether 12 species pass eastwards from the district. Three species that extend from the Panjab apparently do not go beyond Kumaon to the east—at all events they do not reach Sikkim. On the other hand, one Sikkim species reaches Kumaon without passing westward to the Panjab.

TABLE X.—Table of distribution for the Kamaon Himalaya.

SPBCIES.	Eodemic.	Punjab.	Tibet.	Nepal or Sikkim.
1. <i>F. bicornuta</i> ...	...	1	...	...
2. <i>brevifolia</i> ...	...	1	...	1
3. <i>caroDsa</i> ...	...	1	...	1
4. <i>gracilia</i> ...	...	1	...	1
5- <i>IDDgiflnm</i> ...	...	1	1	(1)*
5. <i>raacrantha</i> ...	1	...	...	...
I* <i>megalantha</i> ...	...	1	...	i
B. <i>mollis</i> ...	...	1	...	i
9. <i>Dphiocephala</i> ...	1	...	...	...
ID. <i>pBctinata</i> ...	...	1	...	...
11. <i>porrecta</i> ...	...	1	...	u)
12. <i>rhinanthoides</i> ...	...	1	1	ii)
13. <i>Roylei</i> ...	...	1	1	ii)
14. <i>BiphonaDtha</i> ...	...	1	1	i
15. <i>tenuirostris</i> ...	...	1	...	...
15. <i>trichoglossa</i> ...	...	...	..	ID
17. <i>Dederi</i> ..	...	1	1	1
Totals ...	2	14	5	12t
PercentagB ...	11.7	82.3	28.4	71.5f

* The |) indicate that these species, although occurring in Sikkim as well as in Kamaon, have not yet been reported from the intermediate district of Nepal.

t The total in this case is that of all the EmaDD species that extend to the east, and on this the percentage is calculated.

The district of *Nepal* extends from the Karnali to the Sikkim frontier. Its botany is only known from a few very partial collections: that of Dr. Hamilton, made in 1822-J, which is not Alpine, that of Dr. Wullich, made in 1821, and that of Dr. Scully, made in 1878. These two last are extremely local, and are mainly from the Bams place—the mountain of Crossain Than. Mr. Maries, who made a small temperate and sub-alpine* collection in 1882, obtained no *Pedicularis*. In the three first collections only ID species occur, none of which are endemic. Seven extend to Kamaon and eight to Sikkim, but only two extend to Tibet. The collections, however, are not calculated to throw much light on the relationship of the Himalaya to Tibet at this point. Two species extend here from Kamaon without reaching Sikkim; on the other hand, there are here three Sikkim species that do not extend west to Kamaon.

TABLE XL—Table of distribution for the Nepal Himalaya.

SPECIES,				Endemic.	Kamadn.	Tibet.	Sikkim.
1.	<i>P. brachyfolia</i>	...	...	...	1	...	...
2.	<i>carinata</i>	...	...	...	1	...	1
3.	<i>furfuracea</i>	...	...	...	...	...	1
4.	<i>gracilis</i>	...	...	...	1	...	1
5.	<i>megalantha</i>	...	...	...	1	...	1
5.	<i>mullis</i>	...	...	...	1	...	1
7.	<i>Scullyana</i>	...	...	...	...	...	1
9.	<i>siphonantha</i>	...	...	...	1	1	1
9.	<i>DsaBri</i>	...	...	...	1	1	...
ID	<i>Wallidlii</i>	...	...	...	...	...	1
Totals				...	7	2	8
Percentage				...	70.0	20.0	10.0

The district of *Sikkim* is the only portion of the Eastern Himalaya that has as yet been thoroughly explored. It is particularly rich in *Pedicularis*, probably as rich as any area of equal size in the whole Himalayan province. As here considered, the district consists of two portions—(1) *Sikkim Proper*, which admits of a simple practical definition as the drainage area of the river Tista and its tributaries, and (2) *Chumbi*, which is the valley next adjacent to Sikkim on the east, and which, though politically Tibetan, is geographically part of Bootan. It does not seem desirable to deal with this valley apart from Sikkim, for if treated by itself the districts are unduly multiplied, while if placed in the Bootan-Miri tract of the succeeding paragraph it gives a fictitious appearance of acquaintance with the Alpine Flora of that tract, of which in reality absolutely nothing is known. Moreover, if the use of the inductive method from the evidence afforded by the districts of the Western Himalaya is permissible, the hypothesis may be advanced that the Nepal district ends at the Arun river and does not reach the Sikkim frontier, while the Sikkim district, on the other hand, extends eastward to the Menas river and includes the whole political region of Bootan, and that another natural district exists between the Menas river and the Brahmakund. The evidence which the Chumbi valley species afford does not conflict with this hypothesis. Already 26 species have been reported from it, and of these 26, 75 per cent., are also found in Sikkim. Since, however, those who consider Sikkim Proper a highly natural district may object to this hypothesis, in the subjoined table the species that occur in Sikkim and have not so far been reported from Chumbi, and *vice versa*, are duly indicated. The number of species reported from the conjoint area is 48; of these 29 are endemic, 13 are known to extend westward and occur either in, or to the west of, Nepal, while 8 have already been reported from one or more of the districts to the east. The number of endemic species is very remarkable. At the same time it must

be recollected that the high percentage is largely due to the great increase in the total number of species as compared with any district to the west, and probably also to the wide extent of unexplored Himalaya lying between it and Yunnan, the only eastern district with which we are in a position to compare it. Indeed, the true significance of the figures in this table only becomes apparent when it is considered along with the similar table for Yunnan. Probably no such abrupt break as they seem to indicate exists anywhere in the Himalaya, and the reader is warned against construing them in this sense. If the table given below be consulted, it will be observed that there are in Sikkim Proper 40 species, of which only 16, or 40 per cent, are endemic, and in the Chumbi Valley 34, of which only 4, or 11·7 per cent, are endemic. This is in accordance with the evidence supplied by all the preceding districts, and probably indicates the condition of affairs throughout the entire province.

TABLE XII.—*Table of distribution for the Sikkim-Umdu Himalaya.*

Species.			Endemic	Distributed west to or beyond Nepal.	Ts> Tibe to-China.	East to or beyond Bhotan.
1.	<i>P. alasohonica</i>	(D.)	...	...	1	...
2.	<i>albiflora</i>	(30	1	...	...	...
3.	<i>bell*</i>	...	1	...	...	...
4.	<i>carduacea</i>	(S.)	...	1	...	1
5.	<i>chumbioides</i>	(D.)	1	...	...	...
5.	<i>Clarkii</i>	...	1	...	...	...
7.	<i>Dollata</i>	(S.)	1	...	...	...
8.	<i>confertiflora</i>	...	1	...	...	...
9.	<i>nervipes</i>	(S.)	...	...	...	1
19.	<i>Daltoni</i>	...	1	...	...	...
11.	<i>deudorata</i>	(S.)	1	...	...	...
12.	<i>Elwbsii</i>	...	...	...	...	1
13.	<i>exoelfia</i>	...	1	...	...	...
14.	<i>flagellarifl</i>	(S.)	...	...	...	1
15.	<i>flexuosa</i>	...	1	...	...	...
15.	<i>furfuracea</i>	...	...	1	...	...
17.	<i>Gammieana</i>	(S.)	1	...	...	...
18.	<i>Garckeana</i>	(C)	1	...	...	...
19.	<i>gibber*</i>	(S.)	1	...	...	...
29.	<i>glubifera</i>	...	1	...	...	...
21.	<i>gracilia</i>	...	...	1	...	1

[U.] indicates that the species so marked occurs in the Chumbi valley but has not been reported yet from Sikkim; [S], that the species appears in Sikkim and has not been so far reported from Dhumbi.

TABLE XII.—*Table of distribution for the Sikkim- Chumbi Himalaya—concluded.*

SPECIES.				Endemic.	Distributed west to or beyond NBpal.	TD Tibeto-China.	East to or beyond BoDtan.
22.	P. instar	...	[S.)	1	...	...	...
23.	intBgrifolia	...	...	1	...	...	...
24.	Kingii	...	(S.)	1	...	...	...
25.	lauhnoglossa	...	...	...	...	...	1
26.	bngiflora	...	...	...	1	1	...
27.	lyrata	...	ID)	1	...	...	...
28.	megalantha	...	...	...	1	...	...
29.	miuroualyx	...	...	1	...	...	...
30.	mollia	...	...	...	1	...	...
31.	nBpalsDsia	...	IS.)	1	...	...	...
32.	odontDphora	...	...	1	...	...	...
33.	Dliveriana	...	ID-)	1	...	...	...
34.	Pantlingii	...	...	1	...	...	...
35.	polygamies	...	...	1	...	...	...
36.	porreuta	...	IO-)	...	1	...	1
37.	Prainiana	...	(D-)	1	...	...	...
38.	PrzBWalskii	...	ID)	...	...	1	...
39.	Eeg-eliana	...	ISO	1	...	...	...
40.	rhinanthoies	...	...	...	1	1	1
41.	robust a	...	...	1	...	...	...
42.	Roy lei	...	...	...	1	1	...
43.	s chizorrhyncha	...	...	1	...	...	...
44.	Scully ana	...	[S.)	...	1	...	...
45.	siphonantha	...	...	...	1	1	...
46.	tBUicaulis	...	...	1	...	...	...
47.	trioliDglDasa	...	...	...	1	...	...
48.	Wallichii	...	(SoT)	...	1	...	...
Totals				29	13	6	8
Percentage				6D-4	27- D	12-5	16-5

[D.) indicates that the species so marked occurs in the Uhumbi valley but has not been reported yet from g j k k i m . . . [S.] that species appears in Sikkim and has not been so far reported from Dhumbi.

The *Bovtan-Miri* tract comprises what remains of the "Emodic" or Himalayan division proper to the east of the Chumbi Valley. Of its Alpine Flora nothing is known. From the outer ranges of the Himalayas one species has been received; this species (*P. gracilis*) is common to every district from Afghanistan to Yunnan.

Within the INDO-CHINESE division there are only half as many districts as there are in the Emodic division, and these districts, instead of forming a continuous series running from west to east, lie more or less parallel to each other and run north and south. It is to be expected from this arrangement that the northern portion of each of these districts will prove much richer in species of *Pedicularis* than the southern and therefore more tropical portion; and although it is as yet unfortunately impossible to compare them with each other as to the fulfillment of this expectation, since of the western and central districts only the southern portions are at all known, and of the eastern district only the northern part has been explored, the evidence from the division as a whole is in accordance with it.

The district of the *Assam-Burma uplands* lies between the rivers Brahmaputra and Irrawaddy. It is organically connected at its northern extremity with the Eastern Himalaya on the one hand, and on the other with the succeeding Indo-Chinese district, and passing south-west diverges near the junction of its northern and middle thirds into two unequal branches, the shorter of which passes west, parallel to the Eastern Himalaya, to end in a *cul-de-sac* at the Khasia Hills, and the longer passes south to end in a similar *cul-de-sac* in the Yomadong mountains of Arakan. This district has so far yielded 8 species, of which 2 are endemic, 4 extend westward to the true Himalaya, and 3 eastward to the other Indo-Chinese districts.

TABLE XIII.—Table of distribution for the Assam-Burma uplands.

SPECIES.					Endemic.	Extending to Himalaya Proper.	Extending to other Indo-Chinese districts.
1.	<i>F. uarnosa</i>	...	...	...	...	1	...
2.	<i>curymboea</i>	...	...	...	...	...	1
3.	<i>curvipes</i>	...	...	...	...	1	...
4.	<i>flingellaris</i>	...	...	...	...	1	...
5.	<i>fragilis</i>	...	...	...	1	...	...
6.	<i>grauilis</i>	...	...	...	...	1	1
7.	<i>rex</i>	...	...	...	...	...	1
8.	<i>ep. nDnium complete lecta</i>	...	...	...	1	...	...
TOTAL					2	4	3
Percentage					25%	50%	37.5%

The *Shan plateau* district lies between the Irrawaddy and the Mekong rivers, is organically connected on the north with the two adjacent Indo-Chinese districts, and passes on the south into the Malay Peninsula: it has been so far very little investigated.

Six species have been reported, of which one is endemic, three pass westward to the Assam-Burma uplands, and four pass eastward to the Yunnan district.

TABLE XIV.—*Table of distribution for the Shan plateau.*

SPECIES.					Endemic.	TD Assam-Burma uplands.	TD Yunnan.
1.	P. DollBttii	...	...	...	1	...	...
2.	comptonisefolia	...	...	...	...	...	1
3.	Dorymbosa	...	...	...	...	1	...
4.	graoilis	...	...	...	...	1	1
5.	gruina	...	...	...	...	...	1
6.	TBX	...	...	...	...	1	1
Totals					1	3	4
PercBDtage					155	5D-D	BGB

The *Yunnan* district lies between the Mekong- and the Yang-tse-kiang rivers, is organically united on its south-western border with the Shan plateau district, and passes on the north into the Chinese province. It comprises the Yunnan highlands with the connected ranges of Tonjuin to the south-east and of Kwei-tschou to the east. It has already yielded 40 species, of which 28 are endemic, 9 extend westward to the other Indo-Chinese districts or to the Himalaya, 3 extend northward to China, and one (the identity of which is doubtful) appears to extend east to Japan.

TABLE XV.—*Table of distribution for the Yunnan highlands.*

SPECIES.				Endemic.	To Shan, Assam, or Himalaya.	TD China.	To Japan.
1.	P. AlopecurDS	...	...	1	...	...	...
2.	axillaris	...	...	1	...	...	...
3.	brevifolia	...	...	...	1	...	...
4.	cephalantha	...	...	1	...	...	...
5.	oDrnptDniseifolia	...	...	...	1	...	...
6.	crenata	...	...	1	...	...	...
7.	iebilifl	...	...	1	...	...	...
8.	Delavayi	...	...	1	...	...	...
9.	dBltoiflBa	...	...	1	...	...	...
ID.	iensispica	...	...	1	...	...	...

TABLE XV.—Table of distribution for the Yunnan highlands—concluded.

Species.			Endemic.	TD Shan, Assam or Himalaya.	To China.	TD Japan.
11.	P. ElwBsii	...	...	1	...	...
12.	Filicula	...	1	...	...	...
13.	g-racilis	...	...	1	...	...
14.	gruina	...	...	1	...	...
15.	gyrorrhyncha	...	1	...	...	...
16.	lachDDglossa	...	...	1	...	...
17.	likiangensis	...	1	...	...	...
18.	linsata	...	1	...	...	...
19.	longepetiolata	...	1	...	...	...
20.	longicaulis	...	1	...	...	...
21.	lut9SCBDS	...	1	...	...	...
22.	melampyrifolia	...	1	...	...	...
23.	miuruLhila	...	1	...	...	...
24.	oligantha	...	1	...	...	...
25.	oxyurpa	...	1	...	...	...
25.	polyphylla	...	1	...	...	...
27.	porrecta	...	...	1	...	...
29.	rBDurva	...	...	...	1	...
29.	refracta	...	...	...	...	1
30.	rex	...	...	1	...	...
31.	rhi n an th aides	...	...	1	1	...
32.	rhoiutrioia	...	...	...	1	...
33.	rigiia	...	1	...	...	...
34.	rupicola	...	1	...	...	...
35.	Bigmoide.	...	1	...	...	...
36.	superba	...	1	...	...	...
37.	tenuisBi'ta	...	1	...	...	...
38.	ts.h^gchunoBBb	...	1	...	...	...
39.	VBrenrofolia	...	1	...	...	...
40.	yuDiiftneiiBis	...	1	...	...	...
Totals			2B	9	3"	1
Percentage			700	22.5	7.5	2.5

As in the case of the table for the Sikkim-Chumbi area, the endemic percentage in this has to be discounted. It is largely due to the high actual number of species and to the intervention of the unexplored tracts between it and Dhumbi. The importance of the other figures is great. It is not unusual, perhaps owing to its political disposition, to treat Yunnan as botanically a district of the Tibeto-Chinese province. But on closer examination the *Alpine* Yunnan species at all events appear to be far more Himalayan than Chinese, and the evidence from *Pedicularis* completely accords with the *y'i3W* that Yunnan forms part of the Himalayan and not of the Tibeto-Chinese province. This is best seen by comparing Yunnan with each of these provinces. Three species from Yunnan appear in the Chinese province as above defined, while nine occur in other parts of the Himalayan province. Stated broadly, the figures indicate an affinity to the Himalayan province on the part of Yunnan thrice as great as its affinity to China. The evidence from comparison with adjacent districts is more emphatic still. The only Chinese district rich in *Pedicularis* that borders on Yunnan is Szetschuan. This district extends along the whole northern border of Yunnan, is of almost equal area, possesses very similar physical features, and has been about equally well investigated. The three Yunnan-Chinese species all occur here, two of them extending no further. But the Shan plateau district, which forms the south-west boundary of Yunnan and which has hardly been explored at all, has already been shown to share four species with Yunnan. Still more remarkable are the facts that the Sikkim-Chumbi area, which is separated by 540 miles of unexplored Alpine country, shares five species with Yunnan, and that another species, making six that pass from Yunnan to the Himalaya Proper, re-appears in Nepal and extends throughout the Western Himalaya as far as Kashmir.¹

Equally conclusive is the evidence afforded by Szetschuan itself. This district has so far yielded 28 species, of which 9 are endemic, only 3 (as has been seen) extend to Yunnan, and only 4 to the rest of the Himalaya, while 11 extend to Tibet and Western Kansu and 10 extend to Eastern Kansu. These figures indicate with sufficient clearness that the cleavage line between the Chinese and the Himalayan provinces places *Alpine* Yunnan with the latter rather than with the former.

TABLE XVX—Table of distribution for the Szetschuan [Chinese] district.

SPECIES.				Endemic.	TD Yunnan.	To Himalaya Proper.	To Tibet and Wbat Kansu.	TD East Kansu.
1.	<i>P. anas</i>	...	...	1	...	...	...	...
2.	<i>armata</i>	...	...	...	...	...	1	...
3.	<i>bidentata</i>	...	...	1	...	...	...	...
4.	<i>binaria</i>	...	...	1	...	...	...	...
5.	<i>craspedotricha</i>	...	...	1	...	...	...	...
6.	<i>cristata</i>	...	...	1	...	...	...	...
7.	<i>Davidi</i>	...	...	1	...	...	...	...
8.	<i>Francoetiana</i>	...	...	1	...	...	...	...
9.	<i>lingbensis</i>	...	...	1	...	...	...	...
10.	<i>kansuensis</i>	...	...	...	...	...	1	1
11.	<i>lasiophrys</i>	...	...	...	...	...	1	1

¹ The botanical evidence is in accord with the evidence afforded by the Entomology and Avifauna of Yunnan.

TABLE XVI.—*Table of distribution for the Seetzchn [Chinese] district—concluded.*

StrEcras.				Endemic	To Yunnan.	To Himalaya Proper.	To Tibet and WatKua.	ToEutKaosu.
12.	P. bngipea	...	...	1	...	...	...	...
13.	macrDsiphnn	...	...	...	...	...	...	1
14.	moupineDsia	...	...	...	...	...	...	1
15.	plicata	...	...	...	...	...	...	1
IS.	Przewalskii	...	...	...	...	1	1	...
17.	recurva	...	...	...	1	...	...	...
19.	rhinnnthDides	...	...	...	1	...	1	1
19.	rhndotricha	...	...	...	1	...	...	...
21).	Roborowskii	...	...	...	...	...	1	...
21.	RDylei	...	...	...	...	1	1	...
22.	ruia	...	...	...	...	...	1	...
23.	eima	...	...	...	...	...	1	1
24.	siphon an tha	...	...	...	...	1	...	...
25.	Bzetbchuaica	...	...	...	...	...	...	1
25.	torta	...	...	...	...	...	...	1
27.	bristis	...	...	...	...	...	1	...
2B.	verticilltttB	...	m	...	...	...	1	1
Tutala				9	3	4	11	11
PurceotagB				321	197	142	39-2	357

The SOUTH INDIAN Division forma a single district composed of the Nilgiri Hills and the Western Ghats along¹ with the highlands of Ceylon, and contains, as has been said, only two species, both of which are endemic. One is restricted to Southern India, the other is found there and in Ceylon.

The South Indian district is poorer in species, therefore, than any of thB Himalayan or Indo-Chinese districts. Of the Himalayan, the Western districts are evidently poorer than the Eastern. It is not, however, possible to say that the Indo-Chinese districts are poorer than thB Eastern Himalayan, since the only districts that can at present be compared are Yunnan DU the one hand and the Sikkim-Chumbi area nn the other. But Yunnan, which in area more than seven times exceeds Sikkini and Dhumbi, has as yet only yielded 40 species, as against 48 from the other district. It has to be recollected, however, that Yunnan has been by no means so thoroughly investigated as has Sikkini.

No portion of thB Yunnan district falls within the political limits of British India, and the district is thus excluded from the scopB of the descriptive part of this paper. Nearly all its species are fully described and accurately figured in part vii of Mr. Maximowicz's *Diagnoses Plantarum Asiaticarum* contained in *Melanges Biologiques*, xii, 713 *et seq.* (1BBB), and to this very exact account of them the student is referred. As regards the other regions, it has seemed simpler to account for all the species that have hitherto been recorded from them than to confine the paper too pedantically within the arBa indicated by the political boundaries of the Indian Empire.

The table below shows compactly the physiographical and political constituents of each district with the names (arranged as far as possible chronologically) of the botanists to whose exertions their investigation is due:—

TABLE XVII.—*Conspectus of the Himalayan province.*

DIVISION.	DISTRICT.	Physiographies, components.	Political components.	Botanical investigators.
I.—TRUE HIMALAYA: Middle Region of <i>Sikkim</i> .	a.—Western Himalaya.	1. TEANB-INDUS ... Himalaya west of the rivB: Iniiua: Kai ukDrum [Mustagh] rankB: Hindu-Kush: SafedKoh.	[Kafinstan]: Badukshan: Baltiaban: Kabul.	Griffith: T. Thomson: Stoliczka: Clarke: Dollbt: Aitchison: Gilra.
		2. PANJAB HIM-ALAYA. Himalaya bet we on the Indus and the Sutlej rivers.	Hazara: Kashmir: La dak: Lahul: Spiti: Kullu: Uamba.	Moorcroff: JacqBmonb: Falconer: EdgBWorth: Hay: Ithomson: Stewart: Clark: Stohczka: C. B. Okrke: BrandiS: DuthiB: Heyde: Ellis: Jaeschkb.
		3. KAMAON HIM-ALAYA. Himalaya between thB Sutlej and the KarnalU rivers.	Sirmur: Kunawur- Grxrhwal: Tnhri: Kamaon: [West Nepal partly].	JacqBmonb: Wallich: Hovan: Roys: Vi'ar: Strachey and Winter bottom: Thomson: MuJdun: HullmJster: Brandts: King: Schlich: Gamble: Uuthie.
	b.—Eastern Himalaya.	4. NEPAL HIM-ALAYA. Himalaya between thB Karualli and the Arun rivers.	Kingdom of Nepal except extreme west and extreme east. <i>Only a small portion of Central Nepal is investigated.</i>	Burhanan-Hamilton: Wnllich: Scully: Mes.
		5. SIKKIM-BODTAN HIMALAYA. Himalaya between the Arun and the Manas rivers.	[East Nepal partly]: Sikkim: Chumbi: Phari: [Bootan].	Griffith: Hooker: Bantū: AnderBon: Uarke: King: Gamble.
		6. AHHA-MIBI HIMALAYA. Himalaya between thB Menas and the Dihong rivers.	[Akha]: [Daphla]: [Min] ...	Booth: King.
II.—INDO-CHINESE.	7. ASSAM-BURMESE UPLANDS.	The upland region between Brnh-mapubraaiid Irmwariay rivers, i.e., Himalaya East of Dihoiig; Patkm, Burail, Khuiia, Khoondoung, Muni Pahar and Yomadoung ranges.	[Mishmi]: [Patkoi]: Bumil: Khasia: Mampur: (Western Burma): [Lushmj]: Chittagung: Arakan: [Kachtn].	Wallich: Griffith: Masters: Hooker and Thomson: Simons. Dldham: Kurz: ClurkB: Mann: King: Watt: Colletb: Prain.
	8. SHAN PLATEAU	Upland region between Irrawaddy and Mekunif rivers, i.e., bhan Hills and Pegu Youiah.	[Yunnan]: [Shan States]: [Siam]: [Eastern Burma]: Pegu.	Brandis: J Anderson: Kurz: CDllett.
	9. YUNNAN HIGH-LANDS.	Upland rpiidn between the Mekong and thB Yanv-tse-kianir rivers, z.e., Yunnan mountains. Tonquin hills and Nan-ling ranee.	Yunnan: [KweitBchou]: (Tonquin)...	Delavay: Perny.
III.—SOUTH INDIAN.	10. SOUTH INDIA	Nilehina; Western Ghauts: Ceylon Plateau.	RDuth India: Ceylon ...	Koaniir: RuLter: Unxburgh- Khin: HBynB: Perrottei: Scimidi: Wight: BeddomH: Bumble: Burmann: Moon: Mac-ran- Walker: Cham pi on: Gardner: Thwaicut: Tn...

[] indicate that this area is quite unbiplorad; |) mil rate that this area has been Only partially investigated.

In a very valuable contribution to PhytDgeography¹ Mr. Hemsley has recently pointed out that a system of distribution based partly on existing and partly on anterior conditions must be unsatisfactory. HB adds that the task of the biological geographer is completed when he has represented "as nearly as possible the main features of the distribution of existing animals" or plants.² The mechanical portion of the task truly ends here; the philosophical aspect of the problem only then presents itself. In the case of *Pedicularis* the physiographical features and meteorological conditions of the northern hemisphere may explain how it is that the genus is localised in a series of provinces characterising the *Arctic-Alpine* northern flora. But how the delimitation is effected is of less interest than why the delimitation is possible. The differential effects of physical conditions being so great that resultant areas are expressible in terms of their endemic species, how is it that the presence of one genus in the several areas is explicable? To satisfy this enquiry reference to anterior conditions seems to be essential.

¹ Hoadman and Salvin: *Biologia Centrali-Americana; Botany, Introd.* [188B).

a Hemsley *I.e.* xxix, xxx. The passage quoted is part of a passage taken by Mr. Hemsley from Mr. Wallace's work on *Geographical Distribution of Animals* i, p. 55.

The present distribution of the Arctic-Alpine flora is usually explained on an hypothesis of alternating migrations.¹ This hypothesis may be summarised as follows:—

A circumpolar flora initially uniform in character and, during the warmer period antecedent to one or other of the more general glacial periods, compact in distribution, commenced to migrate southwards under the influence of the gradual decrease of temperature that preceded the glacial period proper. During this advance new forms that appeared did so under conditions that were uniform for the migrating flora. At the same time the progressive enlargement of the area subject to these conditions mitigated the severity of the struggle for existence between rival forms and diminished the swamping effect of the presence alongside of them of the original types. A large proportion of the forms were thus enabled to survive. Here and there accident determined the detention of stragglers, while occasionally a particular meridian of migration ended in a *vul-de-sav*. In these cases necessity compelled the development of a power of accommodating themselves to circumstances which proved sufficient in a few forms to ensure their survival. Wide seas and lofty mountain chains on whose summits a rigorous climate had already become established formed natural obstacles to the advance, and where these were encountered the advance was checked or deflected. Elsewhere the line of furthest advance formed a continuous zone of distribution. The transition between congeneric forms in a given section of this zone was a serial one and represented the evolution of the genus along one meridian of migration; the transition between forms of successive adjacent meridian-sections was in a closed curve. The natural conditions uniform for the invading flora were progressively unfavourable for the displaced one, and few of the forms characteristic of the latter were able to accommodate themselves to adverse circumstances and at the same time to hold their own against members of an invading flora for which these conditions were suited.

When the advance ceased there ensued a period during which the natural conditions were comparatively stable. The struggle for existence within the invading flora was therefore intensified, since the number of forms continued to increase while the area they inhabited ceased to enlarge. Internal pressure tended to make the invading flora extend to localities less favourable for its existence. But in these localities the conditions were favourable for the displaced flora, and here it was able not only to survive, but to resist invasion. Hurl pressed from within, successfully opposed from without, many forms gave way in the struggle, and as here one, then another, kind of variation proved more adapted to local conditions, some local colouring became imparted to different districts of the zone in which the Arctic-Alpine flora now lived.

This period of stability came also to an end. With the gradual increase of temperature that marked the disappearance of the ice, the invading flora began to migrate northwards. Like the advance, the retreat was a meridional one modified by local conditions. Intervening seas checked or deflected it as they did the advance. Mountain ranges, however, played a different part. In place of turning aside the retreating flora they largely attracted it, offering their flanks as routes of safe retreat and their summits as asylums where retreat was altogether cut off. But even with this the area available for the Arctic-Alpine flora was steadily curtailed, the struggle for existence was intensified, the tendency to vary, especially in districts where retreat was delayed, was greatly stimulated, the variations deviated more and more from the original type, while for reasons that are not yet demonstrable, now more, now fewer, forms survived.

¹ This theory was first advanced by Professor K. Forbes (*Brit Assoc. Rptvrt*, 1846, and *Mem. Geol. Survey* i, 336-433 1845), but was greatly extended and elaborated by the late Mr. Darwin (*Origin of Species*, chap. xi [edit. Li uhup. xii]), and especially applied by Sir J. D. Hooker (*Trans. Linn Soc.* xxiii, 253).

The mountains to the north of the zone of furthest advance were not alone in attracting the retreating flora. To a less but still to an appreciable extent certain forms found an asylum and perhaps a base for further advance on the slopes or summits of mountains to the south.

During the retreat the local colouring peculiar to forms of a particular area became imparted to all the districts along the meridian of retreat. In this way the circumpolar flora of the second period of stability, while as compact in distribution as the initial one had been, was less uniform in character. On the other hand, mountain systems that had during the advance formed impassable barriers between adjacent meridians of migration, attracted to their opposite flanks during the retreat the forms they had hitherto kept asunder, and permitted through their passes an interchange of influence and of individuals. Individuals agreeing in morphological characters did not all regain the original seat of the flora, but were content or were compelled to remain in one or more of the Alpine localities *en route*. Their characters these detained individuals at first transmitted unchanged. But when the period of retreat had ceased, there came a time when natural conditions were once more stable. And now even in the most suitable localities slight modifications ensued, while in localities where retreat had been earliest and most completely cut off, this period of stability allowed the retreating flora to develop its latent powers of accommodation and permitted the survival of forms that must otherwise have altogether disappeared. But the somewhat unsuitable conditions of these localities greatly stimulated the tendency to vary, the more suitable varieties surviving and supplanting the original types. This went on till a balance was established and a period (of which the present is probably an example) of approximate equilibrium resulted. This equilibrium was earliest attained in the new circumpolar region, where the natural conditions were those that had characterised the true home of the flora, whatever its geographical position and whether in advance or in retreat. Its greatly circumscribed area caused an enormous reduction in the number of the forms it contained, but owing to continuity of conditions there were necessarily among the survivors fewer variations from the original types, and these variations were slight. It is thus that in general terms the Circumpolar province is poorer in number of forms, that these forms are generally more archaic in structure and the endemic percentage of its separable forms is lower than in other provinces, while in provinces nearer to the circumpolar, as compared with those more remote, the same things hold good.

The behaviour of the Equatorial Flora during these alternating migrations has only an indirect bearing on the distribution of the particular genus under review. It need therefore be but briefly alluded to. It was of necessity in all points the opposite of the other—while the Circumpolar flora advanced and was characterised by a zonal distribution, the Equatorial retreated and had a meridional character imparted to its distribution; while, on the other hand, the Circumpolar flora retreated, the Equatorial advanced, and its mode of distribution became necessarily more zonal. It has been pointed out on a former page that a few forms of *Pedicularis* are present in the Intermediate Flora.¹ But Sir J. J. Hooker has clearly shown² that there are in reality only two Floras. These two are the Circumpolar and the Equatorial; and this Intermediate Flora, which it is convenient to recognise *in practice* since it simplifies the treatment of the other two, has been composed mainly of forms left behind by the Equatorial when the Circumpolar was advancing, by the Circumpolar itself when it was retreating. According to the hypothesis of migrations the present period is one of approximate equilibrium subsequent to a Circumpolar retreat,

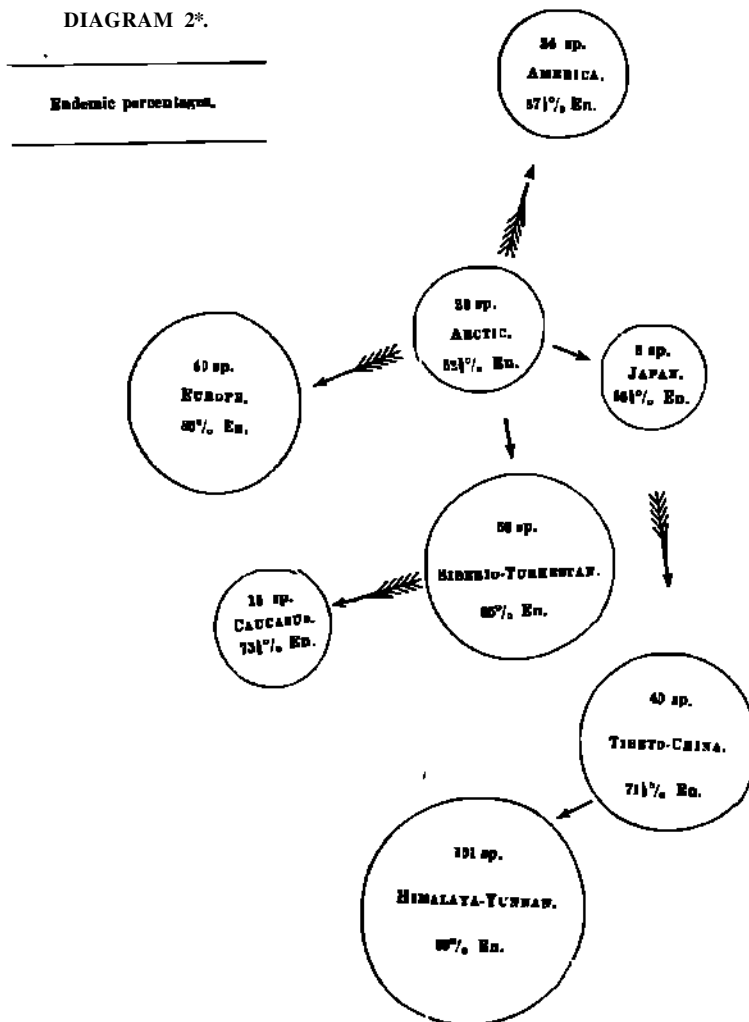
¹ P. 22.

² Godman and Salvin : *Bolivia Central-Americana - Botany; Commentary on Mr. Remdys Introduction*, p. 114.

the forms characteristic of the present *Intermediate* Flora should therefore be largely of Circumpolar type. As, however, the natural conditions to which they have been subjected are such as pass into those favourable for an advance of the Equatorial Flora, a tendency to the zonal distribution characteristic of an advancing flora has been imparted to it.¹ Briefly stated, the condition of affairs has always been this:—the constituents of the *Intermediate* Flora during each period of approximate equilibrium have been mainly derivatives of the flora that retreated during the migration immediately preceding in distribution parallel to the constituents of the flora that advanced during the same time.

The general agreement of the distribution of *Pedicularis* with this hypothesis becomes very evident when table VI given above (p. 25) is replaced by a diagram in which the endemic percentages are shown:—

DIAGRAM 2*.



¹ If the hypothesis be correct, the form 3 characteristic of the Southern Intermediate Flora should evidence their residual character by being of Equatorial type, and BB phyllocladus I circumstance! have protected them from pressure on the part of AD advancing southern Circumpolar Flora during the most recent migration, their forms should exhibit a meridional rather than a zonal distribution. We should expect, for instance, to find in South Africa that lateral distribution; the appearance of the same species in Western Cape Colony and in Natal—is a somewhat exceptional phenomenon. This does not, however, affect the constitution of the genus under discussion.

² This diagram and the nine that succeed it are uniform and have been constructed on the following principle:—The centre of the circle that represents the Arctic province coincides with the North Pole, while the centre of each of the other circles coincides with the centre of the area on a map of the Northern Hemisphere of each of the individual provinces; the area of each circle is at the same time in direct proportion to the total number of species of *Pedicularis* reported from the province that the circle represents—an arbitrary figure being of course chosen for the Arctic province, the others being made uniform to the first.

This diagram appears to prove—

- ^x (1) that there are four meridians of distribution passing from the Circumpolar province to the American, European, Siberian, and Japanese provinces respectively;*
- (2) that there is no extension of the American Dr EurDpean meridians; and
- (3) that the Siberian meridian is projected into the Caucasus.

At the same time it leaves it doubtful—

- (1) whether the Tibeto-Chinese province may be a projection of the Japanese mBriian of distribution or bB due to a bifurcation of the Siberian meridian within that province; and
- (2) whether the Himalaya-Yunnan province may be a projection of the Tibeto-Dhinese meridian (whatever its derivation) Dr be a projection of the meridian of distribution through the Caucasus.

But as these points of dubiety only raise questions of possible alternative interpretation and do not assail the truth of the general position, we are at liberty to proceed at once to a consideration of the special evidence from structure and, in indicating how far it is corroborative of the general arithmetical evidence, to note at what points and in what direction these doubtful problems are solved.

¹ The reader will bear in mind that Sir J. D. Hooker (*Trans. Linn. Soc. xxiii*) has shown the possibility of there having been a meridian of distribution along Greenland, and that this meridian, at all events during the last southward migration, may have terminated in the *cul-de-sac* which its present physiography would suggest. The morphological evidence of *Pedicularis* having already declared the whole of Greenland to be at present circumpolar is not available as a test of this. Sir J. D. Hooker has also shewn in the same place that the flora of Greenland has very much greater Lapponic than American affinities, while Baffin Bay and Davis Strait indicate a sharper cleavage line than the ocean between East Greenland and Norway. It is interesting to observe that, so far as the evidence from *Pedicularis* is concerned, there is, in spite of the present continuity of Arctic-Alpine conditions, as sharp a cleavage between America as a whole and Alaska, for of the twelve Alaskan species, only two—*P. euphrasioides* and *P. palustris*—pass to America, while the significance of this distribution is extremely slight since both these species are examples, as their zonal distribution testifies, of the *Temperate-Intermediate* and *Dot* of the *Arctic-Alpine* Circumpolar Flora. This cleavage is confirmed by the evidence of *P. sudetica*, which on the European and on the Siberian meridians of distribution remains undistinguishable from the Arctic plant, but has on the American meridian been modified into a perfectly distinct, although still representative species, *P. scopulorum*. Besides this negative evidence as regards the American meridian, there is positive evidence as regards the adjacent Japan-Dhina-Himalaya meridian. One species [*P. Uhamissonis*] is confined to this meridian, extending along it to Japan. Two others—*P. verticillata* and *P. Dederi*—appear in Northern China. At the same time one of the endemic species, *P. poggendallii*, has its nearest allies in Chinese and European species, and the other, *P. Menziesii*, is [like *P. verticillata*] distinctly separated from all the species of the American meridian by its character of opposite leaves—a character which does not occur among American species proper, but is, on the other hand, highly characteristic of the Japan-China meridian.

The cleavage between Alaska and Greenland pointed out by Sir J. D. Hooker is strikingly verified by the evidence from this genus. While ten Alaskan species, or 83 per cent., occur in Arctic Asia, only three [*P. euphrasioides*, *P. hirsuta*, and *P. lanata*] or 25 per cent., occur in Greenland. The evidence of *P. euphrasioides* has to be discounted, and though there is evidence that the extension is not direct in both the other cases, there is proof in one case that it need not be. For while *P. hirsuta* is confined to Eastern Arctic Asia, Alaska, and Greenland, *P. hirsuta* extends from Alaska through the whole of Arctic Asia and Europe to Lapland, and it may well be in this direction that its extension into Greenland is to be

sought for. But while the cleavage between Greenland and Alaska is thus borne out, the genus affords no evidence of a cleavage between Greenland and the rest of America. It appears on the contrary to indicate that the American province and Greenland are on the same meridian of distribution. For while of the six species that occur in Greenland, three [*P. tonuU*, *P. lapponia**, and *P. flammea*], or 50 per cent., extend to Lapland, and three [*P. hirsuta*, *P. lanata*, and *P. euphrasioides*], or 50 per cent., to Labrador, thus remaining circumpolar, but the other two [*P. nipharioides* and *P. grimaldii*] into the American

The highest kind of morphological evidence is, as we have already seen, that derived from the structure of the corolla. It has been seen that *Drthorrhynchoua* and *SiphonantliDU.s* corollas, while negating the suggestion of a progressive development the one from the other, agree in indicating a development of both from corollas Df Rhynchulophous type. It has also been seen that many natural groups exhibit thB transition from Rhyncholophous to Anodontous corollas, and that there is strong presumptive evidence of ths independent evolution of Blientate from Anodontoua corollas. We are thus led to the conclusion that among the Anodontous corollas we see the most archaic types exhibited by the genus at the present time.

It is clear from the difficulty that has been experienced in classification that no very natural suctions exist in the genus. In the meantime therefore it is necessary to waive a consideration of the distribution by these. But fortunately the very natural and fundamental character on which classification is founded—the absence or presence of a beak on the corolla—and which divides the genus as a whole into two almost e^ual

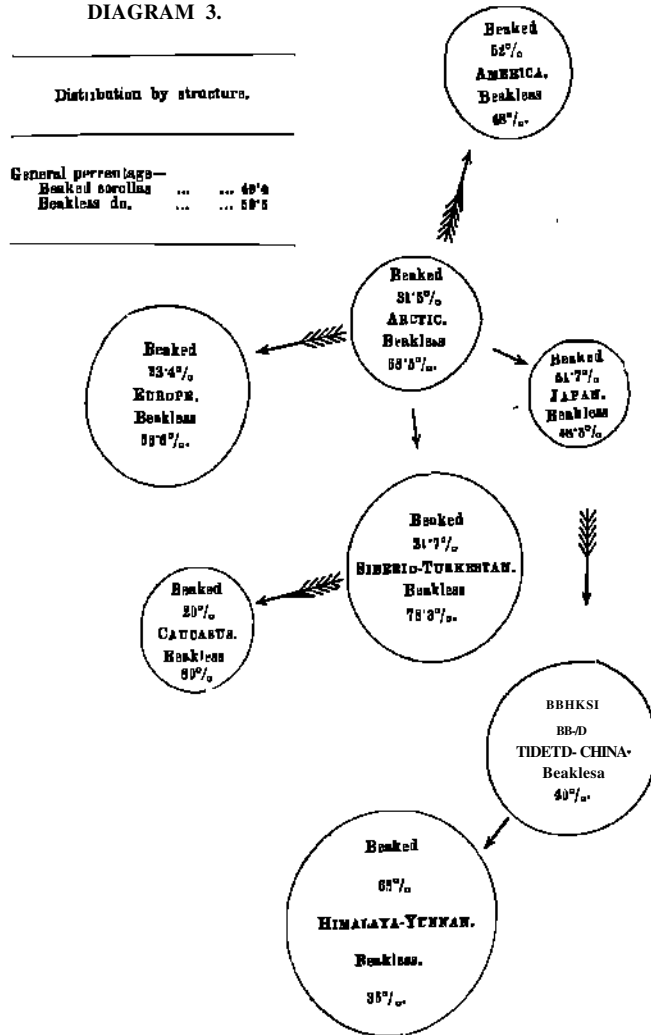
province. The evidence of *P. euphrasioides*, as already said, has to be discounted. It is a Temperate rather than an Arctic-Alpine species, and exhibits the zonal distribution characterising snch species. But the evidence of *P. groenlandica* is very direct, for it is clearly not a species that has been evolved in Greenland, but ono that has extended thither during the return of the circumpolar flora. In the first place, it is the most highly specialised of all the Arctic species, and belongs indeed to the *Surrectz*, the most highly specialised and moat characteristically American group of the RHYNCHOLDPH-E. Then the remaining members of this group (*P. incurva*—Andes of Colombia and *P. atjlleii*—*Californi**) arc endemic in America and absolutely extra-Arctic, while their nearest ally (*P. excel so*) is endemic in the Himalaya and is also extra-Arctic. Finally, *P. grotnlandica* itself ia not peculiar to Greenland, but extends thitlier northwards from New Mexico and California through the Rocky Muuntains, Rupert's Land, and Labrador. The annexed tables more fully explain this note:—

TABLE XV III.—Comparison of distribution fw Alaska and Greenland.

ALASKA.					GREENLAND.			
Species.	Endemic.	To Amerin.	To DrtenUnd.	To Arrtio Siberia.		To America.	To Almka.	To Lapland.
1. F. Mrnziesii ...	1	...	...	...	1. I ¹ , hirsutu, ...	...	I	1
2. verticillata ...	...	...	...	1	2. lanata ...	...	1	...
3. Oederi ...	...	...	...	1	3. euphrasioidcB	1	1	...
4. hirsuta ...	...	...	1	1	4. Upponica ..	1	...	1
5. Innata ...	...	...	1	1	5. flammea ...	1	...	1
6. Langsilurfii ...	...	...	...	1	9. grDenltndica	1	...	...
7. capitata ...	...	...	...	1				
8. Chamissunis ...	...	...	...	1				
9. euphrasioiik-s	...	1	1	1				
10. paluatris ...	...	1	...	1				
11. Budetica ...	...	...	...	1				
12. pedicellate ...	1	...	...	...				
Totals ...	2	2	3	10	Totals ...	4	9	5
Percentages	100	100	150	200	Percentages	100	225	125

parts, lends itself readily for purposes of comparison. Its evidence is again best appreciated when exhibited diagrammatically:—

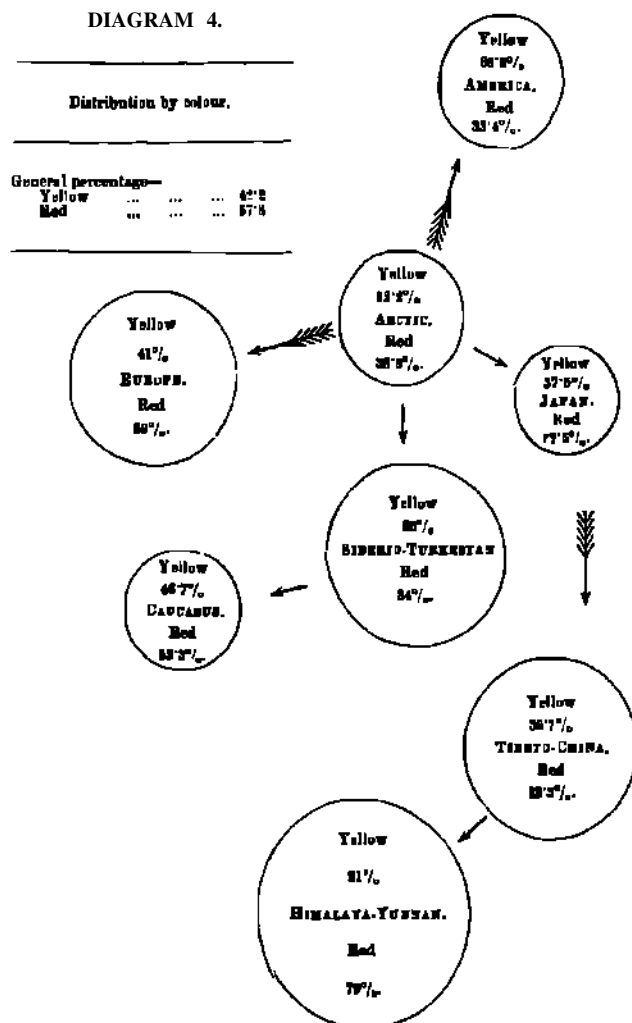
DIAGRAM 3.



Structure thus directly confirms the evidence from endemic percentage as regards the Japanese, the American, and the European meridians of distribution, while curiously it inversely, but still equally completely, confirms the evidence from endemic percentage as regards the Siberian; whereas along the other three meridians the percentage of corollas of archaic type gradually falls towards their equatorial limits, along the Siberian meridian it actually increases. This exceptional arrangement affords on the other hand strong confirmation of the already almost conclusive evidence that the Caucasus is a projection of the Siberian meridian, and on the other makes it almost impossible either that the meridian of distribution for China is derived from that of Siberia, or that the meridian for the Himalaya is extended from that of the Caucasus. At the same time there is direct evidence that the meridian of Japan is projected into China and extends thence to the Himalaya.

Another character that admits of comparative use is colour. As already explained, there are practically two colours in the genus—yellow and red. Yellow being perhaps

chemico-physically the more archaic¹ might be expected to show a general correlation to structure of the more archaic type. It has, however, been seen that the exceptions in both directions are too numerous to admit of colour and structure being considered conjointly: it becomes necessary therefore to consider the general evidence from colour distribution by itself. As before, the simplest method of presentation is by diagram:—



Except in the Circumpolar province itself, the evidence is clear and distinct; while even this province agrees with the hypothesis in having a predominance of the more archaic colour—42·2 per cent, being here yellow, while the general percentage of this colour is only 42·2. The meridian of distribution for Europe, as well as that for Japan, shows complete accord with the evidence from endemic percentage. That for America, however, reverses the rule precisely as that for Siberia and the Caucasus reverses the rule in the case of structure distribution. So at first does that for Siberia, although the rule becomes again apparent before the meridian reaches the Caucasus.

¹ Bern* more nearly allied to chlorophyll in its composition than the other, and thus* more closely related to the substance that is essential in the economy of phanerogamous plants.

The Japan-China-Himalaya meridian of distribution exhibits the most striking predominance of red throughout, and it deserves to be noted that if the species *endemic in the two Arctic peninsulas*¹ that project towards this meridian be subtracted from the rest of the Arctic species, the circumpolar colour percentage becomes—yellow, 66·7; red, 33·3, —a result in accordance with the evidence from endemic percentage and structure alike.

The predominance of red, so marked along the Japan meridian even from within the Circumpolar province, and culminating in the Himalaya in the overwhelming proportion of 79 red to 21 yellow, has some striking features within the last-named province. In the West Himalayan division (Trans-Indus, Panjab Himalaya, and Kumaon districts)—where there are altogether only 23 species—9, or 39 per cent., are yellow. This is in marked agreement with the percentage for Tibeto-China, the slight preponderance of yellow over the average Chinese percentage being perhaps due to the influence of the adjacent meridian of distribution. In the Eastern Division (Nepal, Sikkim, and Chumbi) there are 50 species, of which only 8, or 16 per cent., are yellow, while in the Indo-Chinese division (Assam, Burma, Yunnan) there are 47 species, of which 5, or only 10·6 per cent., are yellow. The condition along this meridian is thus more striking and more uniform than even the diagram indicates.

One other general character—that of phyllotaxis—remains to be considered. We have seen that the leaves in this genus may be alternate or may be opposite, and although, for reasons which have been already explained, the use of this character in a primary subdivision of the genus has been abandoned, the character is nevertheless a highly natural one.

There is the same difficulty in estimating the value of the character here as there was in using it for purposes of classification. It affords from internal evidence no clue to its own evolutionary history. We are unable to gather from morphology whether the alternate-leaved or the opposite-leaved condition is the more archaic.

The alternate-leaved condition prevails, as we have seen, in the proportion [roughly] of 65 : 35. But we have seen also that its general relationship to structure is one of indifference, and we know that of the Tribe EUPHRASIEAE, to which the genus belongs, and of which it certainly does not exhibit the most archaic type of corolla, an opposite-leaved condition is highly characteristic. Its relation to structure in particular sections is not more instructive. If the SIPHODANTHE—"*nobilissimum et omnibus reliquis antependens*"²—are alternate-leaved, the DRIMYDIACEAE, which contend with these for the hegemony of the genus, are characteristically opposite-leaved. RHYNCHOLOPHUS are mostly alternate-leaved, it is true, but there are some of the groups that were included in the abandoned "*Verticillateae*" that have Rhyncholophous corollas. Then BIDENTATEAE, of which till quite recently alternate-leaves were supposed to be characteristic, are not only being reported in constantly increasing numbers from the Eastern Himalayan divisions with opposite leaves, but the highest degree of specialisation on this particular line of evolution (shown by the *Lysithea*) is concomitant with the possession of opposite leaves. As regards ANODONTAE, which exhibit the most archaic types of corolla, the balance is in favour of opposite leaves, the proportion of these to alternate being at present 35 : 27, but the evidence is too slight to be conclusive.

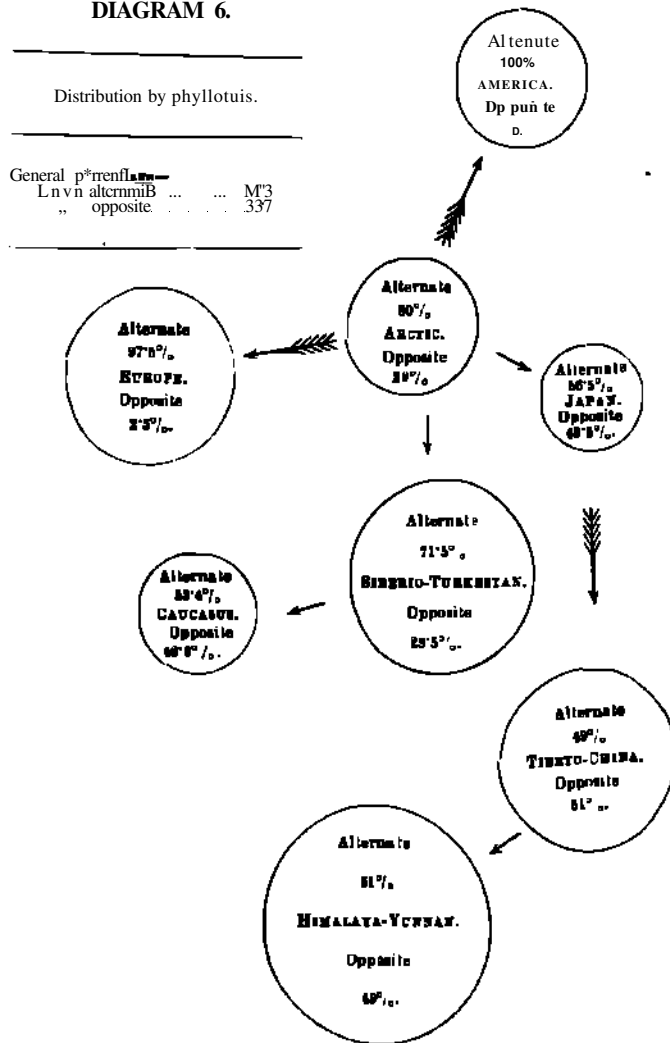
The following diagram on this account affords no assistance in considering the question of general distribution. In this case indeed the evidence obtained elsewhere is required to explain the character that the diagram illustrates. In details, however, and as regards

¹ *p. nasuta* in Kamchatka and *P. pedicellata* in Alaska and Sitka Island, both of which are without close structural allies elsewhere in the Circumpolar Flora and both of which have red corollas.

² Maximowicz, *Mel.*, *Biol.* xii, 775.

particular meridians of distribution, the evidence is in accordance with that derived from other sources:—

DIAGRAM 6.



The most notable features of this diagram are—

- (1) the absence of opposite-leaved species along (in) American and European meridians. In America Proper there are no opposite-leaved species: in Europe only one (*P. verticillata*);
- (2) the progressive increase in the percentage of opposite-leaved species along the Siberian meridian of distribution; and
- (3) the practical equilibrium of the percentage from end to end of the Japan-Himalaya meridian.

While these facts strikingly confirm the evidence already advanced in support of the hypothesis of meridional migration, they throw some light on the evolution of the character in question and on the history of the genus. The lower percentage of opposite-leaved species in the Circumpolar province appears to favour the hypothesis that the genus was at first characterised by alternate leaves only. It is scarcely possible otherwise to suppose that the original circumpolar flora was uniform, and to account for the absence of opposite-leaved *ioTHM* from the American meridian. On the other hand, the absence of such forms

from America sufficiently explains their absence from Labrador and Greenland, the arctic districts into which its meridian of distribution passes. If on the north, it is J, that this character first made its appearance in the Japan-Himalaya meridian, through which the number of opposite-leaved species almost equals the number of alternate leaved ones, we explain at once the fact that we meet in the two arctic districts—Kamchatka and Alaska—into which this meridian passes, all the four verticillate circumpolar species, as well as the fact that two of these [*P. Menziesii* and *P. Vhamissonis*] are confined to these districts. Of the others, *P. amurensis* extends westward as far only as the Yenisei, *P. verticillata* extends westward into Lapland. It is probable that the character was evolved during some period of southward migration anterior to the most recent one, and that *P. verticillata* and *P. amoena*, or some closely representative species, reached the circumpolar province during the northward migration that followed. The intra-arctic cleavage between Alaska and Greenland is, from the evidence adduced by Sir J. D. Hooker of a high antiquity, so that only a westward zonal distribution was open to them! But they had not extended equally far when the succeeding southward migration commenced, hence it happens that while *P. verticillata* and *P. amurensis* have both migrated along the Siberian meridian of distribution, *P. verticillata* alone, having by the same time extended sufficiently far west, has migrated along the European meridian of distribution also. Why *P. amurensis* should have proved unstable in its meridian of distribution [*P. violascens* is evidently an immediate derivative), while there and in Europe *P. verticillata* has remained unchanged, also why in the Himalo-Chinese meridian *P. verticillata* itself has been unstable (*P. refracta* and *P. szechuanica* being clearly immediately derived forms), are problems which it would be premature in the present state of our knowledge to attack. But the facts are nevertheless very striking.

The considerable number of opposite-leaved forms on the Siberio-Caucasus meridian is to some extent capable of explanation on the assumption that the character was evolved in the adjacent Himalo-Chinese meridian without necessarily postulating a retreat for all the characteristic forms as far as the present Circumpolar province. For during periods of stability marking the line of furthest advance, opposite-leaved species extended zonally westward to what is now the Caucasus province. Eastward they either did not extend, or, if they did, the tracts into which they passed are now submerged. Westward beyond the Siberio-Caucasus meridian their extension was checked by an ancient Aralo-Caspian northward projection of that Mediterranean Ocean which in early Tertiary times separated part of India from the rest of Asia, and extended westward to Europe. During periods of retreat, too, many forms were attracted from the Himalo-Chinese meridian to the southern and eastern flanks of the extended mountain system, which in times of advance had delimited the Siberian and the Chinese meridians, but had now, owing to changed physical conditions, become the backbone of the former. As time went on these forms overflowed, through its passes, what had been at first their barrier wall, and coming with forms that had been similarly attracted to the northern and western flanks of the same system from the Siberian plains.

The northern shores of the Early Tertiary Mediterranean Ocean prevented the extension of the genus southward beyond the present limits of the European and the Caucasian.

¹ *Trans. Linn. Soc.* vol. xxiii, p. 252.

² *P. verticillata* extends in Europe from Spain (Sierra Nevada) to the Balkan Peninsula (Rumelia), along the Siberian meridian from Okotsk through Baikal to the Altai range, along the Chinese meridian to Szechuan, and along the Siberian meridian to the Siberian meridian, and extends from Okotsk through Baikal and the Altai range to the Altai mountains.

meridians, while the elevated land that Mr. Wallace has suggested as existing in later Tertiary times where the northern part of the Bay of Bengal now is,¹ enabled an extension of the Himalo-Chinese meridian to take place towards the end of the last period of stability, or perhaps even at the beginning of the last period of retreat, into Southern India. The fact that the South Indian species are so few curiously confirms the idea that it was not in existence during earlier times. And equally striking are the facts that one of the species [*P. zeylanica*] is a member of a highly natural group of forms the rest of which have their seat in the Indo-Chinese division, while the other (*P. Perrottetii*) has its nearest allies in two Kansu and Szetschuan species [*P. macrosiphon*, *musculicola*]; for Mr. Wallace's suggestion is made in order to explain how "a few Malayan species may have migrated to the Peninsula of India and have been preserved only in Ceylon and the Nilgheries," and these two species of *Pedicularis* show equally applicable it is in explaining the presence of a few members of an Arctic-Alpine genus.

That zonal distribution was at some time possible between the southern ends of the European and Siberio-Caucasus meridian? is perhaps evidenced by the existence in Asia Minor of *P. cymosa*. But the evidence is inconclusive since *P. comoensis* extends far along the Siberian meridian, and may have thus a polar derivation. Equally inconclusive is the evidence afforded by the existence of forms so closely allied as *P. acaulis* and *P. Regeliana** or *P. asphnifolia* and *P. albigera* in the European Alps and in the Himalayas respectively. For, as regards the former two, we find an intermediate form in North China, that is, on the Himalayan meridian, but nearer the Circumpolar province; as regards the latter two, we find an allied form (*P. pedicellata*) within the Circumpolar province now. The latter fact equally invalidates the evidence from *P. rostrata* (European) and *P. Nordmanniana* (Caucasus).² It should be noted in passing that the two South Indian species just dealt with are both examples of species with corollas somewhat highly specialised in most respects (that of *P. zeylanica* being of Rhyncholophous, that of *P. Perrottetii* even of Siphonanthous type), and yet that both are beakless. They thus appear to afford strong confirmation of the general evidence from morphology that the appearance of a beak to the corolla was a phenomenon of comparatively recent occurrence—that beakless corollas are the more archaic.

That zonal distribution once took place between the southern ends of the American and the Himalo-Chinese meridians appears possible from the fact that the members of this most highly specialised American group [*P. incurva*, *attolensis*, *groenlandica*] have their nearest known ally in a Himalayan species (*P. excelsa*). Confirmatory of this too is the extraordinary affinity between the Himalayan *P. lachnophylla* and the American *P. Parryi*.³ But it also appears as if the ocean barrier which now prevents such communication had been formed prior to the appearance of opposite leaves as a character in this genus. Another fact that strongly corroborates the idea that the genus was not only originally an alternate-leaved one, but that the character of opposite leaves is late of evolution, is

¹ *Proceedings of the Royal Geographical Society*, xxi, 519. But there is no evidence that marine conditions have ever prevailed in North India to the east of Agra.

> The well-known and extremely extensive affinities that exist between the Balkan Peninsula and Asia Minor are of course not affected by, nor in turn do they affect, at least directly, the reasoning which, for the whole Arctic-Alpine flora, is based on an hypothesis of "Migration;" that for the flora of the Mediterranean basin depends on quite another hypothesis—that of comparative "Permanence."

² These facts, as in the case of the South Indian species, exactly confirm the evidence from tropical or sub-tropical genera. Mr. C. de Candolle has shown this as regards *Meliaca*; Mr. Hemsley as regards genera like *Abelia*, common to Mexico and to Indo-China; and a recent indication of the same thing in the discovery by General Ditlevsen of an *Osteomeles*, hitherto supposed to be endemic in the Sandwich Islands, in Burma.

seen in the South Indian species already discussed, which both have alternate leaves, although in the Himalaya itself there are now as many opposite-leaved as there are alternate-leaved forms.

Although the distribution of the genus is almost entirely meridional, examples of the distribution of the same species along several meridians are not very common. Besides that of *P. verticillata*, the most striking instances are those of *P. Oederi* and *P. Scentrum*, which both occur within the Circumpolar province and both extend along the European and the Siberian meridians. *P. Oederi* extends along the Chinese meridian also as far as the Himalaya, but in a somewhat different condition (VAR. *heteroglossa*). *P. Scentrum*, on the other hand, is represented in Japan only by a closely allied, but perfectly distinct, species (*P. gloriosa*). *P. sudetica* also occurs in the European and Siberian meridians, but is altogether absent from the Himalo-Chinese. On the other hand, it is represented in the American meridian by the closely allied, although perfectly distinct, *P. scnpulorum*.

Nor are the species that have become part of the Intermediate Flora, and that are thus characterised by a zonal distribution, very numerous. In the Temperate Zone, as it is usually understood, the most striking examples are *P. palustris*, *euphrasioides*, *sylvatica*, and *resupinata*. *P. palustris* extends from the British isles throughout Europe, Siberia, Kaintschatka, Alaska, and Rupert's Land to Canada,—throughout the entire temperate complement of the Circumpolar province in fact. *P. sylvatica* extends from the British islands across Europe only; its extension to South-Eastern Scandinavia is, as Mr. Blytt has shewn, an instance of comparatively recent immigration.¹ *P. resupinata*, extends across the whole of Siberia and North China to Japan. *P. euphrasioides* extends from Kamtschatka through Alaska, Rupert's Land, and Labrador to South Greenland. It is thus a sub-arctic species rather than a truly temperate one. The comparatively recent occupation of their temperate habitat by these species is evidenced by the fact that they pass from the Japanese to the American meridian uninfluenced by the ancient cleavage that the truly Arctic flora indicates as separating these.

Species with this zonal type of distribution are not, however, confined to the temperate complement of the Circumpolar province. The few species that descend to comparatively low elevations in the Himalaya exhibit the same phenomenon. Thus *P. carnosia* extends at elevations of 5,000—7,000 feet from Kashmir to Khasia, *P. rex* at similar elevations from Khasia to Kwei-tschou. The parallelism between these and *P. sylvatica* and *P. resupinata* respectively is complete. Nor is this all; for just as we have seen that *P. palustris* occupies the fringe of the Circumpolar province in its whole extent, we find *P. graoilis* at elevations of 8,000—10,000 feet in every Himalayan district from Afghanistan to Yunnan.

There are no species in the temperate complement of the present European Alpine province with a zonal distribution like this. And the absence of any such phenomenon there corroborates very strikingly the evidence concerning the tract derived from other sources. We have already supposed that an ancient Mediterranean Ocean prevented an extension beyond their present limits of the European and Sib Brio-Caucasus meridians. Mr. Ball² and Mr. Dyer³ have independently arrived at the conclusion that the shores

¹ Axel Blytt: *Essay on the Immigration of the Norwegian Flora during alternating rainy and dry periods*, p. 78.

² Ball: *Spicilegium Flora Marocana*; *Jour. Linn. Soc.* xvi, 302.

³ Dyer: *Plant Distribution at a field for Geographical Research*, p. 15.

of this ocean have formed a centre of preservation for the flora that is now characterised as Mediterranean. The physical conditions that permitted this preservation were exactly those that would prevent an Arctic-Alpine genus from establishing itself in the tract. The absence therefore of the genus *Pedicularis* from temperate Southern Europe while it is present in the temperate Himalaya is 'excellent negative evidence' of the validity of the reasoning of these authors.

A brief review of the distribution of the various divisions and sections, which it has been necessary to defer to this stage, must conclude this chapter. It admits of being done most easily by arranging the whole as before in tabular form.

TABLE XIX—*Distribution of Pedicularis by sections.*

Division.	Section.	Arctic.	Europe.	Asia.	Canal.	Japan.	China.	Himalaya.	America.
I.—LoNQHOTRES	Siphonanthus	...	...	0	1	...	11	20	...
	Drosera	...	...	2	...	1	9	17	...
II.—ADUNC*	Rhynchospora	...	5	19	7	3	17	35	12
	Bidentata	...	4	14	25	2	1	9	8
JIL—EBDSTHEJ	Anemone	...	10	19	14	0	14	10	4
	Totals	...	20	40	60	15	49	101	21

It is not easily explained still if the diagrammatic method is adopted, and the figures are better appreciated when put in the form of percentages,

DIAGRAM 6.

Distribution of the LDNQ-IRDSTRES.

Total	...	...	...	...	54 sp.
Percentage	...	...	...	...	20%

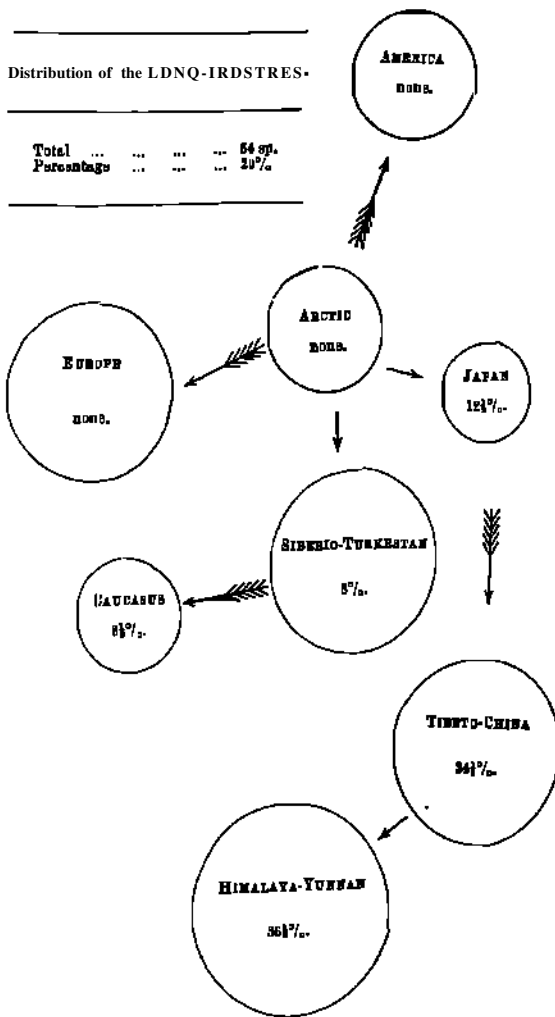
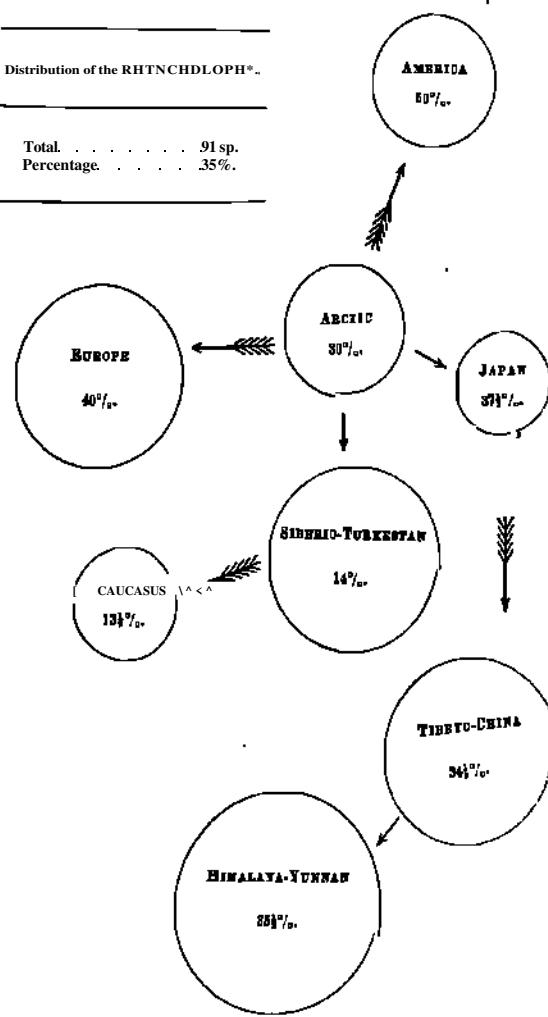


DIAGRAM 7.

Distribution of the RHTNCHDLOPH®.

Total	...	...	...	...	91 sp.
Percentage	...	...	...	...	35%



As the highest division LONGIRDSTRES and the section RHYNDHLOPH® practically include all the "beaked forms" from which the upper percentages in diagram 3 [p. 45] are derived, it seems better to discuss them side by side. It has, however, to be recollected that these sections—the RHYNDHLOPH® especially—include also forms that possess corollas exhibiting the other characters that indicate a higher specialisation of structure but without having happened to develop long beaks. The two long-beaked sections require no detailed consideration. They are almost equal in numbers and in degree of specialisation of structure; they exist side by side and are uniformly distributed; they have originated in the same provinces and apparently contemporaneously; and finally, while quite distinct from each other, they exhibit the same degree of relationship to the RHYNDHLOPH®. Both of them appear from diagram B to have been evolved towards the equatorial extremity of the Chinese meridian of distribution. We have already been led to conclude from morphology that they form the most highly specialised division; this conclusion has shown the probability of its being the division most recently evolved; its present distribution shows that this is not probable merely, but almost certainly the case. It has not extended, along its own meridian even, as far as the Circumpolar province during the most recent northern migration. That it has not done so in previous ones seems certain not only from its complete absence from the Circumpolar province now, but

from the American and European meridians as well. The presence of a few forms on the Siberio-Caucasus meridian, which at first appears to invalidate this conclusion, on closer examination confirms it. For when we examine the distribution of the individual species, it is found that the one which extends westward to Persia (*P. siphonantha*)¹ is an example of the few species that have become sub-Alpine as well as Alpine, and as such has the zonal distribution characteristic of its class, and the four that extend to Siberia are clearly examples of forms attracted to adjacent mountain flanks during a period of retreat. More striking still, only one of these (*P. fongiflora*) has yet overflowed the mountain barrier to the slopes and plains beyond.

The RHYNCHOLOPHES are, as diagram 7 shows, very generally distributed, the most striking features of this distribution being—

- (1) the high percentage in the American meridian;
- (2) the uniform percentage along the whole extent of the Siberia-Caucasus and the Japan-Himalayan meridians; and
- (3) the low percentage of the Siberio-Caucasus meridian.

The uniformity along the Siberian and Chinese meridians, coupled with the marked difference between the two, corroborates the whole of the other evidence as to the distinctness of these meridians. The high percentage of the American meridian, coupled with the fact that it is on this meridian that the highest type of Rhyncholophous corolla occurs, seems to indicate that here this section took origin. Its presence both in Europe and in the Chinese meridian in proportions which, while not quite equal to that in America, are nevertheless high, strongly supports this view, and we have already seen that, so far at least as the Himalayan province is concerned, there appears to have been, during one or other of the periods of furthest advance, zonal communication between the equatorial end of the American meridian and it. But the high percentage in the Circumpolar province shows that it is probable that some at least of the Rhyncholophous forms were evolved at a comparatively remote date and were conducted to the neighbourhood of the pole during a period of retreat anterior to the last, and that, issuing thence during the last southward migration, they were not only redistributed in America but in the European meridians as well. The ancient cleavage already alluded to more than 1000 years as existing between Greenland and Alaska made this impossible so far as the Chinese meridian is concerned; it is therefore a very striking corroboration of the general hypothesis to find that the European Rhyncholophes are all of comparatively simple type (*Rostrate*), as from their polar derivation they might be expected to be, while in the Himalaya there are but two or three examples of this type, though many are almost as highly specialised as the American forms themselves, and are, moreover, closely allied to them. The low percentage in the Siberian meridian seems to show that the last southward migration commenced before many forms had extended eastward by Lapland to Arctic Siberia, while the barriers of an Arab-Caspian Sea to the west, and of an unbroken mountain chain with a more rigorous climate along its summit to the east, prevented zonal communication with Europe and China respectively.

The distribution of the ADUNCES as a whole, which is shown in diagram 8, does not afford evidence that is either direct or conclusive. This is because the two sections that compose them, besides having been, like the sections of LINGIDSTREES, evolved independently, have, unlike SIPHONANTHA and ORTHORRHYNCHUS, originated at a different

¹ *P. uiphonantha** extends from Elbrus on the WBEL through Afghanistan, Kashmir, Kunwm, Nepal, Sikkim, and Ckmmbi to Szetsihuan.

period, in a separate locality and, most probably, also under unlike conditions. The justice of these conclusions becomes more apparent when the remaining sections are discussed in detail. MorB is gained therefore by merely comparing the distribution of this division with that of the remaining sections *conjointly*, as shown in diagram 9, and then analysing the latter.

DIAGRAM 8.

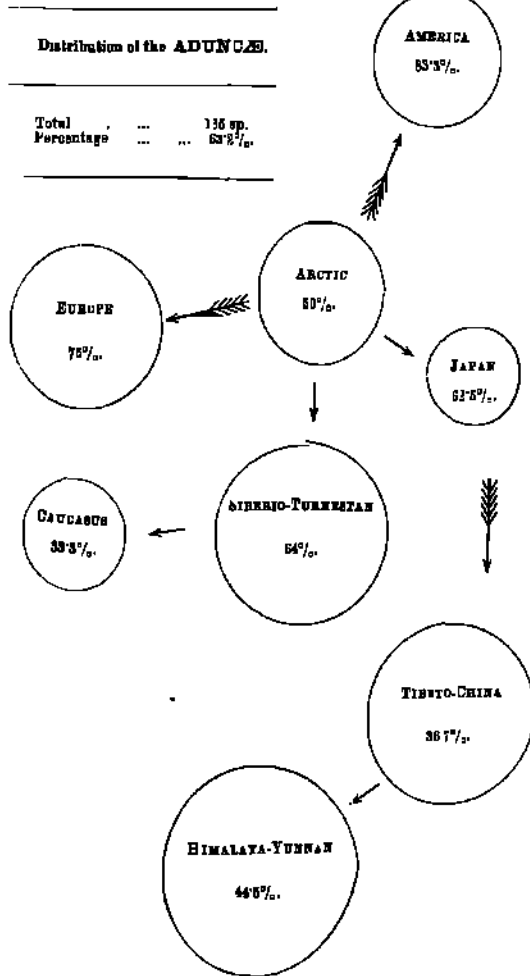
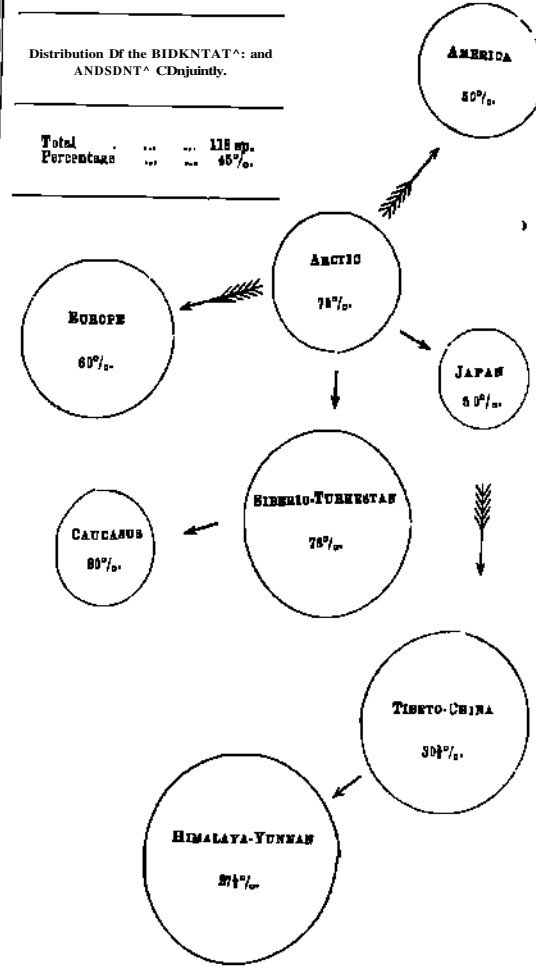


DIAGRAM 9.



The BIDENTAT-E and the ANODDNT-E are composed entirely of beakless forms, and therefore diagram 9 practically repeats the lower percentages already exhibited in diagram 3. The differences are due to localisation, owing to their other natural affinities, of the beakless form in the section SIPHDNANTILE and of thirteen more in the section RHYNCHOLDPHIE.

The most notable features of the diagram are —

- 1) the high percentage in the Circumpolar province;
- 2) the gradual decrease along all the meridians of distribution save one; and
- 3) the gradual increase along that one (the Siberio-Caucasus) meridian.

The evidence already adduced from morphology, that the beakless type of corolla is the most archaic one, is corroborated by the high percentage in the circumpolar region, where the forms still experience natural conditions such as probably prevailed

before the genus began its first migration; it is further strengthened by the decrease of this percentage along the various meridians directly with the distance from the pole. The single exception of the Siberio-Caucasus meridian, as before, strengthens rather than weakens the general evidence. Along the north-west flanks of the mountain system that now practically constitutes it, but that originally limited it on the east and south, there was an unbroken continuity of the physical conditions of its original home, not during advance only, but during retreat as well, while communication with neighbouring meridians was till a very late period shut off on one side by this mountain system and on the other by a sea. Uninfluenced from without and with a continuous similarity of environment, the species of this meridian retained throughout a uniformity of character which disappeared from those of the other meridians.

The two sections have now to be considered separately. Morphological considerations have led us to conclude that the relationship of the *BIDKNTATJE* to the *ANDDONTE* is one of direct descent. But the same considerations have shown that this is also true of the *RHYNCHOLOPHE*, and from the absence of any evidence that the *RHYNCHOLOPHE* have been derived from the *BIDENTATE*, we had to assume that the relationship between these sections is one of collateral descent from the *ANDDONTE*. This presumption, based on the absence of evidence that the *BIDENTATE* were intermediate between the other two sections mentioned, is now established by the direct evidence from distribution. We now find that the *BIDENTATE* probably originated at a later date than the *RHYNCHOLOPHE* and under somewhat different conditions.

DIAGRAM 10.

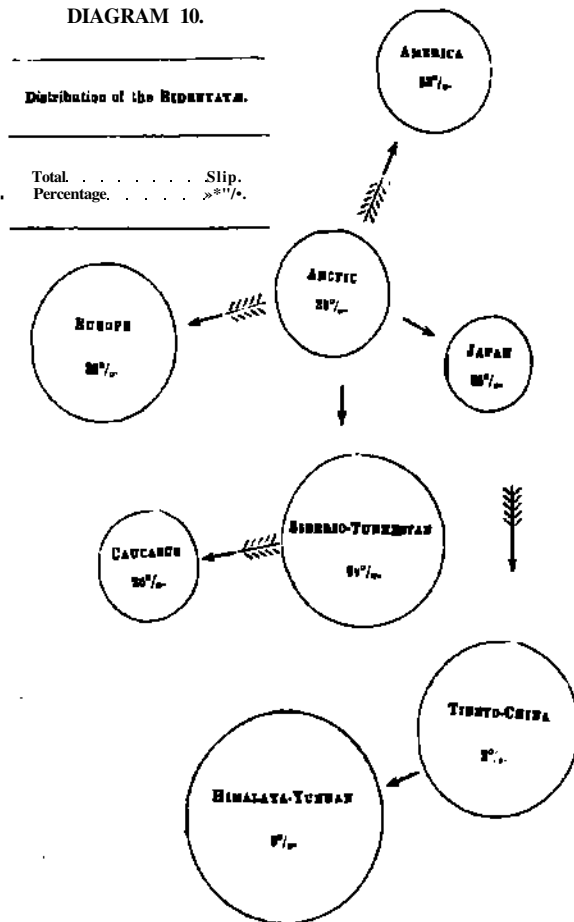
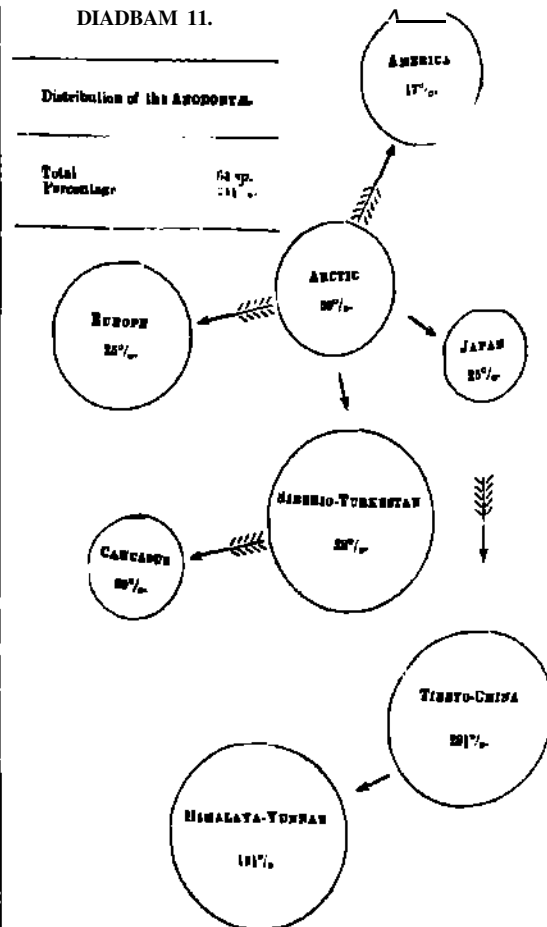


DIAGRAM 11.



This is best shown by diagram ID, which exhibits the distribution of the section and shows how unlike it is to that of any other. The highest percentage (as it happens the highest actual number also) of Bidentate species occurs in the Siberio-Turkestan province. The decrease of the percentage in the Caucasus appears to indicate that the section was evolved on the Siberian meridian during the last period of retreat, and that, too, comparatively recently. Another indication that this type of corolla originated in Siberia is that the only alternate-leaved Bidentate species in China and the Western Himalaya (*P. dolwhorrhiza*) is an excellent example of overflow from one to another adjacent meridian. This section contains the greater number of individuals that belong to the temperate-intermediate flora, and that are characterised by a zonal distribution. In discussing species of that class, we have already seen that these particular species were probably evolved under the temperate conditions they now prefer; and this, as we have seen, could only happen at a time when climatic changes had ceased to be progressive, which time, for these species, must have been just as the point of furthest retreat was being reached. But diagram ID shows further that this character of distribution is not confined to these few species, but is exhibited by the section as a whole; for there is a higher percentage in each of the four provinces bordering on the Circumpolar than in any province more remote, and also than in the Circumpolar province itself. It seems therefore impossible to come to any other conclusion than this:—that the BIDENTATE were evolved under temperate rather than under Arctic or Alpine conditions, and that they appeared at a comparatively recent period.

The occurrence of BIDENTATE in the most easterly division of the Himalayan province appears at first sight to invalidate this reasoning, but in reality it affords it the strongest confirmation. For, first, the Himalayan BIDENTATE are Indo-Chinese and not Emodic—they thus characterise the division where the physical conditions are temperate rather than Alpine. Then, the complete absence of BIDENTATE from China (the single exception of *P. dolichorrhiza*, as has been said, is an example of overflow) indicates an independent appearance of BIDENTATE in Indo-China. And finally, all these Indo-Chinese BIDENTATE have opposite leaves. Now we have already seen that the appearance of even the most highly specialised of the KHYNDHOLDPH^ in all probability preceded the occurrence of opposite leaves in any section. It becomes therefore almost certain that in Indo-China, as in Siberia, the appearance of BIDENTATE was subsequent, and probably in both provinces was long subsequent, to the appearance of the RHYNDHOLDPHJE.

The distribution of the ANDDONT^: shown in diagram 11 alongside of that of the BIDENTATE requires only brief notice. It confirms the evidence advanced already from other sources that the Anodontous is the most archaic type of corolla, and that the ANDDONT-E form the oldest section. The explanation of the distribution of the BIDENTATE enables us to see that the apparent contradiction of this, on the migration hypothesis, for the Siberian meridian now disappears. We are, however, left face to face with the curious fact that the Caucasus province, which is the equatorial termination of the Siberian meridian, exhibits a percentage of archaic forms higher than that of any province,—higher even than that of the Circumpolar province itself. The only possible explanation of this is that the Caucasus has been a centre of preservation for forms of archaic type. But this explanation appears perfectly sufficient; for when the southward migration into the Caucasus province first took place, it did so owing to arctic conditions prevailing on the plains of Turkestan. But owing to the presence of an Arab-Caspian

Sea to the north-west and the barrier of an inclement mountain chain on the south-east, the path of immigration into this province was comparatively narrow, and accommodated comparatively few species. Then, during the period of stability that followed, the natural conditions that made the shores of the Mediterranean Ocean a centre of preservation for the present flora of the Mediterranean basin, prevented the wide extension of such species as had gained access to the arctic and sub-arctic portions of the province. And finally, when retreat began, temperate conditions were early established on the territory through which these invading forms had reached the Caucasus. Their retreat being thus cut off, they could only extend in the Alpine parts of the Caucasus province itself. But as their advance had been greatly checked, the forms thus cut off were few in number, and in place of finding the area subject to natural conditions suitable for their existence steadily curtailed, they found it quite ample. Internal pressure thus being minimised, and there being practically no external pressure, there was little stimulus in this province, compared with any other, to variation at all, such variations as naturally appeared deviating far less than variations elsewhere did from the original archaic types.¹

¹The new species alluded to by M. Franchet [see. above, p. 1, foot-note 12] have been published by Messrs. Forbes and Hemsley (*Jour. Linn. Soc.* xxvi, KM-220; April 12, 1893) while this paper has been passing through the press. They are mentioned in a list of 64 Chinese *Pedicularis*, 10 of which are advanced as new. The following species in the list call for remark:—15. *P. candelifera* Maxim. A new species from Hupeh, Formosa; a monotypic series with B corolla-structure that corroborates the evidence on which [p. 15] the tribe VERTICILLATJIC has been suppressed.—27. *P. fiicifolia* Hemsley. A new species from Hupeh, a member of the series Aiillars.—39. *P. gracilis* Wall, is now reported from Hupeh in Southern China.—34. *P. hirtellia* Franchet. A new species from Yunnan of great interest as being the first alternate-leaved BIDENTATA reported from the Chinese meridian of distribution. In the absence of specimens and in the absence of a full description of the lip, its localisation in the sub-section Striatum must be considered merely tentative.—30. *P. integrifolia* f. *aff. f.* is now reported from Yunnan.—41. *P. leiandra* Franchet. This name is proposed for a plant from Yunnan that Mr. Maximowicz has (*Mel. Biol.* xii, 818) referred to *P. porrecta*, Wall. As Mr. Maximowicz has been able [cf. *Mel. Biol.* xi, 283] to compare it with a Wallichian specimen, while M. Franchet admits that he has only seen a specimen collected by M. Jactiueumont and named [in *Herb. Paris*] by the late Mr. Dentham, the proposed name is not at present acceptable. There is nothing in its description to separate the Yunnan plant from the Sikkim form of *P. porrecta* [p. 1 to 21, B] with fleshy roots, and this Sikkim plant is certainly not specifically distinct from the true *P. porrecta* of the N.-W. Himalaya.—49. *P. macileota* Franchet. A new species from Yunnan, a member of the group *Dxyrarpa*.—RO. *P. melampyroides* Franchet. This name is substituted for *P. melampyroides* Franchet (*Mel. Biol.* xii, 89*) : BENT which has priority. Uut " la publication est un fait que l'auteur ne peut pas annuler." [*Do Cand.*, Luis, 51] and M. Franchet is responsible, even if unintentionally. 0, for the earlier name.—55. *P. oxycarpa* Franchet is now reported from Szechuan.—71. *P. B&lviflora* Franchet. An interesting new species from Yunnan placed, on account of its habit, near the group *Fragilis*, but on account of its inadequately described corolla kept apart and situated between that group and the group *CMata*.—79. *P. stridula* Franchet. A new Yunnan species apparently a SIPHDNANTHA and probably a *Lotiflora*; unfortunately the subliminal inscription is not given in the description.—88. *P. vagans* Hemsley. An interesting new RBYNCHULUTIA from Szechuan which helps to connect the group *Execla* with the rest of the B&tion.—92. *P. Viali* Franchet. A still more interesting new species from Yunnan, connecting the American series *urrecta* Maxim., of which it possesses the disproportionately small lip, with the Himalayan series *Execla* Maxim., with which it shares the peculiar character [hitherto known only in *Execla* and in *Fragilis*] of a mid-lobe of lip larger than the lateral lobes.—93. *P. villosula* Franchet. A new DHTHOBBUTNCHA from Yunnan, belonging to the group *Debiles*.

There are thus (excluding *P. leiandra*) nine new species, and the total for the genus is now 270 species. Three [*P. candelifera*, *Jilrifolia*, *vagans*] are endemic additions to the Chinese province; two [*P. gracilis*, *oxycarpa*] are extensions thither. The total for China is now [cf. p. 25] raised from 49 to 54, the endemic factor is increased from 35 to 30, and the percentage decreased from 71.4 to 70.3. The other six are endemic in Yunnan, and raise the Himalo-Yunnan to Lai [cf. p. 25] from 111 to 117. But the endemic figure stated already being too great by two [*P. jirnnVw*, *oxycarpa*], the factor is raised only from 90 to 94, the endemic percentage falls from 89.1 to 87.5. For Yunnan [cf. p. 35] the total is now 47 [endemic 33], so that the percentage changes from 70.0 to 70.2; for Szechuan [cf. p. 37] the total is now 90 [endemic 9], so that the percentage changes from 32.2 to 10.0.

The extension of *P. grwilii* to Hupeh is what might be expected from the nature of its distribution [cf. p. 51] and evidence from it has to be discounted precisely as the evidence from *P. euphrasoides* has had [p. 44] to be discounted. If therefore the appearance of *P. oxycarpa* in Szechuan vppcarB to invalidate the annexation [p. 37] of Yunnan to the Himalaya, this is more than counterbalanced by the occurrence of *P. integrifolia* in Yunnan as well as in Chumibi.

PART II-SYSTEMATIC ARRANGEMENT OF THE
INDIAN SPECIES.

CHAPTER V.—HISTORICAL ACCOUNT OF INDIAN SPECIES.

FBDM those districts of the Himalayan province that come within the scope of the descriptive portion of this paper, there have been, so far, seventy species reported. Fifty-five of these are capable of complete description; thirteen have not yet been collected in fruit; one has been collected in fruit, but not in flower; one is only represented by leaf specimens and cannot therefore be described, all that may be predicated of it being that it is not referable to any described species, and that it most probably belongs to the sub-section *Ensiphonanthce* of the SIPHDNANTH[^]: or to the sub-section *HyposiphmanthcB* of the RHYNCHDLDPHJE. Of the rest, 3D species belong to the division LDNBIRDSTRES, 25 to the ADUN&fl, and 14 to the EROSTRES.

The earliest published descriptions of Indian species of Pedicularis are those of P. Pfifferi,—from Scandinavian examples—in 18DB¹ and of *P. longiflora*—imm. Siberian examples—in 1B11,² but the first author to describe species from Indian examples was Mr. D. Don, who published three species in 1825³ and described a fourth as a *Rhinanthus*. In 1828⁴ Dr. Wallich issued sheets of what professed to be 13 species, 11 of these being different from those described by Don, but only six of which now stand with Wallich's names; one of the six [*P. carnvsa*] was described and figured by Wallich in 1831-⁵ In 1334⁶ a figure of a South Indian species was published without specific name or description. This species (*P. zeylanica*) had been issued by Wallich in 1829 as a *Tormia*[^] but was, along with three other new species, described from Indian specimens by Mr. Bentham in 1835.⁷ In 1841-2⁸ threD Indian species were described from Siberian specimens. In 1843⁹ an Indian species issued by Wallich was differentiated and re-named by Dr. Bunge, and was described under Bunge's name in the following year.¹⁰ In this year (1844)¹¹ M. Decaisne described and figured two Indian species already distinguished under other names by Don and Schrenk. In 1845¹² Mr. Bentham, while monographing the genus, distinguished two more Indian species (*P. Perrotteii* and *P. flagellifris*), and described under a new name [*P. caulica* = *P. dolwhorrhiza*] one already distinguished by Schrenk. In 1850¹³ Wight figured the two already-described South Indian species; Boissier in 1853¹⁴ diagnosed still another Indian species from Persian examples; and in 1862¹⁵ Klotzsch described as new, and figured, five species, only two of which in reality had previously been unknown or undifferentiated.

¹ Hornem., *Dekon. Plantel.*, ed. ii, p. 580.

² *Mem. Acad. Petersb.* iv, 345.

³ *Prodr. Flor. Nepal* 94, 95.

⁴ *Lithogr. Catalog.*, nil. 411-423.

⁵ *Plant. Asiat. Bar.* ii, 44, t. 154.

⁶ *Baikie, Observ. Nilgher. App.* viii, t. 2.

⁷ *ScrophularinecB Indices*, pp. 51—54.

⁸ *Fischer and Meyer, Enum. Plant. Nov. a C. Schrenkb lect.* i, 22 j ii, 19, 23.

⁹ *Bull. Sc. Acad. Fetersb.* viii, 251.

¹⁰ *Walp. Rep.* iii, 415.

¹¹ *Jacquemont's Voyage, Bot.* 117, 118; tt. 122, 123.

¹² *DO. Prodr.* x, pp. 565, 581; 575.

¹³ *Icones* tt. 1418, 1419.

¹⁴ *Diagn.*, Ser. i; xii, 45.

¹⁵ *Ergebn. Bnt> Pr. Waidrn.* Bot.*, pp. 106—119, tt. 57-61.

In 1877¹ Mr. Maximowicz described two Indian species from Chinese or Mongolian examples, and in 1881² one more from Indian specimens. In the same year Dr. Watt³ described and figured under a new name a species already figured by Kuntze. When describing the Indian species in 1834,* Sir J. D. Hooker published diagnoses of 14 species previously undescribed, and again in 1835^B Mr. Maximowicz published descriptions and figured the flowers of 11 previously undescribed Indian species; while, in 1859/ the writer issued diagnoses of 17 more, taking the opportunity of arranging these and also the species described by Mr. Maximowicz according to the method of the *Flora of British India* so as to facilitate the field-study of the genus by those interested in it in India.

TABLE XX.—Chronology of the Indian species of *Pedicularis*.

Date.	NAME AND AUTHOR OF SPECIES.	Place of publication.	Locality of original specimen.	Remarks.
1809	<i>P. Doderi</i> Vahl.	Humboldt, Dekon. Planten., ed. 2.	Europe	Described; already figured by Derlet (1791) and by Haller (1788).
1811	<i>P. longiflora</i> Rudolph	Mem. Acad. St. Pétersb. IV.	Siberia	Described and figured.
1825	<i>P. brevifolia</i> Don; <i>P. mangantha</i> Don; <i>P. siphonantha</i> Don.	Don: Prodr. Flor. Nepal	India	Described.
1828	<i>P. carnosa</i> Wall.; <i>P. furfuracea</i> Wall.; <i>P. runcifolia</i> Wall.; <i>P. mollis</i> Wall.; <i>P. pectinata</i> Wall.; <i>P. porrecta</i> Wall.	Wallis: Lithogr. Catalog.	India	Edited without descriptions; <i>P. carnosa</i> Rubenqually described and figured in 1831 in <i>Pl. Am. Ear.</i> ii.
1835	<i>P. elephantoides</i> Benth.; <i>P. pyramidata</i> Royh.; <i>P. tenuirostris</i> Benth.; <i>P. zeylanica</i> Benth.	Bentham: Scrophulariaceae Iodide.	India	Described; <i>P. zeylanica</i> previously figured in <i>Baillie, Observ. Nitgherr.</i> and subsequently in <i>Wight, Icons.</i>
1841	<i>P. rhinanthoides</i> Schrenk	Fischer and Meyer's Enum. Pl. Ind. i.	Siberia	Described.
1842	<i>P. cheilanthifolia</i> Schrenk; <i>P. dichrochorda</i> Schrenk.	Ditto ditto, ii	Siberia	Described.
1843	<i>P. Wallichii</i> Bunge	Bull. Acad. Peterb. viii	India	Name only; described in 1849 in <i>Wapf., Rep.</i> iii.
1840	<i>P. flittrilaria</i> Benth.; <i>P. Perrottetii</i> Benth.	DC. Prodr. x.	India	Described; <i>P. Perrottetii</i> figured in 1850 in <i>Wight, Icones.</i>
1859	<i>F. pycnantha</i> Boiss.	Diagn. Ser. i. 12	Persia	Described.
1862	<i>F. macrantha</i> Kl.; <i>P. bicolor</i> Kl.	Ergon. Heia. Pr. Wall em., Bot.	India	Described and figured.
1877	<i>P. alascensis</i> Maxim.; <i>P. Przewalskii</i> Maxim.	Mel. Biol. x	China	Described.
1881	<i>P. Roylei</i> Marim.	Mel. Biol. xi	India	Described.
1884	<i>P. bellii</i> Ek. f.; <i>P. Clarkei</i> Hk. f.; <i>P. curvipes</i> Hk. f.; <i>P. denudata</i> Hk. f.; <i>P. Elwesii</i> Hk. f.; <i>P. exantha</i> Hk. f.; <i>P. flexuosa</i> Hk. f.; <i>P. glaberrima</i> Hk. f.; <i>P. integrifolia</i> Hk. f.; <i>P. lachnoglossa</i> Hk. f.; <i>P. microcalyx</i> Hk. f.; <i>P. polygaloides</i> Hk. f.; <i>P. robusta</i> Hk. f.; <i>P. tricoglossa</i> Hk. f.	Flor. Brit. Ind. iy	India	Described.

¹ *Melanges Biologiques* I, pp. 81 and 91.² *Melange Biologique* xi, p. 288.³ *Jour. Linn. Soc.* xliii, 381.⁴ *Flora of British India*, vol. iv, pp. 316-317.⁵ *Melanges Biologiques* vi, pp. 789-791.⁶ *Jour. AM. ASLC. Bengal* viii, part 2, pp. 268-270.

TABLE XX.—Chronology of the Indian species of *Pedicularis*—concluded.

Date.	NAME AND AUTHORITY OF SPECIES.	Place of publication.	Locality of original specimen.	REMARKS.
1688 ...	<i>P. compacta</i> Franch.; <i>P. fragilis</i> Prain; <i>P. Garckiana</i> Prain; <i>P. gruinata</i> Franch.; <i>P. in star</i> Prain; <i>P. Kingii</i> Prain; <i>P. lyrata</i> Prain; <i>P. ophioccephala</i> Maxim.; <i>P. Prainiana</i> Maxim.; <i>P. rex</i> Clarke; <i>P. Scullyana</i> Prain.	Mel. BIDL. xii ...	India ...	Described and (except <i>P. G-arcJceana</i>) figured.
1889 ...	<i>P. albiflora</i> Prain; <i>P. chumbica</i> Prain; <i>P. collata</i> Prain; <i>P. Collettii</i> Prain; <i>P. coiffertiflora</i> Prain; <i>P. corymbosa</i> Prain; <i>P. Daltoni</i> Prain; <i>P. GammiBana</i> Prain; <i>P. gibbera</i> Prain; <i>P. Heydei</i> Prain; <i>P. nepalensis</i> Prain; <i>P. odontophora</i> Prain; <i>P. Oliveriana</i> Prain; <i>P. Pantlingii</i> Prain; <i>P. Kegeliana</i> Prain; <i>P. scâizDrrhyncha</i> Prain; <i>P. tenuiculis</i> Prain.	Jour. As. SDC. Beng., vol. lviii, pu. 2.	India ...	Described.

The iconography of the Indian species has been by no means synchronous with the appearance of accepted names. This is well seen by consulting the following table :—

TABLE XXL—Iconography of Indian species ; arranged chronologically.

Date.	NAME OF SPECIES.	Author and place of publication.	Name given in work cited.	Locality of plant figured.
1761 ...	<i>P. Dederi</i> ...	Deder: Fbr. Dan. i, t. 30 ...	<i>P. flammea</i> ...	Norway.
1768 ...	<i>P. Dederi</i> ...	Haller: Stirp. Helv. i, t. B.J. 3. ...	<i>P. alpina raule simpliui</i> , etc.	Switzerland.
1811 ...	<i>P. longiflora</i> ..	Eudolph: Mem. Acad. Petersb. iv, t. 3 ...	<i>P. longiflora</i> ...	Siberia.
1823 ...	<i>P. Dederi</i> ...	Keichb. : Iconogr. Dent, i, t. 14, f. 31 ...	<i>P. versicolor</i> ...	Switzerland.
1831 ...	<i>P. carno9a</i> ..	Wallich: Plant. As. Ear. ii, t. 154 ...	<i>P. carno9a</i> ...	Nepal.
1834 ...	<i>P. zeylanica</i> ...	Baikie: Observ. Nilgher, ed. i, t. 2 ...	<i>Pedicularis</i> sp. ...	South India.
1839 ...	<i>P. Oederi</i> ...	Boyle: Ill. Himal., t. 72, f. 2 ...	<i>P. versicolor</i> ...	Kashmir.
1844 ...	<i>P. siphonantha</i> ...	Decaisne: Jaoq. Voy., Bot. t. 122 ...	<i>P. pun data</i> ...	West Himalaya.
	<i>P. Linanthoides</i> VAE. labellata.	Decaisne: Jacq. Voy., bot. t. 123 ...	<i>P. labdlata</i> ...	West Himalaya.
1850 ...	<i>P. Perrottetii</i> ...	Wight: Icones iv, t. 1418 ...	<i>P. Perrottenii</i> ...	South India.
	<i>P. zeylanica</i> ...	Wight: Icones iv, t. 1419 ...	<i>P. zeylanica</i> ...	South India.
1851 ...	<i>P. mollis</i> ...	Hooker: Bot. Magaz. lxvii, t. 4599 ...	<i>P. mollis</i> ...	England; introduced.
1862 ...	<i>P. Oederi</i> ...	Reichb. f.; Flor. Germ. xx, t. 1769, f. 2 ...	<i>P. Dederi</i> ...	Switzerland.
1862 ...	<i>P. longiflora</i> ...	Klotzsch; Eis. Pr. Wald, Bot. t. 57 ...	<i>P. tubiformis</i> ...	West Himalaya.
	<i>P. siphonantha</i> ...	Ditto ditto, Bot. t. 58 ...	<i>P. himalayana</i> ...	West Himalaya.
	<i>P. macrantha</i> ...	Ditto ditto, Bot. t. 59 ...	<i>P. macrantha</i> ...	West Himalaya.
	<i>P. megalantha</i> ...	Ditto ditto, Bot. t. 60 ...	<i>P. Hoffmannii</i> ...	West Himalaya.
	<i>P. bicornuta</i> ...	Ditto ditto, Bot. t. 61 ...	<i>P. bicornuta</i> ...	West Himalaya.
1881 ...	<i>P. bicornuta</i> ..	Watt: Jour. Linn. SDC. xviii, t. 13 ...	<i>P. eximia</i> ..	West Himalaya.

TABLE XXI.—Iconography of Indian species ; arranged chronologically—concluded.

Date.	NAME OF SPECIES.	Author and place of publication.	Kind of plant in work cited.	Locality of plant figured.
1833	<i>P. Peitlandii</i>	Maimowicz : Mel. Biol. xii, t. 1, f. 1	<i>P. Peitlandii</i>	South India.
	<i>P. Przewalskii</i>	Ditto ditto, t. 1, f. 2	<i>P. Przewalskii</i>	North Tibet.
	<i>P. bella</i>	Ditto ditto, t. 1, f. 3	<i>P. bella</i>	East Himalaya.
	<i>P. elephantoides</i>	Ditto ditto, t. 1, f. 4	<i>P. Blephantoides</i>	Kashmir.
	<i>P. Scullyana</i>	Ditto ditto, t. 1, f. B	<i>P. Scullyana</i>	East Himalaya.
	<i>P. macrantha</i>	Ditto ditto, t. 1, f. 5	<i>P. ochroleuca</i>	West Himalaya.
	<i>P. Elwesii</i>	Ditto ditto, t. 1, f. 8	<i>P. Elwesii</i>	East Himalaya.
	<i>P. gruina</i>	Ditto ditto, t. 1, f. 15	<i>P. gruina</i>	Yunnan.
	<i>P. integrifolia</i>	Ditto ditto, t. 2, f. 23	<i>P. integrifolia</i>	East Himalaya.
	<i>P. pectinata</i>	Ditto ditto, t. 2, f. 25	<i>P. pectinata</i>	West Himalaya.
	<i>P. pyramidata</i>	Ditto ditto, t. 2, f. 27	<i>P. pyramidata</i>	West Himalaya.
	<i>P. tenuirostris</i>	Ditto ditto, t. 2, f. 26	<i>P. tenuirostris</i>	West Himalaya.
	<i>P. insularis</i>	Ditto ditto, t. 2, f. 32	<i>P. insularis</i>	East Himalaya.
	<i>P. flexuosa</i>	Ditto ditto, t. 2, f. 35	<i>P. flexuosa</i>	Sikkim.
	<i>P. excelsa</i>	Ditto ditto, t. 3, f. 41	<i>P. excelsa</i>	East Himalaya.
	<i>P. zeylanica</i>	Ditto ditto, t. 3, f. 45	<i>P. zeylanica</i>	South India.
	<i>P. furfuracea</i>	Ditto ditto, t. 3, f. 53	<i>P. Furfuracea</i>	East Himalaya.
	<i>P. camosa</i>	Ditto ditto, t. 3, f. 52	<i>P. carnosa</i>	East Himalaya.
	<i>P. lachnoglossa</i>	Ditto ditto, t. 3, f. 55	<i>P. lachnoglossa</i>	East Himalaya.
	<i>P. Clarkii</i>	Ditto ditto, t. 3, f. 60	<i>P. Clarkii</i>	East Himalaya.
	<i>P. trichoglossa</i>	Ditto ditto, t. 3, f. 63	<i>P. trichoglossa</i>	East Himalaya.
	<i>P. Prainiana</i>	Ditto ditto, t. 3, f. 96	<i>P. Prainiana</i>	East Himalaya.
	<i>P. microcalyx</i>	Ditto ditto, t. 4, f. 71	<i>P. microcalyx</i>	East Himalaya.
	<i>P. dolichorrhiza</i>	Ditto ditto, t. 4, f. 80, and t. B, f. 14B.	<i>P. rahulica</i> and <i>P. dolichorrhiza</i> .	Afghanistan and Siberia.
	<i>P. alaschanica</i>	Ditto ditto, t. 5, f. B9	<i>P. alaschanica</i>	North Tibet.
	<i>P. Fragilis</i>	Ditto ditto, t. 5, f. 93	<i>P. fragilis</i>	Assam.
	<i>P. globifera</i>	Ditto ditto, t. 5, f. D5	<i>P. globifera</i>	East Himalaya.
	<i>P. ophioccephala</i>	Ditto ditto, t. 5, f. 94	<i>P. ophioccephala</i>	West Himalaya.
	<i>P. complanata</i>	Ditto ditto, t. 5, f. 90	<i>P. complanata</i>	Yunnan.
	<i>P. rex</i>	Ditto ditto, t. 5, f. 103	<i>P. rex</i>	Assam.
	<i>P. polygaloides</i>	Ditto ditto, t. 5, f. III)	<i>P. polygaloides</i>	East Himalaya.
	<i>P. Hoylei</i>	Ditto ditto, t. 4, f. 122	<i>P. Hoylei</i>	West Himalaya.
	<i>P. pycnantha</i>	Ditto ditto, t. 4, f. 127, 129	<i>P. pycnantha</i> and <i>P. Semenowi</i> .	Persia and Siberia.
	<i>P. mollis</i>	Ditto ditto, t. 4, f. 129	<i>P. mollis</i>	Nepal.
	<i>P. Kingii</i>	Ditto ditto, t. 4, f. 191	<i>P. Kingii</i>	Sikkim.
	<i>P. lyrata</i>	Ditto ditto, t. 4, f. 134	<i>P. lyrata</i>	East Himalaya.
	<i>P. Oederi</i>	Ditto ditto, t. 7, f. 177	<i>P. vericolor</i>	Arctic Regions.

The naaiea of the chief contributora to our knowledge of the Indian species of the genus will be found in TABLE XVII, column 5. Four collections have been issued independently and without descriptions; these are (1) *Herb. Wallich*; (2) *Herb. Griffith*; (3) *Herb. Wight*; (4) *Herb. Ind. Or. H. f. Sf T. T.* No reductions are necessary in the case of the last two; those that are necessary in the others are given in the subjoined tables:—

TABLE XXII.—*Reductions of the Griffithian species.*

Issued number.	Griff. number.	Journey.	Issued name.	True name.
39-9	1D6I	Afghan 1st year ...	P. Ehphaa Boiss. ...	P. rhinanthoides Schrenk.
3939-1	531	Boot an ...	P. gracilis Wall. ...	P. gracilia Wall. J
—	742	Khasyah ...	—	P. gracilia Wall. VAH. khasiana Hk.f.
5949	—	? Miahmi ...	P. flagellaria Bth. ...	P. flagellaris Bth.
3941	1143	Afghan 1st year ...	—	P. dolichorrhiza Schrenk.
—	157	Afghan 2nd year ...	—	P. dolichorrhiza Schrenk.
—	IBS	Ditto ...	—	P. siphonantha Don VAR. brevifolia Frain.

TABLE XXIII.—*Reductions of the Wallichian Herbarium.*

Cat. number.	Wallichian name.	True name.	RBMAHBS.
411	P. nigralantha Don ...	P. megalantha Don ...	411-12=syD. P. Hoffmisteri Kl.
412	P. furfuracea Wall. ...	P. furfuracea Wall. ...	
413	P. gracilis Wall. ...	P. gracilis Wall. ...	
414	P. stricta Wall. ...	P. gracilia Wall. VAE. typica ...	A distinct form, but not separable as a variety.
415	P. mollis Wall. ...	P. mollis Wall. ...	
415 A	P. asplenifolia Wall. ...	P. Wallichii Bunje. ...	
41BB	"an eadem sp?"	P. Dederi Vahl VAE. heterophylla Prain. ...	
417	P. siphonantha Don ...	P. siphonantha Don VAE. typica. ...	
418A	P. carnosa Wall. ...	P. carnosa Wall. ...	
41BB	P. zeylanica Heyne ...	P. zeylanica Benth. ...	
419	P. lanigera Wall. ...	P. brevifolia Don; [P. carnosa Wall.). ...	419 at the Linn. SDD. Edms. at KSW and at St. Petersburg is P. brevifolia but at Calcutta is the densely woolly state of P. carnosa met with in Kamaron.
42D	P. pectinata Wall. ...	P. pectinata Wall. ...	
421	P. Hookeriana Wall. ...	P. siphonantha Don VAR. typica ...	A distinct form, but not separable as a variety.
422	P. Brunoniana Wall.* ...	P. gracilia Wall. VAH. typica ...	S TM P TM V a Prostrate state of form "stricta."
423	P. porrecta Wall. ...	P. porrecta Wall. ...	

The conspectus of affinities of the Indian species in the next chapter is based on an examination of 191 species preserved in the Calcutta Herbarium, but it could not have been made so complete had it not been for the existence of the two synopses of the genus, already so frequently quoted, prepared by Mr. Maximowicz in 1877 and 1888 respectively. These two articles are so excellent that after the closest study one is left in doubt whether to admire most the minuteness of description and fidelity to detail that they display, or the keen appreciation of affinities and clearness of exposition that characterise them.

In this conspectus there are here and there instances of a slightly different disposition of individual species. This is to some extent due to the present conspectus having been mainly drawn up before the appearance of Mr. Maximowicz's newer synopsis. And so because Mr. Maximowicz's revision is of such a nature that any attempt to supplement it or proposal to alter it might easily become an impertinence, also because an independent complementary view may prove of some use to other students of the genus, but not because the present arrangement claims to be more natural than that of Mr. Maximowicz, nor because it is not open to modification in many places, it is issued practically as it stood before the appearance of Mr. Maximowicz's paper of 1888. The Indian species are indicated by a heavier type.

CHAPTER VI.—CONSPECTUS AFFINITATUM.

Species Indiae typice imprimantur.

PEDICULARIS LINN.

CALYX ovatus campanulatus vel tubulosus saepissime antice et interdum postice fissus apice 2—5-dentatus dentibus raro aequalibus lateralibus connatis vel liberis marginibus dentatis postico saepius minor integerrimo nonnunquam deficiente. Corollae tubus aequalis vel sursum amplius; limbus 2-labiatus labio unctico basi suberecto supra 2-crispato vel sessili cristato lobis 3 saepius patentibus vel deflexis nonnunquam sequalis intermedia tamen saepius minore rarissime major, postico basi tubo continuo erecto rarissime sessili in galeam ad antheras foveatum connatis productum, galea autem erostri et antice integra vel sub apice utrinque dentata aut in rostrum gracile robustum apice acutum truncatum vel integrum vel emarginatum 2-dentatum 2-fidumve abeunt. Stamina 4, didynama sub galea ascendente, filamentis omnibus anticisve tantum hirsutis vel omnibus glabris; antherae transverse per paria approximatae loculis distinctis sequalibus parvulis basi muticis vel rarius aristatis. Stylus apice integer subcapitato-stigmatosus; ovula amphitropa in quoque loculo 4—∞; (sepius indefinita). Uapsula compressa ovata vel ovato-lanceolata, saepissime plus minus obliqua et aspe rostrata, loculicida dehiscens valvis medio septiferis placentas ferentibus sed saepe diu ultra medium coherentibus. Semina in parte inferiore, numero sat variabilia, ovata vel oblonga recta vel curva rarissime sphaerica, testa laxa vel adpressae perforate reticulata vel foveolata striata vel multicostata.

Herbse perennes rarius forsan annuae semiparasiticae vel rarissime semisaprophyticae. Folia alterna subopposita opposita vel 3—5-natis verticillata semel pluriesve pinnotim divisa rarius simpliciter dentata rarissime crenata fl. or alia, decrescentia pleraque bracteis formis, Rhizoma saepe collo natis circumscriptum. Flores saepius cernitipeto nonnunquam tamen centrifugo ordine aperiendi ad apices ramorum caulisque spicatum vel subcapitatum conferti vel pedicellia evolutis racemosi saepe secundi, ebracteolati.

I—LONGIROSTRES.

Corollae tubus rectus labium amplius sessile tenerum galea corollacea longirostris rarissime erostis. *Longirostres* Maxim., Mel. Biol. x, 80 (1877J).

§ SIPHONANTHÆ.

Corollae tubus tenuis vel cylindricus calyce fere semper sed saepius pluries longior, galea, in 1-erostis in reliquis longirostris rostra apice in alabastro ad faucem corollae versus spectante dorso labium medianum attingente. Filamenta sub fauce vel paulo dimissius rarissime fere medio tubo inserta. Folia saepissime alterna; in 3. opposita. Flores racemosi inferiores semper sero et forsitan centrifugo ordine aperti. *Siphonantha* Benth., Scrph. Ind. 53 (1835).

Species ferè omnes Himalaico-Yunnanenses, paucæ etiam Tibeto-Sinenses, 2. quidem in provincia Sibirica observæ 1. etiam usque ad Persiam excurrunt.

A.—*Eusiphonanthæ*:—Corollae tubus tenuis sequalis calyce multoties longior, filamenta [*P. Perrottetii* exceptis] ipso apice tubi inserta: calyx (*P. muscivolve* excepto) antice fissus. Folia alterna.

1. Ehinanthoides.

P. rhinanthoides Schrenk; Enum. PL Nov. i, 22.

P. Delavayi Franchet; Maxim., Mel. Biol. xii, 791.

Nanæ vel elatae glabrae vel parce pilosae foliis linearibus radicalibus longe petiolatis segmentis ovatis, calycis lobis 5-dentatis segmento summo lanceolato vel subulato integro reliquis ovatis mucronato-dentatis.

~~Galea~~ parts ere ete longiore, labio marginibus ciliatis lobis omnibus rotundatis lobis breviter, filamentis antioribus tantum villosis . . . *P. rhinanthoides*.
Sales parts erecta abbreviata, labio marginibus ciliatis lobis medio emarginatis rostro apice bifido, filamentis omnibus villosis . . . *P. Delavayi*.

2. Longifloræ.

P. bidentata Maxim.; Mel. Biol. xii, 795.

P. armata Maxim.; Mel. Biol. x, 86.

P. cranidifolia Maxim.; Mel. Biol. x, 85.

P. chinensis Maxim.; Mel. Biol. x, 87.

P. longiflora Zudolph; Mem. Acad. St. Petersburg. iv, 345.

P. sigmoidea Franchet; Maxim., Mel. Biol. xii, 795.

P. siphonantha Don; Prodr. Flor. Nepal. 95.

P. strobilacea Franchet; Hemsl., Jour. Linn. Soc. xxvi, 216.

Nanæ vel elatae pilosae foliis unari-diboligis radicalibus longe petiolatis segmentis ovatis lanceolatisve calycis lobis 2—3-dentatis segmento summo [*P. strobilacea* excepto] lanceolato vel deficientis reliquis ovatis varie dentatis.

CHIVDB ad normam 2-dentibus; galea ciliata lobis marginibus lobis tobbia omnibus rotundatis filamentis omnibus hirsutis:—

rostrum ferri equini ad instar apice integro; corolla ochroleuca . . . *P. bidentata*.

rostrum tenui sigmoideum apice emarginatum; corolla lutea. . . . *P. armata*.

CalycB ad normam 3-IBntato:—

calycis dentB summo suhulato apice intsgro :—

gaba cristata, labio margins eoiliato lobo mediD Bmarginato rostra

sigmoidBD apicB 2-fido filamentis omnibus hirsute ; corolla lutea *P. cranobpha.*

g-alea B erst at a, labio margins cilia tD :—

filaniBntis omnibus hirsutia :—

labio lobo mBdio emarginato, rostro Diroinnato apice

integro; corolla lutea. *p. Mnensis.*

lubio lobis omnibus emarginatis, rostro uircinnatD, apico

2-fiio; DDiolla lutea. *P. bngiflora.*

labiu pares cilia to lobo msdio emarginato, rostro

sigmoidsD apice intBgro; DDrolla purpuroa *P. siymvidea.*

filamentis anticis tanturn hirsutis, labio lobo mstlio emar-

ginato rDBtrD circinnato apicB 2-fido ; DDrolla punica *P. siphonantha.*

caly ois donta summo reli^uis apics foliacBo. *P. strobilncwr.*

3. *Megalanthæ.*

P. bicorauta Rbtzsch ; Reis. Pr. Wald. y But. 1D9.

P. Blephantoidas Be nth. ; Scroph. Ltd. 53.

P. megalantha Don; Piodr. Fbr. Nepal. 94.

EriictiE siniplices fpluricaulis ascBndens *P. metjqfanthtz VAR. pauvi/lora)* pubesrcenteg vel glabrat^E fuliia ovatis lanceolatisve petiolatis 8eg^l mentis oblongD-obtusua, calycia oblon^i vel ^loboai 5-dentati segmentia omnibus serrato-dentatis pjstico rcliquis minore; labij eciliatt), lobo niedio oblongo.

Filamsiitis omnibus glabria margins crenulatis, gal HB parts basali erecta:—

galea faucB con tort a, rostro decurvo apics profunde 2-portito segmentia

a out is *P. bicornuta.*

galea fauca placa, rostro roctiusculD longiflsimD apiue TBHUpinato

intsgro. *P. elephantvides.*

Filamsntis anticis hirsutis galeee parts basali subreflexa roatro

ciuiinnato apice brBviter 2-lobo segmenbis obtusis. *P. megalantha.*

4. *Muscicolæ.*

t. muscicola Maxim. ; Mel. Biol. x, 94.

P. macrosiphon Francfiet; PL David, ii, 104: n. 253.

P. FBirottetii Benth.; DC, Prodr. x, 555.

PrDCUinbentes raniDScE pares hirsute foliia ellipticia vel lanccoaiatia pinnntipariitis •sectisvB aegmentia oblongis lanceolatisve profunis dentatia calyce cylindrico-campanulato 5-dentalo, labio margine eciliato, filamentis glabria.

Calycis intBgri dsntibus supparibus lineari-lanD&olatis gal9a subessili

roBtiD uircinnato apice emargiuato ; foliorum segoientia petiolulatia *P. muscicola.*

Caljcia anticB fissi dBntB summo relitjuis minors; fDliorum Begmsntis

e latu, basi ssssilibus :—

gale a f ale at a in rostrum porrectum attenuata filamentia apice

tubi ioBBrtis. *P. macrosiphon.*

gulea lata erecta Brostri filamBntis inter medium et upturn IUDi

inSBrtifl. *P. Perrottetii.*

5. Pumiliones.

P. bella Eook.fil.; *Flor. Brit. Ind.* iv, 313.

P. PrzBwaJskii Maxim.; *Md. Biol.* x, 84.

Nanae subacaules canD-villosae foliis caespitosis petiolatis anguste oblongis obtusis segmentis ovatis creuatis, calycis cylindrico-campulati herbacei 5-dentati segmento postico subintegrD reliquis ovatis serratis minore CDrolse tubo extua puberulo, Labio marginB fcciliato, filamentia omnibus hirsutis.

Galea vix inflata rostro sigmoideo baculi episuopalis ad instar apice resupinato emargiDato, labii bD niBiD ovato minimo. *P. bella.*
 Galea, subinflata rostro porrecto apice 2-partito EBgmBntis obtusia labii lobia supparibus media emarginato. *P. Prznvakhii.*

B.—BrevituhcB:—Corollae tubus cylindricus apice aubito ampliatus calycem vix excedens, galea plus minus inflata, filamenta fere medio tubo inserta; calyx antice fissus. Folia alterna.

6. Bobustae.

P. Daltoni Prain; *Jour. As. Sw. Beng.* lviii, 2, 270.

P. Garckeana Prain; Maxim., *Mel. Biol.* xii, 788

P. robusta Eook.fil.; *Flor. Brit. Ind.* iv, 3D6.

P. nepalensis Prain; *Jaur. As. Soc. Beng.* lviii, 2, 268.

Humiles vel raro elatae ssepissime pubescentes pluricipites foliis petiolatis angustB oblongis obtusis pinnatifidis segmentis oblongis mucronato-dBntatis, calycis cylindrico-campulati herbacei 5-dentati segmento postico subintegrD reliquia ovatis serratis ruinoie, corollae tubo extua puberulo, rostro apice profunde SBgmentis acutia 2-fido, Labio margine eciliatD, filaments omnibus hirsutis; pedicellis fructigeris valde slongatis.

Galea parte basali reflexa, rostro porrectD subhDrizDntali, labio margine crenulato lobis rDtundatis medio minore: tubo calyce dimidiD lpgiorB. *P. Daltoni.*

Galeae pars basali brevior, rostro deorsum spectantB:—

rostrum circinnato, labio margine integro lobD medio cuBato-oblongo prominente: tubo calyce dimidiD longiDre. *P. Garckeana.*

rostrum ad pBrpBniculum directum versus apicBm paulum adunco labio margine integro lobis rotundatis supparibus: tubo calycem vix se quant &. *P. robusta.*

rostrum ad perpendiculum directum subrecto labio marginB crenulato lobia omnibus truncatis medio reliquis minore: tubo calyce 2-plo longiora. *P. fepakm.*

7. Macranthae.

P. macrantha Kbisch; *Reis. Pr. Wald., Bot.* 108.

P. Scullyana Praia; Maxim., *Mel. Biol.* xii, 789.

P. ElwBSii Eook.fil.; *Flor. BnL Ind.* iv., 312.

Elatse vel raro humiles plus minus pilosae foliis lanceolatis longepBtiolatis segmentis pinnatifidis -partitisve lanciniis dentatis, calyce ovato 5-dBntato antice fissus, CDrolse tubo calycem vix sequante rostro segmentis acutis 2-fidoj filamentia omnibus hirsutis.

Calyce TBIDIO ad medium fissio dBDtibia subreijualibus ovatis serrato-dentatis ; labio marginB Bciliato :—

gaba rostra dimidio bngiore baai erBcta, labii lobo medio latBralibus a^uilato. *p_m macrantha.*

gaba rostra 3-plo inngiorB baBi subrsfbxa, labii lobo medio latBralibus 3-pb rain ore. *p.* *Scully* *ana.*

Calyce obliipio fere ad basin USIJUB fissD dBiits postioo eubulato intBgro VBI apice BBrrabo. latBralibus ovatis SBrrato-dBntatis |nonnunquam uno laterB VBI utrintjua DDnjunctis), lmbiD margins bngissima ciliato; galBa rostro Eequilonga basi abrupte reflyxa, labii lobo mBdio emarginato latBralibus 2-plo minorB. *P. Elmurt.*

D.— *OppositifolicB*:—Dorollfie tubus tenuis seijualia calycem sequana VBI excBdena, filameata apice tubi inserta. Folia Dposita,

8. Integrifolia.

P. integrifolia Hook, fil; *Flor. Brit Ind.* iv, 30.B

Huunilis pubeacens pauniflora foliia anguate oblong-is margins crenulatia raicalibua caispifoia, calycia sessilis coriacei cylindrico-campanulati 5-dentati antics triente fisai segmentis supparibus oblongia crenatis; filamentia omnibus hirsutis; labio margine eciliato.

Balea inflata rostra tenui basi porrBcto demum uiruinatD apice obtuso integro; Lobo calyce dimidio longiorB. *P. integrifolia.*

9c Gyrorrhyncha.

P. gyrorrhyncha Franchet; *Maxim., Mel. Biol.* zii, 812.

Stricta simplex vel ramosa villosula foliia opposibia terniave brevipetiolatia oblongD-lauceoltitia pinnatipartitia laciniia oblongia pinnatilobia, calycia brevia tubuloai hirsuti 5-dentati integri dente summo integro reliquia mucrouatD-dentatia minorej filamentia omnibus hiraugia; labio margine ciliato.

Graba subsBSBili rostro tenui circinnatD apicB integro; tubo calyce Bubduplo longiDiB. *P. gyrorrhyncha.*

ID. Franchetiana.

P. Franchetiana Maxim.; *MeL Biol.* xii, 823.

Nana ramosiasima foliia parvulia petiolatia aegmentia ovatia dentatia calycia ovati membranacei antice profunde fissi 2-dentati aegmentia latB deltoideia 3-fidia et inciaD-dentatia; filamentia anticia tantum hiraugia; labio marginB ciliato; pedicellia longiaaimia.

Graba subsBSsili rostro tenui dBpendBnts tipics intsgro; tubo calycem sBijuants. *P. Franchetiana.*

§ § DKTHDRRHYN CILfi.

Corollse tubua tenuia calycem sequana VBI saipua plua minua excedena, galea roatrata rostra reutu vel flexuoao apice in alabaatro marginem lobi centralia attingente dorao a labio mediano averso. Filamenta props a medio tubo vel SiepB paulo altia nonnunquam tamen ex advero summi ovarii insert a. Folia oppoaita. Florea asepiasime racemoai centripeto ordine aperti. Dflyx 5-dentatua [in 1. 2-dentatua).

Species fere omnes provinciae Himahico-YunnanBnsia incDlse, pauca etiam in provincia Tibeto-Sinenaa obvize, 2. quism usque ai Sibiricam I. usque ai Japonicam excurrentss.

A.—*Tenuirostres*:—Corollae tubus tenuia calycBm vix superans, rostrum tBnue elongatum sajpiissiniB curvatum. Folia rite VBrticillata. Fbres spiuati, bracts* saltern summas foliis loogs diversas. #

11. Pectinate.

- P. pectinata* Wall.; Cat. 420.
P. tenuirostris Benth.; DU., Prvdr. x, 561.
P. pyramidata Royk; Benth., Scroph. Imt 52.
P. Fetisowi Regel; Act. Hurt Petrop. vi, 349.
P. Abpecuroa Franchet; Maxim., Mel. Biol. xii, 616.

Elatse strictas simplices VBI cauls parce brsvB ramoso ramis strictis foliis ovato-lanceo-atis pinnatifidis -partitisve spicia elongatis dnsis vel basi brave interruptis, bracteis ovatis intBgris VBI apics tantum serratis calyce ovoideo paulo usque ad trientsm fissD; capsula ovata parum exserta.

Calyce dentibus Bupparibus intBgris; filamentis omnibus hirsutis:—

corollæ tubo calycBm 3B[pante filamentia basi pilusia in sucuulo trans verso BX alverso summi Dvariî inasrtia:—

foliis 2-pinnatiparfctis, pstiDlatis, spicis interruptis floribus roseia *P. pectinata*.

foliis pinnatifidis laciniis dentatia, seasilibua^ spicis bracteis orcta

imbricatis cjongBstis, flDribua luteis. *P. tenuirostris*.

DDrullEe tubo calyca \ bngiore filamBntis basi gkbris mBdiD tubD

inaertis; foliis 2-pinnatipartitis, pBtiolutis, spuiis basi tantum

interruptis, floribus rDseis. *P. pyramidata*.

Calyce dButs summo nano integrD; filamentis omnibus g'labris :—

corolla tubo calyce brevB exssrto foliis 2-pinnatipartitis petiolatis,

spicis basi interruptis, calyB dentibus lateralibus subintegris,

galea cristata rostro curvato labio parvo. *P. Fetisowi*.

corollBB tubo calycem vix ee^uante, foliis pinnatifidis 1 acinüs

denbatis SBSsilibus, spicis bracteis arctg imbricatis congestis,

calyue dontibus latBralibus ovatis serratia, galea ecristata,

rostro reoto labio rostro aBquilongo. *P. Afopecuros*.

12. Ssmittortge.

- P. OliVBriana* Prain; Jour. As. Soc. Bmg. lviii, 2, 257.
P. Scobpax Maxim.; Mel. BioL xi, 282.
P. tianschanica Rupr.; Bert. Tiansch. 63.
P. Eoborowskii Maxim.; Mel. BioL xi, 251.
P. semitorta Maxim.; Mel. BioL xii, 813.
P. cristata Maxim.; Mel. BioL xii, 814.

Elatse strictae pluricaulss foliis pinnatissetis -partitisvB spicis elongatis intsrruptis bractBis lancBolatis serratis VBI laciniatim 3—5-partitis calycc- ovato vel campanulato filamentis medio tubD VBI paub altius insertis, capsula ovatolanceolata calyce bngiora.

Bract Bis lanceolatis serratis; calyce nee fisso dBntibus lanceolata:—

calycB campanulatu dsntibua flBrratia rostra Bemiciulari ~~deflexo~~,
 filamBntia glabria, flribua rosBis. *P. Oliveriana*.
 calyce Dvato-inflato dBntibus altBrnis intBgria rostro porrBctD,
 filamentia antijia hiisutis, floribua flavia. *P. Bcolopax*.

Brauteis, saltern aummis, laciniatim 3—5-fidis;

calyDB ovato antice fisao:—

calycB dBntibua aummo nano integra exoepe eerratia, rostro
 convoluto, filamBntia Dmnibua hirsutis, floribus flavia . . . *P. tianschanica*.

calyDB dentibua omnibus integria lanceolata:—

rostro tBnui recto apice recurvo, filamentia glandulos
 punctatis, floribua lutea. *P. Ryborowskii*.

rostro SBmicirculari, filamBntia ankicis hirsutia, floribua flavia *P. semitoria*.

calyce DVDideo, nee fisso; dsntibus Iriangularibus integris summo
 minoTB, galea cristata TDstro tsnui dsflBXD, filamentia anticia
 hirsutia, floribus rosBia. *P. wata*.

B.—Euorthorrhynche:—Dorollse tubus tenuis calycem vix superans rostrum tenue elongatum TBctum. Folia verticillata VBI opposita. Floras dense racemose, bractBBB foliiformes ssepiissime sessiles: calyx nec fissus.

13. Brevifoliae.

P. brevifolia Don; *Prodr. Flor. Nepal.* 94.

P. instar Prain; *Maxim., Mel. Biol.* xii, 815.

Ebngaeae vel humiles graciles ssepiissime simplices folia 3—4-natim verticillata verticillis foliorum florum innatifidis laciniis brevis ovatis calyce campanulato dentibus majusculis ovatis ientatis filamentis medio tubo insertis omnibus glabris, capsula ovata oblique acuminata parum exserta.

Labio 3-fido, roBtro apice emarginato. *P. ierifolia*.

Labio 3-partito, rDatro apice integerrimo *P. instar*.

14. Gracilis.

P. gracilis Wall.; *Uat.* 413.

Ebngata erecta gracilis semel iterumque paniculato-ramosa foliis 2—4-natim verticillatis oblongis pinnatifidis laciniis brevis ovatis calyce tubuloso margine sinuato-dentato vel dBntibus brevissimis, filamentis paulo medio tubo dmissius insertis omnibus glabris, capsula ovata recte acuminata parum exserta.

Labio 3-lobD, rnstro apice integerrimo *P. gracilis*

15. Debiles.

P. Heydei Prain; *Jour. As. Soc. Beng.* lviii, 2, 258.

P. porrecta Wall.; *Vat.* 423.

P. villosula Franchet; *Hemd., Journ. Linn. Soc.* xxvi, 229.

P. CDnfertiflora Prain; *Jour. As. Soc. Beng.* lviii, 2, 258.

P. iebilia Franchet; *Maiim., Mel. Biol.* xii, 817.

P. vnrbeDiofoLa Franchet; *Maxim., Mel. Biol.* xii, 81B.

Humilea e basi cespitose ramosae foliis raicalibus cespilosis caulinis paucis oppositis remotis racemia paucifloris foliis oblongis (in 1. hnceolatis) pinnatifidis laciniis brevis Dvatis calyce campanulato filamentis supra medium tubum insertis capsula ovata pnrum exserta.

Foliis Janceolatig calyae dentibus supparibus ssrratis, labio parvo marginB glabrD, filamentis glabris. *p. Heydei.*

Faliia ovatia:—

calyce dentibua lateralibua majoribus et omnibus aummo nanu excepto SBiratis:—

labiD majors marginB glabrD, filamBntia glabris *P. porrecta.*

[labionondum dBScriptD), filamBntia hirsutia *P. vilhmla.*

calyce dentibus summo acuto excepto 3-dentatia:—

labiD marline glabro, filamentia glabria. *P. cortfertiflora.*

labio margine glabro, filamentis anticis hirsutis *P. debilis.*

labio marginis uiliatu, filamentia anticis hirsutis *P. verbenwfoha.*

C.—*Axillares*:—Corollae tubus tenuis calyce saepissimo plus minus longior rostrum tenue elungdtum rectum; folia opposita. Flores racemosi, bractese foliiformes petiolata¹.

IB, Flexuosae.

P. moupinensiB Franchet; *PL David*, ii, 1D5: n. 255.

P. flexuDSa Hook, fit; *Flor. BriL Ind.* iv, 3DS.

P. chumbica Prain; *Jour. As. Soc. Beng.* lviii, 2, 259.

P. tenuicaulis Prain; *Jour. As. Soc. Beng.* lviii, 2, 259.

P. Keiskei Framh. et Savat.; *Enum. PL Japon.* ii, 459.

EAatae (1 species nana) pluricaulea glabratse vel pubescentes foliis ovato-lanceolatis 2-pinnatipartitis oppositis Yel verticillatis, calyce antice parum (in 1. protunde) fisso breve pedicellato corollae tubo ssepiissime calycem excedente ilamentis medio tubo insertis capsula-ovato-lanceolata calycem longe excedente; calyce in 1. 2-dentato.

Foliis 3—4-natim VBrtoillaLis: floribus perpaucis calycis dBntibus brevibus integris, tubo calycem vix sequante rostro rBcurvo apice Bmarginato^ filamentia anticis hixsutia. *P. moupinemis.*

Foliia oppoaitis; rostro porrecLa:—

calyce dsntibua summo nano exceptj ovatis SBrratis DDr^lse tubo calyce multotiea longiore:—

rustro spice emarginato filamentis anticia hirautilis *P. flexuosa.*

rostro apice integro filamentia glabris; planta cann *P. chumbica.*

calyoe dentibus omnibus lanceolatis intsgris, corolliB tubo calycB i Jongiort?, rostrD apica integro, filamentis anticis hirautila *P. tenuicaulis.*

calyce 2-dentato, segmBntis triangularibus intsgria corollae tubo calycjo 2-plo longiDry, rostro apiao emargintitu, filamentia anticis hirautilis *P. Keiskei.*

IU. Filicifolia.

P. filicifolia Hemd.; *Jour. Linn. Soc.* xxvi, 205.

Procumbens ramosa glabra foliis ellipticis pinnatisectis oppositis segmentis Dvatis oblongisve iuciso-serratis petiolulatis calyce cylindrico-campanulato, labio margine ciliato, filamentis longius supra medium tubum insertis, glabris.

Tubo DalycBm vix sequante TDstrD subrecurvD, calyce dentibus summo
nano 3-dentate Bxcepto BX iatgra basi rotundatia crisiatis P. *filkifdia*.

17. Longipedes.

P. longipes Maxim.; Mel. Biol. xii, 824.

P. axillaria Franchet; Maxim., Mel. BivL xii, 825.

Humiles pluricaules puberulse fullia oblongo-lanceolatis pinnatisectis segmsntis pinnatifidis oppositis, VBI caulinis alternis, calycB campanulato EBD fisso lungissime pedicellato dentibus lanceolatis supparibus, CDrollse tubD calycem pauio excedeuts, labio margine ciliatn filamentia infra medium tubum insertis omnibus glabris.

Dalycia dentibus subintegris rostro porrBcto apica emarginato . . P. *longipea*.

Lalycia dentibua serrato-dBiitatis roatro tenui apice dBDurvo integrci P. *axilfaris*.

II.—ADUNC.E.

Corollse tubus ssepissime incurvus cylindricus aursum paulum ampliatus, labium sessile amplum vel Btipitatum 2-cristatum teneruni galea coriacea rostrata vel erustris.

§§§ RHYNCHOLDPHE.

Dorollse tubus calycem seq[uans vel paub excedens galsa rostrata rostro crassiusculo apice in alabastro ad labium medianum apposite), in 11 specibus omnino deficiente, labium ssepius amplum sessile et quum stipitatum turn cristis saepissime inchoatis. Filamenta ssepissime infra medium tubum et ssepius ex adverso summi ovarii inserta. Folia s^apissime alterna; in 4. opposita. FIDTBS ssepissime spicati et semper Drdine centripeto aperti. *Rhynchvlopha* Bunge; Ledeb. Flor. Ross, iii; 277 (184B),

Species regionis borealis arctico-alpinse totius incol'de in provinciâ quidem Sibiricâ et in Daucasicâ quam in reliquis simpliciter et compare multo pauciore.

A.—*Hyposiphonanthce*.—Corollse tubus rectus tenuior aequalis vel sursum plus minus ampliatus calycem sequana vel dimidio duplove excedena labium sessile rostrum gracile vel deficiens filamenta in 1 specie apice tubi in 3. medio tubo in Teliquis ex adverso summi ovarii inserta: ualyx 2—5-dentatua antice (1 'speciei excepto) fissus. Folia alterna: flores (1 specie floribua spicatia excepta) interrupte racemosi.

18. Dxycarpse.

P. torta Maiim.; Mel. Biol. xii, 8D1.

P. Davidi Franchet; Plant David, ii, 1D5 : B. 255.

P. oxycarpa Franchet; Maxim., MeL Biol. xii, B34.

P. macibnta Franchet; HemsL, Jour. Linn. Sue. xxvi, 212.

Erectae simplices vel s basi c^aespitDSO-pluricaules foliis elliptico-lanceolatis pinnatisectis segmentis pinnatifidis et mucronato-dentatis bracteia tenue petiolatis fDliaceis suaimia

3-sectis calyce mBmbranaceo cylindrico-campanulato semi-fissD 3-dBntato, corollse tubo squali sxtus puberulo labio margins ciliato, capaula longiuscula acuts lanceolata longs Bxserta.

Labio lobu mBdio prominBnte, rustro gracillimD, filamentia omnibus hirsutis:—

calycis dentibus BBrratis lateralibus ovatis summo lanDeolato tubo calycB i longiDrs galea cristata basi tort a filamentis fere apices tubi inBartia; f oliis basi uaulis aggrBgatis *P. torta.*

nalycia dsntibus oblongis integris tubo calycB 2-plD lungiure gale a ecristata r astro basi tor to filamentia trients Bupbrioro tubi insertis foliis BBCUS caulem sparsia pasaim opposita vsi tarnia . . . *P. Davidi.*

Labip lobo media minimD tubo calycsm parum Bxcedente:—

calycis dentibus subulatis integria, rostro criatato sensim attsnuato h'lamentis trionte supsiore tubi inaurtia omnibus hirsutis; caulibus a basi f Dlintis *P. oxycarpa.*

calycis dentibus SBrratis, rDslro porreotD filamsntis infra medium tubum insertie glaberrimis; planta annua y oollo unicalis . . . *P. macilenta.*

19. FurfuracsEe.

P. furfuracea Wall; *Cat.* 412.

P. Pantlingii Prain; *Jour. As. Soc. Beng.* lviii, 2, 273.

P. micro calyx Hook.f*il* ; *Flor. Brit. Ind.* iv, 315.

ErEctse simplicBS vel B basi pluricaules foliis majusculia longs petiolatia ovatia VBI lancBolatia pinnatifidis VBI tantum lobatis SBgmBntis subintegria bractsia pstiolatis foliacBia oalyce HiBmbranacBD ovato VBI campanulatD 5-dsntato, corollae tubo sequali sxtus glabro rostra apice 2-fido, uapsula longuiscula acutB lancBolata longs Bxserta.

Foliorum laminis Dblongo-Dvatis, calycis dentibus supparibus; rosferi EBgmentis ubrimjUB emarginatia; filamentis BX advBrso summi DVari ins Br bis:—

calycB glabro anticB jj-fisso o^{ya}to dBntibus intsgris parvulis non-nunq^uam dBficiBntibus labio margins Bciliato lobis emarginatis latsralibus medio 2-plo majoribua apiois VBrsuris BxtBrioribus majoribus ovatis; filamsntis glabris: foliis pinnatifidis . . . *P. furfuracea.*

calyco hirsuto nee f'sao campanulatu dentibus majuaculis ovatia serratis labio margins Dli at o lobis integria lateralibua niBiio 3-plu majoribus apicis VBrsuris Bxtsrrioribus minutis acutis; filamBntis anticis pubsrulis: foliia subintsgris. *P. Pantlingii.*

FoliDrum laminis lanceolatis pinnatifidis; calycia campanulati glabri antice semifissi dentibus lanceolatia apica (summo breviora excepto) serratis labio margins ciliato lobis integria latBralibus mBdio 2-plo majDribus Tostri segmentia integria acutia, filamentis medio tubo insertis omnibus glabria. *P. microcatyx.*

20. OliganthB.

P. DBpbalantha Franchet; *Maxim., Mel. Biol.* xii, BD5.

P. longspBtiolata Frnnvhet; *Maxim., Mel. Biol.* sii, 8D5.

P. oligantha Franchet; *Maxim., MeL BioL* xii, BOB.

PluricaulBS glabratse foliis majusculis longe petiolatis oblongis vel oblongo-lcmceoJatiR pinnatisectis segmentis oblongis serratis calyce nampanulato antics aeniifisao 3- vel 5-dentate

corollae tubi setualem calycem parum excedente galea margine utrinque 1-dentata rostro porrecto vel apice arcuato attenuata labio lobo medio lateralibus 3-plo minore filamentis paulo supra medium tubum insertis capsula, ovato-oblonga calyce aestivum in DrB: foliis inferioribus in 1 specie oppositis.

Foliis inferioribus oppositis, floribus spicatis; calycis 5-dentato Beg-
in Bntis 2 lanceolatis SBrratis 3 subulatis integris galea gibba
dentibus distinctis Bimis inflexis subitD in roBtrum abeunt, labio
marginibus ciliatis filamentis anticis hirsutis. *P. cephalantha.*

Foliis omnibus Bparris, floribus racemosis:—

calyce 5-dentato BBgnentis lanceolatis serratis galea denticulatis
lanceolatis retroflexis labio marginibus ciliatis filamentis anticis
hirsutis *P. hengepetiolata.*

calyce 3-dentato ut segmenta lateralibus ovatis serratis summo
mini more integerrimo galea denticulata ovatis majusculis obtusis
labio margine longe ciliato, filamentis omnibus glabris . . . *P. ottgantha.*

21. Microphyllae.

P. polyphylla Franchet; Maxim., Mel Biol xii, BD9.

P. gruinata Franchet; Maxim., Mel. Biol. xii, 799.

P. flagellaris Benth.; DP., Prodr. x, 551.

P. Henryi Maxim.; Mel. Biol. xii, 833.

P. tenuisecta Franchet; Maxim., Mel. Bbl. xii, 831.

Strictae sursum fastigiatim vel e basi diffuse ramosae pubescentes polyphyllae foliis parvis brevis petiolatis laminis oblonga pinnatipartitis segmenta cartilagineo-serratis, calycis campanulati 5-dentati dentibus omnibus flabellato-rotundatis inciso-serratis; filamentis omnibus hirsutis; capsula ovata parum exserta.

DalycB vix fissD, uorollBB tubo TBcto, galea rostrata:—*

tubo setualem calycem \ longiore galea angulo rostrato incurva rostrum
porrectum apicB integro tantum decurvo labio lobo medio lateralibus
multo minoribus, filamentis medio tubo insertis:—

labio marginibus ciliatis galeae parts era eta utrinque dentata . . . *P. polyphylla.*

labio marginibus ciliatis galeae parts anthrigris utrinque dentata . . . *P. gruinata.*

tubo sursum ampliato calycem 2-plo longiores galea arcuata rostrato
brevis horizon tali apica 2-fida labii marginibus ciliatis lobo medio
lateralibus vix | minoribus filamentis sx adverao aummi ovarii
insertis *P. flagellaris.*

CalycB semifisao, corollas tubo incurvo sursum ampliato, galea rostrata,
filamentis ex adveiao aummi ovarii insertis:—

tubo calycem vix \ longiores galea recta tantum apicB adunca
brsivasims subrostrata 2-fida labio marginibus ciliatis lobo medio
lateralibus plus 2-plo minoribus *P. Henryi.*

tubo calyce fBrs 2-plo longiore galea fronte verticali angulo
inferioribus truncata labio marginibus ciliatis lobis subaequalis . . . *P. tenuisecta.*

22. Durvipes.

P. curvipBS Hook. fil.; Flor. Brit. Ind. iv, 315.

Glabra ramosa ramis procumbentibus arcuatis foliis parvis petiolatis ovatis pinnatisectis segmenta deDtatis calycia ovati 2-dentati dentibus flabellato-rotundatis incisum-aerratic capsula ovata parum exserta.

Pedioelhi rejtvis. *P. curvipipes.*

23. Darnosse.

- P. carnosa* Wall.; *Cat.* 418.
P. crenata Maxim.; *Mel. Biol.* xii, 832.
P. corymbosa Praw; *Jour. As. Soc. Beng.* lviii, 2, 277.
P. ZBylanica Benth.; *Scroph. Ind.* 54.

Elatiores ramosse caulibua gracilibua flexuosia foliis carnoia vel herbacBis subsssilibus vel breve petiolatia oblongo-lanceolata vel ovatis basi attenuatia margins aemel crenatis lobatia bracteis foliacBis calyci3 herbacBi ovati 2-fili antice aemifissi ssgrneatis serratis cDrollse tubo suraum parum ampliato, filamBntia ex adverse aummi ovarii insertis, capsula ovata parum exserta.

Bale a rostrata, labio margine ciliato :—

- tubo calycB vix \ longiore galea abruptius incurva rostro elongato
 tsnuiore porrecto apice emarginato tilamontis omnibus glabris . . *P. carnosa*.
 tubo calycB plus J longiore galea leviter falcata rostro breve
 coniuo apico intBgro filamentia anticis superne barbatis . . . *P. crenata*.

Galea erustri, labio margins Bciliato :—

- tubo calycs 2-plo longiorB gaha latB arcuatD-incurva labium
 escsdbnty apicB integra filamentis umnino gkbBrrimis . . . *P. corymbosa*.
 tubo calycB vix J longioTB galen fere BTscta labio mauifesto brBviora
 apica crenata filnmentia basi villosulis supBrnB glabris . . . *P. zeylanica*.

24. Racemosse.

- P. raceni* Dsa Doug.; *Hook., Flor. Bor. Amer.* ii, 1D8.
P. yezbensis Maxim.; *Mel. Biol.* x, IDS.
P. resupinata Linn.; *Sp. Plant.* BOB
P. Dollettii Train; *Jour. As. Soc. Beng.* lviii, 2, 278.
P. lancBolata Michx; *Flor. Amer. Bor.* ii, 18.

Elatx ramDsae glabrse piloase vel subscabridse foliia herbacea vel rigidia asepiiaime seasilibus ovatia vel lanceolata margine crenatia calyuis ovati herbacei uutics semifisai 2-fidi aegmentia (1 specie excepta) integris, filamentia ex adverso aummi ovarii insertis, capsula ovata parum exaerta; foliia in 2 speciebua nonnunquam oppoaita.

Dalycis segmsiitis intsgris:—

- galea snsini rostrata rustu incurvD labiD eciliatD filamBntis anticis
 hiisutis; foliis ovatis glabris . . . *P. racemosa*.
 gal9a subito rostrata roatro porrectD labio Qciliato filamantis anticis
 hirsutis; foliia Dvatis pubBrulis . . . *P. yezdemis*.
 galBa SBnsim rostrata rostro dBNNO labio margine oiliato filamentia
 anticis hirsutis; f illis ovatiD-lancBolatis glabris vel subtus pubsrulis
 nonnuniuam oppoaitis. . . *P. resupinata*.
 galBa brevissime rostrata rostro Donico crasso apice emarginato tubo
 antice intus ciliato labio Builiato galsa breviDre filamsntis basi
 villDflulis cetBrum glabris; f oliis ovatis ssssilibus subtus hispide
 pubBrulis supra rigiie scaberrimis . . . *P. Colkttii*.

Calycis segmsntis aBrratis :—

- gaha brevB rustrata rostro DODiD crasso apice intBgro tubo antics
 intus Dili at D labio eciliato galeam BB quants filamBntis basi villosulis
 cetBrum glabris; fuliia lancBDlatis distiotB petiolabis stepius
 oppositis glabris. . . *P. lanceolata*.

B.—Eostrate /—Corolla; hibus rectus cylindricus sursum plus minus amplius calycem paulum usque 3-plo excedens labium subsessile rostrum crassiusculum apice truncatum emarginato-crenulatum (in 1 specie nullum), filamenta medio tubo vel ex adverso summi ovarii inserta; calyx nee fissus profundius 5-dentatus; folia alterna; florae condense racemosi.

25. Recutitse.

- P. incarnata* Jacq.; *Flor. Amtr.* ii, 24.
P. atrorubens Sokkikh.; *Cat. PL Selv.* 21.
P. incutita Linn.; *Sp. Plant.* 608.

Elatse erectae foliosae glabratae vbi superne tantum pubescentes foliis perfoliatis caulinis radicalibusque sequibngis pinnatifidis laciniis lanceolatis inciso-serratis calycis dentibus linearibus lanceolatis subintegra; corollae tubo calycem sequante vel paulo superantibus filamentis ex adverso summi ovarii insertis.

- Galea incurva rostrum porrectum parum emarginatum, filamentis omnibus parce pubescentibus. *P. incarnata**
Haba brevis superne recurvata rostro conico apice emarginato segmentis utrinque 3-dentatis, filamentis anticis brevibus. *P. atrorubens*.
Galea erecta rostri, filamenta antica pares hirsutis. *P. recutita*.

26. Elongatse.

- P. gyroflexa* Vill; *Hist. PL Dauphin*, ii, 426.
P. barrbii Eichb.; *Flor. Exours.* 352.
P. tuberosa Linn.; *Sp. Plant.* 610.
P. elongata Kerner; *Nov. PL Spec*, Dec. i, 14.

Elatse erectae foliosae glabratae vbi pubescentes foliis radicalibus caespitosis elongatis perfoliatis caulinis paucis parvis pinnatisbctis segmentis pinnatifidis, calycis dentibus lanceolatis, corollae tubo calycem sequante vel paulum superante, filamentis ex adverso summi ovarii insertis.

Calycis dentibus omnibus integris; labio lobo medio lateralibus minore :—

- filamentis omnibus hirsutis. *P. gyroflexa*.
filamentis anticis hirsutis. *P. barrbieri*.

Calycis dentibus (summo deltoideo excepto) marginibus serratis; filamenta anticis tantum hirsutis:—

- labio lobo medio lateralibus minore. *P. tuberosa*.
labio lobis subsaequalibus. *P. elongata*.

27. Caespitosae.

- P. rostrata* Linn.; *Sp. Plant.* 607.
P. caespitosa Sieber; *Plant. Ear. Alp.*, fasc. iv.
P. pyrenaica Gay; *Ann. Sc. Nat.* SBI. i, v, 2B, p. 210.
P. mixta Griseb. et Qodr.; *Philippe Fl. Pyr.* ii, 123.
P. Nordmanniana Bunge; *Ledeb., FL RDBS.* iii, 277.
P. cenisia Gaud.; *Flor. Helvet.* iv, 132.
P. elegans Ten.; *Syll. PL App.* iv, 30.
P. odontophora Prain; *Jour. As. Soc. Beng.* lviii, 2, 275.

HumilBS arcuato-aacendentBS vel raro erectae glabratae vel pubascentes foliis radicalibus cespitosis elongatis petiolatis pinnatisectis segmentis pinnatifidis calycis dentibus lanceolatis cDrollse tubo calycem parum superante filamentis ex adverso sutnmi ovarii (in 1 specie medio tubo) insertis.

DalycB denfibus omnibus serratia, filamBntia anticis hirsutis :—

corollae tubo intus glaberrimo; calycB glabro :—

labio margins ciliatD. P- *rodrata*.
labio margine eciliato. P- *coespitu&a*.

corollae tubo intus vsrsus basin ciliato, labiD Bciliato :—

calycs glaberrimo. P. *pyrenaica*.
calycB villosa. P. *rnixta*.

DalycB dents summo integro rsluijuis BBiratia, labio e cilia to, uorollse tubo intus glabro :—

filamBntis antic is tantum hirsutis :—

calycB glaberriniD. P. *Nordmanniana*.
calycB villosa. P. *cemisia_{mi}*

filamBntis omnibus hirsutis; calycs hirauto. P. *elegans*.

DalycB dsntibus omnibus integris, labio euiliatu, filamBntia maiio tubo insartis anticis hiraute. P. *odonfophora*.

28. Asplenifolise.

- P. *pedicellata* Bunge; *Bull. Be. Acad. St. Petersb.* vii, n. 16.
- P. *Pilicula* Francket; *Maxim., Mel. BivL* xii, 853.
- P. *gBminata* Portenschlag; *Qebh. Verzeichn*, 19D.
- P. *asplenif* Dia Floerke ; *Wldd., Sp. Plant*, iii, 208.
- P. *Potanini* Maxim.; *MeL Biol_m* xii, 848.
- P. *albiflDra* Prain; *Jour. As. Soc. Beng.* lviii, 2, 273.
- P. *ornithorrhyncha* Benth.; *ZC7, Prodr.* x, 577.

Humiles glabratse vel pubescentes foliis radicalibus cespitosis elongatis lanceolatis petiolatia segmentis ovatis oblongisve dentatis, foliis caulinis subnullis, corollse tubo calycem ssepiissime plus minus excedente filamentis medio tubo insertis.

DalycB ientibus omnibus serratis:—

labio margins cilia to :—

labio parvulo; filamentis glabris. P. *pedicellate*.
labio majors; filamentis antioia barbatia. P. *Filicuh*.

labio margins eciliato :—

rostra breve crasao apice truncate 2-fido, filamBntis anticis hiraute P- *geminata*.
rostro porrBcto apice smarginato filamBntis antiois parcisaimf)
pubBrulis. P. *a\$pl?nifdi<i*.

Calycs dentB summo integro, reliquis serratis; filamentia omnibus glabris . P. *Potanim*.

DalycB dsntibus Dmnibua intBgris:—

roslro porrBcto filamsntis glabria. p. *albiflora*^
rostro dB^xo-Durvato (filamBntis nonium descriptis) P. *ornithorrhyncha*.

29. Paucifoliatse.

P. yunnanensis Franchet; Maxim., *MeL Bivl.* xii, 851.

P. tsangkanensis Franchet; Maxim., * *MeL Biol.* xii, 85D.

P. Wallichii Bunge; Bull. 5c. Acad. Petersb. viii, 251.

Humilis folioase glabratse vel pubescentes foliis longe petiolatis radicalibus paucis caulinis radicalia fere Equantibus lanceolato-oblonga aegmentis obtusa aerratia calyce dentibus summo minimo excepto basi integra apica serratis filamentis medio tubo vel paulo supra, medium inartia.

Labio margins ciliato; rostro filiformi filamentis antica

hirsutis. *P. yunnanensis*.

Labio margins eciliato :—

rostrum gracili porrecto filiformi anticis hirsutis. *P. Uanchanensis*.

rostrum craesusuulo horizontali truncato apice urenlato filamentis

omnibus hirsutis. *P. Wallichii*

C. Eurhynchophytum:—Corollae tubus incurvus cylindricus aurum amplius calycem sequens vel paulum excedens labium sessile stipitatum ciliatum inconspicuis rostrum craesusuulum apice truncatum nonnuiquam nullum, filamenta infra medium tubum inserta; folia alterna; florea apicem aggregati.

3D. Surrectse.

P. incurva Benth.; DC., *Prodr.* x, 555.

P. groenlandica Eetz.; Fl. Scanf., ed. ii, 45.

P. attenuata -4. Gray; Proc. Amer. Acad. vii, 384.

Elatiora stricta simplices glabratse foliis phyllis radicalibus caulibus aparsis parvis pectinato-pinnatifida apice elongata densa miantha labio subaequali rostrum tenui elongato in alabastro vix omnino oblecto; calyce vix fuso 5-dentato segmentis triangularibus.

Corollae tubo calyce subduplo longiore infractum rostrum porrectum sub-

cylindricum apice emarginatum 3-2-lobum filamentis omnibus glabris. *P. incurva*.

Corollae tubo calyce subaequante eubrycto rostrum curvatum tubo duplo

longius deorsum falcato apice incurvo intermedium filamentis glabris. *P. groenlandica*.

Corollae tubo calycem subaequantibus brevioribus rostrum curvatum tubo

breviore a basi sursum refractum apice integro filamentis omnibus

hirsutis. *P. attenuata*.

30. Subsurrecta.

P. Vialis Franchet; Sems., Jour. Linn. Soc. xxvi, 219.

Elati stricta simplex parce pubescens foliis ovato-lanceolatis pinnatifida racemis laxis micranthis bractea minima sessilibus labio aequali lobis lateralibus rudi angustibus rostrum tenui elongato in alabastro vix omnino oblecto, calyce vix fuso 5-dentato segmentis triangularibus.

Galea supraciliata-DonYexa rostrum ascendens. *P. Vialis*.

31. Excelsa.

P. excelsa Sook. *fit.*; *Flor. Brit Ind.* iv, 311.

Altissima stricta ramosa glabrata foliis radicalibus caulinisque imis evanidis reliquis maximis 3-pinnatipartitis spica elongata bracteis minimis petiolulatis micrantibus labio elongato latissima stipitata cristata lobis minimis lateralibus medio angustioribus rostro tenui in alabastro oblecto, calyce 6-dentato anticis profunde fisso, segmentis minutis.

Sale a filicili rostris apice integro filamentis glabris. *P. excelsa*.

316. Vagans.

P. vagans Hemsl.; *Jour. Linn. Soc.* xxvi, 218.

Longissima gracillima debilis vagans YBI suadens foliis radicalibus maximis 3-pinnatis caulinis sub oppositis petiolatis oblongatis inaequaliter 5—7-lobatis is floribus axillaribus dense fasciculatis labio patens lobis subaequaliter rostro incurvo [calyce 5-dentato segmentis brevibus.

Filamentis omnibus glabris. *P. vagans*.

32. Lachnoglossa.

P. lachnoglossa Hook. *fil.*; *Flor. Brit Ind.* iv, 311.

P. Drizabse Cham, et Schlecht. ; *Linnaea* v, 103.

P. mexicana Zuccar.; *Bunge, Bull. Phys. Math, Petrop.* i, n. 24, 21.

P. Parryi A. Gray; *Amer. Jour. Sci.*, ser. 2, xxxiv, 25t).

P. contorta Benth.; *Hook., Flor. Bor. Amer.* ii, 103.

Elaeostyles strictae simplices glabratae foliis perispermis radicalibus caulinis sparsis diminutis pectinato-pinnatis spica elongata laxiuscula labio stipitata rostro tenui elongato calyce ovato 5-dentato ad medium fisso (in *P. contorta* nondum descriptis) segmento summo minoris filamentis fere medio tubo insertis.

Calycis dentibus dimidiis serratis; Thalamo tubum perianthium apicem integro perianthium villosum labio lobis acutis marginibus ciliatis, filamentis glabris. *P. lachnoglossa*.

Calycis summo integro reliquis serratis:—

Thalamus dimidiatus brevis crassus truncatus aequae longitudo ac lato, labio gahabrevioribus, filamentis glabris. *P. Orizaba*.

Thalamus cylindricus brevis crasso crenulato latiore quam longo, labio gaha longiore, filamentis anticis barbatis. *P. mexicana*.

Calycis dentibus omnibus integris : —

Thalamus conicus laetiusculus dinibus galbentibus longioribus labium superante apice integro, filamentis anticis hirsutis. *P. Parryi*.

Thalamus elongatus linsari in labium latissimum incurvus faro circinnatus (filamentis nondum descriptis). *P. contorta*.

33. Proboscidea.

P. proboscidea Ba. Stev.; *Honogr. Pedic.* 33.

P. Thunbergii Maxim.; *MeL Biol.* xii, 838.

P. brachystachys Bunge ; *Ledeb., Flor. Altaic*, ii, 429.

P. uncinata Sttph.; *Willd., Bp. Plant*, iii, 213.

P. compacta Steph.; Willd., *Sp. Plant*, iii, 219.

P. lapponica Linn.; *Sp. Plant*. 609.

P. HDWBIU A. Gruy; *Prvc. Amer. Acad.* xx, 307.

Elatge strictae simplices fuliosae puberulae foliis radicalibus evanidis caulinis sursum decrescentibus seepissimè pinnatisectis segmentis ovato-lanceolatis inciso-serratis (filiis in specie 1. tantum pinnatifidis in specie altera indivisis) spica elongata multiflora calyce late ovato 5-dentato segmentis deltoideis integris supparibus corollae tubo calyce parum longiore labio distincte stipitato vix tamen basi cristato staminibus ex adverso summi ovarii insertis.

Galea margins villosa; calycis antice fissus; folia pinnatisecta:—

labio margini a ciliato:—

calyce intertubum acutis galea dorsu ventretur convexa rostro horizontali latè conico latitudinis galetur brevior, filamentis anticis hirsutis. *P. proboscidea.*

calycis intertubum obtusis galea dorso adunca rostrum recurvum conico galea parum brevior, filamenta glabris. *P. recurva.*

labio margini eciliato; calycis dentibus acutis galea falcata rostro tenui apice 2-fido galeae latitudinem subsequens, filamentis anticis hirsutis. *P. brachystachya.*

Salea margins glabra:—

calycis antice fissus;

folia pinnatisecta:—

labio margins ciliato; calyce dentibus acutis galea arcuata rostrum apice tenui integro, filamentis anticis hirsutis. *P. unomafra.*

labio margini eciliato; calycis dentibus obtusis galea falcata rostro apice lato emarginato, filamenta antica vix hirsuta. *P. compacta.*

foliis pinnatifidis; labio margini glabro; calycis dentibus minutis galea arcuata 2-fido brevior Drasae filis cylindricis, filamenta glabra. *P. fappuniua.*

calycis haud fissus; folia indivisa; labio margins glabro; calycis dentibus acutis galea angulatum incurva rostro brevis cernuus obtuso, filamentis glabra. *P. Howellii.*

34. Tristea.

P. Draspeiotricha Maxim.; *Mel. Biol.* xii, B39.

P. laaiophrya Maxim.; *Mel. Biol.* x, 104.

P. trichoglossa Hook.f.; *Fhr. Brit Ind.* iv, 310.

P. rhodotricha Maxim.; *Mel. Bid.* xii, 843.

P. tristia Linn.; *Sp. Plant.* B08.

Elatge strictae simplices foliosae pubescentes foliis radicalibus evanidis caulibus sparsis [vel in *P. lasiophryde* congestis] sessilibus lineari-oblongis obtusis obtuse crenatis vel pinnatis crenis dentatis vel lobis serratis spica densa vel basi interrupta calyce ovato-oblongo membranaceo 5-fido segmentis deltoideis ovatisve supparibus corollae tubo calycem parum excedente labio curvato lobis sequilatis brevissime stipitato ecristato et galea brevior filamentis ex adverso summi ovarii insertis omnibus glabris; rhizomate subterraneo incrassato flagella in caules annuos producta emittente.

Calyce dentibus intsgri:—

galsa falcata dorao glabra marginB infBriorB tantum villosa roatro
craasiusculo coniuo apics 2-dent at o, labio 3-fiiio rotundato
margins eciliato. *P. craspedotric/ia.*
galea arcuata lorsD glabra front a dBnsa lanata rostro tenui gracils
dsflexD apicB intsgro, labio 3-partito obovato, marginB paroiiaainiB
ciliato. *P. lasiophrys.*

DalyoB dBntibus SBrratis :—

galea angulo recto in cur v a dorao fronteque lanata margins inferiors
tamBn glabra rostra tenui ildfBXD apics intsgro, labio profunds
3-fido renifonuB, margins Bciliato. *P. trivhoglvsm,*
galea falcata iorao front© et margins inferior omnibus lanata rostu
craasiusculo cDnico dsflsxa apics 2-fido, labio 3-fiiD rBniforma
margins ciliato. *p. rhodofricha.*
galBa falcata margins infsrriorB tantum villosa fronts cluusa angulo
frontali infBriorB aouto apiculato, labio profunds 3-BID cordato-
TDtundato, margins Boiliato. » *P. trutis.*

35. Kuies.

P. Dlarkei Hook, fil; *Flor. Brit. Ind.* iv, 310.

P. ingsna Maxim.; *Mel. Biol.* xii, B41.

P. rudia Maxim. ; *Mel. Biol.* x, 1D2.

P. Prainiana Maxim.; *Mel. Biol.* xii, 844.

Elatse strictae simplices foliose pubescentes foliis radicalibus evanidis caulinis sparsis auriculato-seiSsilibus lineari-oblongis pinnatisectis segmentis ovato-oblongis acutis mucronato-dentatis spica condensata vel basi interrupta calyce campanulato membranaceo 5-dentato SBgmBiitis deltoideis serratis supparibus labio obovato longe stipitato basi minutissime cristato lobis eequirnagnis filamentis medio tubo vel paulo demissiu insertis; rhizomate incrassato subterraneo flagella in caules annuos producta emittente.

G-alea rostrata rostro apico 2-fidu, CDrollDe tubo extus glabro, labio
galeam subsupBrante lobia Dbovatia:—

galsa arcuata margins glabra rostro conico porrscto labio cuneatu-
obovatD 3-lobo margins ciliato, h'lamentis paulo medio tubo
dBniasiu inaBrtia Dmnibua glabris " *p. Clarkpi.*
galea asgulo subobtusio incurva margins villosa roatro brevB crasao
labio latB obdaltoidso 3-fido margins eciliato, filamsntia msdio tube
insertis anticis hirsutia. *p. ingsns.*

Galea naviculari srostri labio margins ciliato, filamEntis medio tubo
inaertia omnibus glabria:—

Corollas tubo Bxtua piloao galsa margins villDSa ubiq^UB sequila^a
labio late ovato 3-lobo galearn a3quants lobis robundatia *P. rudis.*
Doroll'de tubo sxtua glabro galsa lateribus villosa antice dilatata, labio
anguatB cuneato-obovato 3-fido galsa manisste brevioris lobis
ubovtitis. *P. Prainiana.*

D.—*Hyporthorrhynchm*:—Dorollse tubus pincurvus (in 2 speciebus rectus) cylindncus sursum amplius calycem sequans vel excedens labium sessile ecristatum rostrum crassiusculum apice truncatum filamenta Esepissime ex advprso summi ovarii inserta; folia oppDsita vel verticillata; flares spicatum aggregati. Calyx 5-dentatus.

3 B. PseudocesepitDSEe.

P. Grammieana Train; -Jour. As. Soc. Beng. lvi, 2, 2 3D.

P. crassirostris Bunge; Bull. So. Acad. Petersb. viii, 24B.

P. binaria Maxim.; Mel. Biol. xii, 861.

Humiles arcuato-ascendentes vel erects glabratse vel pubescentes foliis radicalibus evanidis caulinis paucis 2-pinnatipartitis -sectisve calycis campanulati dentibus omnibus vel summiD excepto serratis corollae tubo calycem super ante filamentis meiiD tubi) insert is.

Foliis vertiDillatis 2-pinnatisBctis; lubio piano marginB BeiliatD, rDstro apice 2-fiIo ; plantse pBrennBS :—

calyce dentibus summo lancsolatD integro escepto ovatis pro fun do incisD-dentatis, cor oil ie tubo recto ualyco plus 2-plo longiurB, filamentis anticis hirsutis.

P. Gammieana,

calyce dentibua omnibus lanceolatis serratis, cor oil BB tubo incurvo talycem paum Bxcadente, filamentis glabris.

P. crassirostris

Foliis oppositis 2-piDnatipartitis; labio lobis depresso-rotundatis margins ciliato, rDstro apice integro: calyce dBntibus Bum mo nano esuopto oblongis Bsrratis, corollBB tubD TBdD oalyce plus iuplo longioiB, filaments anticis hirsutis ; planta annua.

P. binaria.

37. Ps eu iaspl enif olia.

P. schizorrhyncha Train; Jour. As. Soc. Beng. lvi, 2, 2BD.

Humilis glabrata foliis radicalibus caespitosis elongatis lanceolatis petiolatis seguentis ovatis dentatis foliis caulinis 1-paribus oppositis vel 0, corollse tubo calycem BxcdentB filamentis medio tubo insert is.

DalycB dents Bummo intsgro, rsiliquis serratis; filamentia anticis

hirsutis, rostro apics smarginato BBgmentis utrimjue 3-BBctia . . *P. schizorrhyncha.*

38. Myriophyllse.

P. Tartinowi Maxim.; Mel. Biol. x, 92.

P. cuivituba Maxim.; Mel. Biol. x, 92.

P. myriophylla Pallas; Itin. iii, App., 737.

P. GhamiBBDis Stev.; Monogr. Pedic, 29.

P. alaschanica Maxim.; Mel. BIDL x, 91.

Elatse erectse ramosse yel pluricaules caulibus arcuatD-ascendentibus simplicibus vel parce ramosis, foliis 4-natim verticillatis pinnatisectis SBgmentis distantibus lineari-lancBolatibus pinbatipartitis verticillis florum numerosia interrupts, bracteis saltern summis ovatis integris vel apice tantum serratis calyce ovoideo-iuflato parum fisso dentibua triangularibus sequalibus, filamentis ex adverso summi ovarii insertis capsula parum exserta.

Dalycis dBntibus omnibus SBrratis; filam&ntis omnibus hirsutis :—

roastro verticali. *P. Tartinoici.*

roastro porTBcto grauih subincurvo. *P. curvituba.*

roastro conico breviBsimo. *P. myriophylla.*

Dalycis dentibus omnibus integris vel Bubintegnis ; til amentia anticis tantum hirsutis :—

roastro gracile subincurvo. *P- Chamissonia.*

roastro biBYa an gust 9 uonico. *P- alaschanica.*

386. Conifera.

P. conifera Maxim.; Hemsl, Jour. Linn. Soc. xxvi, 2D5.

Stricta a media conice brevi ramosa, foliis parvis 4—5-natim verticillatis pinnatisectis segmentis approximatis oblongis pinnatifidis, fibribus apicB caulis ram or unique dense raceinosis bracteis foliiformibus calyce turbinato dentibus ex integra basi rotund at is dentatis labio galea brevior filamentis triente superiore tubi insertis.

Bostro Blongato rectiBDulo apicB obtuso emarginato labio lobo
medio anguate ovato apicB cucullato filamBntifl Dnnibua glabria . *P. conifera*.

39. Longi caulis.

P. lDngicaulia Franchet; Maxim., Mel. Biol. xii, 858.

Elata diffuse ramosissima foliis caulinis 4-natim ramealibus per 2 et 3 verticillatih subsessilibus ellipticis pinnatipartitis laciniis cartilagiDeo-serratis, fluribus axillaribus calyce membranaceD campanulato profunde dentatD ilentibus seijualibua basi integris lamina ovatis inciso dentatis, filamentid ex adverso summi oyarii insertis.

Corollse tubo calycem fero duplo super ante, gale a ialcata fronts
ieclivi, rDstrD porrBcto cylinirico, labio lubo medio pruminenter
auminato, filament is omnibus glabria. *P. longicaulis*.

§§§§ BIDENTATÆ.

Corollse tubus calycem paulo excedens ^alea adunca erostris vel brevissime latirostris infra apicem utrinque 1- rarissimB pluridentata, labium stipitatum basi erectuin supra 2-cristatum. Filamenta sspissime ex adverso summi ovarii inserta. Folia pleraijue alterna. Flores spicati et semper ordinis centripetD aperti. *Bidentatce* Maxim. Mel Bid. x, 111 (1877).

Species potius ditionum subarcticarum quam region urn arctico-alpinarum incolse; prsesertim tamen in provinciis subborealibus [e.g. Siberia) occurunt; in provinciis sub-sequinoctialibus [e.g. Caucasica, et Yunnanensi-Himalaica) per-rarse sunt.

A.—*Oppositifolice*:—Labium CD^HEC majusculum rarissime parvulum patens. Folia opposita vel verticillata. Calyx 5-dentatus; in 1. 2-lobatus, lobis altero 2- altero 3-dentato.

4D. Lyratse.

P. dBltdidBa Franchet; Maxim., Mel. Biol. xii, 897.

P. lutescBns Franchet; Maxim., Mel. BioL xii, 898.

P. lyrata Prain; Maxim., Mel Biol xii, 9DD.

Humiles vel nanre foliis ovatis oblongisve pinnatibbis segmentis ovatis serrato-dentatis vel crenulatis calycis campanulali dentibua lanceolatis, galea labium parvulum superante apice rotuniata saccato-producta tubo recto calyce loogiora filamentis omnibus glabris.

SpithamBa foKia deltdideo-uvatia Dorollse tubo calyce BeaijuilDngiDra
galBa utrinijUB 1-iBntata. p. *deltoidea*.

Spithamea fuliia oblongis BDrollee tubo ualyce parum longioro galea
i utrin4u0 5-dentata. f. *lutescem*.

Pygmsea subacaulia, foliis cordato-ovatia longiusculB petiolatia corollse
tubo calyce 2-plo longiorB gaha utrinjue 3-dentata. p_m *tyraia**

41. *JJ/é/ampyrif' o/ia.*

P. mBlampyrifolia Franchet; Maxim., *Mel. Biol.* xii, 895.

Stricta supBrne fastigiato-ramosa foliia 4-natim verticillatis lanceolatis pinnatisectis segno entis pinnatitidis calycis cylindrici dentibus ellipticis mucronato-dentatis galea labium majusculum subsetjuante apice rotundata saccato-producta, tubo incurvo calyce longiore filamentis omnibus glabris.

Corollæ tubo calyce 2-plo longiare, galea utrinque 1-dentata . . *P. ?nela?npyrifvUa.*

42. Rigidæ.

P. CDrnptonisBfolia Franchet; Maxim., *Mel Bioh* xii, 871.

P. rigida Franchet; Maxim., *Mel Biol.* xii, 872.

Htrictæ superne breviter ramosæ foliis 4-natim VBrticillatis oblongD-lanceolatis pin-natilobis segmentis denticulatis calycis campanulati dentibus minutis brevissimis galea frunte verticali in rostrum latum breve continuata.

Corollæ tubo calyce fere 3-plD longiore, galeæ dentibus brBvibus
filfiniBntia anticis paroB hirsutia *P. comptvnicefotia.*

CorDlte tubo calyce 2-pb bngiora, galssB dentibua subulatis filamentis
" DmDibua glabris *P. rigida.*

43. *Platyrrhynchse.*

P. subrostrata U. A. Mey.; *Ind. Cauc.* 1DB.

P. platyrrhyncha Schrenk; *Bull. Phys. Math. Peter,* b. i, 79.

P. interrupta *SUp.*; *WiJld., Sp. Plant,* iii, 214.

P. chorgosBica Hegel et Winhl.; *Ad. Sort. Petrop.* vi, 35D.

Nanse vel elatse simplices foliis 4-nathn verticillatis lanceolatis pinnatipartitis -sectisve laciniis ovatis lanceolatisve calycis rylindricD-campanulati nee fissi dentibus subulatis lanceolatisve galea fronte verticali in rostrum latum breve continuatLi, bractsis liberis, filamentis anticis tantum hirsutis.

Galea labium sequantB brBvissimB rostrata rostrD dentB lato pBrbrevis . . *P. subrostrata.*

Galea labium superante distincte lats rostrata :—

rostro ientB latD distinctissiniD. *P. platyrrhyncha.*

rDstro truncato dents mere anguliformi. *P- interrupta.*

rustro conspicao aDgulo apicali antico obtuso pustico in 3 en tern
acuminatum protracto. *P. chorgosma.*

44. Superbse.

P. superba Franchet; Maxim., *Mel. Biol.* xii, 874.

P. rex Clarke; Maxim., *Mel Biol.* xii, 875.

Elate simplices vel superne fastigiatim ramosæ foliis 4-natim verticillatis 2-pin-natisBctis calycis ovati hinc fissi gaha, fronte verticali rostrata vel erostri; petiohs bracteisque basibus dilatatis in vaginam ochreatam perfoliatam CDnnatis, filamentis omnibus superne barbatis,

Calyces B vagina bractearnm exserto 5-ientato dentibus cribratis,
corolla, rubra labio ampb galuam rostratam eientulam auperante:
caule terBto. *P. mptrba.*

Calyx vagina inoluso 2-bbD, dBntibua nanis intBgris, corolla flava
labio parvo quam gaba infra apicBin trunoatum 2-i an tat a 2-plo
brBviorB : caulB tetragono. P. *rex*.

B.— Verce:—Labium corollae majusculutn patens. Folia sparsa. Calyx 5-dentatus.

45. SudBticse.

- P. *nasuta* M. Bieb.; Stev., Monogr. Pedio. 43.
P. *sudBtica* Willd.; Sp. Plant, iii, 2D9.
P. *scopulorum* A. Gray; Byn. FL N. Amer., 2 ed., ii, i, 308.
P. *songarica* Schrmk; Bull. Phys. Math. Acad. Pehrsb. i, 79.
P. *sarawschani* Da Begel; PL Fedtschenk., 61.
P. *villosa* Ledeb. ; Sprmg., Bijri. Veg. ii, 781).

Humiles simplices caulibus subaphyllis vel parvifoliis basi squamis aphyllis vestitis,
foliis pinnatipartitis laciniis aerratis calycis dentibus sequalibus.

Galea rostro breve conico apice crenulato dents mers angulifarmi;
spica capitata multiflora dens a; caljcis dentibus intBgris galea
labium supBrants; filamantis Dmnibus glabris. P. *namta*.

Baba rDatro brBvisa^mD VBI nulb :—

spica capitata niultiflura densa:—

rDstro dBntibusquB brBvibus; filamsntis glabris:—

calycs isntibua lancBolatis serratis, galea labium
seijuante. P. *mdetim*.

Daly u 9 dentibus deltoideis integris, galea labium
sup Brant e.....P. *scopubrum*.

rostr nullo dBntibus longiusculis ; gaha labium superantB :—

caljBB dBntibus lancBDlatis acuminatis, filamsntis' anticis
hirsutis. P. *songarica*.

calycB dentibus deltoid els; filamBntis Dmnibus glabris;
planta nana subacaulis. P. *sarawsohanica*.

spica Bbngata basi interrupt a, rostrD nullo dBntibus brBvibus,
calycis dentibus internis galea labium SBtruant9, filamBntis
Dmnibus glabria. P. *villosa*.

4B. Elata.

P. *elata* Willd.; Sp. Plant iii, 219.

Elata simplex caule crebre foliato basi squamis aphyllis vestito foliis pinnatipartitis
laciniig serratis calycis dentibus sequalibus integris spica elongata.

Balsa subrostrata dentibus brevibus labium duplo supBrantB filamBntia
antiois hirsutia. P. *elata*.

47. Domosse.

- P. *sohizDDalys* Langs; Prodr. Flor. Eisan. ii, 5D9.
P. *fissa* Turcz.; Bungp, Bull. Phys. Math. Ac. Petersb. i, sub 2-1.
P. *asparagoidBS* Lopeyr.; Abr. 349.
P. *heterodonta* Panč.; Add. ad fl. prim. Berbice 195.
P. *altaica* Strph.; Btev., Monogr. Pedic. 48.
P. *venusta* Sohang.; Bunge, Bull. Phys. Math. Ac. Petersb. i, 24.
P. *brachyodonta* Schbss. et Vukot*; Flora Croatica 582.

- P. Domosa* Linn.; *Bp. Plant* BD9.
P. DampBstris Griseb. et Schrenk; *Iter. Hungar.* 324.
P. apoiochila Maxim.; *Mel. Biol.* xii, 9D7.
P. lseta Stev. ; *Bunge, Ledeb., Flor. Boss,* iii, 2B9.
P. peliolaris Ten.; *Syll App.* iv, 3D.
P. uliginosa Bunge ; *Ind. Sem. Sort. Dorpat.* [1839), p. viii.
P. rubBns Steph. ; *Wmd., Sp. Plant,* iii, 219-
P. flava Pall; *Bin.* iii, App. 735.
P. manishuriua Maxim.; *Mel. Biol.* x, 12D.
P. occulta Janka; *Oesterr. Bot. Zeitschr.* (1872), 1BD.
P. physDcalyx Bunge; *Bull. Phys. Math. Ac. PeUrsb.* i, 382.
P. leucolon Griseb.; *Spicil. PL Rumel.* ii, 17.
P. lāsistachya Bunge ; *Ledeb., Flor. Altaic,* ii, 434.
P. grseca Bunge; *Bull. Phys. Math. Ac. Petersb.* i, 24, p. ID.
P. achilbarfolia Steph.; *Willd., Sp. Plant* iii, 219.
P. FriiBrici Augusti Tommas.; *Lmna* xiii, 74.

Ssepius elatse foliatse folils radicalibus cespitosis lanceolatis elongatis semel vel bis pinnatipartitis -sectisve, spica varia plerumque elongata.

Calycis dBntibus deltDideis ciroiter setjua longis ac latis :—

calycis dBEtibua crBnatis. *P. svhizucalt/x,*

calyois dentibus intBgris :—

floribus purpureis:—

calyce rBticulato, labio gal Bam aetjuantB filamentis glabris . *P. fissa.*

calyce non reticulato, labio galea brBviore filamBntis antiois

hirsutis. *p. asjjaragnides.*

floribus flavia:—

BDTDIBB tubo SBriatim longituinaliter piloso, bractsia

triaDgulis pinnatifidis. *P. heterodonta.*

corollte tubo extus glabrD :—

bracteiB cunBatia 3-fiiis:—

galea suberDstris. *p. altaica.*

galea rDstroita. *p_m venusta.*

bracteia lineari-lanceolata :—

Dristis labii brevibus ovatis ad loborum sinum . . . *P. bravhyodonta.*

cristis labii elongatis parallelia :—

capsula oblique ovata a cumin at a. *p. comosa.*

capaula rBcte ovato-lancBDlatft. *p. campestris.*

Calycis dBntibus lancBolatis VBI Bpathulatis :—

floribus purpursis :—

labio BBBSIB galea bngiore latissima fullis in lacinias line ares

iteratim dissBctia. *p. apodochila.*

labio stipitato:—

bract Bīs linBaribus :—

caub glabrD, braotsis dBntibusijUB calycis intBgria . . . *P. lata.*

caule YLUOSO bracteis SBrratis, oalyuis dentibus integris , *P. petivlaris.*

bractBis cuneatia palmatifidia :—

flbgmentis foliorum pinnatifidia deutibus calypia
deltoidaia subseijualibus, gaUa distincta rostrata . . . *P. uliginosa.*
segment is foliorum pinnatipaxtitis, dentibus calycia
Bubulatia, galea brevissime rostrata. *P. rubem.*

floribus albis vel flavis :—

labio galea longiDiB dsntibus calycia sBrratia :—

bracteis 3-partitia *P. flava.*
bracteis foliaceis serratis. *P. mandshurica.*

galea labio longiorB :^

bractBis cuneatis pinnatifidia *P. occulta.*

bract BIS linearibus :—

calycis dentibus et bracteia BBrratia :—

calycis tubu parce VBI nDn reticulato, ovario

ovato-jblong-o :—

epica densa hirsuta vel lanata :—

spica flavo-lanata, uapsula semi-ovata
anties recta calyce multo longiore. . . *P. lasio&tachys.*

epica ciner BO-hirsuta, capsula DblongD-
ovata calycB panim IDngiore *P. grcera.*

spica laxa subglabra. *P. leucodon.*

calycis tubo CDpiose reticulatD, capsula lats ovata
calyce inclusa. *P. phyaocalyx.*

calycis dentibus et bracteis integerrimis :—

tota breviter canes cente, capsula lanueolato-
Dblooga obliijUB acumiaata calyuB 2-plo longiora
filamentis anticis parue barbatis. *P. achillecefolia.*

spica villosH,, capsula uvato-lanueolata oum apiuolo
fero rBcto calyce parum longiora filamentis
omuibis parcB barbatia. *P. Frideriti Auyusti.*

48. DolicJiDrrhiza.

P. dDlichDrrhiza Schrenk; Enum. PL Nov. ii, 23.

Altissima striata foliata foliis radicalibus Dcespituis mox evaniis 2-pinnatipartitis
spica elongata interrupta ; calycis dentibus triangularibus integris sequilatis tubo
reticulato ; filamentis anticis hirsutis.

Bracteis 3-partitia, laciniis lateralibus dentifDrribus, galea rostrata
rostro longiore quam lato dsorsum dsclivi capsula ovato-
lanueolata exaerta. *P. dolivhorrhiza.*

C.—*Striatce*:—Labium corollae parvum accumbans. Folia sparsa. Dalyx 5-dentatus.

485. Hirtella.

P. hirtella Franchet; Hemsl., Jour. Linn. Soc. xxvi, 2D9.

Eлата stricta foliata foliis pinnatifidis radicalibus brave petiolatis caulinis subsssilibus
SBgmentis obtusis inciso-serratis racemis multifloris laxis Blongatis bracteis ovato-lancBolntis
calycB distincte dentato SBgmentis lateralibus triangularibus postico anticistjue linearibus.

DorollsB tubo bnga sxaerto labio brsviter 3-lobo bbis supparibus,
galea brevi frontB VBrticali dentibus subulatis, calycis segmentis
dentioulatia. *P. hirtella.*

49. Striatse.

P. striata Pall; Bin iii, 255.

P. procera 4. Gray; Amer. Jour. Sci., SBT. 2, xxxiv, 251.

P. Furbishii B. S. Wats.; Proc. Amer. Acad. xvii, 375.

Elatse strictae foliis pinnatipartitis -sectisve segmentis dentatis inciso-lobatis VBI pinnatifidis, ramulis multifloris bracteis e basi latioribus integra cuspidatis cuspe integra YBI serrato, Liliaceae profunde insertis, filamentis anticis superne barbatis.

Foliorum laciniis linearibus dentatis, utrinque dentibus intermixtis galea

2-cuspidata labio parvo foliis pinnatipartitis *P. striata*.

Foliorum laciniis lanceolatis VBI ovatis iterum lobatis VBI fissis :—

foliis pinnatisectis segmentis lanceolatis pinnatifidis, corolla

ampla galea 2-cuspidata labio denticulato sequilonga, calycis

dentibus integra. *P. procera*.

foliis pinnatipartitis laciniis ovatis pinnae lobis calycis dentibus

linearibus labio galea brevioribus. *P. Furbishii*.

D.—*Racemiflorae* :—Labium corollae majusculum patens. Folia sparsa. Calyx 2—3-dentatus (in 2—5-dentatus).

50. Palustres.

P. lusitanica Link et Hoffg; FL Portug. i, 3D5.

P. sylvatica Linn.; Sp. Plant. BB7.

P. euphrasiodis B. Steph.; Willd., Sp. Plant. iii, 2D4.

P. angustifolia Benth.; PL Hartw. 22.

P. adunca JH. Bieb.; Steud., Menthogr. Pedic. 29.

P. palustris Linn.; & p. Plant. BD7.

Humiles vel elatiores simplices multicaules vel ramosae glabratse foliis pinnatisectis -partitisve, ramulis nuncquidam oppositis, calyce fissis dentibus (*P. euphrasiodis* et *P. angustifolia* exceptis) dentatis cristatisve.

Galea infra apicem tantum 2-dentata tubo calycis subaequali VBI duplo longior :—

calyce 5-dentato galea apice incurva valde distincta a capsula inclusa,

caulibus basi ipsa ramosis ramis longioribus foliis pinnatisectis :—

labio galea subaequali. *P. lusitanica*.

labio galea brevioribus. *P. sylvatica*.

calyce 2—3-dentato dentibus brevibus intermixtis, galea distincta, capsula

lanceolata caulibus ramulosis :—

galea breviter subaequali, foliis pinnatipartitis superioribus breviter

capsula calyce 2-plo longiore. *P. euphrasiodis*.

galea fronte breviter subaequali foliis angustis linearibus orenulatis,

capsula calyce 3-plo longiore, labio parvo galea brevioribus. *P. angustifolia*.

Galea simul infra apicem et infra medium 2-dentata, calyce 2-dentato :—

corolla breviter subaequali, galea apice declivi rostrata, floribus

confertis, segmentis foliorum breviter subaequalibus. *P. adunca*.

corollae tubo calyce sequilongiore, galea apice verticali breviter

floribus saepissime sparsis, segmentis foliorum pinnatifidis *P. palustris*.

51. Canadenses.

P. canadensis Linn. ; *Mantiss. Plant.* SB.

P. crenulata Benth.; *DO., Prvdr.* x, 568.

Humiles vel elatiores simplices erectse foliis pinna til obis vel crenatis pubescentibus caulibus basi squamis aphyllis vestitis, calyce antice profunde fisso dentibus minutis vel deficientibus, corolla tubo calyce 2-pb longiore galea infra apicem tantum 2-dentata.

FDIUB inferioribus pinoatipartitis Begmentis ovatis oblongisve
inuisu-dentatis, ceteris semipinnatifidiis ; dent a sub-apicali
loDgiusculo. *P- canadensis.*

FDIUS omnibus linBari-DbloDg-ia Dbtutis crenatis, donta sub-apicali
breui *P- crenulata.*

III.^ERDSTRES.

Curoll^e tubus infract as VBI rectus sursum ampliatus labium stipitatum basi erectuin supra 2-cristatum galea recta erostris labioque tenera.

§§§§§ ANDDONT^E.

Corollae tubua sspissime infractus nonnunquam rectus rarissime mere incurvus vulgo calycem parum excedens, galea tenera ssepissime ere eta erostris vel rarissime minute et inchoate rostrata infra apicem edentata (rarius utrintjue inconstanter et minutissime dentata). Filamenta sspissime ex udverso summi uvarii inserta. Folia alterna, vel Dpposiba. Flores spicati (in 3., quibus caules desunt, pauci et longüssime pedicellati) s^pissime ordine centripeto aperti [flores centrifugi sub-sectionis 1. proprii]. *Anvdon* Bunge in Ledeb., *Flor. Koss.* iii, 29S (184B).

Species sparsifoliatae tjuidem provinciarum omnium in coke, praesertim tamen circumpolares vel in Europe Siberia, Americaeque arctico-alpinse, in provinciis reliquis perrar^e; verticillatae autem prsesertim Indo-Sinenses, nonnull&e Daucaso-Sibiricse, paucse etiam circumpolares una tantum Europaea, ne singula quidem vera Americana.

A.—*tSceptra*.— Corollae tubus rectus exsertus galea ssepissime curvata apice cucullata angulo mox superiore mox inferiore magis protinente, pDsteriore tunc acutiusculo, labium galeae parallelum jin 1 specie accumbens), plerumque ilia brevius. Calyx 5-dentatus vel 5-fidus. Folia majuscula alterna. Species fere omnes macranth&e et |3. acaulibus exceptisj robustae.

52. Acauhs.

P. Regeliana Prain; *Jwr. As. Soc. Beng.* lviii, 2, 274.

P. Arisleri Maxim.; *Mel. Biol.* x, 127.

P. acaulia Wulf.; *Jacq., Collectan.* i, 207.

Nanre acaules foliis cespitosis petiolatis pinnatisectis segmentis ovatis serratodentatis fIdiibus omnibus axillaribus lunge pedunculatis labio galeam aequante calyce 5-tido lauiinis lanceolatis serratis, capsula obliqua.

Calyx anticB triBnte fisso, capsula, lanceolata calycB 2-plo longiDre,
 galea brBVB rostrata cristata, pedicellis floribus longioribus
 SBgmBntis foliorum distantibua, antheribus mucronulatis ; corolla
 purpura. *P. RegeUana.*

Dalyce antice vix fisao, capsula ovata calyois tubo arete inclusa,
 galea erDstri Bcristata :—

peiicellis florem eequantibus segmentis foliorum distantibus,
 galea acuta, antheribus mucronulatis; corolla violacea . . *P. Art&elwri.*
 pedicellis calyce brBvioribus segmentis foliorum densia, galea
 obtusa, antheribus muticis ; corolla alba. *P. acaulis.*

53. Capitatae.

- P. capitata* *Ad.; Mem. Soc. Mosc. v, 1DD.*
P. Maxim Dviczii Krasn.; Script Bot. Hort. Univ. Petrop. ii, 18.
P. semibarbata A. Gray; Proc. Amer. Acad. vii, 385.
P. Dentrathera A. Gray; Bot. Mex. Bound. 120.

Humiles caulibus brevissimis foliatis, foliis petiolatis pinnatipartitis -sectisve, radicalibus
 cespitosis vel D, segmentis ovatis serratis dentatisve floribus in spicam basi passim
 ctmipositam foliatam digBntis labio galea distincte minore calyce 5-dentato laciniis dentatis,

Caulis preter folia floralia nudo vel sub-nudo folia radicalia
 pinnatisecta \ix sup grants spica pauciflora densa floribus albis:—

caula Bubsolitario, galea a medio incurva angulo apicali inferioris
 acuto labium parallelum angustum 2-plo superante filamentis
 omnibus glabris. *P. capitata.*

caulibus numerDsis cespitosis galea tan turn apice incurva angulo
 inferiorB truncato labio amph rotundato patens subbreuiore
 filamento anticis hirsutis. *P. Maximowiczii.*

FDIUS pinnatipartitis radicalibus nullis caulinis spicam multifloram
 superantibus, galea subrecta apice tuta convexa labium parum
 superante :—

laciniis foliorum pinnatifidig, spica esepB basi composita, corolla
 ochroleuca minorB antheris brevis multifloris. *P. semibarbata.*
 laciniis duplicate-dentatis, spica simplice corolla purpurea Daajousola,
 antheris hngae aristatis. *P. ventranthera.*

54. Gloriosae.

- P. Sceptrum Carolinum Linn.; Sp. Plant. 508.*
P. gloriosa Bm. et Moore; Jour. Bot. xv [1877], 295.

ElatiE scapo nudo ssepe ramosD foliis radicalibus cespitosis petiolatis pinnatipartitis
 -sectisve segmentis ovatis spica elongata aphylla bracteis basi dilatatis, floribus magna
 labio galea recta aetjuilongo.

Partitionibus foliortim obtuse lobatis, scapo vujgo simplioe, Builihus
flavis galea labio parallela. P. Bceptrum Carolinum.

gegmbDtis foliorum pinnatiidig, scapo ramoso floribus roseis, labio
patent©. P. gibbosa.

55. *Grandiflora*.

P. grandiflora Fisch.; *Jllem. tSoc. Mosc.* iii, 6D.

Elata ramosa cauls fuliato foliis sub ter pinnatisBctis spica exssrta floribus maximis labio gale a incurva subsequilongo parallslo.

Balsa a cut a margins villoaa, anbheribus lunge aristatis ; corolla

purpurBa. *P. grandiflora*.

B.—*Cydophyllh* :—Corollse tubus infractus galea recta saepissime erecta angub superiore rotundato inferioie (2 sp. exceptis) acute labium patulum galeam subsequans. Calyx 5-dentatus, Folia 3—5- (ssepissime 4-) natim verticillata rarius Dpposita.

56. *Cheilanthes*folise,

P. globifera Hook, *fit.*; *Flor. Brit. Ind.* iv, 3D8.

P. nDas Maxim.; *Mel. Biol.* xii, 8B0.

*P. cheilanthes*folia Bohrenk; *Enum. PL* Nov. ii, 19-

P. Msnziesii Benth.; *DC, Prodr.* x, 5S3.

Humiles vel elatiores multicaules pubescBnte3 vel glabrat^E foliis lanceolatis radicalibus c&spitosis caulinis 4-natim verticillatis pinnatisectis segmentis lanceolatis linearibusve dentatis calyue campanulato antice ^—^—fisso dentibus brevibus insequilatis summo deltoideo integro reliquis cristatis corollae tubo intra calycem infracto galea basi erecta apice brevissime rostrata rostro CDnico integro filamentia insertionB villosulis ceterum glabris.

Galea distinct^ rDstrata:—

roetro dsoTSUinspectantolatissimBuonicoapioarotatlato... *P. globifera*.

roetro declivi anguste conico apicB truncato. *P. anas*.

roetro porrBctD bravissiniB DDIDDO truncate*. *P. cheilanthes*folia.

Galea erosbri VBI brBviseiniB Bubrostrata. *P. Menzini*.

57. *Daphiocephala*Ee.

P. Daphiocephala Maxim.; *Mel. Biol.* xii, 8S7.

P. Roylei Maxim.; *Mel. Biol.* xi, 28B.

Humiles vel elatiores multicaules glabratse foliis lancBDlatis radicalibus cespitosis caulinis 4-natim verticillatis pinnatisectis segmentis linearibus inciso-serratis calyce campanulatD antics vix fissD dents summo deltoideo integro reliquis B lata basi lanceolatis dentatis corollse tubi) intra calycem infracto, filament is insertions villosulis cBtsrum glabris.

Qaha acuminata leviter incurva labium sequantB Tel subsuperantB. *P. ophiowphala*.

Sale a abruptiua clausa Brecta labio manifeatB brevior *P. Roylei*.

58. *Microchila*.

P. microchila Franchet; Maxim., *Mel. Biol.* xii, 884.

Humilis diffEusa glabriuscula foliis oblongis radicalibus multo majoribus caulinis 4-natim verticillatis pinnatilobis bbis depresss rotundatis antics acute dsntatis, floribus racemosia (nee spicatis) calyce campanulato anticB vix fissD dsntibus magnis Dvatis denticulatis corollse tubo intra calycsm infrauto filaments glabris.

Galea arcuata labium plus 2-plo supsrastB st tubo sequilongo . . *P. ?nicrvchiia*.

59 Amoen^e.

P. violascens Schrenk; *Enum. PL Nov.* ii, 22.

P. amrena Ad.; *Stev., Monogr. Ptdic.* 25.

P. kansuensis Maxim.; *Mel. Biol.* xi, 287.

Humiles vel elatiores multicaules pubescentes foliis lanceolatis radicalibus cespitos^{is} caulibus 4-natis verticillatis pinnaefidis segmentis lanceolatis pinnatifidis -partitisve, calyce campanulato, tubo fissis dentibus inaequalibus deltoideis corollae tubo intra calycem infracto filamentis anticis hirsutis.

Collo squamato, foliorum segmentis pinnatifidis ualjet dentibus integra vel majoribus denticulatis labio lobo medio truncato; spica brevis densa :—

galea labium superans. *P. vivlascens*,

labio galea aequilante. *P. amoena*.

Collo esquamato, foliorum segmentis pinnatifidis calyce intibus

Berratis, labio lobis omnibus integris; spica interrupta (verticillata

Denticibus distans), labio galea aequilante. *P. kansuensis*.

BD. Verticillatae.

P. spicata Pall; *Itin.* iii, 444, *App.* 73B.

P. lineata Franchet; *Maxim., Mel. Biol.* xii, 887.

P. likiangensis Franchet; *Maxim., Mel. Biol.* xii, 887.

P. verticillata Linn.; *Sp. Plant* BD.

P. refracta Maxim.; *Mvl. Biol.* si, 289.

P. szetschuanica Maxim.; *Mel. Biol.* xii, 892.

Humiles vel elatiores multicaules pubescentes VBI glabratae caulibus simplicibus foliis ovatis oblongisve radicalibus cespitosus caulinis 4-natis verticillatis pinnatifidis segmentis ovatis oblongisve serratis calyce campanulato, corolla tubo intra calycem infracto.

Grana nana labio plus duplo brevior foliis pinnatifidis -partitisve, floribus purpureis :—

bracteis flabellatis margins anteriore dentatis utrumque integris, spica elongata densa, calyce minuto subgloboso antice nee fissis dentibus parvis integris, foliis pinnatifidis caulibus a simplici VBI fastigiato-ramoso, filamentis anticis hirsutis. *P. spicata*.

bracteis oblongis VBI linearibus apice fimbriatis pinnatifidis vel dentatis, calyce ovato grandidentato, caulis simplicis, spica brevis :—

calycis nee fissi dentibus ovatis summo exserto cristata, foliis pinnatifidis, filamentis omnibus glabris. *P. lineata*.

calycis antice fissi dentibus aequalibus integris foliis pinnatifidis -partitisve, filamentis anticis hirsutis. *P. likiangensis*.

Balea labio parum brevior, calyce antice fissis dentibus brevibus imbricatis VBI obscuris denticulatis, floribus roseis vel purpureis :—

foliis brevipetiolatis pinnatifidis calyce costato non reticulato

antheris discretis filamentis anticis hirsutis, capsula patula *P. verticillata*.

ID His longiusDule petiolatis pinnatilobia -fidiavs calycB tubo costato
et eursum reticulato antharis CDntigua, capsulis patentissimia
aubrefractia:—

foliis obbngia VBI lanosolatia basi cuneatia racBino interrupto,
gaba semper ue quail filamentis anticia hirsutis. *P. refracta.*
foliis coriato-ovatis vel -oblongia pinnatilobis racBmt) tantum
basi interrupt o gab a angulo apicali inferior 9 ssepa apicu-
lato vel infra ilium raiiua 2-dentata, filament is omnibus
glabris. *P. szetschuanica.*

51- Pygmaea.

P. pygmsea Maxim.; Mel. Biol. xii, 885.

Nana caule brevissimo basi squamato, foliis lineari-oblongia radicalibus csespitDsis
caulinDrumijUB verticillD altero pBtiolatis, caulinia ceteris sessilibus 4-natim vertiuillatis
laminis pinnatisectis segmentis imbricatia rotuniatis vel ovalibus müuiDnatu-dentatis calyca
uvoioieo vBiitra fisso dentibus omñibus integris deltuidsis, corolla tubo intra calycetu
infracto, filamentis Dmnibus glabris.

Qalea tubum fsro squant9 angulo inferiorB in apiculum rotun-
da tum protractD. *P. pygmsea.*

B2. Plicatse.

P. plicata Maxim.; Mel Biol. xii, 888.

P. rupicDla Franchet; Maxim., Mel. Biol. xii, B9D.

Humiles ctEspituaLe caulibus simplicibus foliis lineari-oblongis lanceolatisva imis
oppositis reliquis 4-natim VBrticillatis pinnatisectis segmentis pinnatifidia spica terminali
densa brevi (verticillo imo passim remoto) calyce campanulato vsntre fisso dentibus
summo excepto serratia corollse tubo intra. calycem infracto galua subarcuata apics
rotundata filamentis omnibus glabris.

Balsa utro^ue aogub obtuBO cum plica induplicata distinctissima
obliqua inter gibbum et apicem gahse extensa; uuolla flav esc ante *P. plicata.*
Qalea angulo insriorB acuto cum plica Bupsrficali Dbli^ua secua
partBm anterior em marginia; corolla rusea. *P. rupicola.*

B3. Pontica.

P. pontica Bom.; Flor. Orient, iv, 485.

Nana multicaulis glabrata vel puberula foliis obloDgo-lanceolatis radicalibus rsespitosia
caulinis 4-natim verticillatis pinnatipartitis segmentis serratis, spica breve basi interrupta,
calyce campanulato dentibus lanceolatis corollse tubo medio infrauto, filamentis glabris.

Crakea recta erDstri npicB oblique truncata angulo inferioro aouto . *P. pontica.*

64. Pilostachy*e.

P. ternata Maxim.; Mel. Biol. x, 98.

P. pilostachya Maxim.; Mel. Biol. x, 99.

Elate vel humiles pilosae foliis lanceolatis radicalibus cespitosis caulinea saepissime 3-natis verticillatis calyce oblongo dentibus subulatis dense villosa corollae tubo supra limbum Dalycis infracto filamentis glabris fere apice tubi insertis.

Verticillis florum valB distantibus cinemā, foliis radicalibus paucis;

planta Blata. P. *ternata*.

Spica denaa albo-tomentosa, foliis radicalibus numerasis; planta

humilis. P. *pifostachya*.

65. Gibber*.

P. *gibbera* Prain; Jour. As. Soc. Beng. lviii, 2, 2B2.

P. *polygaloides* Hook. fil_m; Flor. Brit. Ind. iv, 317,

Nanse glabratse vel 2-fariam pilosae vel humiles diffuse multicaules foliis oblongis ovakisve radicalibus evanidis caulinis oppositis petiolatis pinnatifidis -partitisve flonibus pedicellatis racemis paucifloris calyce campanulato dentibus summo integrto escepto apice serratis CDIDHSB tubo ipso apicB tantum infracto.

Colb s^uuamato, foliis bngiusoulB petiolatis late ovatis calycB anticB
xix fissD galea erecta apice rotundata filamentia meio tubo
insert is anticia hiraugia capsula lanceolata, Bominibus pauois
majusculia. P. *gibbera*.

DDHO esquamato, folia brava petiolata oblonga calysu antius [^]-fisau
galea deulivi brevissimB rostrata roBtrD subacuto 2-1 obo, filamentis
glabris, capsula ovata, BBminibua minoribus. P. *polygaloides*,

B6. Denudatse.

P. *leptorhiza* Rupr.; Sert. Tiansch. B2.

P. m us chat a Maxim.; Mel. Bid. xi, 285.

P. *abrotanifolia* M. Bieb.; Stev., Mono^r. Pedic. 22.

P. *denudata* Hook, fil; Flor. Brit. Ind. iv, 399.

P. *mollis* Wall.; Cat 415.

P. *densispica* Franchet; Maxim., Mel. Biol. xii, B22.

Elatse glabrats vel pilose foliis oblongis lanceolatisve radicalibus s^upissime evanidis caulinis ssepiissime 4-natis vorticillatis floribus spicatis spicis s^upius interrupts calyce campanulato corollas tubo ipso apice infracto filamentis s^upissime supra medium tubum insertis.

Bpice saltern baai interrupts;—

filamentis apicB tubi inaertia:—

salsa dorso antB rustrum Donicum crasaum criatata filamentis
. p. *leptorhiza*.

anticis parce mrsutia.

galea ecristata Brostri angulo inferiurB acuto filamBntia Dmmbua P. *moschata*.

glabria.

filamentis quadrante supBriore tubi inaertia:—

galea Bubnatrata, filamBntis omnibua glabriB p. *abrotanifolia*.

galea brevisaime roatrata roatro conico acuto filamentia omiui^u
bus hirsutis [^] *denudata*.

bus hirsutis

filamentia basi tubi inSBr^{tis}, galea Brostri utroque angulo obtuso
 filamentis omnibuB glabris. *P. mollu.*

Spica condensata filamentis niBdio tubD insartis galea subrscta erBD^a
 angulo infeiore in apiculum brBvissimum prolecto filamentis anti-
 cis hirsutis. *P. demispica**

y_m—*SubbidentatCB*:—Dorollse tubus rectus vel rarius incurvus [nunquam infractus) galea
 recta erecta utroque angulo obtuso vel rarius angulo inferiors acuto nonnunquam
 infra apicem minutissims ienticulata, labium patulum [in 2. accumbens) ssepissime
 galea brevius. Calyx 5-ientatus. Folia ssepius alterna.

B7. Sima.

P. sima Maxim.; MeL BioL xii, 284-

Eлата simplex vel basi ramosa pub esc ens foliis oblongis petiolatis pinnatipartitis
 laciniis ovatis ubtusis serratis imis oppositis reliquis 3-natim verticillatis floribus verti-
 cillatis verticillis distantibus 3-floris imis remotis calycis cylindrici dente summo deltoideo
 integro reliquis ovatis serratis_f corolla tubo recto labio lobis omnibus rotundatis medio
 minure; filamentis glabris.

Corollæ tubo haud Bxserto gale a subadunca informB brBvissime
 obtusæ TDstrata. *P. sima.*

68. Dollata.

P. cDollata Train; Jour. As. Soc. Bmg. lviii, 2, 265.

Nan a csespitosa glabrata foliis oblongis petiolatis pinnatisectis segmentis ovatis
 pinnatifidis radicalibus paucis caulinis oppositis vel D, floribus 3 [imis 2 Dppnsitis,
 summo singulo) calycis cylindrici dente summo deltoideo integro reliquis ovatis serratis₇
 corolla tubo recto labio lobis ovato-rotundatis supparibus₇ filamentis anticis hirsutis.

D DrolB³ tubo caljDB ^ lon^iors, galea erBcta infra apicem minutis-
 aims denticulata, staminibus meio tubo insBr^{tis}. *P. collata.*

68&. Salvisflora.

P. salviffilDra Franchet; Hemsl., Jour. Linn. Soc. xxvi, 215.

Eлата, ramDsissima, parce pubescens caulibus gracillimis foliis suboppositis pinnatipartitis
 segmentis ovato-lanceolatis lobatis bracteis incisiss distincte petiolatis floribus dissitis laxe
 racemosis calycis tubulosi dentibus supparibus linearibus obtusis apice denticulatis, uorollae
 tubo sensim ampliato intus pubescente labio galea sequilongo.

GalBa erBcta fronts declivi apicB viUosula. *P. sahiceflora,*

69- Fragiles.

P. fragilis Prain; Maxim., MeL Bid. xii, 866.

P. Kingii Prain; Maxim., MeL BioL xii, 895.

Elatre parce pubescentes caulibus gracillimis foliis oppositis ternisve ovatis pinnati-
 partitis -sectisvs segmentis oblongis vei ovatis pinnatifidis serratisve floribus axillaribus

calycB campanulato corollse tubo recto calyce 2-plo longiore Idbiv hlv medio obovato vbtuso lateralibus anyuste ovatis acutis latiore staminibus basi tubi insertis filamentis anticis hirsutis.

Folia 3-natini verticillatis Bubaeailibua calyce BBasili IIBD fissu
dBntibus angustis lancsolatia sequilatia galea brBvissimB late
rostrata, corolla viridi *P. fragilis.*
FDIU\$ oppositia bnge petiolatia calyoB pellicellato untie 9 prof undo
fisso dentibus delboideis aumnj reli^uia majors gale a erosbri
utroijUB angulD obtuaD, corolla alba. *P. Jfingii.*

7D. Daucasicse.

P. pyenantha Bóm.; *Diag.*, ser. 1, 12, p. 45,
P. BDurgBau Maxim.; *Mel. Biol.* xi, 291.
P. cadmea Boiss.; *Diag.*, SBr. 1, 4, p. 82.
P. caucasica M. Bieb.; *FL Taur. Uuv.* ii, 72.

Humiles glabratse vel pubBscentes foliis 2—4-natim verticillatis lancBDlatis pinnati-partitis -sectisve segmentis lanceolatis floribus intRrruptB spicatis calycB campanulato nee fissu dentibua supparibus subidtegris Dorollee tubo medio incurvo labio lobis rotundatis.

Labio galea brBviDra, capsula calycBm vix excedente:—

bract BIS oblongis subintBgris, ovãrD globoso, foliis 4-ratim
VBrticillatis pinnatipartitia rhachi SBrratis, filamentia anticis
hirsutis, floribuB sordidB albidis. *P. pyenantha.*
bractea 3-fidis, ovario ovoideo, folia 3-natim verticillatis pionati-
aectis rhachi intBgris, filamBnhia glabria, floribua purpureia , . *P., BvurgeoL*

Labio galeam seijuantB, folia pinnatiaectia rhachi integrie, capsula
calycB bngiorB:—

bractea rhombeia 3-fidia SBrratijUB, folia oppoaitia, CDTOMEG tubo
elongato extra calycBm incurvo, labio lobia rotundatifi mediD
ad baain valdB cDiiatrico, filamentia glabria, floribua ruseia . . *P. cadmea.*
braDt3ia Dvatia SBrrulatia, folia 4-natim verticillatia corollae tubo
intra calycem incurvo labio lobia Bmarginatia mBdio seaaili,
filamentia anticia hirsutia, floribua albia. *P. caucasica.*

71. Brevilabres.

P. dBnsiflora Benth.; *Hook, Flor. Bor. Amer.* ii, 110, (notul.)
P. bracteoaa Benth.; *Hook., Flor. Bor* Amer.* ii, 11D.

Elatse fDiDsæ foliis sparsis pinnatifidis laciniis inciso-serratis, spicis densis multifloris foliosis calyce nee fissu dentibus subulatis, corollse tubo recto exserto labio galea multoties brevior porrecto accumbente, filamentis omnibus glabris.

Balsa recta angub infBriore obtuso. *-P. densiflora.*
Galea apicB adunca angulo inferiors acuto. *-P. bracteoaa-*

72. Foliisæ.

P. Wilhelmaiana Fuch.; *M. Bieb., Flnr. Taur. Oauc.* iii, 412.
P. sajanensia Steph.; *Bunge, Ledeb. Flor. Ross.* iii, 298.
P. condensata, Al. Bieb.; *Flor. Taur. Cauc** ii, 72.
P. folioaa Lmn.; *Mantiss. Plant. BB.*

ElatEB folios[^] foliia sparais pinnatifidis laciniis inciso-sen-atis, spicis densis multifloris foliosis calyce nee fisso dentibus Ee[^]ualibus integris corolla tubo recto vel leviter incurvo exserto, labio galeam subseqante patulo, galea angulo frontali superiore rotundato inferiore acuto, filamentis ottnibus hirsutis.

Dalyce dentibus linearibus galea glabriuscula fronts obtusa, capsula
latB Dvata obliqua calycBm BxcedentB. P. *Wilhelmsiana*.

DalycB dentibus deltoideis :—

galea subDratata glabra. P. *sajanenn*

gal9a frontB obtusa :—

galsa glabra capsula nbovata seq[^]uali calyce inclusa . . . P. *condensata*.

galea villosa capsula obliquus ovata Bt mucrouata . . . P. *foliosa*.

73. Exaltatse-

P. atropurpursa Nordm.; Bull. Acad. >Sc. St. Prtersb. ii, 313.

P. BxaUata Bessrr; Flora ii (1832), BeibldtL J9.

P. sumana Spreng.; PL Nov. ii, 7D.

Elatse foliosse foliis sparsis pinnatifidia laciniis inciso-serratis, spicis dsnsis multi-floris foliDsis calyce antice fisso dentibus setjualibus integris corollse tubo recto vel leviter incurvo exserto labio galeam subEequante patulo, galea ang-ulo superiore rotundato inferiors acuto, filamentis anticis dense hirsutis posticis glabris vel leviter barbatis.

Brakea infra apicBm brBvissime dBntata margins glabra n'lamsntis
antiuis tan turn hirsutis, Dorulla atrupurpuroa.....P. *atropurpitrea*.

Galea edsntata margins pubescent a filaments anticis dBnss poatioia

lavitBr hirautilis, corolla uruhroleuca :—

tubo corDilse glabro caulB slato pol[^]hylllo. P. *exaltata*.

tubo corollBB intus hirsuto, cauls superne taotum foliato . . . P. *swnana*.

74. LimnogBna.

P. limnDgena Kerner; Oesterr. Bot. Zeitschr. xiii, 3B2.

Humilis caulibus simplicibus, follis lanceolatia pinnatifidia segmentis ovato-lanceolatis serrato-dentatis caulinis sparsis paucia radicalia ceespitosa excedentibus, spica terminali bngiuscula calyce campanulato pedicBllato nee fisso dentibus deltoideia integris corollge tubo recto exserto labio galeam subceijuante patulo; filamentis anticis hirsutis.

Corolla parvula, capsula calycB 2-plo longiorB. P. *limnogen*.

75. Rosese.

P. rDSBa Wulf.; Jacq., Miscell ii, 57.

P. orthantha Griseb.; Spicil. FL Eumel. ii, 15.

Humiles caulibus simplicibus foliis oblongo-lancBolatia pinnatisectia segmentis an[^]uste lanceolatia serratis caulinis sparsis paucis radicalibus ceespitosis minoribus, spica brevi

calyce campanulato nee fisso profunde indentato dentibus angustis integris corollae tubo recto exserto galea angulo superiore obtuso inferiore acuto labio galeam subaequante patulo.

Filamentia omnibus hirsutis. *P. rotea.*

Filamentis anticis hirsutis. *P. orthantha.*

75. *Hirsuta centripeta.*

P. Langslopfii Fisch.; Steud. *Mnogr. Pedic.* 49.

Humilis vel elatior hirsuta foliis pectinatifidis sparsis spica laxa centripeta calyce campanulato corollae tubo recto exserto labio galea brevior patulo, galea obtusissima inira apicem minutissime bidenticulata.

Galea rosea filamentis omnibus hirsuta. *P. Langsdorfii.*

77. *Hirsuta verse.*

P. lanata Willd.; ex Cham, et Schacht., Linn. ii, 584.

P. hirsuta Linn.; Sp. Plant. B09.

P. olympica Buitt.; Diagn. ser. 1, 4, p. 83.

Humiles hirsutae (glabriuscula *P. olympica*) foliis pectinatifidis sparsis spica densa centrifuga calyce campanulato corollae rosae tubo recto exserto labio patulo galea obtusissima.

Spica albo-lanata galeae apice deorsum acutiusculo inferne paucissime

bidenticulato staminibus anticis hirsutis. *P. lanata.*

Spica non albo-lanata galea utroque angulo obtusa tamen amentia omnibus glabris:—

caule cum spica lanato labio galeam subaequantibus. *P. hinuta.*

caule cum spica glabriuscula labio galea breviora. *P. olympica.*

78. *Flammula.*

P. Oedgri Vahl; Eornem., Oekon. PlanteL, BI. ii, 58 D.

P. Alberti Regel; Act. Hort. Petrop. vi, 353.

P. flammula Linn.; Sp. Plant B09.

Humiles hirsutae foliis pinnatifidis spatiosis spica densa centrifuga calyce campanulato corolla citrina cum vel sine maculis duabus ad galeam tubo recto exserto labio patulo galea breviora.

Galea apice deorsum acutiusculaj filamentis anticis hirsutis, foliis

subbrunneatis, corolla brunneo-maculata. *P. Dedm.*

Galea obtusissima filamentis omnibus glabra:—

foliis pinnatifidis rhachi serratis corolla concolore citrina . . . *P. Alberti.*

foliis subbrunneatis corolla brunneo-maculata *P. flammula.*

CHAPTER VII.—SPECIERUM INDICARUM CLAVIS ARTIFICIALIS.

Galea rostrata;	
staminibus apice tubi sequalis insertis;	
foliis sparsis;	
filamentis omnibus hirsutis;	
calyce carapanulato, 3-dentato, antice ad medium fisso;	
floribus luteis.	<i>P. longiflora</i> 2
calycB oblongo, 5-dentato, antice vix fisso; floribus	
purpureis;	
rostro flexuoso apicB emarginato.	<i>P. bella</i> 8
rostro porrecto profunde 2-fido.	<i>P. Przewalskii</i> 9
filamentis antice hirsutis, floribus purpureis;	
rostro apice integro, calyce 5-dentato.	<i>P. rhinanthoides</i> 1
rostra apice 2-fido;	
calycB 5-dentato, galea faucB edentata	<i>P. mpinganthera</i> 6
calyce 3-dentato, galea fauce utrinque 1-dentata	<i>P. siphonantha</i> , 3
filamentis omnibus glabris, floribus luteis;	
rostro longissimo apice resupinato integro	<i>P. elephantoides</i> -
rostro profundi 2-fido, galea fauce contorta	<i>P. biconvoluta</i> 4
foliis oppositis;	
filamentis omnibus hirsutis, floribus purpureis	<i>P. integrifolia</i> 17
staminibus infra apicB (sepius medio nonnunquam infra	
medium) tubi plus minus sursum ampliati insertis;	
foliis sparsis;	
filamentis omnibus hirsutis;	
rostro labium saltern sequens, floribus purpureis,	
filamentis minus tubo insertis;	
rostro circinnato apice 2-fido;	
calycB ovato ad basin usque fisso, labio	
ciliato	<i>P. Elwmi</i> 16
calyce campanulato ad medium fissum, labio	
glabro lobis rotundis.	<i>P. macrantha</i> 14
calyce oblongo vix fisso, labio glabro lobo	
minus oblongo.	<i>P. Garckeana</i> 11
rostra recto apicB 2-fido, calyce oblongo vix fisso	<i>P. Daltoni</i> 10
rostro recto apice truncato-emarginato, calyce	
subinflato nee	<i>P. Wallichii</i> 43
rostro falcato apice acuto integro calycB cam-	
panulato nee	<i>P. gruinva</i> 34
rostro labio manifeste brevius apicB 2-fido ;	
rostro deorsum spectante, filamentis minus tubo	
insertis;	
calycB campanulato ad medium fisso, floribus	
luteis.	<i>P. Scullyana</i> 15

Baha rostrata—*continuata*.

oalyce obltjngo vix fisso, floribua purpurBia;	
tubo calycem requante, labii lobis	
ID inline integris seijuilatis . . .	P. robusta . . . 12
tubo calycB 2-plo longiors, labii lobis	
margins crenulatis medio iBliquis	
minors.	P. nepalensis . . . 13
rostra horizon tali, filamsntia ex adverso summi	
ovarui insrtia.	P. flagellaris . . . 35
filamentia aBticia hirsutia, floribua puniceis;	
gab a faucB utrin^ue 1-dentata, filamentis medio	
tubo insBitis.	P. odontophora . . . 41
galea fauce edentatu, filament is ex adverse) summi	
DTarii insBrtia.	P. Pantlingii . . . 32
filamentis omnibus glabris;	
labio stipitato; floribus puniceis;	
labio o lata basi BBnsim attenuata lobia parvulis,	
filamsntis basi tubi inaertis.	P. exceka 44
labio ang-uste stipitato lobia ovntia a out is, gaJea	
dorso parc9 pilosa;	
rustro apice 2-fiio, filamBntis ex adversD	
summi ovarui insrtis.	P. Clarkti . . . 47
rustro apirce integro pBuiuillab-villoso, fila-	
mentis medio tubo insertis.	P. lachnoylossa . . . 45
labio BBSsili;	
galsa dense hirsuta rostiD falcato apice integTo,	
filamentis props basin tubi insrtis, floribus	
purpuiBis.	P. trichoglosw . . . 46
galea glabra rostro porrectu;	
lubio maTgins ciliatD lobis rotundatis, flori-	
bus puniceis ;	
rostra apiue emarginato, filamentis ex	
advBrso summi ovarui insertis . . .	P. carnosa . . . 37
rpstru 2-fido, filamBntia mudio tubo	
nsertia.	P. microcalyz . . . 33
labio margins BDiliato;	
labio lobis truncatis rostro 2-fido, fila-	
mentis BX ad verso summi ovarui	
insertis, floribus punicBis - . . .	P. furfurawa . . . 31
l'dbD bbis rstundatis rostro Drenato nee	
2-fido, filamBntis mediot ubo insBrtis,	
floribus albis.	P. dbiflwa . . . 42
iuliis oppositis vel vBrticillatis;	
tilamentis omnibus hirsutis;	
etaminibus BX adversj summi ovarui in sacculo	
transverse inseTtis ibique villosis;	
foliis caulinis SBSsilibus, floribus lutsis . . .	P. tenuirvstris . . . 19
iqliis caulinis ladicalibus^ue petiolatis, floribus	
purpureis.	P. pectinate . . . 18

Galea rostrata—conclusa.

staminibus mBdio tubo insertis hiDe glabris, foliis caulinifl petiolatis, floribus purpureis.	<i>P. pyramidata</i> . . .	20
filamentis anticis hirsutis;		
rDstro apice integro, tubo calycsm vix excedente; rostro truncato labio brBvior, staminibus ex aivBrso summi ovarii insBrtis, floribus luteis	<i>P. alasvhanica</i> . . .	51
TDstro aouto labiD aetjuilongD, staminibus medio tubo insBrtis, floribus puniceis.	<i>P. tenuicaulis</i> . . .	30
rostrD apicB inciso, tubo calyce IDUgiore, filamentis medio tubo insertis, floribus purpureis; calycB vix fissus, rostrD truncato apicB laciniato	<i>P. schizorrhyncha</i> . . .	50
calyce trientB fissD, rostro apioB emarginato; rDstro horizon tali labium mquante, foliis pinnatifidis Dppositis.	<i>P. flexuosa</i> . . .	28
rostrD dBfbxo labio brBviorB, foliis parvulis 2-pinnatifidis 4-natis VBrticillatis	<i>P. Gammieana</i> . . .	49
filamentis omnibus glabris, floribus purpureis;		
rDstro labio longiore apicB integro, calyce nee fissus; rostro flbxuoso, staminibus mediD tubo insertis.	<i>P. Oliveriana</i> . . .	21
TDstrD recto, labio parvulo, staminibus supra medium tubum insBrtis.	<i>P. Heydei</i> . . .	25
rostro recto labium sequante; calycB antice ^ fissus, rostro integro, labio 3-fido, tubo calycis triplo longiore.	<i>P. chumbica</i> . . .	29
calyce nee fissD; rostro 2-fido, labio 3-fido, staminibus ex adverse summi ovarii insBrtis, tubo calycB longiorB.	<i>P. brevifolia</i> . . .	22
rDstro apice integro; labiD 3-partito, staminibus medio tubo insertis, tubD calyce \ longiore - ,	<i>P. instar</i> , . . .	23
labio tantum 3-fido; staminibus supra medium tubum insertis, tubD calyce \ longiore, floribus paucis axillaribus - .	<i>P. purrecta</i> . . .	26
staminibus medio tubo insBrtis; tubo calycB duplo longiorB, floribus confBrtis	<i>P. confertiflora</i> . . .	27
tubo calycem vix excedente, floribus paniculato-racemosis	<i>P. gracilis</i> . . .	24
Galea erecta vel brevissima latirostrata;		
galea infra apicem utrinque dentata;		
foliis sparsis ; filamentis anticis hirsutis, galea distincte rDstrataj floribus ochroleucis	<i>P. dvlichvrrhiza</i> . . .	55

Gralea erostris vel brevissimis latirostrata—*continuata*.

foliis DppDatis VBI VBrticillatis;

filamentis omnibus hirsutis, galae utrinque 1-dentata,

floribus luteis. *P. rex* 54

filamentis anticis hirsutis, galea utrinque 1-indentata;

labio angustis stipitato lobis latibilibus media

minoribus, floribus viridibus. *P. fragilis* 66

labio B lata basi stipitato, floribus purpureis;

tubo incurvo labio lobis latibilibus medio

majoribus, galea incurva lobis distincta *P. comptoniaefolia* 53

tubo recto labio lobis supparibus, galea recta

dentibus *P. collata* 65

filamentis omnibus glabris, galea utrinque 3-indentata,

floribus albis. *P. lyrata* 52

galea elentata;

foliis sparsis;

filamentis omnibus hirsutis anticis tamen densioribus,

galea lavit uristata; planta acaulis. *P. Rpgeliana* 56

filamentis anticis hirsutis. *P. Oedeti* 69

filamentis omnibus glabris;

calyce 5-indentato, labio lobis abijulatis, staminibus

medio tubo VBI supra medium insertis;

tubo calyce 4-plo longioribus, labio lobis obovatis,

floribus albis. *P. pbrrottetii* 7

tubo calyce vix brevioribus, labio lobis ovatis

albis, floribus luteis. *P. pbriniana* 48

DalyD9 2-fido, staminibus ex adbrso summi ovarii

filamentis, floribus purpureis;

tubo calyce 2-plo longiore, galea labium Bscadentibus *P. corymbosa* 38

tubo calyce vix brevioribus;

galea labio longioribus; foliis scabris *P. Colkuii* 4D

galea labio brevioribus. *P. zeylanica* 3 9

foliis oppositis vel verticillatis;

filamentis omnibus hirsutis, floribus purpureis *P. denudata* B3

filamentis anticis hirsutis;

staminibus imo tubo insertis, tubo recto, labio parvo

lobis lateralibus medio angustioribus, floribus

albis *P. Einyii* 67

staminibus medio tubo insertis;

tubo medio incurvo, labio lobis latibilibus medio

duplo latioribus, filamentis sordidibus albis. *P. pycnantha* BB

tubo apice infracto, labio lobis roquilatis, floribus

puniceis *P. gibber* B1

filamentis omnibus glabris;

labio marginibus uliatis lobis abijulatis, tubo apice

infracto, staminibus imo tubo insertis *P. mollis* 54

Galea erostri vel brBvissima latirostrata—oonclusa.

labio margins glabro, floribus puniceis;

labio lobis ^quilatis, tubo intra calycem infracto,
staminibus ex adverso ovarii insertis;

galea frontis ibcliva. *P. globifera* .. . 57

galea frontu truncata. *P. chtilanthifolia* . 58

labio lobo meio latioribus min ore, staminibus
ex adverso tubi infractionis insertis;

tubo ipso apice infracto. *P. polygaloides* - • I B2

tubD intra calycem infracto;

galea acuminata labium BupBrante . *P. ophiocephala* . . 59

galea labio manifesto breviorB . . . *P. Royli.* .. . 60

(Galea ignota);

foliis sparsis; pedicellis fructiferis resupinatis;

(filamentis ignutis);

staminibus ex adverso ovarii insertis;

calycis 2-tilo subgracilibus ex adgusta basi divatis serratis . *P. cunipes*, . . . I 36

PART III.—DESCRIPTIONS OF THE INDIAN SPECIES.

DIVISIO I.—LDNGIRDSTRES MAXIM.

§ SIPHDNANTH^E Benth.

Foliis til tern is; fl Drib us quasi DBntrifugo ording opertis :—

calycB iente Bummo integrD r&lijuis SBrratis :—

calycQ 5-dBntato. 1. p. *rhinnani/wides.*

calyca 3-dsntato:—

filamentis omnibus hirsutis. 2. P. *long/flora.*

filamentis anticis hirsutis. 3. P. *siphonantha.*

calycB ientibus omnibus serratis:—

corolloB tubo requali, filamentis apice tubi inserts:—

filamentis omnibus glabris:—

galea rDstrata:—

rDstr" apicB profunis 2-fido, faucg contorta . . . 4. P. *bicornuta.*

roRtro reotiuscub apicB intBgro, faucB plana . . . 5. P. *elephantoides.*

gaha Brostri. 7. P. *Perroittnii.*

filamentis anticis hirsutis. 5. P. *megalantha.*

filamentis omnibus hirsutis :—

rDstro sigmoideo, labiD lobr> msillo minimD 8. P. *bella.*

rostrO porrecto 2-fioo horizontali, lobis supparibus . . 9. P. *Przewahkii.*

corollæ tubo sursum parum umpliato, filamentis medio tabu

insertis omnibus hirsutis:—

calycB DbIDngo antics vix fissD:—

rostrO horizDntali recto. 1 f. P. *Daltoni.*

rostrO DiroinnatD. 11. P. *Qarcfceana.*

rostrO deorsum directo rpcto brevi:—

tubo calycem spijuate. 12. P. *robmta.*

tubo calyoe 2-plo lnngiore. 13. P. *tiepalejsis*

calycB ovato anticB fisso :—

calyce J fisso labio eDiliato:—

lobis supparibus, floribus purpurcis vel Dchroleucis 14. P. *macrantha.*

lobo medio mioorB, floribus luteis. 15. P. *Scullyana.*

calyca fere ad basin USDJVO fisso, labio margins densB

ciliato. 16. P. *Elo-rail.*

Foliis oppositis, floribus manifests csntripetis. 17. P. *inteyrifolia.*

1. Pedicular is rhinanthuides Schrenk (1841).

Kana vel elata glabrata rhizomate brevi radicibus cseapitoais fusiformibus caulibus arcuatis **foliis** lineari-oblongis radicalibus caespitoaia bnge petiolatis pinnatisectid SBginentis 9__12-iugis ovatis mucronato-dBiitatia caulinis paucis sparsis breve petiolatis floribus axil. larjbus pedicellatis racemis densifloris calycis ovati antice ad medium fisai 5-dentati segments summo lanceolato integro reliq[uis ovatis mucronatodentatis minors corollse tubu culy-

cam fere iuplo superante labio 3-fio lobis rotundatis margine eciliatis lateralibus dorso corollae ses_B teg_Bntibus medio duplo latioribus galea subinflata angulo subrecto incurva parte basali tubo dimidio latiore antics inclinata fauce integra 'vel rarius 2-auriculata partB antherigera horizontali in rostrum tenue apise aciito integro sensim abeunti staininibus apicB tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate exssrto capsula calyce SBsqulongiore ovato-obbnga apice oblique acuminata seminibus apice antics cristatis ovoideis pallidis distinctB reticulatis.

VAR. *typica*; rostro galeam subsequante labium vix excedente.—P. rhinanthoides Schrmk in Fisch. et Mcy., Enum. PL Nov. i, 22; Walp_{mj} Rep. 1\y 413; Bwth. DC, Prodr. x, 5B5; Bunge, Ledeb., Flor. Ross, iii, 27B; Prain, Jour. As. Soc. Beng. lviii, 2, 272.—P. Elephas Benth, DO. Prodr. x, 5B5, pro parte (1B4B); Buiss., Flor. Orient iv, 489 [pro parte nee Diagn. 1, 4, 81].

In alpihus HINDU-KUSH; in valle Hadji-gak ad nives, 1D5DO p. s. m., Griffith (Journ. 1DB0)!

DISTRIB.—In alpihus Alatau et in Turkestan.

VAR. *labellata*; rostro galea fere duplo bngiore labium longe excedentB.—P. labellata J&cquem. mss., Dene in Jacquem. Voy., Bvh 117, t. 122 (1844); Walp., Rep. iii, 414; Benth., DC. Prodr. x, 565.—P. rhinanthoides Hook. l., Flor. Brit. Ind. iv, 314 \syn. omn. exclus.) (1884).—P. siphonantha Hook. f., Flor. Brit. Ind. iv, 313 [pro parte nee Don] (1884).

In HIMALAYA occidental:—Glatong Ghauti, 18,309 p. s. m., Jacquemont; Zirkotnl, Falcvner! Kunawar, Vicary! Lanak, 12,0D0 p. s. m., Thvmson! Lahul, Hay! Sai, 13,D0D p. s. m., Tanner! Ladak, 11,000 p. s. m., Jvschke! Karnag, 14—17,000 p. a.m.; Rupschu, 15-18,000 p. s. m.; Chandra, 12—13,000 p. a.m.; Kibler, 14-15,500 p. a. m.; Gieumal, 15,000 p. s. m.; Ishomori et Tehra, 15—17,000 p. a. m.; Stoliczka! Pangi, 11—16,590 p. a. m., Heyde! In Himalaya orientali:—Phari; apud Kangma et ad ripas fluminis Pe-namong Clm, et in aliia locia, Kingii mercenar!

DISTRIB.—In Yarkand, in Kansu, in Tibet borBali et in Yunnan.

Caulibua 3-5—30 cm. altis; foliorum petiolia 2—5 cm. hia caulinarum 82epiu3 basi diktatis, segmentia 5 mm. ssepiasime distantibua; pedicellia 5 — 9 mm., calyoe 12—I⁵ mm., coull[^] tubo VAR. *typicm* 18 mm, VAR. *labellafa* 25—28 mm. longo, galese parte basali 4 x 4 mm. paite antherigera 6 X 3"5 mm. rostro VAR. *typicve* 3—5 mm. VAR. *labelhtcs* 8—10 mm. labio VAR. *txjpim* IB mm. lato VAR. *lafollattz* 25—28 mm.; capsula 19 m^{m>} longa 6 mm. lata basi oblonga seminibua 2 mm. longia,

PLATE 1. A—D; figa. 1—8.—P. rhinanthoiB8 Schrenk.

A—Specimen of VAR. *typica* from Hadji-gak.

B— „ of „ „ from Sairam, Turkestan.

^— „ oi form connecting VAR. *typica* with VAR. *labellata* from Tehri-Garhwal.

D—Specimen of VAR. *labelUia* from Pangi.

Fig. B. is from a specimen of VAR. *labellata* from Rupschu.

The description is based, on an examination of 13 individual specimens of VAR. *typica* and of 48 specimens of VAR. *labellata*.

Mr. Maximowicz in 1877 (*Mel. Biol.* x, 82) diagnosed *P. rhinanthoides* from *P. labellata* as follows:—

filaments glabrous, beak shorter than tube 2-dentate galea, whole plant

a span high *P. rhinanthoides* J

anterior filaments hirsute, beak longer than the edentulous galea . . . *P. labellata*;

adding to the diagnosis in 1888 (*Mel. Biol.* xii, 786), as regards *P. rhinanthoides*, "very like *P. labellata*." The original plant is not at Calcutta, but specimens from Sairam, Turkestan, collected by Mr. A. Hegel and named by Mr. Maximowicz have been examined. In these the anterior stamens are hirsute, as MM. Fischer and Meyer say they found them in Schrenk's specimens and not, as Bunge tells us he found them [*I.e.* 27B),¹ all glabrous. In Griffith's specimens, (*Jour. LDBD*), the anterior stamens are hirsute, and not, as M. Boissier [*U.*] indicates, all glabrous. The hairs on the filaments of *VAR. typica* are not numerous, but appear to be usually present; I have not found them once absent in 23 individual corollas analysed. Thus the principal diagnostic character fails. Nor do any of the other characters hold; Himalayan specimens of "*P. labellata*" vary a great deal in size, but have the beak very uniformly twice the length of the hood, while specimens from Phari (of which I have examined 11), though not exceeding 12 cm. in height, have the beak thrice the length of the hood. On the other hand, the gathering from Bamsor [Duthie 57B) consists of dwarf specimens with the short beak of *VAR. typica*, but with the densely hairy anterior filaments of "*P. labellata*." Among the 48 specimens of ^{1c}*P. labellata*" in the herbaria of Calcutta and Saharanpur examined by me, 43 have edentulous corollas, 4 have the throat 2-auriculate (a flower from one of these is shown in Plate 1, fig. 8), and one from Zalang Karpo in Karnag collected by Dr. Stoliczka has the throat on both sides very distinctly toothed, the teeth being much longer than in any specimen of *P. siphonantha*, a species in which this character is a normal one. It is not therefore possible to consider *P. labellata* specifically separable from *P. rhinanthoides*.

Dr. Griffith's Hadji-gak plant, referred by Mr. Bentham to *P. Elephas* Boissier in 1846, is by Boissier himself, so recently as 1879, only doubtfully placed there. And this cannot be its position, since Boissier describes *P. Elephas* as having the apex of the beak 2-fid, whereas the apex of beak in Griffith's plant, which agrees completely with Fischer and Meyer's description of *P. rhinanthoides*[^] and is precisely the same as A. Hegel's Sairam specimens, is entire. Genuine *P. Elephas*, on the other hand, cannot be satisfactorily diagnosed from *P. siphonantha*. But another Griffithian specimen referred by Bentham *Lc.* to *P. labellata* is not that plant, but is *P. siphonantha* *VAR. breviflora*; consequently *P. labellata* Boiss. (*l.c.* 489), which depends on this specimen alone, is not the same as *P. labellata* Jacq., but is = *P. siphonantha* Don. Sir J. D. Hooker, *Lc.* 313, reduces *P. labellata* to *P. siphonantha*; the following are the diagnostic characters of the two species:—

calyx 5-toothed, margin of lip ciliate, lobes not emarginate, basal

portion of hood incline! forward, beak entire at apex . . . , *P. rhinanthoides*;

calyx 3-toothed, margin of lip ciliate, midlobe emarginate, basal

portion of hood erect, beak 2-fid at apex *P. siphonantha*

¹ In every case in which the letters *I.e.* are employed the reference is to the synonymy that follows the specific description of the particular species under review, and not to any other part of the text

P. rhinanthoides flowers in June in Alatau, in July in Hindu-Kush, and in August in the Himalaya; the flowers are purple or pink, sometimes pale rose; in one gathering it is noted as having white flowers with salmon-coloured spots.

2. *Pedicularis longiflora* Rudolph (1811).

Nana vel elata glabrata rhizomate brevi radicibus cespitosis fusiformibus caulibus centrali erecto excepto arcuate ascendentibus foliis radicalibus cespitosis petiolatis pinnatisectis segmentis 5—8-jugis lanceolatis pinnatifidis -partitisve laciniis serratis caulibus nunciosis sparsis breve petiolatis petiolis glabris vel margine hirsutis floribus axillaribus pedicellatis racemosis densiflora calycis anguste ovati antice ad medium fissi 3-dentati segmento summo subulato vel D integro lateralibus lanceolatis serratodentatis (raro integris et rarissime divisij minore corollae tubo extus pubescente calycem 4—7-plo superante labio 3-fido lobis emarginatis margine ciliatis lateralibus medio dimidio latioribus galea subinflata circinnate incurva parte basali tubo 1/2-jugulata erecta fauce integra vel 2-sinuata parts antherigera falcata in rostrum tenue apice obtuso 2-fido sensim abeunti staminibus apice tubi insertis filamentis omnibus hirsutis nario lanceolato stigmate exserto capsula calyce sesquilingiore ovata apice acuta seminibus apice subcristatis ovoideis nigris striatis vix reticulatis.—*P. longiflora* Rudolph, *Mem. Acad. Petersb.* iv, 345, L 3; Spreng., *Syst. Veg.* ii, 777; Bunge, *Ledeb. Flor. Ross.* iii, 276; Maxim., *Mel. Biol.* x, 86; Prain, *Jour. As. Soc. Beng.* lviii, 2, 272.—*P. tubiflora* Fisch., *Mem. Soc. Mosc.* iii, 58 (1812); Steven, *Mynogr. Pedic.* 31; Walp., *Rep.* iii, 413; Benth., *DO. Prodr.* x, 5B5; Hook. f., *Flor. Brit. Ind.* iv, 314.—*P. tubiformis* Klotzsch, *Reis. Pr. Wald.*, Bvt. 1DB, t 57 (18B2).

In HIMALAYA occidental:—Drankar, 12,DDD p. s. m., Thomson! Lahul, Hay! Lei, 12—14,DDD p. s. m.; Rupschu, 15—18,DDI p. s. m.; Kibler, 14—15,5DD p. s. m.; Drankar, 12,3Dt p. s. m.; Lanak, 15—18,0DD p. s. m.; prope Chikkim, 13,5DD—15,5DD p. s. m.; apud Ishomori et prope Kargil, Stoliczka! Mashow, 11,ODD p. s. m., Brandts! Pangi, 11—1B,5DD p. s. m., Heyde! Kamaon; Hoffmeister, Strachey et Winterbottom; in valle Ralam, 11—12,DDD p. s. m., et apud Kuthi in valle Byas, 12—13,DDD p. s. m., Duthie 3,232! In Himalaya orientali:—apud Jongri, 13,DD0 p. s. m., Kingii mercenar. ! Sikkim, 12—14,ODD p. s. m., Hooker! Jaffrey! Lachoong, 9,DDD p. s. m., Pantling! apud Tan-ka-la, Dho-la, Uhop-ta et Ta-lung Pa-dong, 11—13,DDD p. s. m., Kingii mercenar. ! Chumbi; apud Toong-shong, apud Ree-dong-oong et in locis aliis plurimis, Kingii mervenar. ! Phari, apud Kangma et ad ripas fl. Pe-na-mong Dhu, Kingii mercenar. ! Bootan; La-ree, 13,DDB p. s. m. j Kingii meroenar. !

DISTRIB.—In Siberia baicalensi et in Mongolia boreali freijuensj in Tibet boreali atque in China boreali.

Caule 2—2D cm. altis; foliorum petiolis 1—3.5 cm., segmentis 3 mm. contiguis; pedicellis 3—10 mm., calycis 13—12 mm., corollae tubo 45—65 mm., galeae parte basali 3 mm. parte antherigera 4 mm. rostro B mm. parum bifido segmentis rotundatis labio 14 mm. lato; capsula 19 mm. longa 5 mm. lata basi angustata antice sinuata seminibus 2mm. longis.

PLATE 1. E, F; figs. 1D-1 B.—*P. longiflora* Rudolph.

E—Specimen from Ladak, W. Tibet.

*— JJ ji ReBiong¹, Chumbi.

Fig. 1D.—Five differently-toothed calyces, all from a single specimen *horn* Jongri

This description of *P. longiflora* is based on an examination of 109 separate specimens and on the dissection of flowers from specimens of 53 different gatherings.

P. tubiformis Klotzsch is only a tall form of the species.

Of 40 gatherings at Calcutta, where the colour of the corolla has been noted, 31 are yellow-flowered, two Sikkim gatherings have white flowers, and one from Kan^g-ma in Phari has yellow tube and lip with purple galea. Mr. Maximowicz finds that the lower lip of specimens from Burchan-Budda in N. Tibet has two cuneate purple marks, and the same thing is seen in some of the Calcutta specimens from Jongri.

Of Indian species this comes nearest to *P. siphonantha*; the diagnosis is as follows:—

all lobes of lip emarginate, galea throat 2-sinuate, all filaments hirsute *P. hnniflora* ;
only central lobe distinctly emarginate, galea throat 2-entate, only
anterior filaments hirsute. *p. siphonantha*.

Fruiting specimens also are easily diagnosed; in *P. longiflora* the capsule is sinuate anteriorly and the seeds are black, striate, but not reticulated; in *P. siphonantha* the capsule is not sinuate, the seeds are pale and distinctly reticulated.

Of extra-Indian species *P. chinensis* Maxim., a distinct species in habit, stature, leaves, and calyx much like certain forms of *P. megalantha*, comes near to this, but differs in having the lateral lobes of the lip rounded, not truncate, and in having the apex of the beak of corolla entire. A specimen of the original gathering of *P. chinensis* has been kindly sent to Calcutta by Mr. Maximowicz. Certain specimens from North China (Potanin, 1885) issued as "*P. chinensis*" from the St. Petersburg Herbarium are however, only *P. tubiformis* Klotzsch, and therefore are merely tall forms of *P. longiflora* Rudolph.

The only author who has followed Steven in giving Fischer's name for the species, and who has at the same time quoted Rudolph's name (as a synonym), has been Walpers. He (*i.e.*) has taken the deliberate, if somewhat unusual, step of indicating that the name which he keeps subordinate was published in 1811, and at the same time shows that he supposes the name which he accepts to have been first published in Steven's work, *i.e.*, in 1823, or 12 years later than the date of his synonym,

3. *Pedicularis Siphonantha* Bon (1825); *Hook l., Flor. Brit Ind.* iv, 313
[syn. *P. labellata* atque *P. Hoffmeisteri exolusij* (1884).

Nana vel elata glabra VBI pubescentibus rhizomate ramoso radicibus fusiformibus caulibus decumbentibus vel ascendentibus foliis radicalibus cespitosis petiolatis pinnatisectis segmentis 8—15-jugis lanceolatis ovatisve pinnatifidis vel dentatis caulinis paucis sparsis brevis petiolatis floribus axillaribus pedicellatis racemis densifloris calycis ovati antica infra medium fissi 3-dentati segmento summo subulate vel D integro lateralibus ovatis serrato-dentatis nonnunquam divisis minoribus corolla tubo calycem 2—5-plo superante labio 3-fido margine ciliato lobis lateralibus subrotundatis dorso corollae sese tegentibus medio emarginato dimidio latioribus galea subinflata circinnate incurva pars basali tubo dimidio latiore erecta fauce 2-dentata -auriculatae parte antherigera falcata in rostrum tenue apice obtuso 2-fido sensim abeunti staminibus apice tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate exserto capsula calyce sesquialongiore ovato-oblonga apice subrecte acuminata seminibus apice antice cristatis ovoideis pallidis distincte reticulatis.

VAR. *typica*; corollae tubo calycem 4—5-plo superante galea faucibus acutiuscule 2-dentata; foliorum segmentis lanceolatis.—*P. siphonantha* Don, *Prodr. Flor. Nepal* 95; Wall, *Cat* 417; Benth., *Scroph. Ind.* 53; Walp., *Rep.* iii, 413; Benth., *DC. Prodr.* x, 5B5; Maxim., *MeL Biol.* xii, 796.—*P. Hookeriana* Wall, *Vat* 421 (1828); Benth., *Scroph. Ind.*, 53; Walp., *Rep.* iii, 413; Benth., *DC. Prodr.* x, 5B4.—*P. himalayca* Klotzsch, *Retz. Pr. Wald.*, *Bot* 107, t. 58 (1862).

In HIMALAYA occidentalis—Tibet Occidentali, Reeves! *Fahonerii mercenar.* (sepiariae)! Lahul, Hay! Watt! Gilgit, Giles! Kashmir, Royle! Sedgwick! Dhenie, Stewart! Chamba? Ellis! Pangi, Brandis! Stoliczka! Zaskar, Stoliczka! Sirmur, Vicary! Kamaon, Wallich! Simla, Royle! Kundu, 9000 p. s. m. et Jakko, 11,000 p. s. m., Svoblich! Pindir, 12,000 p. a. m., prope nives glacie coarctata, Collett! Dharma, 11—12,000 p. a. m., Duthie! Reid! in valle Ralam, 13—15,000 p. s. m. et apud Taulea, infra Srikanta, 12—13,000 p. a. m., Duthie! Tehri; in valle Damdar, 14,000 p. a. m. et prope Dudu infra Srikanta, Duthie! Garhwal; prope Kuari, 12—13,000 p. a. m. et supra Bhowani, Duthie! Nepal occidentalis; Budhi, 11—12,000 p. a. m. et Palang Gadh, Duthie! Nepal centralis; in Gosain Than, Wallich! Scully! In Himalaya orientalis:—Jongri, 14,000 p. s. m., Watt! *Kingii mercenar.* (sepiariae)! Sikkim; 11—15,000 p. a. m., Hooker! Kurz! Jaffrey! Lang-mang-nang-zo, 10,000 p. s. m. et Yeumtong, Hance! p. a. m., Panthong! Saibod-la, 15,000 p. a. m.; Donkia-la, 14,500 p. a. m.; Beeroom, 13,000 p. a. m.; Gria-gong, 13,000 p. a. m.; Na-tong; Ze-lep-la; Too-koo-la; BDD-tang; Koo-ma-pya; Retchi-la et apud Chun-gDD infra NotoDt in partibus ad Sikkiro pertinentibus; Chumbi, aed infrequens, *Kingii mercenar.*!

DISTRIB.—In Linse prov. Sze-tachuan.

VAK. *hrevituba*; corollae tubo calycem 2—3-plo excedente galea fauce obtuse 2-auriculata vel integra; foliorum segmentis ovatis.—*P. punctata* Dene in *Jacquem. Voy.*, *Bot* 111, t. 122 [1844]; Walp., *Rep.* iii, 414; Benth., *DC. Prodr.* x, 564.—*P. Elephanta* Burm., *Diavp.* aer. 1, 4, Bl (1844); Walp., *Rep.* iii, 414; Benth., *DC. Prodr.* x, 555 [pro parte]; Boiss., *Flor. Orient* iv, 489 [pro parte].—*P. labellata* Benth., *DC. Prodr.* x, 565 [pro parte] (1845); Boiss., *Flor. Orient* iv, 4B9 [nee Jacquem.].—*P. Hookeriana* Aitch., *Jour. Linn. Soc.* xyiii (1880), 84 (nee Wall).

In HIMALAYA occidentalis:—circa Gombour, Jacquemont; in valle fl. Chenab superioris, 12,000 p. s. m., Baden-Powell! apud Sanch, 14,000 p. a. m., Ellis! Gilgit, 11—13,000 p. a. m., Giles! In Afghanistan; apud Shendtoi in paludosa, Aitchison 759!

DISTRIB.—Persia.

Caulibus 2—35 cm. altis; foliorum petiolis 2—4 cm. segmentis 2—12 mm.; pedicellis 5—9 mm., calyce 9—11 mm., corollae tubo VAR. *typicae* 30—70 mm. VAR. *brevitubae* 18—28 mm. galeae parte basali 2 x 4 mm. parte antherigera 4 x 2.5 mm. rDstrD 7 mm. longo labio 10—20 mm. lato; capsula 18 mm. longa B mm. lata basi rotundata, seminibus 2 nini. Maio—septembre floret.

PLATE 2. A—D; figs. 1—14.—*Pedicularis siphonantha* Don.

A—Specimen of VAR *typica* from Na-tong, Sikkim.

B— „ „ „ from Tehri-Garhwal.

L¹— „ „ „ *brevituba* from Upper Chenab Valley-

This account of *P. sijhvnantha* is based on the examination of 117 separate specimens of VAR. *typica* and of 13 separate specimens of VAR. *brevituba*. Analyses of flowers from specimens of 71 different gatherings have been made.

The corolla tube in this widely distributed species elongates gradually as it extends from west to east; in Afghan specimens it is 18 mm. long, in Kashmir ones 30 mm., in Garhwal specimens 43 mm., in Nepalese 50 mm., in East Himalayan sometimes as much as 70 mm. long. The colour of the corolla varies somewhat; besides the many gatherings where *no* field-note has been made, there are at Calcutta 35 in which the corolla is said to be pink, 9 where it is noted as being rose-pink, 4 where it is noted as being deep purple; of one gathered at Yeum-tong Mr. Pantling has noted that the hood and beak are deep purple, the lip and tube pale pink; Dungbo, one of Dr. King's Lepcha collectors, has carefully noted on 3 specimens obtained by him on the same day at Dhoon-gu that one has a purple, another a pink, the third a white, corolla; of another gathering from Chumbi Valley the same collector notes the corolla as being pink outside and white within. Jacquemint has noted of VAR. *brevifuba* "corolla albo-punctata;" more recently Dr. Aitchison has noted of the same variety on a gathering from Shendtoi, Afghanistan, "flowers cherry-coloured with splashes of white."

For VAR. *typica* there are two distinct forms easily separated by habit and leaves:—

[a] "vera" = *P. siphonantha* Don. Prodr.; dwarf densely tufted with short decumbent stems or stemless and with leaf segments nearly contiguous, the more usual form in the Central and Eastern Himalaya; and

[b] "Hookeriana-himalayca" = *P. Hookeriana* Wall, and also = *P. himalayca* Klotzsch; tall ascending or erect (up to 35 cm. high) with leaf segments distant and subalternate, the more usual form in the Western Himalaya though not uncommon in the Eastern Himalaya also, more especially in Dhumbi and in Phari. Western dwarf forms have the corolla tube as short as it is in tall specimens from the same districts; Eastern tall forms have the long corolla tube characteristic of the genuine dwarf Nepal and Sikkim plant. Finally, several gatherings from Lahul, Pangi, and Tehri have ovate leaf segments, and thus simulate VAR. *breviluba*; from that variety their longer corolla tube, more densely hirsute anterior filaments and more acutely-toothed galea throat alone distinguish them.

For VAR. *brevifuba* there are also two distinct forms:—

[7] "Elephas" = *P. Elephas* Buies., Diagn., but only partly of Beuth., DO. Prodr. and only partly of Boiss., Flor. Orient; with short stems and contiguous imbricate leaf segments, a Persian plant of which every character as given in the author's careful description belongs to *P. siphonantha* except that he describes the filaments as glabrous—a point wherein he is in error as regards an Afghan plant that he has referred to his own species; and

[5] "punctata" = *P. punctata* Dene., also = *P. labellata* Boiss. but not of Jacquem., and = *P. Hookeriana* Aitchison but not of Wall.; tall erect with distant alternate leaf segments, confined to the Panjab Himalaya and Trans-Indus districts.

For Indian species VAR. *typica* repeats the habit and foliage of the various forms of *P. hngiflora*, VAR. *brevituba* those of the different varieties of *P. rhinanthiden*.

4. *Pedicularis bicornuta* Kutzwh (18B2).

Elata pubescens rhizomate incrassato radicibus fusiformibus carnosius caule erecto striato incrassato foliis petiolatis lanceolatis pinnatifidis caulinis inferioribus demum emarcescentibus

floralibus multo majoribus segmentis ID—3D-jugis Dblongis obtusis crenatis floribus axillari-
bus pedicellatis racemis centrifugis ssepissime condensata calycis globosi inter cDtas
hirsutas reticulati antice ad medium fissi 5-dentati segmentis supparibus lanceolatis vel
ovatis margine serratis corollae tubo extus puberulo calycem dimidio dupbe excedente
labio 3-partito bbis lateralibus rotundatis medio oblongo duplo majoribus galea subinflata
circinnata parte basali fauce tensa dorso bistorta parte antherigera falcata in rostrum
praelongum profunde bifidum segmentis lanceolatis sensim abeunti staminibus apice tubi
insertis filamentis glabris margine undulatis ovario lanceolato stigmate exserto capsula
calyce dimidio longiore ovato-lanceolata apice acuta seminibus majusculis profunde
reticulatis.—*P. bicornuta* KloUsvh, *Reis. Pr. Wald., Bot.* 109, t. 61; *Hook. l., Flor. Brit.*
Lid. iv, 312.—*P. eximia* Watt, *Jour. Linn. Soc.* xviii [1881], 381, t. 13.

In HIMALAYA occidentali:—Kashmir; in Pyr Panjal, *Falconer! Royle! Bellew! Sedgwick!*
Sartoris! Alimalikimat, *Falconer!* apud Kamri, 11—13, ODD p. s. m., *Giles!* Lahul, ID—
15, DOD p. s. m., *Brandts!* Watt! in valle Bhaga, 3,5D0—13, ODD p. s. m.; apud Sungnum in
Spiti, 11,500—12, DDD p. s. m.; props Transe Sundo in Karnag, 14—17, DDD p. a. m.; props
Puddum, 12, DDD p. s. m. et apud Rangdam Groupa in Zaskar, 12—14, DDD p. s. m., *Shliczka!*
Pangi, 11—13,500 p. s. m., *Heyde!* in jugo Sanrch, 14,000 p. s. m., *Ellis!* Kunawar,
IloffmUr; Garhwal, in valle Nila, 10—11,000 p. a. in.; Tehri, apud Kudughera, 11—
12,000 p. s. m. et in valle Damdar, 10—11,000 p. a. m., *Duthie!* Gilgit; Sai, 11—13,000
p. s. m., *Tanner!* Badakshan; Ishkitoul, 9, DD0 p. s. m., *(riles!* Afghanistan; in vallibus
Kurraïn et Hariab in declivis graminosis, 10—1*2,000 p. s. m. et apud Shendtoi, in pratis,
10—11, DDD p. a. m., *Aitchison!* Junio-Augusto floret, corolla concolor lutea.

Caulibus B-4D cm. altis cygni pennae crassitudine, rhizomatibus usque ad 10 cm.
longis; foliorum petiolis 4—B cm., laminis 8—10 cm. longis 2 cm. latis segmentis 5—8 mm.;
pedicellis 3—B mm., calyce 15—IB mm., corollae tubo 18—28 mm. galere parte basali 2½
mm. longa 2 mm. lata par to antherigera 5 x 3 mm. rostra 9—11 mm. labio 27—3D mm-
lato; capsula 25—30 mm. longa 10 mm. lata basi rotundata, seminibus 25 mm. longis.

PLATE 3. A, B; figs. 1—14.—*Pedicularis bicornuta* Khtzsch

A, figs. 1—11.—Specimen from Pangi.

B, figs. 12—14.— „ „ Kurram Valley, Afghanistan.

This account of *P. bicornuta* is based on an examination of B2 separate specimens,
and on the analysis of flowers from specimens of 29 different gatherings.

The nearest ally of the species is *P. elephantoides*. The diagnosis is as follows:—

corolla throat contorted, beak deeply 2-fid.	<i>P. bicornuta;</i>
corolla throat not contorted, beak very long, entire at apex.	<i>P. elephantoides.</i>

There are two distinct forms of the species—that from Garhwal and the Panjab
Himalaya with elongated looser racemes, with a longer corolla tube and with smaller
calyx teeth; and that from the Trans-Indus district, which has more condensed racemes,
a shorter corolla tube, larger calyx teeth and a more densely leafy stem. But the
peculiarly contorted corolla throat which characterises this species and makes its
confusion with any other Indian species impossible is the same in both districts, so that
the forms are not separable even as varieties. Extreme conditions of the more Eastern
form (*Duthie* 237!) from Rudughera in Garhwal have very lax racemes and closely
resemble *P. msgalantha*, which species, however, is without the contortion of the corolla
throat and has hirsute anterior filaments. The Trans-Indus form, on the other hand,
repeats the habit and foliage of *P. elephantoides*.

Klotzsch's figure represents the usual Eastern form and is excellent; Watt's figure, which I have been enabled, through the kindness of its author, to compare with the original specimen of *P. eximia*, shows the calyx to be smaller and the beak less deeply bifid than they are in the plant which the artist had before him; *P. eximia* is simply the ordinary Eastern form of this species originally described by Klotzsch.

5. *Pedicularis elephantoides* Benth. (1835).

Elata pubescens caule erecto stricto incrassato foliis petiolatis oblongis pinnatifidis caulinis inferioribus demum emarcescentibus foliis majoribus segmentis 5—12-jugis oblongis obtusis crenatis floribus axillaribus pedicellatis racemis centrifugis condensatis vel basi interruptis calycis globosi inter costas dense reticulati antice ad medium fissi 5-dentati segmentis late lanceolatis duplicato-serratis postico reliquis duplo minore corollae tubo calycem dimidio exsertentibus labio tripartito lobis lateralibus rotundatis medio oblongo duplo majoribus galea subinflata circinnata parte basali tubo dimidio latiore erecta fauce integra parte antherigera falcata in rostrum rectiusculum porrectum a basi tenui apice resupinato integrum abeunti staminibus apice tubi insertis filamentis glabris marginibus undulatis ovario lanceolato stigmate subexserto capsula calyce triente breviorae nuda lanceolata apice acuminata.—*P. elephantoides* Benth., *Scroph. Ind.* 53; *Walp. Hep.* iii, 413; Benth., *DO. Prodr.* x, 554; *Maxim., Mel. Biol.* x, 82 et xii, t. 1, / 4; *Prain, Jour. As. Soc. Beng.* lvi, 2, 2B9.—*P. rhinanthoides* Hook. f., *Flor. Brit. Ind.* iv, 314 [pro parte, nunc *Svhenk*] (1884).

In HIMALAYA occidentali:—Kashmir, Boyle, Sedgwick!

Pedicellis 3—5 mm., calyce 15—18 mm., corollae tubo 18—25 mm. galeae parte basali 3 mm. longa 2 mm. lata parte antherigera 3 X 3 mm. rostra 13 mm. breviora labio 28 mm. lato. Radix specimini Dalcuthensi deest; capsulae mihi ignotae descriptio ex ill. Maximowicz, *I.e.* Julio floret. Corolla lutea concolorem in speciminibus Roylei invenit Maximowicz; in specimine Calcuttensi tubum labioque luteum galeam rostrumque purpureum video.

PLATE 3. D; figs. 15—21.—*Pedicularis elephantoides* Benth.

Specimen from Kashmir collected by Major Sedgwick, R.E.

This account of *P. elephantoides* is based on Bentham's very brief diagnosis, on the excellent description and figure by Maximowicz *II.* w. and on the examination of two flowering specimens collected in Kashmir in 1885. The species is very closely allied to *P. bicornuta*, of which it repeats the foliar leaves, calyx, corolla tube and lip, as well as the glabrous stamens with very characteristic undulate margins. It differs, however, in the uncontracted corolla throat and in the much longer and quite undivided beak. In his figure of Royle's plant Maximowicz shows the midlobe of lip truncate and the anterior filaments sparingly hirsute. These characters are not present in Sedgwick's specimens. The species appears to be rare, for no specimens were received either at Saharanpur or at Calcutta from the time of its collection by Royle till Sedgwick met with it in 1885. It is just possible that it may be a hybrid, *P. bicornuta* X *megalantha*.

B. *Pedicularis megalantha* Don (1825).

Elata [rarissime nana] erecta vel ascendens pubescens vel glabrata caulibus simplicibus vel ramosis » diu distinctis longeque fusiformibus radicebus brevibus uespitis **fibrosis**

cincto foliis glabris vel nervis subtus pubescentibus petiolatis ovatis acutis pinnatipartitis seginsntis 7—12-jugia oblongo-ovata crenato-dentata floribus axillaribus pedicellatis calycibus hirsuti oblongi antice vix triente fissi 5-dentati segmento summo subintegro parvo vel 0 reliquis (nonnunquam conjunctis) ovatis crenato-dentatis corollae tubo calycem 2—4-plo superante labio 3-fido lobis lateralibus irregulariter rotundatis medio rhomboideo vel subligulato 2—4-plo latiore galea labio incumbente et hoc obtectum angulo recto incurva parte basali subreflexa parte antherigera horizontali rostro circinnato a basi tenui apice bifido aeginentia brevissimis obtusis ataminibus apice tubi insertis filamentis anticis Irirsutia ovario lanceolata atigmate inulso capsula calyce fere duplo longiore ovato-lanceolata apice acuta seminibus ovoideis pallidia distincte rebiculatis.

VAR. *typica*; striata racemis densa multiflora demum elongatis corollae tubo calycem 2—3-plo superante labio lobo medio rhomboideo lateralibus duplo minore.—P. megalantha Don, *Prodr. Flor. Nepal.* 94; Wall., *Cat.* 411; Benlh., *Scroph. Ind.* 53; Walp., *Rep.* III, 413; Benth., *DO. Prodr.* x, 554; Ruzgel *Gartenjl.*, t 943; Hook. f., *Flor. Brit. Ind.* iv, 312; Maxim., *Mel Biol.* aii, 793; Prain, *Jour. As. Sou. Beng.* lviii, 2, 259.—P. Roffmeisteri Kbtzsch, *Reis. Pr. Wald, Bol.* IDS, t 60 (1862).

In HIMALAYA occidentalis—Zirkotal, Falconer, 793! Ohur, Rnghi! Pangi, Stoliczka! Clenie, Stewart! Kullu et Sangka, 8,510 p. s. m., Brandis! Deoban, 7—8,110 p. s. m., Duthie 202! Inghal, 9,000 p. s. m., Smith! Nagkanda, 9—10,000 p. s. m., Watt! Kamaon, Wallich! Royle! Garhwal, King! Kathi, 7,000 p. a. m., Collett! Kunawar, Hoffmeister! Shinkota* 7—8,000 p. s. m.; Kutti in Byaus, 12—13,000 p. a. m. et Nabbi in valle Kutti, 11,000 p. s. m., Duthie! Nepal centrali: Wallich! Scully! In Himalaya orientali:—Sikkim, Hooker; Tongloo, Thomson! Mon Lepcha, 10—13,000 p. s. m., Anderson! Ta-lim-sam-dong, 12,000 p. s. m.; Lasha, 12,000 p. a. m., Kingii mercenar.! Jongri, 13,000 p. a. m., Vlarke! Kinyii mercenar.! Nepal orientali:—Domkerka, 12,000 p. a. m. et Bijan, 11,000, Kingii mercenar.! Bootan: apud Riahi-la, Ulwes! Uhumbi: Yao-so; Puuka-be-semo; Kou-ma-pya et LoD-nm pto, Kingii mercenar! !

VAR. *pauciflora*; diffuse ramosa racemia aubtriflora corolla tubo calycem 3 — 4-plo superante labio lobo medio prominente aubligulato lateralibus truncatis 4-plo angustiore.—P. megalantha VAR. *pauciflora* Prain in Maxim. *Mel Biol.* xii, 793 et *Jour. As. Soc. Beng.* lviii, 2, 2B9.

In HIMALAYA orientali:—Jongri; apud Bloktan 12,000 p. a. m.; Kankerteng, 13,000 p. s. m. et Bijan, 11,000 p. a. m., Kingii mercenar.! Pbari; Kingii mercenar.!

Stem 5—45 cm, altis nonnunquam minimi digiti crassitudine, radice centrali 3—7 cm. longo fusiformi tenuiore; foliorum petiolia 4—8 cm. longa laminis 5—7 cm. longis 2—3.5 cm, latia aegmentia saltern cauli propiuribus 5—7 mm. contigua; pedicel 5—12 mm. longis, calyce 15—22 mm., corolla; tubo VAR. *typica* in apiciminibus occidentibus 30—50 mm. in speciminibus orientalibus 40—50 mm. VAR. *pauciflorae* 70—90 mm. longis, galeae parte basali 2 mm. longa, 3 mm. lata parie antherigera 4 mm. longa, 3 mm. lata, rostro 12—14 mm. longo labio 25—35 mm. lato; capsula 30 mm. longa 9 mui. lata bbsi rotundato-oblonga, seminibus 35 mm. longis. Floret Julio—Septembre.

PLATE 4. A—D; figs. 1—15.—*Pedicularis mBgalantha*, Don.

A—Specimen Bn Df VAR. *typica* ("vBra") from Chumbi.

B_____, „ „ „ (forma "*Hoffmeisteri*") from Kamaon.

C—Part of specimen of VAR. *pauciflora* from tibktan, near Jongri.

Fig. 9 is incorrect, and should be neglected.

This account of *P. megalantha* is based on the examination Df 1D1 separate specimens of VAR. *tijpica* and 13 separate specimens of VAR. *pauciflora*. Analyses of flowers from 33 different gatherings of VAR. *tijpica* and from 4 gatherings Df VAR. *pauciflora* have been made. This species appears to be truly annual. The corolla varies in colour; in all Western Himalayan specimens it is pale yellow; Don speaks (V.c.) doubtfully, but probably correctly, of the lip in Nepalese specimens a3 being yellowish-red, the rest of the corolla being purple; Hooker describes the corolla in Sikkim specimens as rose-purple. King's native collectors note the Pun-ka-be-see-mo and the Lu-ma-poo gatherings as having pale pink corollas; the other Dhuinbi specimens, and all the specimens of VAR. *pauciflora*, have dark purple corollas, those of the latter having dyed the drying paper in which they were received at Calcutta.

Dr. Garcke of Berlin has very kindly sent to Calcutta authentic specimens of *P. Hoffmeisteri* Klotzsch, which is reduced in the *Flora of British India* to *P. siphonantha*; they show, as Mr. Maximowicz had already suggested [Mel. BioL x, 82, footnote 8], that Klotzsch's species is a form of *P. megalantha* VAR. *typica*.

7. *Pedicularis Perrottetii* Benth. (1846).

Humilis parce pilosa rhizomate tenui lignoso serpenta radicibus fibrosis caule gracili decumbente folioso ramoso foliis petiolatis profunde pinnatipartitis rhachi alatis segaiensis 5—9-jugis oblongis obtusis pinnatifidis laciniis rotundatis denticulatis floribus paucis breve pedicellatis axillaribus remotis calycia tubulato-cylindrici costis parce pilosi antice parum fissi 5-dentati segmentis cristatis postico anticis dimidio lateralibus duplo minoribus corollae tubo extus puberulo longissimè fere prædorsus angustato fauce ipsa tamen subito parum ampliata calycem triplo superante labio 3-lobo galea dimidio longiore lobis lateralibus ovatis medium obovato-cuneatum spathulatum duplo excedentibus galea erecta naviculari antice subadunca pars basali tubo fere triplo latiore in partem antherigeram erectam)streni sensira acuminatam producta staminibus medio inter summum ovarium et tubi apicem insertis filamentis glaberrimis axibus antherarum ad præpendiculum directis ovario lanceolato stigmate BXSBrito—*P. Perrottetii* Benth., DO. Prodr. x, 555; Wight, Icones t 1418; Hooker f., Flor. Brit Ind. iv, 317; Maxim., Mel BioL xii, t. 1, f. 1.

In INDIA AUSTRALI:—in montibus Kundah, Perrottet, Jerdon!

Caule 9 cm. alto, rhizomate 4 cm. longo; petiolis 0.5—1 cm. longis laminis 2—3 cm. longis his 0.5—1 cm. latis segmentis 5—8 mm. longis 3 mm. latis; pedicellis 3—5 mm. longis, calycis 3D mm. longo 45 mm. lato, corollae tubo 90—100 mm. longo 25 mm. lato fauce 8 mm. lato galeae parte basali 9 mm. longa hac 6.5 mm. lata, pars antherigera 5 mm. longa, labio 24 mm. longo hoc 22 mm. lato; corolla alba.

PLATE 8. B; figs. 8—11.—*Pedicularis Perrottetii* Benth.

Specimen from S. India, distributed from Kew; Eerb. Wight, n. 24D2.

ThB species is unlike all other SIPHONANTHIE in its beakless corolla; it is most nearly allied to *P. macrosiphon* Franch. and *P. musdcola* Maxim.

8. *Pedicularis bella* Hwh f. (1884).

Nana caespitosa canescens radicibus fibrosis cauliculis subnullis foliis fere omnibus radicalibus petiolatis ovato-lanceolatis obtusis pinnatilobis segmentis contiguis rotundatis obtusis crenatis floribus axillaribus pedicellatis in caulicub 1—14 calycis cylindrico-campanulati dense canescentis antice triente fissi 5-dentati segmentis lateralibus e basi angusta suborbiculatis postice lanceolatis dimidio majoribus ovario tubo extus puberulo calycem plus duplo excedentibus antice 3-lobis lobis lateralibus oblique divalibus medio ovato 4-lobis latioribus galea vix inflata angulo recto curvata parte basali abrupte reflexa parte antherigera parum inclinata angustiore longioreque leviter falcata in rostrum tenue apice emarginatum obtusum recurvum sensim attenuata staminibus apice tubi insertis filamentis omnibus barbatis ovario anguste ovato stigmate subexserto capsula oblonga oblonga breve cuspidata calyce dimidio excedentibus seminibus pallidis distincte reticulatis.—*P. bella* Hook. f., *Fr. Brit. Ind. iv*, 313; *Maxim., Mel Biol* xii, 737, t 1, f. 3.

In HIMALAYA orientali:—Sikkim; ad Kongra Lama, 15,000 p. s. m., *Hooker*; apud Ling-tu, *Pantling*! Chumbi; in Dhum-la-re prope nives et ad Sy-am-poo, *Kingii mercenar.*! Phari; apud Do-tho, *Kingii mercenar.* (ter)! Corolla saturate purpurea; flor. Junio, Julio.

Cauliculis $d=3$ cm. altis, radice centrali pennae corvinee crassitudine 3—5 cm. longo; petiolis $D=2$ cm. basi vaginato-dilatatis lanuginosis 1—1.5 X $D=75$ cm. segmentis vix 1 mm.; pedicellis 3—7 mm., calyce 12—15 mm. X 5 mm., corollae tubo 28—34 mm. galeae parte basali 3 X 2.5 mm. parte antherigera 10 X 2.5 mm. rostro 8 mm. longo, labio 20—24 mm. lato.

PLATE 5. B; figs. 8—15.—*Pedicularis bella* Hook. f.

Specimen fide Chum-la-re, near the snows.

This account of *P. bella* is based on an examination of five different gatherings (25 specimens) of the species at Calcutta. Dr. King's collectors have not brought fruiting specimens; the description of capsule and seeds is from the *Flora of British India*. The species is most nearly allied to *P. Przewalskii* Maxim,

9. *Pedicularis Przewalskii* Maxim. (1877).

Nana caespitosa pilosa rhizomate brevi radicibus caespitosis carnosissimis fusiformibus cauliculis subnullis foliis fere omnibus radicalibus petiolatis anguste oblongis obtusis pinnatilobis lobis 9—13-jugis contiguis rotundatis obtusis crenatis foliis axillaribus pedicellatis in cauliculo 2—3 calycis cylindrico-campanulati antice triente fissi 5-dentati segmento summo subintegro anticis dimidio lateralibus duplo minore reliquis ovatis crenulato-dentatis ovario tubo extus puberulo calycem triplo excedente labio 3-lobis lobis supparibus medio emarginato rotundato lateralibus ovatis galea subinflata angulo recto incurva parte basali erecta tubo sequilata parte antherigera incurva in rostrum rectum horizontale apice segmentis acutis bifidum sensim attenuata staminibus apice tubi insertis filamentis omnibus hirsutis ovario lanceolato stigmate incluso capsula oblonga oblonga breve cuspidata calycem fere duplo superante.—*P. Przewalskii* Maxim*, *Mel. Biol* x., 84 et xii, 787, t 1, f. 2; *Prain, Jour. As. Soc. Beng.* lviⁱⁱ, 2, 27D.

In HIMALAYA orientali:—Phari, *Kingii mercenar.*!

DISTRIB.—In Dhinse prov. Kansu et Sze-tschuan; in Tibet boreali.

Cauliculis D—35 cm. altis, rhizomate 05—1 X D'5 cm., radicibus 2—3 cm.; petiolis 1—15 cm., laminis 1-5—25 cm. X 05 cm. segouentis vix 2 mm.; pedicellis 4—9 mm., calyce 12—14 X 5 mm., corollae tubo 3D—35 mm., galeae parte basali 7 x 2-5 mm., parte antherigera 5 X 3'5 mm., rostro B mm. longo labio 18—2D mm. lato. Capsules descriptio ex *Maxim*, *I.e.* x, 84; specimina fructigera non vidi. Flares pulchre rosei.

PLATE 5. D; figs. IB—21.—*Pedicularis Przewalskii Maxim.*

Specimen from Phari.

This description is founded on an examination of 12 specimens—2 from Sze-tschuan, collected by Potanin; 4 from Kansu, collected by Przewalskii; and 5 from Phari, obtained by one of Dr. King's native collectors.

The Phari specimens are very poor and, till Mr. Maximowicz kindly sent to Calcutta the excellent suite of Chinese specimens, could not be disposed of, but were placed tentatively beside *P. aspleniifolia* VAR. *pubescens* (now *P. Daltoni*). From *P. Daltoni*, however, *P. Przewalskii* is very distinct, the diagnosis between the species being as follows:—

Corolla tube uniform externally densely pubescent, lobes of lip subequal,	
basal portion of gradually-beaked galea erect beak horizontal,	
filaments inserted at apex of tube.	<i>P. Przewalskii</i> ;
corolla tube expanded at top glabrescent relatively shorter, mid-lobe of	
lip smallest, base of abruptly-beaked galea reflexed beak decimate,	
filaments inserted below apex of tube.	<i>P. Daltoni</i> .

The corolla of the Phari specimens agrees exactly with that of the Chinese ones, but the calyx is shorter and is subinflated. As regards calyx the Chinese specimens of *P. Przewalskii* more closely resemble *P. Daltoni* than the specimens from Phari do.

10. *Pedicularis Daltoni* Prain (1889).

Nan a dense pubescens rhizomate horizontal caudice pluricipite maximo radicibus longissimis caulibus brevibus erectis foliis petiolatis linearibus pinnatifidis segmentis 12—20-jugis contiguis ovatis mucronato-dentatis floribus axillaribus longissime pedicellatis racemis densifloris calycis cylindrico-campanulati dense pubescentis antice triente fissi 5-dentati segmentis ellipticis serratis postico anticis dimidia lateralibus duplo minore corollae tubo extus leviter puberulo calyce dimidio longiore sursum ampliato labio 3-fido lobis rotundatis margins crenulatis lateralibus medio dimidio latioribus galea inflata arcuate incurva parte basali leviter reflexa tubo aequilata parte antherigera abrupte incurva in rostrum rectum leviter deorsum directum apice segmentis acutis bifidum abruptius attenuata staminibus medio inter summum ovarium et apicem tubi insertis filamentis omnibus hirsutis ovario lanceolato stigmate incluso capsula oblique oblonga breve cuspidata calycem fere duplo superante seminibus ovoideis pallidis distincte reticulatis.—*P. Daltoni* Prain, *Jour. As. Sou. Benf.* lviii, 2, 27D.—*P. aspleniifolia* VAR. *pubescens* Hook. *l.*, *Flor. Brit Ind.* iv, 315 (1864). *Pedicularis* n. 20, *Herb. Ind. Dr. II. f. & T. T.*

In HIMALAYA orientali:—Sikkim; ad Don-kia-la, 14,000 p. s. m., *Hooker! Kingii mercenar.!* ad Ze-lep-la, *Kingii mercenar.!* Chumbi; ad Perm-la props Ohum-la-ree, in Chum-la-ree ad nives et apud Ka-poop, *Kingii mercenar.!* Phari:—*Kingii mercenar.!* Julio-Augusto floret; corolla rosea.

Caulibus, B CDID singulo 2—2D, 2—3 cm. altis, rhizomate 4—10 cm. longo hoc 1—2 cm. crasso radicibus usque ad 15 cm. longis; petiolis 2—4 cm. baai ssepius vaginato-dilatatis laminis 2"5—4 X D"5 cm. segmentis vix 2 mm.; Dedicellis 25—Bt) mm., calyes ID—12 X 5 mm., cDrollee tubo IB mm. galeee parts basali 5 x 2 mm. parte antherigera 55 X 3-5 mm. rostro 5 mm, longo labio 18—2D mm. lato; capsula 2f) X B mm. seminibus 1"75 mm. longis.

PLATE 5. A, B; figs. 1—6.—*Pedicularia Daltoni* Prain.

A—Specimen from Dhum-la-ree, near the snows.

B— „ „ Donkia-la, 17,000-

This description is based on the examination and analyses of flowers from 47 specimens. The species stands almost exactly intermediate between *P. Przewahkii* and *P. Garckeana*. The diagnosis from *P. Przewahkii* has been already given: the diagnosis from *P. Garckeana* is as follows:—

galea base reflexed, thin, inflated, abruptly beaked bank straight ;	
mii-lobe of lip rounded; all filaments Bequally hairy, stamens	
inserted distinctly below apex of tube.	<i>P. Daltoni</i> ;
galea base erect, not inflated, gradually beaked beak circinnate; mid-	
lobe of lip cuueate, projecting; posterior filaments very sparingly	
hirsute, stamens inserted near apex of tube.	<i>P. ffarckeana</i> .

The deeply 2-fid beak at once distinguishes the species from *P. asphnifolia* and its allies.

11. *Pbdiuularis Garckeana* Prain (18BB).

Elata hirsuta rhizomate brevior radicibus carnis fusiformibus caulibus gracilibus erectis polyphyllis foliis petiolatis linearibus pinnatifidis segmentis 12—2D-jugis contiguis ovatis mucronato-dentatis floribus axillaribus longe pedicellatis racemis densifloria calycis cylindrici-campanulati hirsuti antice triente fissi 5-dentati segmBntis ellipticis cristatis postico reliquis dimidio angustiore corollae tubo extus IBviter puberulo calycis plus dimidio longiore labio 3-fido lobis lateralibus ovatis medio oblongo parum prominente truncato dimidio latioribus galea inflata circinnata parte basali erecta tubo squilata parte antherigera falcata in rostrum gracile apice segmentis acutis bifido circulum formans sensim producta staminibus medio inter summum ovarium et apicem tubi insertis filameatis anticis dense posticis parcius hirsutis ovario lanceolato stigmata incluso capsula oblique oblonga breve cuspidata calycem dimidio superante.—*P. Uarckeana* Prain in *Maxim[^] Mel Biol* xii, 783; *Jour. As. Soc. Bmg.* Iviii, 2, 2B7.

In HIMALAYA orientali:—Chumbi; ad Na-toot, ad Tan-kala, apud Be-ong-chin prope Chumbi, apud Loo-ma-poo, ad Bootang et ad Pun-ka-bee-see-mo, *Kingii mercenar.* ! Uorolla varie ro[^]ea, punicea vel albo-rosea notatur; Julio floret.

CaulibuB B—IB cm. altis, rhizomate 1—2x D5 cm., radicibus 5—B cm.; petiolis 2—3 cm. vaginato-dilatatis laminis 3.5—Bx D5 cm., segmentis 2 mm.; pedicellis 8—18 mm., calyce 14—16 X B mm., corolla tubo 22—30 mm., galese partB basali 4 x 2 nun. partB antherigera 7 X 3'5 mm. rostro 7.5 mm. longo, labio IB—2D mm. lato; capsula 22 mm. longa.

PLATE 5. A; figs. 1—7.—*Pedicularia Garckeana Prain.*

A—Specimen from Tan-ka-la, Sikkim.

Fig. 7—Part of specimen from Na-toot, Sikkim.

The description of *P. ffarckeana* is based on the examination of 57 specimens; two or more flowers from specimens of each gathering have been analysed. The shorter specimens very closely resemble taller ones of *P. Daltoni* on the one hand and of *P. robusta* on the other; between these two species this stands intermediate in many respects. At the same time by the taller habit of many of its specimens, by the longer and narrower cuneate mid-lobe of lip, and by the posterior filaments being distinctly less hirsute than the anterior, it approaches *P. megalantha*, certain forms of which it sometimes closely resembles. The diagnosis from *P. Daltoni* has been given; from *P. robusta* it is diagnosed as follows:—

mid-lobes of lip cuneate; galea erect, not inflated; beak circinnate,
long; posterior filaments sparingly hairy. *P. Qarchetta* ;
mid-lobes of lip rounded; galea reflexed, inflated; beak straight,
short; all filaments equally hairy. *P. robusta*;

while from *P. megalantha* the diagnosis is—

tube short, half exceeding calyx; galea erect, beak deeply 2-fid,
segments acute; posterior filaments sparingly hairy. *P. Garckeana*;
tube much exceeding calyx; galea reflexed, beak shortly 2-fid,
segments obtuse; posterior filaments quite glabrous. *P. megalantha*.

12. *Pedicularia robusta* Hook. f. [1844].

Nana dense pubescens rhizomate horizontali radicibus longioribus caulibus brevibus arcuatis apicibus foliis angustis oblongis obtusis pinnatifidis segmentis 8—10-jugis cordatis ovatis obtusis crenatis floribus axillaribus pedicellatis racemis densifloris calycis cylindrico-campanulati pubescentis antice triente fissi 5-dentati segmentis supparibus oblongis obtusis serratis corollae tubo extus glabro calycem haud excedente labio 3-lobis lobis rotundatis subaequalibus medio prominulo galea perinflata aogulo obtuso incurva parte basali recta parte antherigera leviter falcata in rostrum breve apice segmentis acutis bifidum statim deorsum directum sensim producta staminibus medio tubo insertis filamentis omnibus barbatis ovario lanceolato stigmate inulso capsula oblique oblonga brevis cuspidata calycem fere duplo superante, seminibus ovoideis pallidis immaturis distincte reticulatis (maturis teste cl. Hooker, subtiliter striatis nee punctulatis).—*P. robusta* Hook. f., *Flor. Brit. Ind.* iv, 366.

In HIMALAYA orientali:—Sikkim; Samdong, 15,000 p. s. m., Hooker; Elwes! King's mercenar. ! Phari:—King's mercenar. I

Caulibus 2—6 cm, altis, rhizomate 2—4 cm. longo hoc 0.5—1 cm. crasso, radicibus 4—7 cm. longis; petiolis 1—2 cm., laminis 2—3 X 0.5 cm., segmentis vix 2 mm.; pedicellis 4—9 mm., calyce 10 X 4.5 mm., corolla tubo 9 mm., galeae parte basali 4 X 2.5 mm., parte antherigera 8 x 4 mm., rostra 4 mm. longo, labio 15—18 mm. lato; capsula 1.8 x 5 mm., seminibus 1.5 mm. longis. Corolla purpurea; Septembris floret.

PLATE S. C, D ; figs. 7—13.— *Pedicularis robusta* *HooJc.f.*

D—Specimen collected in Alpine Sikkim by Captain Elwes.

D— „ from Phari collected by thB Lama Ujyen GryatskD.

This description of *P. robusta* is based on the examination of only three specimens, two of which are now figured. The species stands intermediate between *P. Garckeana* and *P. nepalensis*. The diagnosis from *P. Garckeana* has been already given; that from *P. nepalensis* is as follows: —

mil-bbe of lip piominent, margin BntirB; tube not exceeding calyx, BxtBrnally
glabrescent; capsulB half exceeding calyx. *P. robusta*;
mid-lobB not prominent, margin crenulatB, lobes truncate; tube twice as long as
calyx, puberulDUS without; capsule twice as long as calyx. *P. nepalensis*.

Though the corollas somewhat closely resemble those of *P. nepalensis*, the latter is easily distinguished by its few, axillary, bng-pedi celled flowers and its very short stems.

13- *Pedicularis nepalensis* *Prain* [1889).

Nana cespitosa glaberrima rhizomate brsvi radicibus cespitosis carnosis fusiformibus cauliculis subnullis foliis fere omnibus radicalibus longe pstiolatis linearibus pinnatifidis segmentis 8—12-jugis contiguis ovatis mucronatD-dentatis floribus axillaribus bnge pedicellatis in cauliculo 3 — 6 calycis cylindrico-campanulati costis parce hirsuti antice triente fissi 5-dentati segmentis ellipticis serratis postico relitjuis parum angustiore corolla tubo extus pares puberub calyce fere duplo longiore labio 3-lobo margins crenulatD serrato bbis truncatis lateralibus ovatis medio rotundato duplo majoribus galea perinflata angulo subrecto incurva parte basali leviter reflexa parte antherigera falcata in rostrum breve apice segmentis acutis bifidum deorsum dirBctum abruptius attenuata staminibus medio inter summum ovarium et apicem tubi insertis filamentis omnibus barbatis ovario lanceolato stigmate incluso capsula oblique oblonga breve cuspidata calycem fere 2-plo longiore seminibus lats ovatis pallidis distincte reticulatis.—*P. nepalensis* *Prain*, *Jour. As. SQC. Beng.* lviii, 2, 258.

In HIMALAYA orientali:—In Nepaliâ orientali, ad Ka-gling, 13,DD) p. s. m., *Kingii mercenar.* ! Sikkim; apud Choon-goo, *Kingii mercenar.* I Corolla saturate purpurea; Augusta floret.

Cauliculis D—1 cm. altis, rhizomale D5—1 X D5 cm., radicibus 2—3 cm.; **petiolia** 2—3 cm., laminis 2 cm. x 0.75 cm., segmentis 2—3 mm.; pedicellis 25—35 mm., calyce 15 X 5 mm., cDrollae tubo 25—28 mm., galea parte basali 5 x 3 mm., parte antherigera 10 X 45 mm., rostra 45 mm. ltmgo, labio 27—3D mm. lato; capsula 20 X 5 mm., seminibus 2 x 1 mm.

PLATE 6. E; figs. 14—20—*Pedicularis nepalensis* *Prain*,

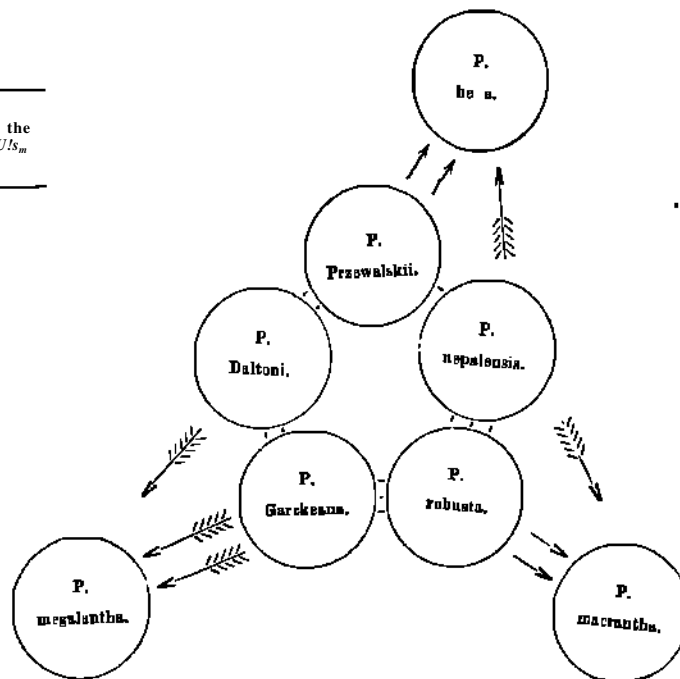
E—Specimen from Ka-gling, East Nepal.

This species is represented at Calcutta by one large gathering of 23 specimens from Ka-gling received in 1888 and a small one of 3 specimens from Dhoon-goD, received in 1882. On an examination of these the account is based. The flowers, as description and figure show, are very like those of *P. robusta*, but the habit and facies **are** widely different and almost repeat those of *P. Przewalkii*, between which and *P. robusta* it appears to stand intermediate.

The type of corolla of this, and more especially of *P. robusta*, in which the tube is shorter, approaches that of *P. macrantha*, and its allies, where, however, the general habit is widely different. The relationship of the group to which this belongs to the *Pumilivus* is very close, for *P. Daltoni*, which is by its habit hardly distinguishable from the other three species, is by its corolla very nearly related to *P. Przewalskii*. As regards the other three species it is not improbable that ultimately they may be demonstrated to be forms of one species only. *P. nepalensis*, though differing in habit, has the same corolla tube as *P. Garckeana*, and differs chiefly in having more inflated galea, shorter, more acute beak, shorter and wider mid-lobe of lip. *P. robusta*, so far as the meagre material available shows, is in habit an abbreviated *P. Garckeana* with, however, a galea, beak, and lip more like those of *P. nepalensis* and a corolla tube different from those of both the others. The somewhat intricate relationships of these species are shown in diagram 12.

DIAGRAM 12.

Relationships of the species of the groups *Jobustes* and *Pumilio* *Uls*_m



14. *Pedicularis macrantha* Klotzsch [18B2).

Humilis vel elata glabra rhizomate brevissimo radicibus carnosius fusiformibus fasciculatis caule erecto stricto simplici pennae corvinae crassitudine oligophyllo foliis radicalibus paucis demum evanidis longe petiolatis ssepius pinnatisectis segmentis ID—IB-jugis distantibus ovato-lanceolatis pinnatipartitis laciniis argute dentatis floribus axillaribus longe pedicellatis racemis laxiusculis foliis summis floralibus ad bracteas lineares reductis calycis ovati costis pilosi autice ad medium fissi 5-dentati segmentis supparibus oblongo-lanceolatis incisD-serratis corollae tubo sursum ampliato calycem vix zeijuanter labio 3-lobato lobo medio DrbiculatD integro vel emarginatD lateralibus orbiculatis aut brevioribus sequilato aut ^equilongo et angustiore galea inflata circinnata partB basali erecta vel leviter reflexa recta vel dextrorsum torta parte antherigera falcata in rostrum conicum circinnatum apice SEgmentis acutis breviter bifidum sensim vel abruptius producta

staminibus medio inter summum ovarium et tubi apicem inaertia filamentia omnibus pilosis ovario ovato-lanceolato stigmatibus subincluso capsula oblique ovato-lanceolata apice acuminata calycem triente excedente seminibus ovoideis pallidis distincte reticulatis.

VAR. *typica*; labio lobo medio lateralibus sequilongo et manifestis angustiore galea parte basali contorta parts antheras foveate sensim in rostrum attenuata.—P. *macrantha* Klotzsch, *Beis. Pr. Wald., BoL* 1D8, t 59, *Book, l., Flor. Brit Ind.* iv, 311.

In HIMALAYA occidentalis—Kamaon, *Hvffminter* ! prope glaciem in valle Ralam, 13DDD p. s. m., *Duthie*! Uarhwal; ad Kulhara, 12DDD p. s. m., *Strachty et Winter bottom**

VAR. *lutescens*; labio lobo medio nee proiunente lateralibus suppari galea rarissimè contorto in rostrum a basi subabrupte tenuius abeunti.—P. *ochroleuca* Duthie in *Maxim., Md. BioL* xii, 79 D, t 1, l. 5 [*nee Svhhsser*] (1883).

In HIMALAYA occidentali:—Kamaon; Darma, in valle Nipchang, 14—15,DDD p. a. m.; in valle Dhauri prope Bidang, 14—15,001) p. s. m.; Byaus, ad Palang Gadh, 11—12,DDD p. a. m.; et prope glaciem in Lebang, 14—15,ODD p. s. m., *Duthie*! In Nepal occidentali; ex adverso pagi Budh nuncupati, 10—11,DDD p. a. m. et ad Nampa Gadh, 12,DD0 p. s. m., *Duthie* !

Floret Julio-Septembre; corolla VAR. *typicoe* concolor roaeae, VAR. *lutescentis* tubo labioque lacteo galea purpurea.

Caulibus 5—15 cm. altis, radiibus 5—8 X D5 cm.; petiolia 3—12 cm. basi leviter vaginato-dilatata lamina lanceolata 5—12 X 1—2*5 cm., rhachi dentatis (in specimine VAR. *typice* in valla Ralam a cl. *Duthie* lecto rhachi late alata), segmentis 8—12 mm.; pedicellis 5—9 mm., calyce 12—14 X 5 mm., CDrolse tubo 1D mm., galea parte basali 5 X 2*5 mm. parte antherigera 7—8*5 X 35 mm., rostro B mm. longo, labio VAR. *typice* 25 mm. lato [lobo medio 7 mm. longo hoc B mm. lato] VAR. *lutescentis* 20—22 mm. lato [libo medio 5 mm. longo hoc B mm. lato ssepissime rotundato sed in specimine ad glaciem Lebang a cl. *Duthie* lecto emarginato-truncato); capsula 18 X 6 mm., aeminibus 1*75 mm. longis.

PLATE 7. A—D; figs. 1—13.—*Peiicularis macrantha* Klotzsch.

A—Specimen of VAR. *typica*^ part of Dr. Hoffmeister's original gathering.

B—), „ „ from near the Ralam glacier, Kamaou.

D— „ „ *lutescens* from Bidang, in Dhauri Valley.

D—Fruiting specimen of same gathering [Herb. Saharanpur].

The characters by which the two varieties of this species are separated are not at all reliable in other species of the genus, and probably will be found untenable here when more material is available for study. The present description is based on the examination of three specimens (two gatherings) of the typical plant, one specimen being an original one which Dr. Garcke has kindly sent to Calcutta, and 17 specimens [mostly in Herb. Saharanpur] of five separate gatherings of VAR. *lutescens*.

It appears to be a local species, but Mr. Duthie informs me that it is abundant where it occurs; he tells me also that the two varieties grow side by side, and it did not occur to him in the field that they could be the same plant.

15. *Pedioularis Scullyana* Prain (1888).

Elata hirsuta foliosa rhiz ornate horizontali elongato crasso carnosum radicibus caespitosis fusiformibus caule erecto stricto robusto foliis petiolatis lanceolatis pinnatipartitis rhachialatis segmentis 14—20-jugis pinnatifidis laciniis paucidentatis floribus axillaribus racemo denso centrifugo approximate pedicellatis calycis ovati costis hirsuti antice ad medium fissi 5-dentati segmentis cristato dentatis corollae tubo sursum ampliato extus pubescenti calycis lobis vix exsertatis labio 3-lobato lobis lateralibus ovatis medio orbiculato plus duplo inaequalibus galea perinflata angulo recto bis incurva parte basali angulo obtuso reflexo parte antherigera falcata in rostrum brevis bifidum statim deorsum directum productsraminibus medio tubo insertis filamentis rufo-villosis ovario divato-lanceolato stigmate subincluso capsula lanceolata acuta calyce duplo longiore seminibus angustis ovoideis distincte reticulatis.—*P. Scullyana* Prain in Maxim., *Mel Biol* xii, 789, t. 1, f. B; *Jour. As. Soc. Bmg.* lviii, 2, 2B8.

In HIMALAYA centrali et Orientali:—Nepal; ad Grossain Than, Wallich! Scully! Jongri, ad Pey-kiong-la, ai Bijan, 11,000 p. s. m. st. apud Domkerka, 12,000 p. s. in., Kingii mercenar.! Flores concolores lutei; Augusto floret.

Rhizomate 1—1.5 cm. longo 1—1.5 cm. lato, radicibus 5—8 mm. longis subfibrillosis, caulibus 14—45 cm. altis digitibus minimi crassitudinis; foliorum petiolis 3—8 cm. longis, laminis 7—10 cm. longis his 1.75—1 cm. latis in speciminibus orientalibus, 2.5—3 cm. latis in speciminibus e Grossain Than, summorum floralium mersis serratis, segmentis 6—12 mm. 4—9-jugis; pedicellis 3—7 mm., calycis 18—21 mm. longo hoc 7—9 mm. lato, corollae tubo 10—18 mm. longo basi 2.5 mm. apice 8 mm. lato, galea parte basali 5 mm. X 2.5 mm. parte antherigera 12—14 mm. X 5 mm. rostro 4 mm. longo, labio 20—25 mm. lato in speciminibus orientalibus, plus quam 30 mm. lato in speciminibus e Grossain Than; capsula 28 mm. longa hac 9 mm. lata basi anticae nee tamen postice rotundata, seminibus 2.5 mm. longis.

PLATE 9. A—C; figs. 1—7.—*Pedioularis Scullyana* Prain.

A—Specimen from Grossain Than, Nepal.

B— „ „ Pey-kiong-la, Jongri.

D—Fruiting specimen from Bijan, on the Sikkim-Nepal frontier.

The account of *P. Scullyana* is based on the examination of 55 specimens in flower and fruit. It is most nearly allied to *P. macrantha*, Horn which it differs by its much larger flowers, its smaller mid-lobe of lip and much shorter beak. This, and not *P. macrantha*, is the Nepal species sent to Calcutta by Scully. Wallich's specimens were mixed, not by Wallich himself, but by Don! with *P. megalanthe*; a sheet of this, named "*P. megalantha*" by Don himself and distributed "ex herb. R. Brown," is in the Calcutta herbarium. The Jongri specimens have stouter stems than Scully's specimens, but not than Wallich's Nepal one. In both the Nepal gatherings the corolla is somewhat more abruptly beaked than it is in any of the Jongri ones.

16. *Pedicularis Elwesii* Hook. f. (1884).

Humilis vix elata rhizomate perenni simpliciter simplici collo simpliciter multicauli radicibus fusiformibus carnosius caulibus ascenduntibus arcuatis pubescentibus uligophyllia

foliis radicalibus caespitosis caulinis sparsis petiolatis lanceolatis pinnatisectis segmentis 3-5-jugis pinnatifidis laciniis serratis floribus axillaribus caulum apicibus confertis pedicellatis calycis obliqui ovati anticis fere ad basin fissi 3- vel 5-dentati segmentis lateralibus stepiua conjunctis basi angusta ovatis margine serratis postico lanceolato integro vel apice serrato duplo majoribus corolla tubo sursum ampliato calycem vix exsertentem labio 3-lobato lobis orbiculatis margine dense ciliatis lateralibus integris medio emarginato duplo majoribus galea subinflata angulo recto incurva parte basali annulo subrecto reflexa dextrorsumque torta parte antherigera subrecta in rostrum falcatum apice profunde segmentis subulatis bifidum sensim producta staminibus medio tubo insertis filamentis omnibus superne rufo-barbatis ovario ovato-oblongo stigmate exserto capsula ovata acuminata seminibus ovoideis pallidis stria to-reticulatis basi appendiculatis anticis profunde nigro-sulcata.—*P. Elwesii* Hook. f., *Flor. Brit. Ind.* iv, 312; *Maxim., Mel. Biol.* xii, 793, t. 1, f. 8.

In HIMALAYA orientali:—Sikkim, in valle Lachen, 12000 p. s. m., *Hookey*, *Elwes*; ad Kan-ko-la, 13000 p. s. m., *Hooker*! ad Tschikook, 12,000 p. s. m., *Pantling*! Dhumbi: ad Syam-poo, ad Perm-la prop. Chumla-ree et in Dhum-la-ree ad nives, *Kinyi mercenar.* Phari: (bis) *Kingi merwnar.* Jongri; apud Ong-la-thang infra Kin-chin-janga, 12000 p. s. m., *Kinyi mercenar.* Julio, Augusto, et Septembri floret; corollis concoloribus saturate purpureis specimine Dalcottensi ad nives in Dhum-la-ree lecto, cui flores albi adnotantur, excepto-

DISTRIB.—Yunnan.

Rhizomate 2-3 cm. interdum superne ramulos, radicibus 7-10 cm. longis usque ad 1 cm. crassis, caulis 3-25 cm. altis corvici pennae crassitudine; foliorum petioli 3-9 cm. longis caulorum praesertim floralium vaginato-dilatati laminis 4-12 cm. longis his 1 cm. latia segmentis 4-5 mm. latis contiguis et interdum retro-imbricatis; pedicellis 4-9 mm., calyce 12-18 mm., corollae tubo 11-17 mm. galeae parte basali 3x2*5 mm. parte antherigera 9-10 x 3 mm., rostro 3-7 mm. longo, labio 20-25 mm. lato; capsula 15 mm. longa hac 5 mm. lata, seminibus 2.5 mm. longis.

PLATE 8. A; figs. 1-7 and fig. 12.—*Pedicularis Elwesii* Hook. f.

Specimen from Phari.

This description is founded on an examination of 43 specimens from 8 gatherings.

The species is well distinguished by the very dense fringe of ciliate hairs on the margin of the lip and by the deeply-cleft calyx.

17. *Pedicularis integrifolia* Hook. f. (1884).

Humilis caespitosa glandulose pubescens rhizomate incrassato maximo radicibus fusiformibus carnosissimis pluricauli raulibus simplicibus ascendentibus foliis angustis oblongis margine crenulatis radicalibus caespitosis petiolatis caulinis 2-4-paribus oppositis sessilibus filiformibus verticillo terminali (nonnunquam etiam in verticillo huic proximo inferioribus) axillaribus calycibus cylindricis campanulatis glandulose pubescentia antice tripartite 5-dentati segmentis oblongis supparibus margine crenatis corollae tubo calycem plus dimidio excedente labio 3-lobato lobis rotundatis subaequilatis galea inflata angulo recto incurva parte basali erecta tubo aequilata parte antherigera horizontali in rostrum tenue longissimum porrectum & demum flexuosum apice obtuso intermedium abrupte abeunt staminibus apice tubi insertis filamentis omnibus barbatis ovario ovato stigmatibus incluso.—*P. integrifolia* Hook. f., *Flor. Brit. Ind.* iv, 313; *Maxim., Md. Bot.* xii, t. 2, f. 23.

In HIMALAYA orientali:—Sikkim, ad Tungu 14,000 p. s. m., *Hooker*. Phari:—(quater), *Kingii mercenar.*! [Nuperrime etiam in Yunnan a *Delavayo* detecta.]

Caulibus 4—7 cm. altis, rhizomate 2—3 cm. X 1—1.5 cm. radicibus 3—4 cm. longis, petiolis fuliorum radicalium 3—5 cm. longis promtus vaginato-dilatatis laminis 2—3 cm. X 0.5 cm., laminis caulinis 1.25—1.5 cm. X 0.75—1 cm. segmentis brevissimis; calyce 12 mm. longo, hinc 4.5 mm. lato, corollae tubo 20 mm. longo, calycis parts basali 4 mm. X 2 mm. parte antherigera 5 mm., X 5 mm., rostra 15 mm. longo labio 18 mm. lato. Corolla saturate purpurea; Julio floret.

PLATE 5. D; figs. 22—27.—*Pedicularis integrifolia* *Hvöl.*

Specimen from Phari.

This account of *P. integrifolia* is based on an examination of 20 specimens, and on the analysis of flowers and buds from 4 gatherings. The opposite leaves indicate great affinity with the flexuose-beaked *ORTHODRBYNCHILE*, the aestivation, however (fig. 27), and the staminal insertion [fig. 25), are characteristically *Siphonanthoua*.

§§ ORTHODRBYNCH^E Prain.

Eostro flexuoso, labio 10-glorB:—

filamentis omnibus hirsutis:—

staminibus ex ad verso summi ovarii insertis basi superneque barbatis:—

foliis caulinis petiolatis, floribus purpureis. 18. *P. pectinata*.

foliis caulinis sessilibus, floribus luteis. Id. *P. tenuirostris*.

staminibus medio tubo insertis basi glabris superni parcius barbatis,

foliis caulinis petiolatis floribus purpureis. 20. *P. pyramidata*.

filamentis omnibus glabris. 21. *P. Oliveriana*.

Rostro polystachio, labium subsequens (in *P. Heydei* labio longistachio):—

foliis verticillatis; filamentis glabris:—

floribus interruptis spicatis:—

rostrum apice 2-fido, labio 3-fido. 22. *P. breweriae*.

rostrum apice integro, labio 3-partito. 23. *P. wistar*.

floribus paniculato-racemosis. 24. *P. gracilis*.

foliis oppositis:—

bracteis sessilibus; filamentis glabris:—

labio parvulo rostro brevior, floribus interruptis spicatis . . . 25. *P. Heydei*.

labio rostrum seijuate:—

floribus paucis distantibus bracteis ovatis. 26. *P. porrecta*.

floribus eubcapitatis confertis bracteis laciniatis 27. *P. confertiflora*.

bracteis petiolatis:—

filamentis anticis hirsutis:—

rostrum apice 2-lobum, tubo calyce brevior. 28. *P. flexuosa*.

rostra apice integro, tubo calycis brevior. 30. *P. tenuicaulis*.

filamentis omnibus glabris. 29. *P. chumbica*.

18. *Pedicularis pectinata* Wall. (1828).

Elata sparse 3—4-fariam pilosa rhizomate horizontali incrassato collo pluricipite caulibus erectis teretibus fistulosis simpliciter ramosis ramis oppositisque 3—4-natis verticillatis foliis petiolatis petiolis radicalibus longissimis laminis plicatis vel oblongo-lanceolatis anatis

pinnaficsectis -partitisvs SBgmentis 8—15-jugis linearibus serratis VBI lanceolatis pinnatifidiis SBrrato-dentatis floribus subsBSsilibus dsnss spicatis bracteis ayrrato-ieiitatis infBrioribus lancBolatis suinmis ovatis acutis calycis ovati inflati glabri VBI costis hirsuti 5-dsntati SBgmsntis lancBolatis acutis VBI ovatis acuminatis margins inbsgris corolla tubo calycis sequilongo antica ai insBrüDnsm filamentsorum lsvitsr sacculato labio rotundato antics 3-lobo lobis latsralibus ovatis meio orbiculato duplo majoribus galsa inflata angulo rscto iucurva parta basali lsvitsr antics incurva parts antherigera horizon tali in rastrum a msdio tsnus basi porrBctum apica acuto intsgro circinnats dBflaxum sensim producta staminibus in sacco sx advsrso summi ovarii insrtis filamentsis basi Bt supra myium dense rufo-villosis cstBrum glabris ovario Dvato stigmatis incluso capsula lata ovata acuminata parum exserta ssminibus majusculis ovatis testa pallidis rugosis profunds rBticulatis.

VAR. *typica*; foliis ssepius pinnabisBctis s eg mentis pinnatifidiis calycis distincte inflato ientibus lancsolatis acutis.—P. psctinata Wall, *Oat* 42D; *Benth.*, *Scroph. Ind.* 52; *Walp.*, *Hep. ill.* 411; *Benth.*, *DO. Prodr.* x, 56D; *Hook.* l., *Flor. Brit Ind.* iv, 3 OB; *Maxim.*, *Mel BIDL* xii, 81D, t 2, l 25.

In HIMALAYA Occidsntali:—Bandkots, *Falconer!* in vails Sind, 8,DDD p. s. m., *Clarke!* Dhor Nagkania, *Royle!* Kamaon, *Wallich!* Laka, *Edgeworth!* Thsog, 5,DDD p. s. m., *Gamble!* Chor Jubal, 11,DDD p. s. in., *Collett!* Simla, *Schlich!* in vaile Dhassak, 11,ODD p. s. m., *Ellis* (1455)! Dalhousis, 7,DDD-8,7DD p. s. m., *Olarke!* Gilgit, 8,DDD p. s. m., *Tanner!* Jaunsar Bahar; in montibus Dsoban, 7—B,ODD p. s. m. Bt in jugo Kinani, 8—9,DDD p. s. m., *Duthie!* Dharma; in Mulapa &aih; Byaus in Palang &adh, 11,DDD p. s. m., props Kutti, 13—14,DDD p. s. m. Bt ad Dhalek, 11—12,DDD p. s. m.; Tshri-Barhwal, in Rudughsra Badh, 11—12,DD0 p. s. m.; in Lekhun Gradh infra Srikanta, 11—12,DD0 p. s. m. st supra Taulsa. 13—14,DDD p. s. m.; in valle fl. Jumna intsr Ongri st Banas; ad Dumbotia Gradh, 9—1D,DDD p. s. m.; in vails Ralam props glacism, 12,DDD p. s. m., *Duthie!* apud Harong, 9,DDD p. s. m., *Brandis!*

VAR. *palans*; foliis pinnatipartitis SBgrnsntis linearibus calyce campanulato dsntibus ovatis acuminatis.—P. psctinata VAR. pyramidata *Hook.* l., *Flor. Brit Ind.* iv, 3D5 (1884) \syn. P. pyramidata *exclus.*).—P. pyramidata *Herb. Ind. Or. H. f. \$ T. T. [nee Royle).*

In HIMALAYA occidsntali:— Kashmir: ZircDtal, *Royle!* Pyr Panjal, 11,ODD p. s. m., *Olarke!* in vails Chassak, 11,DOD p. s. m., cum VAB. prsecadsnts, *Ellis* [14B5)! Sanch Pass, 12,100 p. s. m., *Ellis* (1543J! in vails Ajok, 1D,DDD p. s. m., *Ellis* (148B)! *Him. Bor. Occid.*, 7—12,DDD p. s. m., *Thomson!* ["P. pyramidata," *Herb. Ind. Dr.*)! Lahul, *Hay!* *Jeschke* [233) 1 *Watt!* Dranti Pass, 12,DDD p. s. m., *Badm-Powell!* Pangi, *Stolickza!* *Brandis* (3153)!

Uaulibus 4D—1DD cm. altis cygni pennse crassitudins, rhizomate 8—12 cm. longo D-5—1 cm. crasso, ramis 5—15 cm. longis; foliis maximis pBtiolis 4—12 cm. longi-s laminis 5—15 cm. X 25—5 cm. SBgrnsntis 12—2D mm. X 5 mm.; calycis 1D mm. longo hoc 5 mm. lato, corolla tubo 1D mm. longo galeaj parts basali 4 x 3 mm. parts antherigera 5 X 35 mm. rostro 10 mm. longo labio 2D mm. lato; capsula 11 X B mm., ssininibus 3 mm. longis, his 175 mm. latis. Julio et Augusto floret; corolla purpurBa.

PLATE 23. A, B; figs. 1—11.—*Pedicularis pectinata* Wall.

A—Specimens of VAR. *typica*;—*right hand* from Kamaon [Wall. Cat. n. 42D in Herb. Ualcufct.); *left hand* from Dhor Nagkanda (Royle).

B—Specimen of VAR. *palans* from Ajok valley (Ellis; Flora of Upper Dhenab, n. 1486).

This account of *P. pectinata* is based on the examination of more than one hundred flowering specimens belonging to 43 different gatherings; flowers from every individual specimen have been analysed. Plate 23A, which represents a specimen of Wallich's original plant, and B, which represents one exactly = *P. pyramidata* Herb. Ind. Or. (not of RoyU\ rather illustrate extreme forms of a variable species than distinct varieties. With this explanation they are now advanced as affording the simplest explanation of the synonymy of the group to which the species belongs.

P. pyramidata closely resembles this species, and varies equally in habit. But neither at Calcutta nor at Saharanpur, where both species are very well represented, is there a single form where the floral structure is intermediate. The diagnosis between the two species is as follows:—

beak of corolla gradually tapering ¹ to middle, then uniformly slender; tube hardly longer than calyx, sacculate in front at the staminal insertion; lower half of galea suberect; stamens inserted opposite top of ovary, densely pilose at insertion as above.	<i>P. pectinata</i> ;
beak of corolla uniformly slender from its base; tube narrow, straight, half exceeding calyx, not sacculate; lower half of galea inclined forwards; stamens inserted above middle of tube, glabrous at insertion and only sparingly hirsute above.	<i>P. pyramidata</i> .

In floral structure *P. pectinata* is more nearly allied to *P. tenuirostris* than to *P. pyramidata*; *P. tenuirostris* has the same peculiar transverse furrow at the staminal insertion (a character so far peculiar to these two species), and has identical stamens; its only diagnostic marks are its yellow (not purple) corolla, its more slender beak, its denser spike, and its less incised sessile cauline leaves. The capsules, and more especially the seeds, in these three species are scarcely distinguishable [see Plate 37).

19. *Pedicularis tenuirostris* Benth. [1835).

Elata 4-fariani pilosa rhizomate incrassato extus crustaceo caulibus erectis strictis teretibus simplicibus ramosisve ramis gracilibus foliisque 4-natis verticillatis foliis lanceolatis lanceolato-linearibusve radicalibus petiolatis caulinis sessilibus pinnatifidis -sectisve segmentis 15—25-jugis oblongis obtusis margine serrato-dentatis floribus dense spicatis sessilibus bracteis ovatis acuminatis margine villosulis integris calycis campanulati antica vix fissi costis hirsuti 5-dentati demum inflati segmentis sequalibus late lanceolatis acutis margine integris corollae tubo calyce seculongo antice ad insertionem filamentorum leviter sacculato labio obovato antice 3-loba lobis lateralibus ovatis medio suborbiculato dimidio majoribus galea inflata angulo reducto incurva parte basali sursum purum ampliata fauce bisinuata fere erecta parte antherigera horizontali in rostrum a medio gracillimum basi porrectum apice acuto integro circinnate deflexum producta staminibus in sacculo ex aduerso summi ovarii insertis filamentis basi et supra medium dense rufo-villoso ceterum

glabris ovario ovato stigmatibus incluso capsula late ovata acuminata parum exserta seminibus majusculis ovatis testa pallidis rugosis profundè reticulatis.—*P. tenuirostris* Benth., *Scroph. Ind.* 52; *Walp., Rep.* iii, 411; *Benth., DO. Prodr.* x, 5B1; *Hook, f., Flor. Brit. Ind.* iv, 307; *Maxim., Mel. Biol.* xii, 811, t. 2, f. 2B.

In HIMALAYA occidentalis—Kashmir: Yentisur, *Falconer* (bis)! Sonamurg, 10,500 p. a.m., et Kunzalwan, 7,500, *Clarke!* in valle Sind, *Stoliczka!* Pangi, *Stoliczka!* Brandis! Song, 9,000 p.s. m., *Brandis!* Dhamba, *Ellis!* Dharwas, 10,000 p. s. m., *Baden-Powell!* Tibet occ.; 10,000 p. s. m., *Thomson!* Lahul, 9,500 p. s. m. *Brandis!* Jceschke, n. 230! *Watt!* Gilgit, *Biddulph!* *Giles!* Tehri Garhwal; in valle fl. Ganges, supra Derali, 8—9,000 p. s. m., *Duthie* (5B1)! in valle Nila, 10—11,000 p. s. m., *Duthie* (5Bla)! in valle fl. Ganges inter Byramghati et Grangutri, 10,000 p. s. m., *Duthie* (1873; spp. optima fructigera nomine "*P. pyramidata*" distributa)!

Daulibus 40—80 cm. altis cygni pennæ crassitudine, rhizomate 8—12 cm. longo 0.5—1 cm. crasso ramis 5—15 cm. longis; foliis maximis 12 cm. longis his 4 cm. latis saepissime ternis 8 X 2 cm. foliis inferioribus nonnunquam brevius petiolatis, segmentis 3 x 10—5 mm.; calyce 10 X 5 mm., corollæ tubo 10 mm. longo galea. part. a. basali 4 x 3 mm. parts antherigera 5 X 3.5 mm. rostro 9 mm. longo labio 12 mm. lato, capsula 11 X 8 mm. seminibus 3 mm. longis his 1.75 mm. latis. Julio et Augusto floret; corolla lutea.

PLATE 24. C; figs. 8—15.—*Pedicularis tenuirostris* Benth.

Specimen from Lahul (Jceschke n. 230).

This account of *P. tenuirostris* is based on the examination of 39 specimens (23 gatherings, with analyses of flowers from 35 specimens. The species is at once diagnosed both from *P. pyramidata* and *P. pectinata* by its sessile cauline leaves. *Duthie* n. 1873 (issued as "*P. pyramidata*") is a gathering of excellent fruiting specimens of this; the original specimen preserved at Saharanpur still retains some corollas.

20. *Pedicularis pyramidata* Boyle (1835).

Elate sparse 3-4 fariam pilosa rhizomate crasso horizontali crib pluricipite caulis teretibus fistulosis simplicibus foliis 3-4-natis verticillatis petioli radicalibus longissimis laminis oblongo-lanceolatis acutis pinnatisectis partibus sessilibus 8—15-jugis linearibus serratis vel lanceolatis pinnatifidis serrato-dentatis subsessilibus dense spicatis bracteis inferioribus lanceolatis apice serratis reliquis ovatis acutis inters calycis campanulato-ovati hirsuti 5-dentati segment ovatis acuminatis maris integris corolla tubo calyce dimidio longiore labia obcordato antice 3-lobis lobis lateralibus ovatis medio 3-plo latioribus galea inflata angust. recto incurva parte basali declinata par., antherigera horizontali in rostrum a basi tenue abrupte producta staminibus, uncinis medio nunc fere apice tubi insertis supine tantum parce hirsutis ovatis ovato stigmate incluso capsula late ovata acuminata parum exserta seminibus testa pallidia profunde reticulatis.—*P. pyramidata* Boyle « Benth. & Pl. Ind. Lina-IZ Bit. L. n. s. xiv, PL Mis., 155; *Walp., Rep.* iii, 411; *Benth., DK Prodr.* x, 560; *Maxim., Mel. Biol.* xii, 810, t. 2, f. 27; *Præm. Jour. As. Soc. Ben.* Ivm, I, 256.—*P. tenuirostris* Aitchison, *Jcur. Linn. Soc.* xviii (1880), 84 (nec Benth.).—*P. Ailchison*, *Jour. Linn. Soc.* xviii (1880), 84 (nec Wall).

In HIMALAYA occidentali:—Kashmir, Davcsu kind, *Royle!* Pyr Panjal, *Sedgtvick!* Kala Pani, 1D5D0 p. s. m., GVes/DeDSan, 13,0DD p. s. m. et Kunzewan, 7,5D0 p. s. in., *Clarke!* Bilgit: *Biddulph!* *Giles!* Afghanistan: Safed Koh, 9,5DD p. s. m., *Collett* (122)! Shendtoi, *Aitchison* (n. 796 nomine "*P. pectinata*" edit.)! et in vallB Kurram In. 0 nomine "*P. tenuirostris*" edit.)! Lahul, in pratis, **10,000 p. s. m.**, *Brandts!* *Say!* in valle fl. Bhaga, 9,500—13,000 p. s. m., *Stoliczka!*

Daulibus 40—100 cm. altis cygni pennse crassitudine, rhizomate 8—12 cm. longo hoc D'5—1 cm. crasso; foliis maximis petiolis 5—B cm. longis, laminis 5—9 cm. X 2—3 cm. segmentis 5—15 mm. X 3 mm.; calyce 10 mm. longo hoc 5 mm. lato, corollse tubo 13—13 mm. longo, galese parte basali 3'5 X 3 mm. parte antherigera 5 X 35 mm. rostra 11 mm. longo labio 12 mm. lato; capsula 11 X S mm, seminibus 3 mm. longis his 1'75 mm. latis. Julio-Augusto floret; corolla purpurea vel rosea.

PLATE 24. A, B; figs. 1—7.—*Pedicularis pyramidata Royh.*

A—Specimen from Lahul (Brandis).

B— „ „ Safed Koh, Afghanistan (Collett n. 122).

This account of *P. pyramidaia* is based on the analysis of flowers from 39 specimens. The species is closely allied to *P. pectinata*, of which it appears to be the representative in the trans-Indus Himalayan district. The areas affected by the two species are distinct in the outer Himalayan ranges and hardly DVBr lap in the inner ranges. The time has not yet arrived for the treatment of this plant as a mere variety of *P. pectinata*; the diagnosis has been already given under that species.

21. *Pediularis Oliveriana* Prain (18B9).

Elata glabra caulibus simplicibus gracilibus foliia 4-natim verticiliatis breve petiolatis ovatis lanceolatisve pinnatisectis rhachi alatis segmentis 8—10-jugis acutis lanceolatis pinnatifidis laciniis Dvatis cartilMgineo-serratis floribus subsessilibus spicis interrupts verticillastris 4-floris bracteis inferioribus foliaceis summis linearibus margine dentatis calycis campanulati 5 dentati segmentis supparibus parvis acutis margine serratis corollae tubo calycem parum excedente labio obcordato antice 3-lobo lobis lateralibus ovatis medio rotundato duplo majoribus galra subinflata augulo subacuto incurva parte basali erecta tubo sequilata parte antherigera deflexa in rostrum circinnatum apice acuto integro sursum spectante sensim producta staminibus medio tubo insertis filamentis glabris ovario ovato acuminato stigmate incluso.—*P. Oliveriana Frain, Jour. As. Svc. Beng. lviij, 2, 257.*

In HIMALAYA orientali:—Phari; *Kingii mercenar. !*

Caulibus penn§, anserin§, crassis spicis longioribus 20—25 cm., petiolis caulinis 0'5 cm., laminis 2—3 X 1 cm. segmentis 8 X 2 mm.; pBdicellis 0—2 mm. calyce 5—B mm. corollse tubo 7 mm. longo galea parte basali 2'5 X 1'5 mm. parta antherigera 3B X 2 mm. rosrro 7 mm. longo labio 7—8 mm. lato, ovario 4 mm. longo.

PLATE 22. A ; figs. 1—7.—*Pedicularis Oliveriana Praia.*

Specimen from Thari [Lama Ujyen Gryatsko, n. 75).

The Lama brought from Phari one gathering of this plant by itself. From one of these specimens the figure 22A is drawn. During the same journey he must have met

with it frequently, for he has collected it alongaide of, and sent specimens mixed with, gatherings of *P. gracilis*, *P. alaschaniua*, *P. mollis*, and *P. ghbifera*. None of Dr. King's other collectors have met with it.

Thers arB neither roots nor capsules and the colour of the corolla is not noted, but ths flowering spikes are quite capable of description, and from the specimens ib seems as if the flowers had been purple. ThB species belongs to a group not represented in India by another form; its nearest ally ia *P. semitorta* Maxim. The diagnosis between them is as follows:—

bracts narrow, simple ; ualyx not deft anteriorly; corolla throat eientulous;

all filaments glabrous; corolla (?) purple. *P. Oliveriana*;

bracts triangular, 3-fid; calyx anteriorly cleft; corolla throat toothed;

anterior filaments hirsuta; corolla certainly yelbw. *P. semitorta*.

22. *Pedicularis brevifolia* Don [1825].

Elata pubescBns vel glabra rhizomate brevissimo lignoso radicibus cespitosis fibrosis caule gracili erecto terete simplicB vel B basi ramoso f oliis pBtiolatis radicalibus caespitosis demum Bvanidis caulinis 2—4-natim verticillatis lanceolatis ovatisve pinnatisectis -partitisve ssginentis 7—9-jugis contiguis oblongis inciso-serratis VBI pinnatifidis floribus ssssilibus 4-ternis verticillatospicatis verticillis inferioribus distantibus bracteia foliaceis breviter petiolatis summis confertia bracteis sessilibus calyois membranacsi brave campanulati 5-fidi dente postico subuluto integro reliquis oblongis cristatn-serratis in inure corolla tubo calyce SBsquilongiore labio 3-lobo lobis lateralibus ovatia medio orbiculars parum latioribus galea subiiiflata angulo recto incurva parte basali erecta tubo sequilata parte anthsrigrsra horizontali in rDstruin deflexo-porrBctum a basi tsnus apice obtuse emarginatum producta staminibus ex adverso summi ovarii insertis filamentis glabris ovario ovato stigmate exserto capsula ovata oblique acuminata calyce dimidio longiors semi nib us ovoidsis fulvis distincte reticulis.—*P. brevifolia* Ztow, *Prodr. Flor. Nepal.* 94; *Benth., Scroph. Ind.* 53; *Walp. Rep.* iii, 411; *Benth., DC, Prvdr.* x, 551; *Huok. l., Flor. Brit Ind.* iv, 307.—*P. lanigera* Wall, *Cat.* 419 [*pro maxima parte*] (1828).

In HIMALAYA occidental!:—Kashmir, 11,DDD p. a. m., *Bellew ! Lahul, Jveschkv ! Kamaon*, ad Palanij Badh, 11—12,DD0 p. 3. m., *Duthie ! Nepal*:—ex advsrso pagi Budhi, ID—11,B^ p. s. m., *Duthie!* in Grosain Than, *Wallich I* Julio- August o floret; corolla purpurea VBI rosea-

Daulibus 12—3D cm. altis, radicibus 4 cm. bngis, petiolis D5—1 cm. laminis 2 cm. bngis his 0.5—1.25 cm. latissegmentis 3—4 X 1.5—2.5 mm., pedicelUs D—25 mm., calycB 5 X 3 mm., corollse tubo B mm. longo galea parte basali 2.5 X 1.5 mm. parts antherigera 4 X 2.5 mm. rDstro 7—9 mm. longo labio IB mm. lato, capsula 11 mm. bnga hac 55 mm. lata, seminibus 1.25 mm. longis his D.75 mm. laLis.

PLATE 2B. A—D; figs. 1—7.—*Pedicularis brevifolia* Don.

A—Specimen from Palang Gradh, Byaus (Duthie, n. 5B37 in Herb. Saharanpur).

B— „ „ Kashmir, with deeply 2-fid apex of bBak.

C— >, „ Lahul, with opposite leaves (Jaeschke, n. 235 in Herb. Calcutta).

This account Df *P. irevi/olia* is baaed on the examination of 22 specimens. There are two distinct forms assumed by the species :—

(a)"vera;" tall, arect, leavBS 4-nats lanceolate pinnatipartite pstioles 0 for upper leaves short for lower, spikes elongated in flower, whorls 3—5 cm. distant. This iovixx

repeats the habit, and largely the foliage, of *P. instar* and *P. denudata*, and seems restricted to Nepal and Kamaon; and

(£) "tibetica," shorter, ascending, petioles longer, leaves 3-nate or opposite, ovate-oblong, pinnatisect, spikes subcapitate in flower, only slightly elongated in fruit. This form repeats the habit of *P. confertiflora* and seems confined to the Panjab-Himalayan district.

Don's description applies to the Nepal-Kamaon form only, but is excellent, and emphasises the character of 'obtuse emarginate apex of beak,' which is alone sufficient to diagnose the species from all those to which it is closely allied. There is at Calcutta a sheet "ex herb. E. Brown," named *P. brevifolia* by Don himself, collected in 1819 in Gosain Than by Wallich. With this plant Duthie's Kamaon and West Nepal specimens altogether agree. This, Dr. King tells me, is the plant named "*P. lanigera*" (Wall. Cat. n. 419) at the rooms of the Linnean Society of London; it is also Wall. Cat. n. 419 at Kew; and is, Mr. Maximowicz tells me, the plant of Wall. Cat. n. 419 at St. Petersburg. At Calcutta, however, the specimen representing Wall. Cat. n. 419 is a plant with alternate leaves, and is the densely-woolly form of *P. carnosia* that occurs along with the normal form in the Kamaon and Punjab-Himalayan districts. This may well be the case in other herbaria also, and the fact is noted here to obviate misunderstanding on the part of consultants. Both in the field and in herbaria form "vera" has been treated as a form of *P. porrecta*. Form "tibetica," on the other hand, which has been very generally accepted as "*P. brevifolia*," has had mixed with it two other species—*P. Heydei* and *P. confertiflora*. The following are diagnoses of each of these in turn:—

flowers numerous, spiked; stamens inserted opposite top of ovary; lobes of lip rounded; beak deeply emarginate, obtuse at apex; leaves usually 3—4-nate; plant hirsute. *P. brevifolia*;
flowers few axillary; stamens inserted above middle of tube; mid-lobe of lip rhomboid; beak entire acute at apex; leaves usually opposite; plant glabrous. *P. porrecta*.

leaves oblong-ovate; stamens inserted opposite top of ovary; lip large 3-fid, equalling beak with emarginate obtuse apex; roots fibrous. *P. brevifolia*;
leaves narrowly lanceolate; stamens inserted near apex of tube; lip very small, margin sinuate, hardly lobed, much shorter than beak with entire acute apex; roots fleshy. *P. Heydei*.

bracts foliar; stamens inserted opposite top of ovary; beak obtuse Binarginate at apex; corolla tube hardly exceeding calyx *P. brevifolia*;
bracts 3—7-fid; segments lanceolate; stamens inserted in middle of tube; beak acute entire at apex; corolla tube twice as long as calyx *P. confertiflora*.

Besides these species, which are known to have been mixed with *P. brevifolia* in distribution, it much resembles the typical variety of the next species, *P. instar*. The diagnosis is as follows:—

lip 3-fid; apex of beak obtuse emarginate. *P. brevifolia*;
lip 3-partite; apex of beak acute entire. *P. instar*.

23. *Pedicularis instar Prain* (1888).

Elata vel nana pubescens rhizomate brevissimo radicibus caespitosis fibrosis caule gracili erecto terete simplice vel e basi ramoso foliis minimis radicalibus brevibus petiolatis caespitosis mox evanidis caulinis subsessilibus 2—4-natis verticillatis Linceolaiis oblongisve pinnatilobis segmentis 7—9-jugis cernitibus brevissimis ovatis et minute serratis floribus subsessilibus 4-ternis verticillato-spicatis verticillis inferioribus distantibus summis confertis bracteis foliaceis imis saepe foliis caulinis longioribus calycis herbacei campanulati 5-dentati segmentum postico integro reliquis cristato-serratis corollae tubo calyce sesquilongioribus labio 3-partito lobis obovatis lateralibus medio parum angustioribus galea subinflata angulo recto incurva parte basali erecta tubo setulata parte antherigera horizontali in rostrum deflexo-porrectum a basi tenue apice acuto intus breviter produuta staminibus medio inter summum ovarium et tubi apicem insertis filamentis glabris ovario ovato mucronato stigmate subexserto capsula ovata oblique acuminata calycem dimidio duplo superante seminibus ovoideis fulvis distincte reticulatis.

VAR. *typica*; caule elato erecto stricto foliis caulinis 4-natis verticillatis ovato-oblongis sessilibus calyce late breve campanulato dentibus magnis ovatis rostro labio manifeste brevior capsula late ovata calyce dimidio longiore.—
P. instar *Prain in Maxim. Mel. Biol.* xii, 815, t. 2, f. 32; *Jour. As. Soc. Beng.* Iviii, 2, 257.

In HIMALAYA orientali:—Sikkim, Ong-la-thang, infra Kinchinjanga; et in *Pey-kiong-la*, 13,000 p. s. m., *Kingii mercenar.* !

VAR. *paradoxa*; caulibus saepius caespitosis nanis foliis caulinis lanceolatis inferioribus brevissime petiolatis saepissime oppositis nonnunquam verticillo inferiore 3—4-natis dispositis calyce angustiore oblongo rostra labio sesquilongo capsula anguste ovata calyce duplo longiore.—P. instar *VAK paradoxa Prain, Jour. As. Soc. Beng.* Iviii, 2, 257.

In HIMALAYA orientali:—Nepal orientali: ad Nia-pokri, 12,000 p. s. m.; Jongri, ad Bijan 12,000 p. s. m., *Kingii mercenar.* I

Julio—Augusto floret; corolla rubra.

Daule VAR. *typica* 2—5 cm. alto VAR. *paradoxa* 2—8 cm., radicibus 3—5 cm. longis, petiolis radicalibus 1—2 cm. laminis 7.5—15 cm. longis his VAR. *typica* 5 cm., *paradoxa* vix 1.25 cm. latis segmentis 1 mm. longia his 2 mm. latis; pedicellis 0.5 mm., calyce VAR. *typica* 5 x 4 mm. VAR. *paradoxa* 6.5 x 3.5 mm. corollae tubo 7 mm. longae* parte basali 2 mm. longa hac 1.5 mm. lata parte antherigera 4 x 2.5 mm. rostro VAR. *typica* 3—3.5 mm. longo VAR. *paradoxa* 6—7 mm. longo labio 10 mm. lato; capsula VAR. *typica* 8 mm. longa hac 4.5 mm. lata VAR. *paradoxa* 12 mm. longa vix 3 mm. 1.5 mm. PLATE 25 D, E; figs. 8—19.—*Pedicularis instar Prain.*

D—Specimen of VAR. *typica* from Ong-la-thang, Jongri.

E—,, ,, *paradoxa* from Nia-pokri, Jongri.

This account is based on an examination of 15 specimens of VAR. *typica* and 58 specimens of VAR. *paradoxa*. The most nearly allied species is *P. brevifolia*, the *Kama-Dii-Nep* form of which VAR. *typica* closely resembles; the diagnosis has been already given.

P. Ileydei sometimes much resembles VAR. *paradoxa*, but the small hardly-lobed lip of that species at once distinguishes it from **this**. But VAR. *typica* most closely imitates the habit, foliage, and calyx of *P. denudaia*, while VAR. *paradoxa* equally strikingly repeats the same characters of *P. polygahides*. In these two species, however, "which in vegetative characters differ as widely as do the two varieties of *P. instar*, the corollas, though very closely resembling each other, are separable by staminal characters,—filaments hirsute in *P. dvnudata*, glabrous in *P. polygahides*. The only difference between the two varieties of *P. instar*, on the other hand, is that the beak is longer in VAR. *paradoxa* than it is in the type. This single character is not sufficient to separate the two as distinct species.

24. *Pedicularis gracilis* Wall (1828).

Elata vel decumbens 2—4-fariam pilosa rhizomate lignoso sBepissime incrassato radicibus fibrosis caulibus singulis vel cespitosis gracilibus vel strictis simplicibus VBI semel iterumve ramosis foliis ramisque oppositis vel 3—4-natis verticillatis radicalibus mox evanescentibus caulinis subsessilibus ovato-oblongis pinnatisectis segmentis 6—9-jugis oblongis obtusis inciso-serratis floribus breve pedicellatis gracillime paniculatis racemosive vel omnibus axillaribus distantibus calycis cylindrico-oblongi membranacei glabri vel pubescentis nee fissi 5-dentati segmentis brevibus ssepissime integerrimis corollae tubo calycem parum excedente labio suborbiculare antice 3-lobis lobis lateralibus ovatis medio rhomboideo-ovato duplo majoribus galea subinflata angulo recto incurva parte basali erecta tuba sequilata parte antherigera horizontali in rostrum deflexo-porrectum a basi tenue apice acuto integerrimo producta staminibus media tubo vel paulo altius insertis filamentis glaberrimis ovario ovato* stigmate exserto capsula late ovata acuta parum vel dimidio calyce longiore seminibus dense fulvo-cinereis distincte reticulatis.

VAR. *typica*; erecta vel procumbens caulis lineis pilosis exceptis foliisque glabro foliis caulinis majoribus ramealibus parvulis bracteis foliisque distincte petiolatis calyce margine villosulo sinuato vix dentato capsula vix exserta staminibus medio tubo insertis.—*P. gracilis* Wall., *Cat.* 413; *Benth Scroph. Ind.* 52; *Walp., Rep.* iii, 411; *Benth., DC. Prodr.* 2, 5B1; *Thu/c. l., Flor. Brit. Ind.* iv, 3D7.—*P. stricta* Wall, *Cat.* 414 [182BJ.—*P. Brunonian* Wall, *Cat.* 422 (1828).

1. Formae "verse" distributio [Wall, *Cat.* 413].

In HIMALAYA occidentali—Dranti, in jugo, 12,000 p. s. m., *Baden-Powell* [n. 267]! Tehri-Garhwal; prope Dangalla in valle fl. Ganges, 6-7,000 p. s. m. *Duthie* (n. 1874)! ad ripas fl. Ganges infra Jangla, 8—9,000 p. s. m., *Duthie* (n. 233)! Kumaon: in valle Ralam, 12—13,000 p. s. m., *Duthie* (3224)! Nepal: in montibus SheDpur et in Gosain Than, *Wallich* (*Cat.* n. 413 [Jii])! *Scully*! In Himalaya orientali:—Sikkim: ad Eheedong, *Kingii mercenar.*! Chumbi: ad RinchingODg in valle Chumbi, et apud Galing, locum inter Dhumbi et Phari medium, *Kingii mercenar.*! f. *h^c* omnia cum *P. gracili* Wall, consentanea); in Himalaya occidentali etiam spp. *P. porrectae* simillima, in Jumnotri ai nives legit *Duthie* (n. B10)! in Lahul legit *Watt*!

2. Formae "strictae" distributio [Wall, *Cat.* 414].

In HIMALAYA occidentali:—Kashmir, *Falconer* n. 794 (pro maxima parte sed cum *P. teniirvstri* in distributione commixta)! Dalhousie, 7,000 p. s. m., *Clarice*! Pauwi; Busahir, 7,000 p. s. m., *Brandis* [3157]! Jaunsar Bahar; in montibus Deoban, 7—8,000 p. s. m.

Duthie (12DD et 1201)! Simla, 7— 8,000 p. s. m., *Thomson* (*Herb. Ind. Or.*)! *Stoliczka*! *Schlich*! *Gamble* (4775)! Mussoorie, *Royle*! *King*! *Duthie*! Kamaon :— *Wallich* [CW. n.414)! *Cheena*, *Davidson*! *Hay*! Byaus, in valle Kali, 9—1D, DOD p. s. m., *Duthie* (n. 3223)! Tehri-Grarhwal, *Duthie*! Kullu, 8—1D, ODD, *Brandis* (3159)! *Watt* (8653)! Nagkanda, *Stoliczka*! ad Bhagi, 9DD0 p. s. m., *Watt* (8BD3)! Tranda, *Stoliczka*! Nepal: Gosain Than, *Wallich* [Vat 414)! et in sched. "ex Herb. R. Brown" (sub nomine *P. brevifolia*)! *Scully* (202)! in Afghanistan; apud Shendtni, 9—1D, D05 p. s. m., *Aitchison*! In Himalaya orientali:—Jongri; apui Bijan, 12DDD p. s. m., *Kingii mercenar* J Sikkim; Darjeeling, *Hooker* [*Herb. Ind. Or.*]! *Thomson*! *Anderson*! *Kurz*! Rai-Dp-tey, 10, DD0 p. s. m., *Kingii mercenar.*! Bootan; *Griffith* (531 Jour.)! [spp. hsec Dmnia cum *P. stricta* Wall, consentanea.)

3. Formse^{ls} prostrate" distributio [*Wall*, *Vat* 422).

In HIMALAYA occidentali:—Kamaon, *Wallich* [*Vat*. n. 422)! Mussoorie, *King*! In Himalaya orientali:—Sikkim; Darjeeling, *Thomson*! *Kurz*! Tongloo et Jellapahar, *King*! (spp. hsec omnia cum *P. Brunoniana* Wall. cDnsentanea.)

VAR. *macrocarpa*; erecta vel ascendens caule lineis pibsis exceptis foliis^{ue} glabro bracteia sessilibus foliis omnibus petiolatis caulinis majoribus ramealibus parvulis calyce distincte dentato segmentis ovatis serrati3 capsula dimirtio exserta staminibus supra medium tubum insertis.

In HIMALAYA orientali: Phulbot, 1D, ODD p. s. m., *Thomson*! Tongb, 8, DDD p. s. m., *Anderson*! Phullaloong, 11, ODD p. s. m. et Singalelah, 1D, DDD p. s. m., *Clarke* (13418). (12732)! DhoDa-bamia, prope Singalelah, 12, DDD p. s. m. (bis), *Kingii mercenar.*! Dhumbi: Taong-shong (bis) *Kingii mercenar.*!

VAR. *khasiana* ; erecta caule foliisque puberulo bracteis foliisque sessilibus ^{sæpius} basi subauriculatis foliis caulinis ramealibusque parvulis calyce puberulo dentibus brevibus cartilagineis crenulatis acutis capsula vix exserta staminibus medio tubo insertis. VAR. *khasiana* *Hook. l*, *Flor. m. Brit.* InTM iv, 3D7.

In ASSAM:—in montibus Khasia; Kak Tani, *Griffith* (Jour. 742)! *Hooker* [*Herb. Ind. Or.*]! Nunklow, *Simons*! Kala Pani, 4, 5DD p. s. m. et Moflong, 5, 5tD p. s. ⁿ¹» *Clarke* (5311)! (18079)! In mont. Barfil; supra Konoma, 6, 5DD p. s. m., *Prām*! supra Kegwima, i, 5D0 p. s. m., *Clarke*! BURMA :—in mont. Shan; Toungyi, 5, DDD p. s. m. et Koni, 4, ODD p. s. m., *Collett*!

Daulibus 4[]—120 cm. altis, foliis 2-5 X 15 cm. segmentis 4—8 X 2 mm. (in ^{vak} *khasiana* 05 X D'25 cm. segmentis parvulis), calyce B mm. longD hoc 2'5 mm. la^{Di} corollse tubo 7—8 mm. longo galea parte basali 2 X 1'5 mm. parte antherigera 3 X 2 mm. rostro 5*5 mm. longo labio 10 mm. lato; capsula 8 mm. longa hac 5 mm- lata [m VAR. *macrocarpa* 11 mm. longa 5 mm. lata), seminibus L'25—1-5 mm. longis.

PLATE 19. A—U; figs. 1—9.—*Pedicularis gracilis* *Wall*. VAR. *typica*.

A—Specimen of form "stricta" from Gosain Than, Nepal \Wall, *Cat* n- 414 in *Herb. Calcutt.*).

B—Fruiting specimen of form "stricta" from Sikkim, 10—11,000 |T. Thomson, anno 1857).

C—Specimen of form "prostata" from Kamaon [P. *Brunoniana* *Wall*, *Cat*. n. 422 in *Herb. Calcutt.*).

PLATE 2D. D, E ; figs. 11—17.—*Pedicularis gracilis* Wall. VAR. *typica*.

D—Specimen of form "vera" from Nepal [Wall., *Vat.* n. 413 in Herb. Calcutta.

E— " " approaching to *P. porrecta* from Jumnutri, near the snows (Duthie n. 81D in Herb. Saharanpur).

PLATE 21. A—Ej figs. 1—13.—*Pedicularis gracilis* Wall* VAR. *macrocarpa* Prain and VAR. *khasiana* Hook, l.

A, D—Specimen of VAR. *macrocarpa* from Jongri; Dhooabamia.

B— " " " n Singalelah (Clarke n. 12732).

D— " " *khasiana* from Toungyi, Shan Hills (Dollett n. 8).

E— " " " " Kala Pani, Khasia Hills (Griffith n. 742).

The present account of this widely-distributed and very variable Himalayan species is based on the examination of 154 specimens with dissections of over 250 corollas. Of these specimens 104 have been of VAR. *typica* (form "vera" 25, "stricta" 68, and "prDstrata" 11), 35 have been of VAR. *macrocarpa*, and 24 of VAR. *khasiana*.

The species is most nearly allied to *P. porrecta*, which is usually very different in habit. The leaves and calyx of *P. porrecta* are subcoriaceous (in this respect, however, VAR. *khasiana* approaches it), its calyx teeth are distinct and serrate at the apices [in which respects VAR. *macrocarpa* approaches it), while it is much shorter and smaller and is hardly branched (though even in these characters it is approached by an extreme form of VAR. *typica*; Duthie n. 81D in Herb. Saharanpur, and specimens in Herb. G. Watt.). Perhaps *P. porrecta* itself will ultimately have to be regarded as only an extreme variety of *P. gracilis*.

The forms that are included here under *P. gracilis* are as a rule very easily distinguished, but connecting specimens of all kinds occur, and they pass into each other on every hand.

Most easily distinguished of all is VAR. *khasiana*, with small thick cauline leaves, hardly larger than those on the branches, sub-coriaceous calyx with cartilaginous subdentate margin, and with a distinct geographical area; (it is confined to the Indo-Chinese Division of the Himalayan province.) But Mr. Duthie has collected in Jaunsar Bahar (n. 12DD!) specimens with the membranous calyx and sinuate hardly dentate margin of VAR. *typica*, form «stricta," and with the small cauline leaves of VAR. *khasiana*. On the other hand, Mr. Clarke's specimens from Kegwima and my own from Konoma, two localities in the Naga hills, have the calyx and puberulous stems of VAR. *khasiana*, but have the cauline leaves shortly petioled, and therefore connect VAR. *khasiana* with the other two varieties. The Shan hill plant collected by General Collett is exactly the Khasian variety.

The other varieties are confined to the Himalaya proper. Of these, VAR. *macrocarpa* has to be recognised as separate from the typical plant by characters of almost as great weight as those that give *P. porrecta* specific rank. These are its ovate serrate calyx-teeth, its higher staminal insertion, and its much larger capsule. In *fades* all its gatherings very well agree; and though it grows side by side with all the three forms of VAR. *typica*, there are really no intermediate states. Since, however, it is probable that ultimately even *P. porrecta* will require to be reduced to *P. gracilis*, I have not ventured to accord more than varietal rank to this plant.

Of VAR. *tijpica*, out of which Wallich carved three "species," there are two very distinct forms: —

[a) "*vera*," with slender stems and opposite decussate leaves and flexuous branches [sometimes with leaves and branches 3-nate), and with the calyx margin distinctly, though shortly, toothed, but with the teeth entire = *Wall. Cat.* n. 413; and

[3) "*stricta*," with stouter erect stems and 4-nately whorled leaves and rigid branches [also sometimes with the branches 3-nate), and with the calyx margin not toothed = *Wall. Cat.* n. 414. The true plant is somewhat uncommon, though it is present at Calcutta or at Saharanpur from many of the inner valleys of Kumaon, Nepal, Sikkim, and Dhumbi. The erect form (*P. stricta* Wall.) is common everywhere from Afghanistan to Bootan, and it is this form that passes into VAR. *khasiana*. It affects usually grassy slopes and forest glades; when it grows on marshy ground it becomes decumbent and the cauline leaves as well as the radical ones drop off. It then becomes the plant figured on Plate 190, the distribution of which in the text is given as that of form "*prostrata*," and is the plant = *Wall., Cat.* n. 422. It is thus really only a state of form "*stricta*," not a separate form.

25. *Pedicularis Heydei* Prain [1889).

Humilis pubescens rhizomate brevissimo radicibus caespitosis carnosius caulibus gracilibus caespitosis arcuatis teretibus simplicibus foliis lanceolatis pinnatisectis radicalibus caespitosis longe petiolatis caulinis 2-paribus oppositis superioribus subsessilibus segmentis 18—25-jugis linearibus dense contiguis floribus breve pedicellatis subspicatis verticillastris summis confertis bracteis oblongis calyce brevioribus calycis crasse herbacei dense villosi oblongi 5-fidi segmentis supparibus lata basi lanceolatis margins crenulatis corolla tubo calyce plus dimidio longiore labio parvo 3-sinuato margine crenato lobis semicircularibus siliulatis galea subinflata angulo recto incurva parte basali erecta parte antherigera horizontali in rostrum deflexo-porrectum labio duplo longius a basi tenue rostro apice acuto integro producta staminibus fere apicibus tubi inserta filamentis glabris ovario ovato stigmate exserto capsula ovata apice subacuminata vix debilius calyce dimidio longiore. — *P. Heydei* Prain in *Jour. As. Soc. Beng.* lviii, 2, 258.

In HIMALAYA occidentali :— Lahul, ad Key-lang, 12,000 p. s. m., Watt! Pangi, 15,500 p. s. m., Heyde !

Caule 8—14 cm. altis, radicibus 5—8 cm. longis, petiulis radicalibus 3 cm. longis laminis 1.5—2 X 0.5 cm. segmentis 2 X 0.5 mm., pedicellis 2—5 mm., calyce 8 X 3.5 mm., corollae tubo 12—14 mm., galeae parte basali 2 x 1 mm. parte antherigera 4 X 1.5 ^{in Uim} rostro 8—7 mm. longo labio 35 mm. longo hoc 5 mm. lato, capsula 11 mm. longa corolla rubra.

PLATE 27. E ; figs. 9—14.—*Pedicularis Heydei* Prain.

Specimen from Pangi.

This species is described from two gatherings : one gathering of 10 specimens in *Serb. Cakut*, and another of a single specimen in *Herb. G. Watt.* Dr. Watt's specimen Mr. N. E. Brown had already noted that this is probably a separable form. It is at once diagnosed from *P. brevifolia*, with which it has been hitherto placed, by the entire apex of beak and the very small lip. The lip and the very different calyx separate it from

P. instar VAR. *parade*, which it also resembles. Fig. E represents the proportion of lip and beak accurately. The small figures are erroneous, inasmuch as the lithographer has made them represent the beak shorter than in the drawings from which they were copied.

2B. *Pedicularis porrecta* Watt. [U2S).

Humilis glabra vel 2-3-fariam hirsuta rhizomate brevissimo radicibus c^{aspitosis} carnoT auliL c[^]sis AnplioilmB vel a basi ramosis Mn^s glabⁿs radica^hbus carnosus caulibus p^J bus mox eva niig ^{^^} X₃ [^]epissimB 2) -paribus longe petiolatis c^{aspitosis} pauci bus mox eva niig ^{^^} X₃ [^]epissimB 2) -paribus oppositis inferioribus breve petiolatis summis sessilibus laminis oblongo-^c cis pinnatifidi. -sectTM s[^]BntU e-S.jugis oblongis obtusis inciso-serratis flo^{...}ibus breve pedicellatis racemis paucifloris calycis oblongi coriacei glaberrimi 5-dentati segmento ideo integro vicinis triplo latioribus ovatis m^{...} crenato-serratis imis summo

ce cristatis corollæ tubo calycem duplo su
3-lobo lotas lateralibus ov^{ti} m^{di}. rho^{boidep}-oyat. dupl. majonbus 6Jea [^]bmflata angulo recto incurva parte basa^{...} rostrum defl

api^{CB},n tab .nser^{us} ilamento «[°]TM^{...} [^] i b u a OToideis Wvis ai^Billo^{te} rrti- subauminato vix obliqua calycB dimidio loigote seminiBus
0QU&-P. porrscta HWI, Cut 423; B[»]«^{...}, Jer./^{*} M. 58, W^{*}, [^]...^{...}, "1. A^{tt}, DP. k^{*}. «, 561; fi^{*}/, nr. Brit hi. *, 307; Ita., "I «, B[»]

h HDOUXi o^{CB}id^{eBt}aU:-ICash^m,r, ad Shalum, R*. Kamaon, IRUM, 0^{MI} *^{...}. Laka, [^] r f l Garhwal, fi[«] M[>] ^{K, TM^{on}}, Bh^{owari}, W^{...} s. m. j^t prop. glaciem ad d Lebang, -15,000 p. Duthie! In Himalaya orientali:—Sikkim; in Tang-ka-la, 7^{Tim}[^] mercenar.!

DISTRIB.—Yunnan.

Caulibus 5—30 cm. altis, radicibus 5—6 cm. longis, petiolis radicalibus 1—2 cm. laminis 1-5-2 X OT. cm. segmentis 3 X » mm.; P [^] [^]—6 mm., calyce 7 mm. longo, corolla tubo 12-14 mm. longo galeæ partebasah 3 X 1 o m^{...} parte antherigera 3.5 × 2 mm. rostro 7 mm. longo hbio 10 mm. lato; capsula 10 mm. longa seminibus 1 25 m^{*}. lon^{...}is.

PLATE 20. A-C; figs. 1-10.—*Pedicularis porrecta* Wall.

A, figs. ^r ^r specimen fr^{...} Kamaon (Wall., Cat. n. 423 in Herb. Calcutt.).
B, figs. ^{...} Sikkim; "Tang-ka-la north of Ze-lep-la at the

same elevation."

C, figs. 8 & 9—Specimen from Laka (collected by Edgeworth).

Fig. 10—From Ralam valley. Specimen in Herb. Saharaupur.

This account of *P. porrecta* is based on the dissection of flowers from 39 specimens. In «BU species tk. leaves «. always opposite and the bracts are alw^s sessile, the always I - PMi) flowered, the corolla tube is elo^{...}ted the oaly/aBi have. ar^e subcoriaceous, ani the »tam» are always inserted above 1 [^]IddlB of L, ub^B, so that only eittlen^e condition, of P. »TM* (which in its various fMms elbi^{bits} now one, now another, of th^{BS}» character, but generally retains its paniculat[^] race^m»e habit) ar^E Kkdy I. give tart, in div^{un}. In doubtful cases, however—so^yclose is the rBktioI18Uip of the two species—we have to rely on the faws due to its -w) I.U. 1 M. t «te.» d on the

elongated corolla tube as the only characters wherein *P. porrecta* finally differs from *P. gracilis*. These are characters which in no other instance are accorded any weight. Since, however, a very different reduction, viz. to *P. brevifolia*, has been proposed, it seems better to allow *P. porrecta* to stand for the present. From *P. brevifolia* it is at once distinguished by its entire apex of beak, and can never be satisfactorily included in that species. From *P. Hvydei* it differs by its ovate glabrous leaves with fewer segments^ its unequal calyx segments₇ and its much larger lip.

27. *PeiiDiilaris Donfertiflora* Train [1859].

Humilis vel elata dense pubescens rhizomate brevi vel elongato lignoso radicibus fibrosis caulibus gracilibus teretibus simplicibus vel e basi ramosis ramo centrali erecto reliquis decumbentibus apice ascendentibus foliis radicalibus petiolatis cespitosus mox evanidis caulinis 1-paribus oppositis vel 0 subsessilibus omnibus ovato-oblongis pinna-tisectis segmentis 5—7-jugis ovatis inciso-serratis floribus brevis pedicellatis oppositis VB! verticillastro imo nonnunquam 4-floro densius confertis vel verticillo inferiore reliquis remoto bracteis 3-angularibus subfoliaceis 3—7-partitis laciniis sublinearibus basi integris apice cristatis calycis membranacei hirsuti campanulati 5-secti dente postico deltoideo integro reliquis lanceolatis apice cristatis brevior corollae tubo calyce fere duplo longiore labio late cordato-ovato antice 3-loba lobo medio 3-lobato latioribus late ovatis faucem amplexantibus et post galeam sese tegentibus plus 3-plo minore galea subinflata angulo reetD incurva parte basali sursum leviter extensa parte antherigera fere horizontali in rostrum deflexo-porrectum a basi tenue apice obtuso integerrimo producta staminibus medio tubo insertis filamentis glabris ovario ovato stigmate exserto capsula oblique ovata mucronata calyce dimidio longiore seminibus ovoideis fulvis distincte reticulatis.—*P. donfertiflora* Prain, Jour. As. Soc. Beng. lviii, 2, 258.—*P. brevifolia* Herb. Ind. Or. H. f. if T. T. \spp. Sikkimens.) ; Hook. l., Flor. Brit. Ind. iv, 307 \pro parte, nee Dm) (1884).

In HIMALAYA orientali:—Sikkim, 13—15, DDD p. s. m., Hooker! Dhumbi; ad Reedongoong, prope Dhumbi; et apud Ka-poop prope Ze-lep-la, *Kingii mzyrenar. I* Phari; ad Ting, *Kingii mercenar. !*

Junio—Augusto floret; corolla rosacea, vel tubo alba ceterum rosea.

Stem 5—25 cm. altus, rhizomate D—3 cm. longo radicibus 3—5 cm. longis, petiolis 1—3 cm. longis latioribus 1—3 X 0.5—1 cm. segmentis 3—5 X 2—4 mm., pedicellis 2—5 mm., calyce 7 X 35 mm., corollae tubo 11 mm. longo galea parte basali 2.5 X 1.5 mm. parte antherigera 4 X 2.5 mm. rostro 7 mm. longo labio 18 mm. lato, capsula 18 mm. longa hac 5 mm. lata seminibus 1.25 mm. longis bis 0.75 mm. latis.

PLATE 27. A—D; figs. 1—8.—*Pedicularis confertiflora* Prain.

A—Specimen from Ting.

B—Fruiting specimen from Sikkim [*Herb. Ind. Or.*].

D—Specimen from Ka-poop, near Ze-lep-la.

D—Portion of central erect branch from a second specimen of the Ka-poop gathering.

This account is founded on the dissection of flowers from 32 specimens.

The species imitates the habit and foliage of the Panjab-Himalayan form of *P. brevifolia*^ and is the Sikkim plant included in *P. brevifolia* in the *Flora of British India*.

The diagnosis has been already given under *P. brevifolia*. But it equally closely resembles in habit *P. tenuicaulis*, from which the diagnosis is effected by the stamens being all glabrous in *P. confertiflora* while the anterior filaments are hirsute in *P. tenuicaulis*; *P. tenuicaulis*, moreover, has very different capsule and seeds. *P. chumbica*, another species that resembles this and agrees with it in having glabrous stamens, is diagnosed by its much elongated corolla tube, its lanceolate capsule, and its filaments inserted at different levels within the corolla tube.

28. *Fedicularis flexuosa* Hook, f. (1884).

Humilis vel elata pilosa rhizomate HgnDSo radicibus casspitosis fibrosis caulibus numerosis simplicibus vel e basi ramosis ascendentibus foliis cauleq^a sparse pilis crispis aspersis petiolatis radicalibus casspitosis caulinis oppositis ovato-oblongis pinnatipartitis rhachi dentatis segmentis 8-14-jugis oblongis pinnatifidiis -sectisve lacinis serratis floribus axillaribus pedicellatis inferioribus distantibus summis confertis bracteis foliaceis petiolatis calycis cylindrico-campanulati hirsuti antice triente fissi 5-dentati segments summo deltoideo integro relicis cristato-dentatis ellipticis imis duobus summo aquilongo lateralibus duplo brevioribus corolla* tubo extus leviter puberulo calyce plus duplo longiore labio ovato-rotundato antice 3-lobis lobis laterahbus medio plus duplo majoribus^b galea sub-inflata arcuato-incurva parte basali erecta parte antherigera leviter falcata in rostrum robustum porrectum horizontalem apice obtuso parum emarginato producta staminibus medio inter summum ovarium et apicem tubi insertis filamentis anticis hirsutis ovario lanceolato stigmate exserto capsula ovata-lanceolata acuminata calyce triente longiore seminibus ovatis testa nigris minutissime reticulatis.-*P. flexuosa* Hook f., *Fbr. Brit. Ind.* iv, 3D8; *Maxim., Mel. Biol.* xii, 820, t 2, l. 35.

In HIMALAYA orientali.—Sikkim, 1D-13, JD p. s. m., *Booker [Herb. Ind. Or.]* I Mon Lepcha, 11, ODD p. s. m. *Thomson!* Jongri, 13—15, DDD p. s. m. *Anderson!* Singalelah, 11, DDO p. s. m. et Jongri, 12, ODD p. s. m. *Clarke!* Jongri, 14, DDD p. s. m. *Watt!* Kotah-yurong, 15, ODD p. s. m.; Tha-moo-tsa, props Jongri, 12, DOD p. s. m.; Beeroom, 13, DDI p. s. m.; Natong; Lamteng, 8, 8D0 p. s. m., *Kingii mercem r.!* Dhumbi:-ad Rin-chin-gong, *Kingii mersenar.!*

Junio, Julio, et Augusto floret; corolla purpurea.

Daulibus 8—30 cm. altis, rhizomate 2—5 cm. longis radicibus 5-12 cm. longis, petiolis radicalibus 3—6 cm. longis caulinis 1-5 cm. floralibus 5—1 cm. laminis maximis 5 X 25 cm. segmentis 1D X 6 mm., pedicellis 4—6 mm., calyce 8-9 mm. longo hoc 4 mm. lato, corolla tubo 1B—22 mm. longo galea parte basali 4 X 2½ mm. parte antherigera 5 x 3 mm. rostro 6 mm. longo labio 12 mm. lato, capsula 9—12 mm. longa seminibus 1½ mm. longis 1D75 mm. latis.

PLATE 18. A, B, figs. 1—8.—*Pedicularis flexuosa* Hook. f.

A—Specimen from Sikkim [*Herb. Ind. Or.* n. 5].

B—Fruiting specimen from Jongri.

This account is based on an examination of 31 flowering and 17 fruiting specimens and on the analyses of 57 corollas. In his very accurate description Mr. Maximowicz states that he has found the filaments inserted at the apex of the tube. A considerable number

of corollas havB been examined in order to find, if possible, another instance of this high insertion, but Plate 18, fig. 4, shows the highest point of insertion in any of the flowers analysed; usually it is a little lower than in the case figured. The longer tube and the emarginate apex of beak distinguish this species from *P. tenuicaulis*. From *P. chumbica* it is separated by the emarginatB apex of beak and by the anterior filaments being hirsute.

29. *Pedicularis chumbica* Prain [IBBD).

Nana caespitosa glabra rhizomate nodoso radicibus caespitosis fusiformibus fibrosisve caulibus nuiperosis gracillimis brevibus debilibus foliis radicalibus densissime caespitosis longe petiolatis caulinis 1-paribus oppositis vel D floralibusque distincte petiolatis pinnatisectis segmentis 8—1D-jugis ovatis contiguis serratD-dentatis floribus paucis pedicellatis confertis vel inferioribus nonnunquam parum remotis calycis cylindrico-campanulati glabri antice triente fissi 5-dentati segmento summo lineari integro rplitjuis anguste lanceolatis apice cristatis corollae tubo calyce fere triplo longiore labio antice 3-lobis lobis rotundatis lateralibus medio parum majoribus galea subinflata arcuate incurva parts basali erecta tubo parum latiore parte antherigera falcata in rostrum tenue deflexum apice integro acuto producta staminibus anticis fere medio tubo posticis ex adverso summi ovarii insertis filamentis omnibus glabris ovario lanceolate stigmate exserto capsula recta lanceolata apice acuta calyce fere duplo longiore seminibus paucis ovatis testa nigrescentibus minutissime reticulatis.—*P. chumbica* Prain in *Jour. As. Soc. Beng** Iviii, 2, 259.

In HIMALAYA orientali:—Chumbi; ad Za-negang, inter Cho-la et Chumbi medium et apud Put-lo, *Eingii mrcenar*!

Julio floret; corolla purpurea.

Caulibus 4—B cm. altis, radicibus 4—5 cm. longis petiolis radicalibus 1'5 c^m-caulinis floralibusque D'5 cm. laminis 1 X 0'35 cm. segmentis 2—3 X 1 mm., pedicellis 4—6 mm. longis, calyce B mm. longo hoc 3 mm. latD, corollae tubo 11—18 mm. **longo** gale^ parte basali 25 X 25 mm. partB antherigera 4 x 3 mm. rostro B"5 mm. **longo** labio 14 mm. lato, capsula 11 mnj. longa hac 4"5 mm. lata seminibus T25 mm. **longis**.

PLATE 22. B; figs. 8—15.—*Pedicularis chumbica* Prain.

Specimen from Put-lo.

TIIB species is described from* an examination of seven specimens. It is closely allied by its calyx, its capsule, and its seeds to *P. flezuosa* and *P. tenuicaulis*; fr^{DQ1} both it differs by its dwarf habit and its glabrous filaments. From the former it also differs by its entire apex of beak; from the latter by its serrate calyx teeth. It cbseely repeats the habit and foliage of *P. schizorrhyncha*, which has, however, **dierep** capsules and seeds, and has a short stout truncate beak laciniate at the apex.

3D. *Pedicularis tenuicaulis* Prain (1B89).

Humilis vel elata glabra rhizomate brevi radicibus fibrosis tuberis interspersis caulibus **caespitosis** simpliibus gracillimis flexuosis foliis petiolatis radicalibus caespitosis **cau in**

oppositis Dvato-oblongis pinnatisectis segmentis B—8-jugis ovato-lanceolatis pinnatifidis laciniis serrato-dentatis floribus axillaribus pedicellatis inferioribus distantibus summis confertis bracteis petiolatis foliaceis calycis campanulati glabri antice trientB fissi 5-dentati segmentis integris summo subulato reliquis lanceolatis ovatis corolla tubo calyce parum longiore labio 3-lobo lobis rotundatis lateralibus medio duplo majoribus galea subinflata angulo recta incurva parte basali erecta tubo seijulata parte antherigera fere horizontali in rostrum tenue deflexo-porrBctum apice acuto integro producta staminibus medio tubo inserta filamentis antica barbati ovario Dvato-lanceolato stigmate exserto capsula recta lanceolata acuminata calycis dimidio longiore seminibus undecim tssta nigriscentibus minute reticulatis.—*P. tenuicaulis* Prain in *Jvur_m As. Soc. Beng.* lviii, 2, 259.

In HIMALAYA orientali:—Bijan, 12,000 p. s. m., *Kingii mercenar.* ! Chumbij ad Tan-ka-la Bt ad Pun-ka-beB-SBB-mo, *Kingii mercenar.*

Julio st Augusto floret, corolla punicea,

Daulibua 5—30 cm. altis rkiz ornate 1—2 cm. radice nunc fibrosa tuberis interspersa 3—5 cm. longia nunc omnibus fusiformibus carnosius, petiolis radicalibus 8 cm. longia caulina 2—4 cm. floralibus 1—2 cm. laminis 2—3 X 1 cm. segmentis 3—5 X 2—3 mm., pedicellis 4—8 mm., calyce 7"5 mm. longo hoc 3 mm. lato, corollas tubo 8—9 mm. longo galea parte basali 4 x 2 mm. parte antherigera 5 X 25 mm. rostro 5 mm. longo labio 11 mm. lato, capsula 10—13 mm. longa hac 4 mm. lata seminibus 1"5 mm. longis his 1"75 mm. latia.

PLATE 18. U—E; figs. 9—18.—*Pedicularis tenuicaulis* Prain.

C—Specimen from Tan-ka-la; "north of Zy-lep-la and at the same elevation."

D—,, ,, Pan-ka-beB-SBB-mo.

E—Fruiting specimen from Bijan, 12,000, on the Sikkim-Nepal frontier.

This account of *P. tenuicaulis* is based on an examination of 14 flowering and 30 fruiting specimens, many of the latter (all collected at the same time) having corollas still attached.

The species was originally distributed from Calcutta as a variety of *P. flexuosa*, to which it is most nearly allied. The diagnosis is as follows:—

calyx teeth entire; corolla tube only slightly longer than calyx; beak slightly deflexed, slender, acute, and entire at apex. . . . *P. tenuicaulis*;
calyx teeth crested, except upper; corolla tube more than twice as long as calyx; beak straight, slender; apex obtuse, emarginate. . . *P. flexuosa*.

It is also closely related to *P. rhumlica*, the diagnosis being as follows:—

calyx teeth entire; corolla tube only slightly longer than calyx; anterior filaments hirsute. . . . *P. tenuicaulis*;
calyx teeth serrate, except the upper; corolla tube thrice as long as calyx; all filaments glabrous. . . . *P. chumbica*.

The calyx teeth are erroneously shown in the figured plant (Plate 18, D) as serrate; the true condition is that exhibited in the analytical diagrams.

DIVISIO II.—ADUNDJE PRAIN.

§§§ RHYNCHOLOPH-E Bunge.

Foliis altBrnis:—

corolla tubo rectD, labio SBSBUI (Dorolla in *P. curvipede* ignota):—

Dalyce 5-dentate galere rostro faloatD VBraus apicem attsnuatD:—

f oliis majusculia longs petiolatis; caulibus Dligophyllia:—

laminis ovatis:—

calyce *iBiQ* ai basin ustjue fisso dBntibua minutis rDatro
2-fiio segmentis iterum emarginatis lobulis exte-
roribua majoribus labio margins Bciliato lobis trun-
catia filamentis glabria. 31. *P. furfuracea.*

calyce DBD fiaao denbibus DVatia majDribus rostro 2-fido
BBgmBntia iterum Bmarginatia lobiilis sxterioribua
minoribua labio margins ciliato lobia intBgria
filamBntia anticia hirButia. 32. *P. Pantlingii.*

laminia lanceolata:—

calyce \ fisao, roatro 2-fido haud iterum BmarginatD
Inbio margins ciliato lobia integria filamentia glabria . 33. *P. mkrocalyx.*

f oliiB minimia; caulibua polyphyllia; filamBntis Dmnibua
hiraugia:—

calycB vix fiaao, roatro labium setjuante apice acuto integro . 34. *P. gruina.*

calycB \ fisso, roBtro bravs labio multo brevior apice
2-fiio. 35. *P. flagellariu.*

calyce 2-dentato:—

calycia ientibus laminid e baai angusta Dvatis ^corolla ignota) . 36. *P. curvipes.*

calyDIB dBntibua e lata basi triangularibua ovatiave:—

galea rostro falcato versus apicsm acutum integrum
attenuato. 37. *P. carnosa.*

galsa erostri:—

tubo calyca 2-plo longioTB, galsa labium BXDBiente . 38. *P. corymbosa.*

tubo calycem vix BXDBdents:—

gaha labiD brBviore. 39. *P. zeylanica.*

galea labio longiorB. 40. *P. Collettii.*

calyce 5-dentato galea roatro porrecto craBBiusculo apice Dbtuao
truncato:—

galea faucB utrius^uo 1-dentata, filamentia antiuis hirsutis . 41. *P. odontophora.*

galea edentata:—

filamBntia omnibus glabris. 42. *P. albiflora.*

filamentis omnibus hirsutia. 43. *P. Wallichii*

corollaB tubo incurvo, labio [*P. triohoglossce* excepto) stipitato:—

labio aeaaili, galea rostrata. 45. *P. trichoglossa.*

labio lata basi stipitato bbis minimis, gaha rostrata. 44. *P. excelsa.*

labio BX angusta basi stipitato, lobis ovatis aoutis:—

galea rostrata:—

rostrD apice integro penicillatD-villoso filamentis medio tubs

insBrtia. 45. *P. lachnoglossa.*

rostro apice 2-fiio filamentis ex ad verso Bummi ovarii insBrtis 47. *P. Clarke-**

galoa eroBtri. 48. *P. Prainiann.*

Foliis Dppuaitia ; filaments antiuis hirsutia :—

uorollse tubo recto ; labio seasili: —

roatro conico apice Bmarginato; f oliis minimis 4-natim VBrficillatis . 49. *P. Uammieana*.

rostra uylindricu apics truncato Bt laciniato foliis lanceolatis oppositia

vel caulinis D. 5D. *P. tchizorrhymha*.

cDrolls tubo incurvo; labiD sessili; rostra brBVe conico apicB truncate

integro; foliis 4-natim VBrficillatis. 51. *P. alaschanica*.

31. Fedicularis furfuracea Wall (1828).

Humilis vel elata glabra rhizomate brsvissimo vel parum elongato repsnte collo paucisquamato stjuamis lanceolatis membranacBis radicibus fibrDsis ceespitosis tuberis interspersis caulibua B basi itBrunnjus ramosia elongatis laxis ascBiidsntibus sparse foliatis foliis radicalibus parvulis mox Bvaniiis caulinis longs pstiolatis laminis superne glabBrrimia subtus furfuracsis Dblongo-ovatis rotundatisve pinnatifidis -partitisve ssgrnsntis 5 — G-jugia oblongia SBrrato-dentatis floribus laxa racsmosis bracteis foliacsia brsve pBdicsllatis calycis metubranacBi ovati glabri antice profunds fisai 5-dentati jnonnunquain 2-dentati rarius margine integri) segmentis ssmpr minimis intBgBrrimis corolla? tubo suraum latB ampliato calycsm vix Bxcednte labio 3-lobo lobia Bmarginafcis ovatis latBralibus msdio duplo latioribus galsa angulo recto incurva inflata parte basali erecta tubo dimiio anguatiore fauces 2-sinuata parts antherigBra horizontali in rostrum porrBctum apice bifidum segmsntis obliqua iterum emarginatis lobulis externia ovatis multo majoribus abruptiua producta staminibua BX adverso summi Dvarii insrtis filamentis glaberrimis ovario lancesolato stigmata exasrto capsula anguste lanceolata anticB sinuata apice acuminata calycem plus duplo BXcedents seminibus ovato-acutis nigris minutissime reticulatia.—*P. furfuracea* Wall, *Vat* 412; *Benth.*, *Scrph. Ind.* 54; *Walp.*, *Eep.* iii, 415; *Smth.*, *DC. Prodr.* x, 5BD; *Hook*, *l.*, *Ffor. Brit Ind.* iv, 31B; *Maxim.*, *Mel. BioL* xii, t 3, l. 55.

In HIMALAYA cBntrali:— Nepal: in Gossain Than, *Wallich!* *Scully!* In Himalaya orientali:—Sikkim: *Hooker*, *Kurz!* Tonglo, 8—10,000 p. a. m., *Thomson!* *Anderson!* *Gamble!* Phalbot, *Thomson!* Ze-lsp-la, 95DD p. s. m., Khe-dhen, Cho-le-la, Yeumthong, Chokka, props Jongri, 14DOD p. a. m., Tiamphung, Min-zBr-dara₃ Singalslah, 12,000 p. a. m., Lingtoo, 120DO p. s. m. [bis), *Kingii mercenar.* ! Yak-la, 1D0DD p. s. m., *Clarke!* Dhumbi: apud Rinchiongong, in Pan-kn-la st ad Ka-poop, *Kingii mercenar.* !

Junio—Julio florst; corolla sajpiissime pallidB punicsa, nonnunquam alba, et nunc punicsa albo-punctata nunc alba punicBo-suffusa notatur.

Daulibua B—45 cm. altis psnnse corvinse crassitudins, radicibus 5—12 cm. longis, petiolis 1-5—3 cm. longis laminis 25 X 1'5—B X 4 cm. segmsntia 6 X 4—20 X 8 mm., pedicellia 2—5 mm., calyces 6 mm. longo hoc 3 mm. lato, corolla tubo 7—9 mm. longo galea parts basali 3'5 X 25 mm. parts antherigsra 5 x 3 mm. rostro B mm. longo labio 18 mm. lato, capsula 15 mm. longa hac 4 mm. lata SBminibus 2 mm. X 1 mm.

PLATE 16. A; figs. 1—9.—Psdicularis furfuracsa Wall.

SpecimBn from Sossain Than, Nepal [*Wall.*, *Cat* n. 412 in Herb. Calcutta).

This account is bassd on an examination of 95 spBcimsns. The character dsrivBd from the apsx of the beak is very constant in this and in *P. Pantlwgii*, the next species-

These two much resemble each other, but nevertheless differ constantly in all the numerous points given in the diagnosis. The two calyces shown in fig. 3 occurred on the same specimen—one from Lingtoo, in Sikkim.

32. *Pedicularis Pantlingii* Prain (1889).

Elata superne pubescens rhizomate brevi lignoso nodoso caudice saepe multicaule radicibus caespitosis fibrosis caulibus simplicibus elongatis strictis foliosis foliis longe petiolatis superne pilis brevibus albis sub lente aspersis subtus furfuraceis late ovatis basi subcordatis subintegris vel pinnatifidis lobis rotundatis margine dentatis, floribus dense racemosis demum distantibus bracteis foliaceis breve pedicellatis calycis campanulati hirsuti vix fissi 5-dentati segmenta lateralibus ovatis inciso-serratis postico intermedio integro parum majoribus corolla tubo sursum parum ampliato calyce aequilongo labio 3-lobato margine ciliato lobis lateralibus ovatis medio orbiculato 3-lobato latioribus galea subinflata angulo abruptiore incurva parte basali tubo sequilata erecta parte antherigera horizontal in rostrum deflexo-porrectum apice bifidum segmentis oblique iterum emarginatis lobulis externis minimis abruptius producta staminibus ex adverse summi ovarii insertis filamentis anticis parce puberulis ovario lanceolato stigmate exserto capsula late lanceolata apice acuta calycis plus duplo excedente seminibus late ovatis testa nigra minutissimis reticulata.—*P. Pantlingii* Prain in *Jour. As. Soc. Bmg.* lviii, 2, 273. [^]
P. furfuracea VAR. *integrifolia* Hook. f., *Flor. Brit. Ind.* iv, 31B (1884).—*Pedicularis* n. 30, *Herb. Ind. Or. H. l.* § T.T.

In HIMALAYA orientali:—Sikkim: *Hooker*; ad Na-tong, 13,000 p. s. m., *Pantlingii Kingii mercenar.* ad Ta-ne-do; in Ze-lep-la; ad Tiamphong, prope Jongri; *Kingii mercenar.* Nepal orientali: ad Kagling, prope Kang-la 14,000 p. s. m., et ad Bijan, 12,000 p. s. m., *Kingii mercenar.* Chumbi: in Be-ong-chinJa; *Kingii mercenar.*

Julio et Augusto floret; corolla pallide purpurea.

Caulibus 40—60 cm. altis cygni pennae crassitudine, rhizomate 1—3 cm. longo 0.5—1 cm. crasso radicibus 5—8 cm. longis, petiolis 2.5—3 cm. longis laminis 2.5 X 2.5—3 X 4.5 cm. lobis 5 mm. longis 9 mm. latis, pedicellis 0—3 mm., calyce 8 mm. longo 3.5 mm. lato, corollas tubo 3 mm. longo, galea parte basali 4 X 2.5 mm., parte antherigera 5-5 X 3 mm. rostro 5 mm. longo labio 17 mm. lato, capsula 20 mm. longa hac 6.5 mm. lata seminibus 2 mm. X 1 mm.

PLATE 15. B; figs. 15—17.—*Pedicularis Pantlingii* Prain.

Specimen from Na-tong, Sikkim.

This account is based on the examination of corollas from 43 specimens and capsules from 17 fruiting specimens.

The species is most nearly allied to *P. furfuracea*, and is accounted for in the *Flora of British India* as a variety of that species. It differs, however, sufficiently to be entitled to specific rank. The diagnosis is as follows:—

calyx 5-lobed cleft teeth large, lobes of lip not truncate margin ciliate;	
beak 2-fid segments emarginate, outer lobules smaller, anterior	
filaments puberulous.	<i>P. Pantlingii</i> ;
calyx 5-lobed cleft teeth minute, lobes of lip truncate ciliate, beak	
2-fid segments emarginate outer lobules ovate larger, all filaments	
glabrous.	<i>P. furfuracea</i> .

33. *Pedicularis micro calyx* Hook. f. [1884).

Humilis vel elata glabra VBI superne 2-fariam pibsa rhizomate brevissimo VBI parum elongate serpente CDMD squamis Dvatis membranacsis paucis vestito radicibus ctespitDsis carnosus fusiformibus Daub simplici VBI rarius e basi ramoso elongate flexuoso gracili oligophyllo foliis longs petiolatis supernB glabsrrimis subtus furfuraceis lanceolatis basi pinnatissectis cBterum pinnatipartitis rhachi alatis ssgnrentis 8—IDjugis oblongo- lancsolatis pinnatifidis Bt serratis radicalibus perpaucis mox omnibus svandis caulinis saBpissime 2 floribus racemosis vsrsus apicem confertis inferioribus longe pedicsllatis bractsis foliaceis calycis campanulati membranacei antics ad msdium fissi 5-dsntati SBgmsnto postico lats lancBDlato integro reliquis lancBolatis obtusis apice serratis parum brBviore corolla; tubo calycem fere duple superante labio 3-lobD margins ciliato lobis latsralibus rotundatis medio orbiculato duplo majoribus galsa vix inflata angulo abrupto incurva partB basali tubo ffiijuilata erecta parta antherigsra horizontali in rostrum lsvitsr deflexum apics SBgnientis simplicibus acutis bifidum abruptius producta staminibus medio tubo inssrtis filamentis glaberrimis ovariD lancsolato stigmatB subexsarfco capsula lancsolata apics acuminata calycB plus duplo bngiDrB seminibus oblongo-Dvatis minutissims rsticulatis.—*P. microcalyx* ffookf., *Fbr. Brit. Ind.* iv, 315; *Maxim., Mel. Biol.* xii, 852, t 4, l. 71.

In HIMALAYA orisntali:—Sikkim; Lachsn, Samdong, et Kankola, 12—15, ODD p. s.m., *Hooker*; Jongri, 14, ODD, *Watt*! Patang-la, Kapur ad fines Nepalise versus et ad Dhoam-put-la, prope Jongri, 15, DD) p. s. m., *Kingii mercenar.* ! Chumbi, *Kingii mercenar.* !

Cauls ID_4D cm. altD, rhizDmate D—2 cm. longD radicibus 3—4'5 cm. longis, petiolis radicalibua B—8 cm. caulinis 1'5—3 cm. laminis 2'5—B X 1—1'5 cm. SBgmsntis 5 X 2—3 mm., psdicellis infsrrioribus usque ad ID mm. summis 1—3 mm., calycB 5-5 mm. longo hoc 2-5 mm. lato, corollas tubo B—9 mm. bngo gales parte basali 3 mm. longa hac 1-5 mm. lata parts antherigera 5 mm. longa hac 2 mm. lata rostro 55 mm. longo labio 11 mm. lato, capsula 16 mm. longa hac 5-5 mm. lata seminibus 175 mm. longis, fere 1 mm. latis.

Junio, Julio, et Augusto floret; corolla purpursa.

PLATE 15. C; figs. 18—24.—*Pedicularis microcalyx* Hook. f.

Specimen from Patang-la.

This account is based on the examination and analysis of flowsrs from 36 specimens. It has, as Mr. Maxjmowicz shows, considerable affinity with the species of ths ssriss *Bostratx*, which it connects with the group *Furfuracea*, to which it appears to me rather to belong.

34. *Pedicularis gruina* Franchet (1888).

Humilis hirsuta B basi ramosa caule msdio erecto subramoso lateralibus procumbentibus radicanibus simplicibus polyphyllis rhizomate brsvi fusiformi foliis parvis sparsis petiolatis pinnatipartitis segmsntis 5-B-jugis lata basi ssssilibus oblongis subrscurvis cartilaginso-SBrratis floribus axillaribus racsmosis basi distantibus apice confertis psdicellis calycs longioribus calycis campanulato-cylindrici hirsuti vix fissi 5-dsntati ssgmsirlls flabellato-rotundatis mucronato-dsntatis basi angustis ^ijuahbus corolla tubo calycsm

paulo superans labio 3-lobato cordato-rotundato brevior quam lato lobis lateralibus oblongo. Datis medio suborbiculatis parvis multo majoribus galea inflata angulo recto incurva parte basali erecta parte antherigera horizontali ad marginem utrinque obtuse auriculata in rostrum productum apice acuto integerrimum tantum decurvum sesquialongius sensim attenuata staminibus medio inter summum ovarium. Bt apicem tubi insertis filamentis omnibus barbatis ovario lanceolato-oblongo stigmate subexserto.—*P. gruina* Franchet, *Maxim., Mel Biol* xii, 799, t. 1, f. 15; *Praia, Jour. As. Soc. Beng.* lviii, 2, 272.

YUNNAN:—in monte Che-tcho-tze supra Ta-pin-tze in quercetis, *Delavay*; prope Li-kiang in paludibus, *Delavay*; apud Momysn in paludibus, *J. Anderson*. Corolla purpurea.

Caulibus centralibus 6—10 cm. altis reliquis 12—15 cm. longis foliorum petiolis 1—1.5 cm. laminis 1.5 cm. longis his 5 cm. latis segmentis 2—3 mm. distantibus, pedicellis 9—12 mm., calyce 8 mm. longo, corolla tubo 75 mm. galeae parte basali 3 mm. longo tubo recurvata parte antherigera 3 mm. x 2 mm. rostra 5 mm. longo labio 15 mm. lato, ovario 2.5 mm.

PLATE ID. A; figs. 1—5.—*Pedicularis gruina* Franchet.

Specimen from Momysn.

Momysn, the locality of the single Calcutta Herbarium gathering, is just within the Yunnan frontier.

35. *Pedicularis flagellaris* Benth. (184B).

Pubescens e basi ramosa caulibus elongatis simplicibus medio erecto reliquis prostratis. Cum-bentibus polyphyllis rhizomate breviter fusiformi foliis parvis sparsis petiolatis pinnatisectis segmentis 5—8-jugis sessilibus lanceolatis subrecurvis cartilagineo-serratis floribus axillaribus racemis basi distantibus apice confertis pedicellis calyce brevioribus calycis campanulato-cylindrici pubescentis antice triente fissi 5-dentati segmentis flabellato-rotundatis mucronato-dentatis basi angustatis aequalibus corollae tubo sursum ampliato calyce fere duplo longiore labio 3-lobato lobis lateralibus datis medium parum elongatum dimidiatioribus galea inflata arcuato-incurva parte basali tubo angustiore parum inclinata parte antherigera falcata in rostrum brevissimum apice bifidum producta staminibus ex adverso summi ovarii insertis filamentis omnibus hirsutis ovario lanceolato stigmate exserto capsula lanceolata acuminata calyce triente longiore.—*P. flagellaris* Benth., *DO. Prodr.* x, 5B1; *Hook, f., Flor. Brit. Ind.* iv, 315.

In HIMALAYA orientali:—Sikkim, Lachoong, 11,000 p. s. m., *Hooker*; in Assam superioribus, *Griffith* fn. 3940 ex *Herb. Kew distrib.*] Khasia, *Oldham*! Corolla rosea.

Caulibus centralibus 15 cm. altis reliquis 20—30 cm. longis, foliorum petiolis 1—1.5 cm. laminis 1 cm. longis his 5 cm. latis segmentis 2—3 mm. distantibus, pedicellis 3—5 mm. longis, calyce 8.5 mm. longo, corollae tubo 11—13 mm. longo fauce basi dimidio latiore galeae parte basali 4 mm. longa hac 2 mm. lata tubo inferioreaequilata parte antherigera 45 mm. longa hac 25 mm. lata rostra 2 mm. longo labio 13 mm. lato, ovario 2.5 mm. longo; capsulae mihi ignotae ex ill. *Hooker*o descriptio.

PLATE ID. B; figs. B—D.—*Pedicularis flagellaris* Benth.

Specimen from Khasia (Oldham).

The species is here described from a single Khasia gathering and from a fragment of Griffith's Assam plant, the exact locality of which is unknown.

36. *Pedicularis curvipes* Hook f. (1884).

Glaberrima ramosa caulibus elongatis gracilibus ramis bngioribus arcuatis foliis parvis sparsis petiolatis ovatis pinnatisectis segmsntis 3—5-jugis Dbngis pinnatifidis et dentatis floribus axillaribus longe pedicellatis pedicellis saltern fructigeris recurvis calycis ovati glnbri meinbranacei antice triente fissi 2-dentati segmentis basi angustiore ovato-lanceolatis flabellatis margine serratis corollae tubo calyce longiore cylindrico labio et galea etiam nunc ignotis staminibus ex adverso summi ovarii insertis filamentis ignotis capsula pendula oblonga suboblique acuminata calyce dimidio longiore seminibus paucis anguste ellipticis pallidis vix reticulatis.—*P. curvipes* Hook. l., *Fbr. Brit Ind.* iv, 31S; *Maxim., Mel Biol* xii, 919; *Clarke, Jour. Linn. Soc.* xxv, 51.

In HIMALAYA orientali:—Sikkim, apud Tumbok, ID,ODD p. s. m., *Clarke*. In Assam; in montibus Barél, Japvo, 9,DDD—9,9D0 p. s. m., *Clarke*!

Daulibus 30 cm., petiolis 8 mm. laminis 8—18 X B—12 mm., pedicellis B—ID mm., calycis (8 mm.) limbo sub B mm., cDrollge tubo ID mm., capsula 9 mm, X 4 mm. seminibus 2*5 mm. bng-is his D5 mm. latis.

PLATE 35. A; figs. 1—4.—*Pedicularis curvipss Book. f.*

Specimen from Japvo, Naga Hills; (D. B. Clarke, n. 41334B).

This species is described frDin a single specimen kindly sent to Calcutta by Mr. Clarke, who has met with it twice in rather remote localities and both times in fruit only. From a single withered corolla attached to the tip of thB uppermost capsule, I have been able to ascertain the site of staminal insertion and to learn that the lip is sessile. Of the nature of the galea (whether beaked or not) or of the filaments (whether hirsute or glabrous) nothing can yet be said.

37. *Pedicularis carnos*a Wall. (1828).

Humilis vel elata hirsuta nonnunquam lanuginosa rarius glabrata rhizomate tenui Hgnoso radicibus fasciculatis caule gracili flexuosD polyphylo s^pissime ramoso foliis carnosis vel ssep*ius herbaceis brevissime petiolatis vel subsessilibus ovatis oblongisvB obtusis rarissime lineari-lanceolatis acutis basi attenuatis crenatis denticulatisque floribus axilla*''ribus numerosis pedicellatis racemo elongate laxo foliis summis ad bract^{as} ovatas calyce vix dimidio longiores reductis calycis hirsuti ovati 2-fidi antice ad medium fissi segmentis nonnunquam divisis ovatis denticulatis corollae tubo calyce vix dimidio longiore sursum hviter ampliato labio margine ciliato 3-lobo lobis rotundatis latBralibus medio dimidio latioribus galea inflata abruptius arcuato-incurva parte basali Qrecta parte antherigera fere horizontali in rostrum breve tenuius porrectum apice emarginatum sensim producta staminibus ex adversD summi ovarii insertis filamentis glabris ovario Dvato stigmate exserto capsula oblique ovata apice acuminata parum exserta seminibus parvis nigris subsphsericis distincte reticulatis.—*P. carnos*a Wall, *Cat.* 418 [182B); *Plant Asiat Ear.* ii, 44, t 154 (1831); *Smth., Scroph. Ind.* 54; *WalPn Rep.* iii, 415; *Bmtk, DC. Prodr.* x, 58D; *Hook. l., Fhr. Brit Ind.* iv, 313; *Maxim., Mel. Biol.* xii, t 3, l. 52.—*Rhinanthus bifidua* Ham. in *Don Prodr. Fbr. Nepal.* 94 (1825).

In HIMALAYA occidentali:—Dalhousie, 7,DD) p. s. m., *Clark [J.]I Clarke \C.B.)* ! Simla, 7,DDD p. s. in., *Thomson! Rvyle ! Gamble! Schlkh ! Hawke*!* TheDg, prope Simla,

7,000
K. r^Vrr^m 7^GV ***** Bt Mattianah > 7000 p. a. m, SMicz* ! Garhwal,
K>gl Tehn-Garhwal: supra Phaidi, 5,DDD-B,DD[> p. .. m., Duthie ! in valle Aglar
prope Mussoone, Duthie ! apud Muasoorie, King ! Duthie ! Eoyh / ft_{cdl}tr/ in valb
Kangra: ad Sirhunto, 3,300 p. s. m. et ai Bukkloh, Clarke ! Cheena, Davidson ! Sirmur,
yTM*y ! *_Bpal.-ad Narainhati, U f a . / in Gosain Than et in montibua ShBopore,
WalUh ! props Khatmandu, Scully ! Sikkim; fli ^ O ^ W K_{ab} i: K a l_a
f a m i etc-» *-B,DD[p_p a. m., Simons ! Hooker et Thomson ! Mann !

DISTIB.—Yunnan:

Oaulibua 6-75 cm. altis, rhizomate 2-5 cm. longo radicibus 3 cm. Wis fusifor-
mibus_{VB1} fibrils, petiolis radbi propioribus 0.5—1.5 cm. longis_{SUMMI3} brevissimis vel D
amxnis fo_horum maxim_Orum 45 x 1-1.5 cm. minimorum 15 X 0.5 cm. segmentis
2-15-jugis_^ p_{isslme} 1 x 1 mm. nannunquam 2"5-3 x 2 mm. in lamina inferi-
oribus_^ pedxcelk, 2.5-3 mm., calyce 7-5-8 mm., corolla tub₀ 1D-12 mm. longo
apice 3-0 mm. lato galeae parte basali 4 x 2 mm. parte anth_Brig_Bra 5-5 X 3 mm. rostr.
3-5 mm. longo labio 15 mm. lato, capaula 9.5-11 mm. longa aeminibus 1 mm. lngis.

Junio-S_{Bpt}mbr_B fl_Dret; corolla Sajp_{isslme} marffin₈ kbii p_aie purpurea, p_at_B
gal_{Bff} anthengera saturate purpur.a, labio medians gal_ee parte erecta tub_Dqu_B albis,
nonnunpam tamen floribus concobribus purpur_BD-puni_{CB}is.

PLATE 14. A; figs. 1-8.-P_Bdicularis carnos_a Wall.

Specimen from Mussoorie (& King in Herb. Calcutta.

^ ^ r r t I / . carnos_a h_{SB}i o n th_B BXamin_^ion of 131 specim_Bns. It is
undoubtedly Rtonankus MfiJus Ham., a sh_BBt rf which with 4 spec imens ^ ^
He Buchanan[^]Hamilton'a manuacript description affiaed is preser_{VB}J in th_B Calcutta
P. (S7¹a Don⁷ is, "A (Det 419) 41 v_hid_B " th_B ^ Set - - «* t-baria) is
(Torenia incisa Heyne) is, however, P. zeylanica Benth. Its nea ^ ^ is P. crenata
Maxim., diagnosed by its shorter
bearded, and its uncl_eft calyx. beak) its lip subequally lobed, ita aLrior fiiaments

38. Pedicularis uorymbosa Praia [1BB9).

Humilia vel elata pubes_{en}s vel glabra rhizomate tenui lignoso radicibus fasciculatis
cauh gracih flexuoso polyphylb a[^]pis.ime ramoso folia carnos_{is} vel herbac_Bia br.vissime
peholahs val subs_{BSS1}hbus ovatis oblongi₈VB obtusia basi attenuatia crenatis d.nticulati^e
n[^]nbus subs_{BSS1}ilua de_{en}s, ai apicem rami confettiafoliig ^ ^ ^ ^ ^ ^ ^ ^
sessiles cal_{ce} ym m dumdio longiores reducti scalyt_{is} h_{ist}iti vll gl_Bni subcampanulati
antice ad medium fiasi 2-fidi Se_gm_Bntis ovatis crenato-dentatis carols tuba aarsum
pli / y C_B d_B P₁₀DgiOrB kb₁₀ 3₁₀b₀ 10bis oblong_Sia ovati «ve acutis quilatis galea
Z v₁₁ / y C_B d_B late arcuato_{in} curva parte basali elongata fau_{CB} tubi duplo ad_gusti^e inch-
nata t .
tinuat¹ T_{PaF}Am antheri^era₁₁₁ » «q"ilatam vix horizontalism brevissimam erostrsm con-
stigmat_e exserto ^ ad r_{So} SUMMI oVarii insertIs filam[^]tis glabBrrimia ovario ovato
nigris subsphaer_e ^ kstin q_{UB} oVata apic_B aCUMid^e a parum exserta sem₁₀b_{us} parvis
lviii, 2, 277. " ^ reticulatis.—P. corymbosa Prain in Jour. As. Soc. Beng.

In BURMA superiors:—In collibus Shan nuncupatia; apud Pwehla, 4DD0 p. s. m. et ad Tamakan, 4DDD p. s. m., *Uolhtt!* In colle Maymyo, 4DDD p. s. m., *Kingii mercenar.* ! In pratis humidis et in paludosis crescit.

Noverobre floret; corolla in speciminibus Collettianis punicea et alba in speciminibus Kingianis con color rosea.

Daulibus 9—3D cm. altis ramis systemate cDrymbiformi dispositis, rhizomate 2—5 cm. longo radicibus 3 cm. longis fusifornribus fibrosisve, petiolis radici propioribus Dō—Tō cm. longis summis brevissimis vel D, laminis foliorum maximorum 5 X 1'5 cm. minimorum 3 X D5 cm. floralium (subBequimagnorum) 15 X D5 cm. segmentis 12—15-jugis 2'5 X 4 mm. (in laminis inferioribus), pedicellis 0—2 mm., calyce 12 mm. longD, corollse tubo 2D—25 mm. longo apice B mm. lato galese parte basali IB mm. longa hac 35 mm. lata parts antherigera 4 mm. longa antfce deuliva labio 14—2D mm. lato, capsula 12 mm. longa seminibus 1 mm. longis.

PLATE 14. B; figs. 9—14.—*Pedicularis corymbosa* Prain.

Specimen from Pwehla, Shan Hills [Ci]llett n. 52).

This species has been described from an examination of 15 specimens. This ^{fl} pretty little red and white *Pedizularis*," as General Dollett has described it in his letters, is very nearly allied to *P. crenata* Maxim., from which it differs in being beakless and in having a longer galea, a narrower lip, glabrous stamens and a cleft calyx. Among Indian species it is, on the one hand, related to *P. carnosa*—between which species and this *P. crenata* stands intermediate as regards corolla; and, on the other hani, to *P. zeylanica*—which differs mainly in having a much shorter corolla-tube and galea. *P. cvrymbosa* stands, in fact, intermediate between *P. crenata* and *P. zeylanica*, and the four species [*P. carnosa*, *vrenata*, *corymbosa*, *zeylanica*) form an exceedingly natural serially disposed group. The Shan Hills plant has stouter and firmer leaves than the MaymyD specimens, which precisely repeat the habit and foliage of Nepalese and Khasia examples of *P. carnvsa*.

The name "*P. corymbosa*" is, I find, already a synonym, having been applied by M. Pallas to a plant which that botanist had already named "*P. paniculata*." Neither Df Pallas' names, Mr. Maximowicz informs me, will ever be received—on their author's authority—since both the plants are simply states of *P. euphrasiodss*.

39. *Pedicularis zeylanica* Bmih. (1835).

Humilis vel elata pubescens rhizomate tenui lignoso radicibus fasciculatis caule gracili flexuoso polyphylb srepissiuB ramoso foliis carnosis subsessilibus oblango-lanceolatis obtusis basi attenuatis crenatis denticulatisiue floribus subsessilibus axillaribus numerosis dense racemosis foliis flornlibus ad bracteas lanceolatas calyce duplo longiores reductis calycis puberuli vel glabri ovati 2-fidi antice ultra medium fissi segmentis ovatis integris vel subcrista^is corolke tubo sursum ampliato intus antice glandubse ciliato calycem dimidio superantB labio 3-lobo lobis supparibus nunc omnibus obtusis nunc lateralibus obtusis medio acute rarius omnibus acutis galea nee inflata leviter arcuata parte basali fauce tubi dimidio angustiore fere erecta et in partem antherigeram leviter inclinatam angustiore brevissimam subrostratam apicis margine crenatam continuata staminibus ex adverso summi Dvarii insertis filamentis omnibus ad insertionem barbatis superne glabnr-rimis ovario ovato stigmate exserto capsilla oblique Dvata apice acuminata parum exyerta scminibus nigris suborbiculatis distincte reticulatis.—*P. zeylanica* Bmtk, *Scroph. Lid.* 54;

Walp. Rep. iii, 429; *Benth.*, DO. Prodr. x, 580; *Wight, hones* iv, t 1419; *Book. l.*, *Fbr. Brit Ind.* iv, 317; *Maxim.*, *Mel Biol.* xii, I 3, l. 45.—*Pedicularis* sp., *Schmid in Baikie, Observ. Neilgher.* ed. i, App. viii, t 2 (1834).—*Torenia incisa* Heyne in Wall Oat 418B (*Lith. Cat Corrigend. et Addend.* p. 235) ilb28).

In INDIA AUSTRALI:— in montibus Nilghiri, 6,000—7,000 p. s. in., Heyne [*W<rtl.* Oat n. 418B)! *Wight* (n. 2401)! *Schmid*; (7. *Thompson!* *Stocks!* prop_B Dotacamund, *King!* *Gamble!* In Zeylanica:—apud Newera Ellia, 6,010 p. s. m., *Tkvaite*s (U- P. n. 229j! aliisque bcis, nee infrequens.

Caulibus 12—35 cm. altis, raris nunc fasciatis nunc systemate corymbiformi dispositis, rhizomate 2—5 cm. longo radicibus 3—6 cm. longis fusiformibus fibrosisve, petiols nullis 0.5 cm. excedentibus laminis foliorum maximorum 4 x 1 cm., minimorum 2.5 X 0.5 cm., floralium 15—2 X 0.35 cm. vel angustioribus, segmentis 12—20-jugis 2 x 2 mm., pedicellis 0—2 mm., calyce 8—10 mm. limbo, corolla tubo 12—14 mm. longo apice 5 mm, lato galeae parte basali 5 X 3.5 mm. parte antherigera 2.5 X 2.5 mm. antice decliva lobis 14—18 mm. lato, capsula 13 mm, bays seminibus 1 mm. longis.

Augusto—Septembri floret; corolla punicea vel punicea et alba.

PLATE 14. D; figs. 15—21.—*Pedicularis zeylanica* *Benth.*

SpBcimBn from Ootacamund (Ramble n. 12510).

This species is described from an examination of 31 species. It is = *Torenia incisa* Heyne in Wall. Cat.; a sheet of *Out.* n. 416H with 4 specimens is preserved at Calcutta. It is well figured in the first edition of Baikie's work on the Nilghiri Hills. Its close affinity to *P. carnos* has been indicated by Wallis, who issued it [under Heyne's name) in 1829, in association with *P. carnos* from Nepal; by Benth in *BO. Prodr.* l.e., by Wight and by Maximowicz.

The group to which it belongs forms a distinct subdivision of the *Resupinate* of Maximowicz [*Lc.* xii, 830).

40. *Pedicularis Collettii* Prain (1889).

Elata erecta scabra rhizomate brevissimo radicibus elongatis fusiformibus carnos horizontalibus caule rigido stricto tefete fistuloso hispidopubescente purpurascens polyphyllus versus apicem fastigiato-ramosus foliis sessilibus late ovatis acutis basi auriculatis subtus hispidopubescentibus supra rigide subscabris margine crenatis denticulatis quibus floribus axillaribus numerosis sessilibus spica densa aggregatis foliis summis ad bracteis ovatis acutis margine denticulatis (nee crenatis) vel integras calyce duplo longiores reductis calycis coriacei hispidopubescentis 2-fidis antice ad medium postice triente fissi segmentis oblongo-lanceolatis integris apice obtusis corolla tubo sursum ampliato intus antice glandulose ciliato calycem vix dimidio superante labio substipitato basi latiusculo antice 3-lobis lobis orbiculatis aequilatis galea subinflata late arcuato-incurva parte basali fauce tubi duplo angustiore erecta in partem antherigeram subfalcatam rostro brevi conico truncato apice emarginato continuatam staminibus ex adverso medii ovarii insertis filamentis ad insertionem rufo-villosis ceterum glaberrimis ovario-lanceolato acuminato stigmatibus exserto.—P. Collettii Prain in Jour. As. Soc. Beng* lviii, 2, 278.

In BURMA superiore :—in collibus Shan nuncupatis; apud Toungyi, 5,005 p. s. m.; in tractu Koni, 4,000 p. s. m., *Collett* [nn. 88, 909)!

Caulibus altissimis, ultra 90 cm., penne cygni crassitudine, radicibus 8—12 cm. longis 1½—1 cm. crassis, foliis radicalibus D, caulinis (J5—4D) sparsis intervallis 2—3 cm, longis distantibus laminis maximorum B X 2 cm. minimorum 4 X 1½ cm, floralibus 2 X 1—1 X D5 cm., segmentis 12—2D-jugis 1—2 X 1 mm. pedicellia vix L mm. calyce 14—15 mm. longo 5 mm. lato, corollae tubo 15—18 mm. longo, galeae parts basali 8 X 35 mm. parte antherigera 9 X 4 mm., rostro 15 mm. longo labio 18 mm. lato.

Novembre floret, corolla saturate purpurea; in declivis graminosis crescit.

PLATE 15. A; figs. 1—5.—*Pedicularis Dollettii* Prain.

Specimen from Koni, Shan Hills (Dollett, n. 9D9).

The species is described from two gatherings, neither of which unfortunately is in fruit. It is most nearly allied to the *Varnosce* group among Indian species; from these its habit and foliage at once distinguish it. Its most natural allies are, however, the Japanese *P. yezoensis* and the American *P. lanceolata*. It is, however, one of the most distinct species of the genus.

41. *Pedicularis odontophora* Prain (1889).

Humilis rhizomatibus serpente nodis stipulatis distantibus radicante collo confertim squamatis caulibus brevissimis puberulis foliis longe petiolatis radicalibus paucis demum evanidis caulinis sparsis pinnatisectis segmentis 3—5-jugis pinnatifidis laciniis dentatis floribus paucis axillaribus subconfertis pedicellatis calycis cylindrico-campanulati antice parum fissi 5-dentati segmentis integris anticis summoque deltoideis lateralibus subulatis corollae tubo calycem duplo superante sursum vix ampliatus labio 3-lobis lobis ovatis lateralibus medio dimidio majoribus galea subinflata arcuato-incurva parte basali tubo aequilata erecta parte antherigera falcata utrinque obtuse 1-dentata in rostrum porrectum horizontale a basi sequilatum apice truncatum emarginatum producta staminibus medio tubo insertis filamentis anticis omnino et dense hirsutis posticis superne glaberrimis inferne sparse barbatis ovario ovoideo stigmate exserto.

In HIMALAYA orientali:—Sikkim, ad Natong; Phari, ad Do-tho; *Kmgii mercenaria*!

Corollae tubo labii fauce galeaeque parte basali albis, labii margine pallide puniceo, galeae parte antheras foveante rostroque rosea.

Augusto floret; capsula nondum visa.

Rhizomate 5—7 cm. longis internodiis 1—25 cm., caulibus 2½—B cm. altis, foliorum radicalium petiolis 25—3 cm. longis caulinarum 05—1 cm. laminis ovatis 2—3 cm. longis 2—2.5 cm. latis segmentis B—12 mm. iis cauli propioribus petiolatis 2—3 mm. longis, pedicellis 2—4 mm. longis, calyce 7 mm. longo, corolla tubo 13 mm. longae fauce 3 mm. lata galeae parte basali 3 mm. longa 2 mm. lata parte antherigera B mm. longa 2.5 mm. lata, rostro 3½ mm. longo, labio 11 mm. lato.

PLATE 16. D; figs. 18—23.—*Pedicularis odontophora* Prain.

Specimen from Do-tho, 4 miles from Phari.

This very distinct species is described from 14 specimens. Mr. Maximowicz in a letter has suggested that its place is among the *Rostratae*, and this is almost certainly its true position. It has been placed in the *Cespitosae* group of the *Eostrate* series in the "Conspectus of Affinities," but it is an aberrant member, and perhaps it deserves an independent position.

42. *Pedicularis albiflora* Prain (1889).

Humilis caespitosa glaberrima rhizomate brevissimo lignoso radicibus caespitosis fusiformibus carnosia colub pluricauli squamis denticatis confertim vestito caulibus brevibus vel subnullis glabris aphyllis foliis radicalibus numerosis caespitosis longe petiolatis oblongo-lanceolatis pinnatifidis segmentis 5—8-jugis ovatis distantibus mucronato-dentatis floribus paucis breve pedicellatis sparsis VBI subdenticatis imis alternis suramis suboppositis bracteis calyce dimidio longioribus basi obcuneato vaginato-dilatatis 3-sectis segmentis petiolulo angustato ovatis pinnatifidis et mucronato-dentatis calycis cylindrico-campanulati antice vix fissi 5-dentati segmentis integris inaequalibus lanceolatis summo acuto reliquis obtusis corollae tubo calycem plus duplo superante prorsus angustato labio 3-lobis lobis rotundatis lateralibus medio dimidio majoribus galea nee inflata arcuato-incurva pars basali erecta tubo aequilata parte antherigera falcata in rostrum conicum deflexo-porrectum apice crenatum producta staminibus medio tubo insertis filamentis glaberrimis ovario lanceolato stigmate subexserto.—*P. albiflora* Prain in *Jour. As. Soc. Bmg.* lviii, 2, 273.—*P. asplenifolia* VAR. *albiflora* Hook. f., *Flor. Brit Ind.* iv, 315 (1884).

In HIMALAYA orientali:—Sikkim; Kan-ko-la, *Iloofor*; *Kingii mercenar.* !

Augusto floret; corolla, ex ill. *floofero*, alba.

Uaulibus D—8 cm., rhizomate 1 X D5 cm. radicibus 4—6 cm., petiolis 2—4 cm., lamina 1.5—2 cm. X D5 cm. segmentis 4 x 2 mm., pedicellis 2—5 mm., bracteis 15 mm. X ID mm., calyce 8—10 mm. longo hoc 3.5 mm. lato, corollae tubo 20—24 mm. longo galea parte basali 5 X 25 mm. parte antherigera 6 X 275 mm. rostro 35 mm. longo, labio 18 mm. lato.

PLATE 17. D, D; figs. 9 —13.—*Pedicularis albiflora* Prain.

Specimens from Kan-ko-la, Sikkim.

Of Indian species this is most nearly allied to *P. odontophora*, but differs by its compressed rhizome, lanceolate leaves, distinct bracts, edentulous throat and glabrous stamens. From its nearest ally [*P. aspleiifolia* Floerke] it differs by its peculiar 3-sect bracts, ovate leaf segments, calyx teeth all entire, corolla tube more than twice as long and filaments all glabrous. In *P. asplenifolia* the bracts are foliar, the leaf segments lanceolate, the calyx teeth all serrate, the corolla tube hardly longer than the calyx, and the anterior filaments hirsute. It is allied, but much less closely, to *P. Waihoi* Bunge (*P. asplenifolia* of Wall., but not of Focke), which differs in its few radical leaves with many long lanceolate, in place of few short ovate, leaf scales, in its subinflated calyx and its filaments all hirsute.

43. *Pedicularis Wallichii* Bunge (1843).

Humilis glabra rhizomate incrassato verticali basi radicibus fusiformibus carnosia apice in ramis pluribus supra solum extrusis unicaulis abeunti ramorum colla squamis lanceolatis vestitis caule simplice subnudo brevi foliis radicalibus paucis [1—4] longe petiolatis caulinis 1—3 lineari-lanceolatis pinnatifidis segmenta 12—25-jugia ovato-lanceolatis crenato-serratis floribus paucis racemo 2—5-floro distincte pedicellatis bracteis foliaceis breve petiolatis crenatis calycis inflato-campanulati coriacei glaberrimi antice parum fissi 5-dentati segmentis lanceolatis superioribus postico subintegro reliquis cristatis crollæ

tubo calycem dimidio superante fauce ipsa parum ampliatus labio 3-lobis rotundatis margine sinuatis lateralibus medio dimidio majoribus galea subinflata arcuato-incurva parte basali erecta tubo aequilata parte antherigera falcata in rostrum porrectum fere horizontal apice margine truncato-laciniatum abruptius producta staminibus medio inter summum ovarium et tubi apicem insertis filamentis omnibus superne barbatis ovario ovoideo stigmate exserto capsula lanceolata oblique acuminata seminibus paucis anguste ellipticis testa nigrescentibus vix reticulatis.—*P. Wallichii* Bunge in *Bull. Scient. Acad. Petersb.* viii (1843), 251 (non in) et in *Walp. Rep.* hi, 415 (1844); *Pram in Jour. As. Soc. Beng.* lviii, 2, 273.—*P. asplenifolia* Wull., *Cat.* 41BA [1328]; *Benth. Scroph. Ind.* 54; *DC. Prodr.* x, 578 [in parte].—*V. asplenifolia* Hook. f., *Flor. Brit. Ind.* ivj 315 (1884) [syn. omni. et var. *wmb. exdus.*]; nequaquam *P. asplenifolia* Floerke.

In HIMALAYA centrali et orientali:—Nepal; in Gossain Than, Wallich [*Cat.* n. 41 BA]! Sikkim: ad Samdong et in Tan-ka-la, 14—15, DDD, Hooker; Jongii, 14, DD, Watt! Patang-la; Ka-pur, infra Kin chin janga; in Phullaloong, 12, DDDp. s. ni., *Kingii meizenar*! Chumbi: ad Lu-ma-poD, *Kingii mercenar*! Nepal orientali: Kagling, prope Kangla, 14,000 p. s. m. et apud Bijan, ad fines Sikkimenses, 12,003 p. s. m., *Kingii mercenar*!

Junio, Julio, et Augusto floret; corolla cinnabari rubra.

Caule 3'5—11 cm. alto rhizomate 5—8 cm. bugro hoc D5 cm. crasso radicibus B—B cm. longis, petiolis 2—B cm., laminis 2—3 cm. X D'25—D5 cm. segmentis 1 — 2 X 1 mm., bracteis IB mm. X 3 mm., pedicellis 3—B mm., calyce 13 mm. longo hoc 3 mm. lato, corollae tubo IB—18 mm. longo galeae parte basali B5 X 2'5 mm. parts antherigera 6 X 4 mm. rostro 35 mm. longo labio 16 mm. lato, capsula 20 mm. longa hac 7'5 mm. lata seminibus 2'5 mm. longis D75 mm. latis.

PLATE 17. A, B; figs. 1—8.—*Pedicularis Wallichii* Bunge.

A—Specimen from Gossain Than, Nepal [*Wall Cat.* n. 41 BA in Herb. Calett.]-
13—Fruiting specimen from Bijan Sikkim-Nepal frontier.

This account of *P. Wallichii* is based on the examination of 93 specimens. It must be noted that although Wallich named this species *P. asplenifolia*, he quotes neither Floerke, who first applied this name to a species of *Pedicularis*, nor Willdenow, by whom Floerke's species was first described, as the authority for the name; and it appears probable that Wallich applied the name to this plant (which it suits much better than it does the species that bears it), not from any idea that it was conspecific with Floerke's species, to which it is not remarkably closely related, but because he had either for the moment overlooked the fact that the name was pre-occupied or because he considered with Bentham [*vide Scroph. Ind.* 54, footnote] that Floerke's plant was properly reduced to *P. rostrata*, and that therefore he was at liberty to apply the name Floerke had used to designate a different species. But whether this was Wallich's intention or not, Bunge is clearly right in according specific rank to Wallich's plant. It is not, however, more nearly related to *P. rostrata*, as Bunge says, than to *P. asplenifolia*, but is equally distinct from both. Bentham, who in 1835 located Floerke's plant in *P. rostrata* (in this following Steven), in 1848 reconsidered his opinion, restored Floerke's species, and now placed the Wallichian plant within it, treating *P. geminata* Portenschlag (*P. Portenschlagii* Saut.), another species equally well characterised and which, as Reichenbach, Maximowicz and Steiner show, is quite distinct, in the same way. From both *P. Wallichii* is at once diagnosed by its lanceolate leaf-scales, few radical leaves, very different laminae, glabrous coriaceous subinflated calyx, much longer corolla

tubs and basal part of hood, stamens inserted higher up, filaments all hirsute, narrower longer anthers, much longer capsules and much larger seeds. In habit it apparently more nearly approaches to *P. yunnanensis* and *P. tsangchamensis* than it does to any of the European species with which it has been compared or confounded.

44. *Pedicularis excelsa* Hook. f. (1884).

Altissima glabra rhizomate brevi nodoso lignoso radicibus fibrosis cespitosis caule terete fistulosum ramoso folioso foliis radicalibus caulinisque imis mox evanidis foliis summo caule manentibus circa 12 longe petiolatis laminis magnis ovatis acutis pinnatipartitis rhachis dimidio superiore dentato-alato segmentis 15-jugis distantibus oppositis vel in subalternis ovato-lanceolatis pinnatisectis laciniis 5—9-jugis oblongis obtusis pinnatifidis et mucronato-dentatis floribus breviter pedicellatis bracteis ovatis petiolatis foliis pinnatifidis calycem sequantibus racemis strictis densifloris calycis ovoidei membrana demum breviter ciliati antice profunde fissi 5-dentati limbo postice productiore denribus brevibus obtuse deltoidibus integris corollae mox caduceae tubo sursum leviter ampliato demum dextrorse torto calycem parum superante labio patente margine ciliato e basi lata sensim attenuato ovato-oblongo ipso apice 3-loba lobis lateralibus minimis orbiculatis medio elongato reflexo et ad rostrum subbifido obcucullato galea suberecta margine faucibus ampliatis densius villosa parte antherigera a parte basali brevissima inserta internodi angustius obtuso in rostrum elongatum deflexum apice integerrimo in lobo labii medio nidulante sensim attenuate staminibus ex adverso summi ovarii insertis filamentis glaberrimis ovario late ovoidi stigmate incluso capsula calyce 4-plo longiore ovato-oblonga apice rotundata oblique reticulata seminibus nigris minute reticulatis.—*P. excelsa* Hook. f., *Flor. Brit. Ind.* iv, 311; *Maxim., Mel. Biol.* xii, 828, t. 3, f. 44.

In HIMALAYA orientalis:—Sikkim; Yeumtong, in valle Lachen, 12,000 p. s. m., Hooker; inter Tang-ka-la et Ohumbi, *Eingii mercenaria*.! Chumbi; ad Rinchingong, *Kingii mercenaria*.! Phari; ad Ga-ling, *Kingii mercenaria*.!

Augusto floret; corolla pallide punicea.

Caule 95—100 cm. alto basi indicis digiti crassitudine, rhizomate 3—4 cm. crasso radicibus 6—8 cm. longis, foliorum petiolis 2—6 cm. longis laminis majorum 13 X 10 cm. minorum 4 X 3 cm. segmentis majoribus 55 X 25 mm. laciniis 8 X 4 mm., racemis 8—20 cm. longis, bracteis 9 mm. longis, calyce 5 mm. longo, corollas tubo 5 mm. longo, galea 7 mm. longa hac 3 mm. lata rostro 10 mm. longo labio 18 mm. longo basi 5 mm. parte triloba vix 3 mm. lato.

PLATE 13. Figs 1—7.—*Pedicularis excelsa* Hook. f.

Specimen from between Tang-ka-la and Chumbi.

This account of *P. excelsa* is based on an examination of 9 specimens, none of which are in fruit; the description of capsule and seeds is taken from the *Flora of British India*. This is a very fine species forming, as Maximowicz U. shows, a monotypic series that in many respects connects the more usual *Rhyncholophous* forms with the highly specialised American series *Surrectae*. The lowest flowers of the raceme at times appear to remain closed till after those higher up are opened, but this is not, as I at first supposed, the rule, as it is in *Sipkonthae*. After the flowers are opened the

tip of the beak for some time nestles in the terminal lobule of the lip (fig. 1), but later, owing to the twisting of the galea, the beak is averted from the lip (figs. 2, 3). The corolla then soon falls off, and its caducous character renders the species almost unique among *Pedicularis*, the rule being for the withering corolla to persist and become gradually extruded by the ripening capsule before it finally is blown or falls away. It is impossible to mistake this for any other species at present known.

45. *Pedicularis lachnoglossa* Hook. f. (1884).

Elata glabriuscula rhizomate magnopere incrassato verticali basi radicibus fusiformibus carnosius apice in ramis pluribus supra solum extrusis unicaulibus abeunti ramorum collis et squamis propriis lanceolatis et petiolorum vaginis veterum densissime vestitis caule simplice erecto stricto subnudo foliis radicalibus dense cespitosis longe petiolatis linearilanceolatis pectinato-pinnatifidis segmentis 4—8—jugis linearibus acutis distantibus cartilagineo-serrulatis caulinis 1—3 intervallo longo separatis imo tantum petiolo brevi reliquis sessilibus bracteiformibus floribus distincte pedicellatis bracteis linearibus cartilagineo-serratis inferioribus calyce longioribus racemis strictis laxifloris calycis cylindrico-campanulati glabriusculi 5-fidi segmentis margine villosis lanceolatis a medio denticulatis norollse tubo sursum fauce ipsa parum ampliato calycem parum superante et extra ilium incurvo labio parvulo 3-partito bina margine longiuscule ciliatis ellipticis acutis subquimagnis galea subinflata angulo subrecto incurva parte basali glabra recta parte antherigera rufo-villosa ferb horizontali in rostrum deflexo-porrectum rufo-villosum apice iritegerrimo villo longissimo denso demum producta staminibus medio inter summum ovarium et apicem tubi insertis filamentis glaberrimis ovario oblongo-lanceolato stigmate incluso capsula ovato-lanceolata sensim attenuata calyce plus dimidio longiore seminibus anguste ovatis griseo-ochraceis testa laxa perforato-reticulatis.—*R. lachnoglossa* Hook, l., *Flor. Brit. Ind.* iv, 311; *Maxim., Mel. Biol.* xii, B37, t 3, l. 55.

In HIMALAYA Orientali :—Sikkim ; in valle Lachen, 14,000 p. s. m., *Hooker*; Donkia-la, 15,000 p. s. m., *Kingii mercenar.* I Chumbi ;—Dho-le-la, Pat-ze-la, KoD-ma py-a (bis), *Kingii mercenar.* ! Phari;—*Kingii mercenar.* !

DISTRIB.—Yunnan.

Julio—Augusto) floret; corolla rubra, purpurea, vel, rarius, sordide alba.

Stem 12—45 cm. alt., rhizomate cactoides extus crustaceo 7—12 cm. longo hoc 0.5—1.5 cm. crasso, foliorum petiolis 3—10 cm. longis laminis 5—12 cm. longis 1—1.5 cm. latis segmentis 5 X 2 mm., pedicellis 5 mm. longis, racemis usque ad 20 cm. extensis floribus in—20 mm. remotis bracteis 15—25 ram. longis, calycis 10 mm. longo 4 mm. lato corollae tubo 12 mm. longo galea parte basali 3.5 X 2 mm. parte antherigera 5 x 3 mm., rostrum 4 mm. longo labio 8 mm. longo hoc 4 mm. lato, capsula 16 mm. longa hac 6 mm. lata, seminibus 2.5 mm. longis 1 mm. latis.

PLATE 12- A; figs. 1—7.—*Pedicularis lachnoglossa* Hook. f.

Specimen from Pat-ze-la.

This account of *P. lachnoglossa* is based on the examination of 35 specimens. The corolla is usually red or purple; in one gathering, however, that from Koo-ma-py-a [*Herb. Calcutt.* n. BIB], it is noted in the field as dirty yellowish white. It has no near ally

among Indian species, the nearest being a group of American species, of one of which (*P. Purryi*) it exactly repeats the habit and foliage.

4B. *Pedicularis trichoglossa* Hook, f. (1884).

Elata hirsuta vel pilosa rhizomatibus altius subterraneo horizontali magnopere crassatim ex apice rotundato ramos plures filicales sursum subsistentibus in crassescens emittente flagellis singulis simplicibus collo radicibus fibrosis brevibus dense cespitosis cincto caule simplice erecto stricto striato-terribili dense polyphyllis foliis radicalibus caulinisque imis mox emarcescentibus evanidisve sessilibus basi auriculatis lineari-oblongis pinnatifidis segmentis 12—20-jugis ovato-oblongis obtusis mucronato-dentatis contiguis floribus brevis pedicellatis spica laxiuscula stricta sepius inter brachia distincta parte caulis foliosa remota dispositis bracteis lineari-oblongis acutis apice subulatis inferioribus florem sequantibus summis calyce brevioribus calycis hirsuti subcoriacei campanulati 5-secti segmentis supparibus oblongo-lanceolatis lanceolatis vel lineari-lanceolatis apice subacutis margine serrato-dentatis corolla tubum calyce brevioris medio inter rantes inferiores antice inclinato labio 3-secto coriaceo multo quam longo latiore lobis reniformibus subsequimagnis galea inflata circinnata dorso villosa longo rubiginosa dense obtecta parte basali recta tubo aequilata fere horizontali parte antherigera falcata deorsum directa in rostrum circinnatum deflexum apice integerrimo spatulato subreflexo sensim producta staminibus ex adverso summi ovarii insertis filamentis ad insertionem parce barbatis ceterum glaberrimis ovario ovato stylo longissime exserto capsula ovata compressa acuta parum exserta seminibus majusculis testa rugosis pallidis perforate reticulatis.—*P. trichoglossa* Hook. f. *Brit Ind.* iv, 311; *Maxim., Mel. Biol.* xii, 812, t. 3, f. 55.

In HIMALAYA occidentali:—Kamaon; supra Nabbi, 12—13,000 p. s. m.; in valle Kutti et supra Nepalcha, 13,000 p. s. m.; sub tegmine betularum in valle eadem; praeDpe Bidang, 14—15,000 p. s. m. et prope Rama, 12—13,000 p. s. m., in valle Dhauli; in Mulapa Gradh, ad glaciem, 12,000 p. s. m., *Duthie* Nepal occidentali; in Nampa Gadh, 12—13,000 p. s. m., et BX pagi Budhi adverse, 11—12,000 p. s. m. in umbrosis betulaceis, *Duthie*! In Himalaya Orientali:—Sikkim; ad Wallanchoon, apud Momay et Tungu, 12—13,000 p. s. m., *Hooker*; in Sochu, supra Tungu, 13,000 p. s. m., *Kingii mercenar. I* ad Zey-lep-la, 14,000 p. s. m., ad ripas humidam rivulorum, *Pantling*! In Patong-la, *Kingii mercenar. I* Dhumbi; apud Perm-la, prope Chum-la-ree; ad Kapoop, *Kingii mercenar. I* Phari; ad Do-tho; apud Sham-chen, et ad Groop, *Kingii mercenar. I*

Julio—Augusto floret; corolla purpurea.

Caulibus 12—90 cm. altis, rhizomatis cactoides extus crustacei parte quae superstiti 12 cm. longa 2—3 cm. crassa, flagellis subterraneis lucem quasrentibus gawllimis B—12 um, lungis, foliis B—8 cm. longis 375 cm. latis segmentis 4x2—3 mm., pedicellis 2—3 mm. calycibus 14 mm. longo hoc B mm. lato corollae tubum 12 mm. longo galea parte basali 10 mm. longa hac 3 mm. lata parte antherigera 7 mm. longa 45 mm. lata rostro B mm. longa labio 16 mm. lato, capsula 15 mm. longa 8 mm. lata seminibus 2.5 mm. longis 1.5 mm. latis.

PLATE 12. B; figs 8—15.—*Pedicularis trichoglossa* Hook. f.

Specimen from Patong-la.

This account of *P. trichoglossa* is founded on an examination of 54 specimens. The species is most nearly allied to *P. rhodotricha*. The diagnosis is as follows:—

beak shorter, deflexed, apex entire; margin of lip glabrous . . . *P. trichoglossa*;
beak conical, falcate, apex 2-fid; margin of lip ciliate. . . . *P. rhodotricha*.

47. *Pedicularis Dlarkei* Hook. f. (1884).

*Elata hirsuta vel pilosa rhizomate altius subterraneo incrassato ex apice pyramidalis ramos plures sursum sensim crassescens emittente flagellis singulis simplicibus collo radicibus fibrosis brevibus dense cespitosis cincto caule simplice erecto stricto striatiterete fistuloso dense polyphylo foliis radicalibus caulisque imis mox evanidis sessilibus basi auriculatis lineari-oblongis pinnatisectis rhachi alatis segmentis 15—25-jugis siliis distantibus ovato-oblongis acutis mucronato-dentatis floribus brevis pedicellatis spica condensata stricta parts caulis foliosa continua dispositis bracteis lineari-oblongis acutis apice serratis inferioribus flore longioribus summis calyce brevioribus calycis hirsuti membranacei campanulati 5-dentati segmentis supparibus peristichio deltoideo integro reliquis lanceolatis duplicato-serratis corolla tubo fere recto calycem parum excedente labio cuneato-obovato antice 3-fido lobis margine ciliatis obovatis sequimagnis cum dente deltoideo subulato inter lobos inter] ecto galea vix inflata arcuato-incurva parte basali recta tubo zequilata parte antherigera leviter falcata fere horizontali vertice parce pilosa in rostrum conicum rectum apice segmentis sinuatis 2-fidum sensim attenuata staminibus ex adverso summi ovarii insertis ad insertionem parce villosulis ceterum glaberrimis ovario ovato stigmate exserto capsula ovata acutiuscula parum exserta seminibus majusculis testa rugosis pallidis perforate reticulatis.—*P. Dlarkei* Hook. f., *Flor. Brit. Ind.* iv., 31D-*Maxim., Mel. Biol.* aii, 84 D, t. 3, f. BD.*

In HIMALAYA orientali:—Sikkim; Yeumtong et Tungu, 12—13,000 p. s. m., *Hooker et Phullabong*, 13,000 p. s. m., *Thomson!* Abktong, 13,000—15,500 p. a. m., *Anderson!* Jongri, 13,000 p. s. m., *Clarke!* Tang-ka-la, *Kingii mercenar.!* Dhumbij ad Pun-ka-bee-see-moj *Kingii mercenar.!* Phari; ad Sham-dhu, *Kingii mercenar.!* Nepal Orientali; ad Bloktan, 12,000 p. s. m., et ad Kogling prope Kangla, 14,000 p. s. m., *Kingii mercenar.!*

Julio, Augusto, Septembre floret; corolla ssepissime punicea, nonnunquam tamen albo-punctata.

Caulibus 25—80 cm. altis nonnunquam minimi digiti crassitudine, rhizomatis cactoidi extus crustacei parte quae superstit ultra 7 cm. longa 1—1.5 cm. crassa flagellis subterraneis lucem quærentibus 4—5 cm. longis, foliis 4—6 cm. longis, his 0.75—1.25 cm. latis segmentis 4—7 X 25 mm., pedicellis 2—3 mm., calyce 15 mm. longo 5 mm. lato, corollae tubo 18 mm. longo galea parte basali 45 X 2.5 mm., parte antherigera 15 X 3 mm. rostro 5 mm. longo labio 13 mm. longo hoc 9 mm. lato, capsula 16 mm. longa hac 8 mm. lata semi-nibus 2.5 mm. longis his 1.5 mm. latis.

PLATE 11. A; figs. 1—7.—*Pedicularis Clarkei* Hook. f.

Specimen from Tang-ka-la,—north of Ze-lsp-la and at the same elevation.

This account of *P. Clarkei* is based on an examination of 37 specimens. The species repeats the habit and foliage with the calyx, corolla tube, and lip of *P. Prainiana*, *P. J?rainiana* differs in having a beakless hood.

48. *Pedicularis Prainiana* Maxim. (1888).

Elata hirsuta rhizomate ipso non viso (fere certe rhizomatibus *P. trichoglossa* et *P. Clarkei* invenietur simillima) flagelli subterranei parte summa manente gracili ciliis radicibus fibrosis brevibus dense cespitosis cincto caule simplice erecto stricto striato-terete fistuloso dense polyphylo foliis radicalibus caulinisque imis mox evandis sessilibus basi auriculatis lineari-oblongis pinnatisectis rhachi alatis aegmentis 15—25-jugis diatantibus ovato-oblongis acutis mucronato-dentatis fibrillis brevis pedicellatis spica condensata stricta parte caulium foliosa continua dispositis bracteis lineari-oblongis acutis apice serratis inferioribus flore longioribus aummis calyce brevioribus calycis hirsuti membranacei campanulati 5-dentati segmentis supparibus poatice bilobato integro reliquis lanceolatis duplicato-serratis corollae tubo cum galea arcuato-incurva calycem parum excedente labio cuneato-obovato antic 3-fido lobis margine ciliatis obovatis sequimagnis cum dente umbonato inter lobos interjecto galea naviculari dorso parce pilosa parte basali tubo sequilata eoque continua parte antherigera fronte rotundata antice latius aperta erostri ataminibus medio tubo insertis filamentis glaberrimis ovario ovoideo atigmate parum exserto.—*P. Prainiana* Maxim., *MeL Bid.* xii, 844, t. 3, l. 65; *Prain in Jour. As. Soc. Bmg.* lviii, 2, 277.—*P. rudis* Prain in sched. [ex Herb. Uahut distrib. 1885), *nee* Maxim.

In HIMALAYA orientali:— Chumbi, apud Lu-ma-poo, *Kingii mervinar.* (n. 509)!

Julio floret; corolla lutea.

Caulis 45 cm. altus, foliis 7—10 cm. longis 1.5—2 cm. latis segmentis 4—5 mm. pedicellis 2—3 mm. calycis 10 mm. longi 5 mm. latius, corollae tubo 17 mm. longi galea parte basali 5 x 3 mm. parte antherigera 8 x 5 mm., labio 10 mm. longo bilobato.

PLATE 11. B; figs. 8—11.—*Pedicularis Prainiana* Maxim.

Specimen from Lu-ma-poo, Chumbi.

There is only one gathering of this species. The plant exactly repeats the habit and foliage of *P. Clarkei*; as regards corolla it is closely allied to *P. rudis*, for which it was at first taken. It is, however, as Mr. Maximowicz has shown, perfectly distinct; the diagnosis is as follows:—

corolla tube glabrous, galea dilated in front with sides villous, lip narrowly	
cuneate-obovate 3-fid short broader than galea with bilobate	<i>P. Prainiana</i> ;
corolla tube pubescent, galea equally wide throughout with margin	
villous, lip broadly ovate 3-lobed bilobed the galea with lobes	
rounded	<i>P. rudis</i> .

49. *Pedicularis Gammieana* Prain (1889).

Humilis hirsuta rhizomate tenui caulibus gracilibus arcuatis paucis foliis radicalibus nullis caulinis petiolatis parvis verticillatis verticillis [2] 4-ternis vel verticillis inferiore paribus 2 oppositis decussatis in intervallo separatis 2-pinnatis partitis segmentis 2-jugis laciniis ovato-oblongis profunde incisus floribus paucis axillaribus brevis pedicellatis contra bracteis foliiformibus petiolatis calycis campanulati hirsuti antice triente fissi 5-dentati segmento postico lanceolato integro reliquis e basi attenuata in laminam ellipticam profunde acutis incisa-dentatam dilatatis corollae tubo calypem duplo superante lobis 3-lobatis lobis rotundatis lateralibus medio duplo majoribus galea inflata arcuato-incurva

parte basali tubo parum latiore erecta parte antherigera falcata in rostrum breve concum apice emarginato abrupte producta staminibus medio tubo insertis filamentis anticis superne barbatis ovario ovoideo-lanceolato stigmata exserto.—*P. Gammieana Prain in Jyur. As. Soc. Beng. lvi, 2, 2BO.*

In HIMALAYA Orientali:—Sikkim; ad Lang-niang-nang-zo, 10, *OID* p. s. m., *Pantling!* Maio floret; corolla saturate purpurea.

Daulibus B—8 cm. altis, petiolis 6—IB mm. longis laminis 12 X B mm. segmentis 6 x 3 mm. et 2—6 mm. remotis, pedicellis 2—3 mm., calyce 7 mm. longo, corollae tubo IB mm. longo galea parte basali B X 2½ mm. parte antherigera B X 3 mm. rostro 3½ mm. longo labio 12 mm. lato.

PLATE 22. C; figs. IB—2D.—*Pedicularis Gammieana Prain.*

Specimen from the solitary gathering.

The material of this species is not very adequate, but it is impossible to associate it with any of the known species of the genus. The corolla differs from that of *P. binaria* only in having the lower lip eciliate and the central lobe of the lip less depressed; the habit and foliage of *P. binaria* are, however, so very dissimilar that it is impossible to unite it with that species. It is not unlike a dwarfed condition of *P. flexuosa* with whorled instead of opposite and with much more incised leaves; it has, however, a deflexed and more deeply emarginate beak; the calyx, besides, is very different. The species that it most closely resembles is *P. odontophora* from which it is, however, at once diagnosed by the absence of teeth on the corolla throat and by the leaves being whorled and not alternate. It is peculiar among Indian species in its time of flowering, almost the only other species collected so early in the year being *P. siphnantha*.

50. *Pedicularis schizorrhyncha Prain (1889).*

Nana caespitosa glabra rhizomate nodoso radicibus caespitosis fusiformibus fibrosisve caulibus numerosis gracillimis brevibus debilibus foliis radicalibus densissime caespitosis caulinis 1-paribus oppositis vel 2 omnibus longe petiolatis lanceolatis pinnatisectis segmentis B—8-jugis ovatis subdistantibus serrato-dentatis racemis ssepiissime 3-floris rarius 4-floris floribus breve pedicellatis bracteis foliaceis calycis oblongi nervis pubescentibus antice vix fissi 5-dentati dente postico lanceolato reliquis oblongis omnibus apice cristatis corolla tubo calyce duplo longiore labio 3-partito margins ciliato lobis rotundatis lateralibus medio dimidio majoribus galea inflata arcuato-incurva parte basali tubo aquilata erecta parte antherigera falcata margine 2-auriculata auriculis nonnunquam in deutes subulato-lineares excurrentibus antice in rostrum porrectum leviter deflexum breve conicum apice truncatum margine laciniatum educta staminibus medio inter summum ovarium et apicem tubi insertis filamentis anticis hirsutis ovario ovoideo stigmate exserto capsula ovata apiculata parum exserta seminibus subtriquetris nigris minutissime reticulatis.—*P. schizorrhyncha Prain in Jyur. As. Soc. Beng. lvi, 2, 2BD.*

In HIMALAYA orientali:—Sikkim, *Jafrey!* Kan-ker-teng, 13, *DDD* p. s. m.; Bijan, 12, *DDD* p. s. m., *Kingii mercenar.!* Dhumbi; ad Tan-ka-la, *Kingii mercenar.!*

Augusto—»Septembre floret; corolla punicea.

Caulibus 3—5 cm. altis, radicibus 4—5 cm. longis, petiolis radicalibus caulioisqua 2 cm. longis floralibus vix 5 cm. longis laminis 9 X 3—i mm. segmentis 1—2 X 1 mm.,

pedicellis 2—3 mm., calyce 9 mm. longo 4 mm- lato, corolla tubo IB—18 mm. longo galea parts erecta 5 X 25 mm. partB antherigera 7 X 4'5 mm. rostra 3 mm. longo labi3 17 mm. lato, capsula 11 X B mm. seminibus 12 5 mm. longis.

PLATE 25. D; figs. 13—19.—*Pedicularis schizorrhyncha* Prain.

Specimen from Sikkim (Jaffrey).

The account of *P. schizorrhyncha* is base! on an examination nf 73 specimens. This species repeats the habit and foliage of *P. chumbica*, to which, however, it is not very closely related; the diagnosis has been already given. This seems an opposit-leaved *Rostrata* rather than a truly *Orthvrrhynvhous* species.

51. *Pedicularis alaschanica* Maxim. (1B77).

Humilis vel elatior e basi ramosa villosa rhizomate crasso lignoso caulibus teretibus apice ascendentibus foliis quaternatim verticillatis oppositiave petiolatis pinnatissectis segmsntis 8—12-jugis lanceolatis decurrentibus distantibus serratis floribus sessilibus Bpici interrupts verticillastris 4-floris dispositis bracteis inferioribus totis foliaceis reliquis basi integris membranaceis ovatis apice foliaceis pinnatilobis serratisve calycis mBm-branacei ovoidei hirsuti 5-dentati segmento postico deltoideo reliquis lanceolatis acutis diinidio brevior corollse tubo calyce aequilongo labio rotundato antice 3-lubo lobis later-alibus ovatis medio orbiculatu multo majoribus galea inflata arcuato-incurva parte basau erecta fauce 2-sinuata margine glandulosB incrassato parte antherigera subfalcata in rostrum anguste conicum porrectum apicB integro truncatum producta staminibus BX adverso summi ovarii insertis filamentis anticis hirsutis ovario ovoideD stigmate subexserto capsula late ovata acuminata parum exserta ssminibus majusculis ovatis teata pallidis rugosis profunde reticulatis.

VAR. *typica*; elatior foliia 4-ternis calyce margine et ad costas hirsuto dente postico margin Q integro reliquis serratis rostro gale^ latitudinena sequante apice leviter sinuato.—*P. alaschanica* Maxim., *Mel. Biol.* x, 91 et xii, BBD, L 5, / 35a; Prain in *Jour. As. Soc. Bmg.* lviii, 2, 251-

In HIMALAYA orientali:—Phari; *Kingii mercenar.*!

DISTRIB.—Mongolia; in alpibus Alaschan. China; Kansu orientali et boreali.

VAR. *tibetica*; humilis foliis oppositis vel rarius 3-natim verticillatis calyce dense villosa dentibus omnibus margine integris rostrD galeaj longitudine manifesto brevior.—*P. alaschanica* VAR. *tibetica* Maxim., *Mel. Biol-* xn, 8BD, t Dj f. 866; Prain in *Jour. As. Soc. Beng.* lviii, 2, 251-

In HIMALAYA orientali:—Phari; apud Do-tho, *Kingii mercenar.* !

DISTRIB.—Tibet bor.-orient. ; in valle Assak-gol.

Augusto floret; corolla lutea.

Caulibus VAR. *typkcd* 15—20 cm. longis VAR. *tibeticce* 5—8 cm., rhizomate 5—B cm- longo petiolis 1-5—2 cm., laminis 2—25 X D'5—0 75 cm. segmentis 3—4 X 1 mm. calyce 11 mm. longo hoc 5 mm. lato cDrollse tubo 11 mm. lungo galea parte basali 4 X 2 mm. parte antherigera 5 x 3 mm. rostro VAR. *typicce* 3 mm. longo VAR. *tibdicce* vix 1 mm- longo ldbio ID mm. lato, capsula 11 mm. longa seminibus 3 mm. longis 1'75 mm. latis.

PLATE 25. A, B; figs. 1—12. —*Pedicularis alaschanica* Maxim.

A—Specimen of VAR. *typica* from Phari (Laina Ujyen Gyatsko n. 45).

B— „ „ „ *tibetica* from Do-thD.

This account of *P. alaschanica* is, as regards VAR. *typica*, based on the examination of one Chinese specimen [E. Kansu, *Potanin*; 1885, kindly sent by Mr. Maximowicz] and 10 specimens from Phari—all gathered by the Lama Ujyen Gyatsko. Mr. Maximowicz describes the filaments as glabrous in the Alaschan specimens, but in the Chinese one and in all those from Phari, of both varieties, the anterior filaments are hirsute. The specimens, of which one has been figured, here treated as examples of VAR. *typica* are, as regards calyx, clearly referable to that variety, but as regards beak are intermediate between the two varieties recognised by Maximowicz. With a more extensive suite of specimens from Southern Tibet, it may become necessary to merge the varieties in one. ThB species has no near Indian ally, the nearest species being the Siberian *P. myriophylla*, the Chinese *P. curvituba*, and the Japanese *P. Uhamissonis*. Of VAR. *tibetica* proper I have examined B specimens, all of one gathering.

§§§§ BIDENTALE Maxim.

Folia opposita vel VBrticillata:—

galsa infra apicem utrinque 3-dentata 52. *P. lyrata*.

galea infra apicem utrinque 1-dentata:—

filamentis antica hirsuta, foliis subsessilibus basi connatis 53. *P. comptonii* B. folia.

filamentis dimidiis hirsuta foliis bracteatis basi in vaginas per-

foliatis connatis 54. *P. rex*.

Folia sparsa, galea infra apicem 1-dentata, filamentis anticis hirsuta 55. *P. dolhervrhiza*.

52. *Pedicularis lyrata* Train (1888).

Humilis subcaulis pubescens simplex vel pluriceps rhizomate tenui lignoso radicibus fibrosis ramosis foliis oppositis subcordato-ovatis obtusis grandicrenatis denticulatisque radicalibus breve petiolatis caulinis subsessilibus floribus laxe racemosis breve pedicellatis bracteis foliaceis basi dilatatis sessilibus calycis tubulosi hirsuti profunde 5-dentati segmentis summo subulato integro reliquis e basi angustiore integra breve ellipticis parce dentatis corollae tubo recto sursum parum ampliato intus glandulose ciliato calycem dimidio superante labio 2-plicato antice 3-lobis lobis subaequalibus rotundatis margine eros-crenulatis medio prominulo emarginato galea arcuate incurva parte basali erecta parte antherigera subfalcata apice angulatum cucullata deorsum breve producta et infra apicem segmentis utrinque 3-dentata bifida dente inferioris subulato reliquis deltoideis brevioribus brevioribus summi ovarii insertis filamentis glabris ovario lanceolato acuto stigmate incluso disco antice ovoideo incrassato capsula oblongo-lanceolata acuta calyce fere duplo longiore seminibus parvulis ovoideis testa rubro-fuscis distincte reticulatis. — *P. lyrata* Prain, Maxim., *Md. Biol.* xii, 90D, t. 4, l. 135; *Jour. As. Soc. Bmg.* lviii, 2, 255.

In HIMALAYA orientali:—Phari; et ad Ting, *Kinyi mervinar.*!

Julio et Augusto floret; corolla alba.

Caulibus 0-5 cm. altis rhizomate 2-5 cm. longo, radicibus 1-3 cm. longis petiolis radicalibus 1-1.5 cm. caulinis 0.25-0.5 cm. laminis 2×1 cm. segmentis $2-3 \times 3$ mm., calyce 7 mm. longo hoc 2.5 mm. lato corollæ tubo 12 mm. longo galea parte basali 5×2 mm. parte antherigera 4×2 mm. labio 7×4.5 mm. capsula 14×5 mm. seminibus 1.25 mm. longis.

PLATE 31. B; figs. 7-13.—*Pedicularis lyrata* Prain.

Specimen from Ting.

The description of this species is based on an examination of 11 specimens. Its nearest ally is *P. lutescens*, a Yunnan species, which differs by its shorter corolla tube, its 5-fid galea teeth, and its disc prolonged anteriorly into a spur.

53. *Pedicularis comptoniæfolia* Franchet (1888).

Elate superne breviter ramosa glabrata caule terete. « * foliis coriaceis 4-natis verticillatis brevissime petiolatis lanceolatis acuminatis pinnatilobis segmentis 10-14-jugis rotundatis cartilagineo-denticulatis floribus subsessilibus versus apices caulis apicatis spicis interruptis plurifloris, bracteis foliaceis mucronato-serrulatis calycem superius antibus calycis campanulati inflati chartacei brevissime 5-dentati segmentis deltoideis inæqualibus integris margine villosis corollæ tubo ad calycis faucem incurvo sursum ampliato calycem plus duplo superante labio obovato margine subcrenulato antice 3-loba lobo medio prominulo rotundato lateralibus ovatis dimidio minore galea parum arcuata tubo subcontinua eique æquilata fronte inclinata in rostrum brevissimum latum oblique truncatum utrinque 1-dentatum abeunte staminibus ex adverso summi ovarii insertis filamentis basi villosulis anticis etiam superne parce barbatis ovario ovato stigmate exserto capsula late ovata parum mserta seminibus ovoideis cinereis distincte reticulatis.—*P. comptoniæfolia* Franchet, Maxim., Mel. Biol. xii, 871, t. 5, f. 96; Prain, Jour. As. Soc. Beng. lviii, 2, 265.

In BURMA:—in mont. saian, apud castra "Fort Stedman" nuncupata, 6,000 p. s. m., Collett (n. 911)!

DISTRIB.—Yunnan.

Novembri floret; corollæ purpurea.

Caulibus ultra 80 cm. altis, petiolis 1-3 mm. laminis $3-5 \times 0.5-0.75$ cm. segmentis 2.5×3 mm. spicis 12-20 cm. calyce 6 mm. longo hoc 3.5 mm. lato corollæ tubo 15 mm. longo galea 7.5 mm. longa 3 mm. lata labio 8 mm. lato, capsula 8.5×6.5 mm. seminibus 2 mm. longis.

PLATE 15. B; figs. 6-11.—*Pedicularis comptoniæfolia* Franchet. " " " " " "

Specimen from Fort Stedman, Shan Hills (Collett n. 911).

This description is from three specimens by General Collett, C.B., in 1888. They differ from the Yunnan plant named by Franchet and described by Maximowicz in having shorter leaves, and especially in not having the midlobe of the lower lip emarginate; in other respects they appear to agree exactly.

54. *Pedicularis rex* Clarke (1888).

Elata glabra rhizomate incrassato caule erecto stricto crasso tetragDno subalato simplice vel supernB fastigiatim pares ramoso foliis radicalibus sub anthesi emarcidis caulinis 4-natini et decussatim verticillatis petiolatis petiolis inferiorum basi dilatatis summorum alatis et in vaginam campanulatam pBrfoliatam connatis laminis ellipticis pinnatisectis rachi alatis segmentis 13—17-jugis distantibus lane solatia acutis pinnatifidis laciniis argute dsntatis floribus subsessilibus laxe spicatis verticillastris 4-floris intervallo distincto remotis bracteis fDliaceis 4-natim verticillatis basi in tubum membranaceum calyces superantBm connatis calycis tenuis membranacei ventrB fissi dorso senjibifidi laciniis requalibus latissimB ovatis apiDB ipso nunc intsgro nunc 2- vel 3-dentato corolla tubo recto calyceni plus duplo superante medio intus glanduloso-ciliato labio rDtundatD valde 2-plicato antice 3-lobo lobo medio prominulo cuuullato transvrse late ovali latsralibus semitundis multo minoribus galea subrecta tubo subcontinua parte basali parum inclinata parte antherigera suberostri ante apicem subulatD-bidentata staminibus ex ad verso summi ovarii insertis filamentis omnibus superne villosis ovario ovato stigmate incluso disco antice in cornu ovarium subsequans producto capsula subrhomboidea vix exserta seminibus nigris **ellipticis** utrinque apiculatis minutis reticulatis.—*P. rex* Clarke[^] Maxim[^] Mel. Biol. **xii**, **875**, t 5, /- 1D3; Prain, Jvur* As. Soc. Beng. lviii, 2, 266.

In ASSAM:—in mont. Khasia; apud Shillong, 5—6DDD p. s. m., Mann! Clarke; in BURMA; Brandis!

DISTRIB.—Yunnan; Kwei-tschow.

Junio floret; corolla lutea.

Daulibus 40—120 cm. altis, petiolis 1—2 cm. laminis 5—7 X 2—3 cm. segmentis 15 X 5 mm., spicis **8—30** cm. longis, verticillastris 3D mm. remotis, vaginis 1D—12 mm. altis, calyce 9 mm. longo hoc 4 Dim. lato, corollae tubo 24 mm. longo galea 16 mm. longa, hac 5 mm. lafca labio 9 mm. longo hoc 7'5 mm. lato, capsula 1S mm. longa hac 13 mm. lata seminibus 3 mm. longis.

PLATE 30. A; figs. 1—8.—*Pedicularis rex* Clarke.

Specimen from Burma.

This description is founded on the examination of 23 specimens. This fine species is most nearly allied to *P. superla*, in which also the flowers are sheathed by connivent bracts, but which has a very different calyx and corolla.

55. *Pedicularia dolichorhiza* Schrank (1841).

Elata hirsuta rhizomate incrassato collo squamis magnis late ovatis tenuibus membranaceis vestito caule simplice stricto terete fistuloso foliis radicalibus numerosis longe petiolatis caulinis sursum decrescentibus subsessilibus pinnatisectis segmentis 15—25-jugis lanceolatis pinnatipartitis lobis cartilagineis mucronatoserratis floribus laxius spicatis sessilibus bracteis inferioribus foliaceis summis trifidis lacinia media lanceolata margine senulata lateralibus dentiformibus calycis villosi campanulati membranacei 5-dentati segmentis deltoideis lanceolatis vel subulatis acutis postico integro reliquis margine minutissime senulatis corollae tubo cal]cem vix excedente labio 2-plicato basi intus

ciliato antice 3-lobo lobis obovatis lateralibus medio dimidio majoribua galea curvata brevior
 galea adunca parte basali tubo continua parte antherigera in rostrum conicum apice
 bifidum segmentis deltoideis staininibus ex adverso medii ovarii insertis filamentis
 insertions villosulis anticis superne sparse barbatis ovario ovato-lanceolato stigmate exserto
 capsula ovata acuminata calyce dimidio longiorB seminibus *longs* ovatis appendiculatis
 testa subrutilis distincte reticulatis.—*P. dolichorrhiza* Schrenk, *Fisch. et Mey.*, *Enum. Pl*
Nov. ii, 23; *Bunge, Bull Phys. Math. Petersb.* i, 379; *Walp., Rep.* iii, 426; *Smth., DC.*
Prodr. x, 570; *Bunge, Ledeb., Flor. Boss-* ill, 291; *Maxim., Mel Biol* x, 117; *Regel, Ada*
ffort. Petrop. vi, 352; *Maxim., Mel Biol* xii, 905, t B, l. 146; *Prain, Jour. As. Soc.*
Beng. lviii, 2, 275.—*P. cabulica* Benth., *DV. Prodr.* x, 575 (184B); *Maxim., Mel Biol*
 xii, 855, t 4, l. 80.—*P. fissa* Hook. l, *Flor. Brit Ind.* iv, 31B [1884], *nee Turcz.*

In HIMALAYA occidentali:—Kashmir; ad Dras, 10—11,000 p. s. m., *Henderson!*
 inter Baltal et Dras, transitu Zoji-la, *Henderson*; prope Iskardo, *Falconer*, fin Herb-
 Saharanpur)! *Grilgit, Tanner* (n. 255)! hsec spp. omnia cum planta Schrenkiana omnino
 consentanea. Afghanistan:—in graminosis Kurzar, *Griffith* (Journ. n. 1143)! sp. typicum
P. cabulicx. *Grilgit*; apud Sai, 10,000, *Tanner!* Hindu Kush, *Griffith* [n. 3941 Kew
 distrib.)! *Giles fter!* hsc omnia inter *P. dolichorrhizam* gBnuinam et *P. cabulicam*
 mediantia.

DISTRIB.—Turkestan; Mongolia boreali; Tibet boreali.

Corolla ochroleuca; Augusto—Septembre floret.

Daulibus 20—90 cm, altis, petiolia radicalibua et caulinis imis 10—15 cm. *longis*
 laminis 15 X 3 cm., segmentis 15 mm. X 4 mm., calyce 12—13 mm. longo hoc 5 mm.
 lato, corolla tubo IB mm. longo galea parte basali B X 3'5 mm. parte antherigera
 B X 5 mm. rostro 3 mm. longD labio 11 mm. lato, capsula. 15—IB mm. longa hac
 8 mm. lata seminibus 2 mm. longis.

PLATE 30. B; figs. 9—14.—Pedicularis dolichorrhiza Schrenk.

Specimen from Sai; Gilgit.

This account of *P. dolichorrhiza* is based on an examination of 21 specimens-
 Dr. Henderson's specimen has precisely the calyx and corolla of Mr. A. Regel's
 specimens from Sairam in Turkestan; RBgePs appears to be exactly Schrenk's plant.
 Dr. Falconer's gathering from Iskardo and OHB of Colonel Tanner's gatherings from
 Grilgit are the same thing. All Dr. Griles' specimens and Dr. Griffith's Hindu Kush
 gathering (Jour. n. 157], with the gathering by Colonel Tanner at Sai which haa been
 figured, agree with each other in every respect and differ from the genuine plant only in
 having the capsule one-half in place of one-thiri longer than the calyx. "*P. cabulica*,"
 which is Dr. Griffith's plant from Kurzar, has a corolla indistinguishable from the
 Hindu Kush plant, and has the same longer capsule; its calyx has, however, subulate
 teeth. As this is the only character by which its separation may be effected from
P. dolichorrhiza, it seems inadvisable to treat it even as a variety.

DIVISID IIL-ERDSTRES PKAIN.

§§§§§ ANDDNT-E Bunge.

Floribus axillaribus, loDgisBimè peiioellatis; foliifl UeEspitosifl; planta

nuna ucaulia. 55. *P. Regeliana*,

Floribus spicatis; caulibus distinctis:—

foliis verticillatis VBI oppositis; floribus cBntripeto ordine apBrtia:—

tubo coioUre infracto:—

tubo intra calycem infra ctu :—

labio lobis sequilatis :—

galea fronts dediva. 57. *P. globifera.*

galea fronts truncata. 58. *P. cheilanthifolia*

labiD lobo mediD latsralibua minors :—

galea acuminata labium distinct9 superante . 59. *P. ophiucephala.*

galea labio manifesto breviers. 51). *P. Hoy lei.*

tubo apiuB ipso infracto:—

labio margin B ciliato :—

filamentis anticis hirsutis. 51. *P. gibbera.*

filamBntia omnibus glabria. B2. *P. polygaloides.*

filamentia omnibus hirsutis. 53. *P. denudattu*

labio margins ciliatu. 64. *P. mollis.*

tubo corolltB recto :—

labio lobia supparibua. 65. *P. collata.*

labio lobo mBdio lateralia excedBnte :—

labio margine ciliato. B5. *P. fragilis.*

labio marginB eciliato. B7. *P. Kingii.*

tubo DorDlle incurvo (haud infracto). 68. *P. pycnantha.*

f oliia sp arsis, floribus centrifugo or din 9 apBrtis. 59. *P. Oederi.*

5B. Pedicularis Regeliana Train [1839).

Nana acaulis rhizomats incrassato collo paucisquamato stolona brevia flagellifera emittente fuliis utespitosis petiolatis pinnatisectis se^mentis 4—7-jugis ovato-rotundatis basi angustatis serrato-dcutatis floribus paucis axillaribus lun^issimy crassius peilicellatis calycis cylindricD-campanulati costis hirsuti antics triente fiasi 5-dentati segmentis ovatis serratis insequaiibus pnsbico lateralibus triplo antiisque duplo minury cDrolls tubo sursuin ampliato calycem. daplo excadente labis 3-fido lobis rotundatis leviter emarginatis laberalibas ineiio dimidio majoribus galea inflata arcuato-incurva parte basali tubo angustiore parum inclinata parte antherigera f^lcata apice cucullata fauce utrinque 1-dentata dentibus deorsum directis dorso lsviter cristata staminibus medio inter summum ovarium et tub! apicem insertis filamentis omnibus (anticis densioribus) hirsutis ovario ovato stigmate exserto capsula DVato-acuta basi angustata triente exserta seminibus paucioribus anguste ovoideis cinerascentibus striatis vix rsticulatis.—*P. Regeliana Prain, Jour. As. ASW. Ueny. lviii, 2, 274.*

In HIMALAYA orientali: —Sikkim; ad Ze-lep-la, Tang-ka-la et Phu-la-loong, 12—13,000 p. s. m.; Jongri; apud Tha moo-tsa, ad Bijan, et ad Kan-ker-teng, 11—12,DDD p. s. m., *Kingii mercenar. !*

Augusto floret; corolla concolor purpurea.

Stolonibus 0—3 cm. longis, foliorum petiolis 1—B cm. laminis 0.75—6 cm. longis 0.5—1.5 cm. latis seginentis 2—5 mm. iis rhizDmati propioribus petiululis distinctis, podicellis 9—4fimm., calyce 9—11mm. longo, corollse tubo 15—18mm. longo fauce 5 mm. lata basi duplo latiore gale^ parte basali 2 mm. longa 2 mm. lata parte antherigera 9 — 11 mm. lunga

3 mm. lata rostro 2—3 mm. longo labio 17 mm. lato, capsula 17—20 mm. longa hac B5 mm. lata seminibus 2 mm. longis.

PLATE 10. D; figs. 11—17.—*Pedicularis Regeliana* *Praia*.

specimen from Phu-la-iDong.

This description is based on an examination of 105 specimens. The species is not closely allied to any Indian one, the nearest species being the European *P. acaulis* and the Northern Chinese *P. Artsdceri*. From both it is at once distinguished by its much longer capsules. *P. Artsdceri* has been noted as tinging the paper in which specimens are dried with purple; the same thing happens with *P. Regeliana*. The only other Indian *Pedicularis* that appears to do so is *P. megahnta* VAR. *pauciflora*.

57. *Pedicularis globifera* Hook. f. (1884).

Nana vel humilis nonnunquam tamen elatior parce pubescens vel glabrata rhizomate incrassato collo pluricipite squamis lanceolatis paucis vestito radicibus fusiformibus carnosis caulibus cespitosis simplicibus vel e basi ramulis foliis radicalibus longe petiolatis dense caespitosis caulinis breve petiolatis verticillis (1—2) 4-ternis pinnatisectis segmentis 10—18-jugis lanceolatis linearibusve cartilagineo-dentatis floribus subsessilibus verticillatis dense confertis vel inferioribus distantibus bracteis inferioribus foliaceis summis ovatis lanceolatis pinnatisectis calyce brevioribus calycis oblongo-campanulati costis dense hirsuti antice tri-5-fissi 5-dentati segmentis inaequilatis summo deltoideo integro vicinis cristatis duplo angustiore antice etiam cristatis aequilato corollae tubo supra basin infracto sursum ampliato calycem plus dimidio superante labio duplo latiore quam longo 3-lobato lobis orbiculatis medio lateralibus vix dimidio angustiore galea incurva parte basali erecta tubo continua parte antherigera fronte decliva in rostrum deorsum spectans brevissimum conicum apice rotundatum abeunt staminibus ex adverso medii ovarii insertis filamentis ipso basi minutissime villosulis ceterum glabris ovario ovato lanceolato stigmate exserto capsula ovata lanceolata apice acuta calycem plus dimidio excedente seminibus ovoideis basi appendiculatis testa pallidis distincte reticulatis.—*P. globifera* Hook. f., *Flor. Brit. Ind.* iv, 308; *Maxim., Mel. Biol.* xii, 869, t. 5, f. 95.

In HIMALAYA Orientali:—Sikkim; Hooker; Phari; (scepissime); et apud Sa-moo-da in Tibet australi, *Kingii mervanar.* ! Julio—Augusto floret.

Caulibus 2—25 cm. rhizomate 4—7 cm. longo 0.5—1 cm. crasso radicibus 3—4 cm. longis, petiolis radicalibus 2—5 cm. caulinis 0.5—0.75 cm. laminis 2.5 X 0.75 cm. segmentis 2—3 x 1 mm., calyce 8—9 mm. X 3.5 mm., corolla tubo 12 mm. longo galbra fl. 1 mm. longa rostrum 1.5 mm. longo labio 6 mm. longo hoc 10 mm. lato, capsula 14 X 5 mm. seminibus 2 mm. longis.

PLATE 32. D; figs. 7—12.—*Pedicularis globifera* Hook. f.

Specimen from Sa-moo-da, 40 miles north of Phari.

This account of *P. globifera* is based on an examination of 49 specimens. The species is very nearly related to *P. cheilanthifolia*, of which it repeats every character except that of curvature of upper lip of corolla. In one gathering from Phari the corolla is noted as white; in the Sa-moo-da gathering it is noted as dark purple; usually it appears to be pale pink. It seems to be the representative in the Eastern Himalaya of *P. cheilanthifolia*.

53. Pedicularis cheilanthifolia Schrmh [1841).

Humilis vel elatior parce pubescens vel glabrata rhizomate incrassato collo pluricipite squamia ovatis paucis vestitD radicibus fusifDrnibus carnosis caulibus cespitosis simpliubus (vel rarissime verticillato-ramosis) foliis radicalibus ltmge petiolatis dense ceespitosis caulinis breve petiolatis verticillis (1—2) 4-ternis pinnatisBctis segmentis 8—1'2-jugis ovato-lanceolatis linearibusve cartilagineD-dBntatis floribus subsessilibus rarissime inferioribus distincte pedicellatis verticillatis dense confertis vel inferioribus distantibus bracteis inferioribus foliaceis summis ovatis lanceolatis pinnatisectis calyce brevioribus calycis oblongo-campanulati costis dense hirsuti antice triente fissi 5-dentati segmentis insequilatis summo deltoideo integro vicinis cristatis duplo angustiore anticis etiam cristatis sequilato corullge tubo supra basin infracto sursum ampliato calycem plus dimidio superante labio parum latiore quam longo 3-lobo lobis orbiculatis sequilatis galea arcuata parts basali erecta tubo continua parte antherigera subfalcata in rostrum porrectum brevissimuin conicuni truncatum abeunti staminibus ex adverse medii ovarii insertis filaments ipso basi minutissime villosulis ceterum glabris ovario ovato-lancBolato stigmatе exserto capsula lancenlata apice acuta calyce 2-plo longiora seminibus ovoidsis basi appendiculatis testa pallidis distincte reticulatis.

VAR. *typica*; galea labio manifests longiore.—*P. cheilanthifolia Schrenk, Fisch. et Mey., Enum. PL Nov. ii, 19; Walp^ Rep. Hi, 939; Bunje, Zedeb., Flor. Ross, iii, 273; Benth., DO. Prodr.x, 552; Maxim., Mel Biol x, 89; Hook- /., Fhr. Brit. Ind. iv, 3DB; Maxim., Md. BivL xii, 869.—P. abrotanifolia Herb. Ind. Dr. H. l. if T. T. (nee M. BiebJ.*

In HIMALAYA occidentals—Dhakmanthuru, et Zirkotal, *Falconer/ Kanaor, 18,3D0 p. s. m., Jacquemont; Tibet Occident., reg. alpina, 11—15,DDL p.s. m. Thomson (Herb. Ind. OrJ! Lahul et Kanaor, Hay ! Lahul, Jaeschke ! Watt! Stewart! Ladak; ad Grreinthal, ad Industhal, et in Pangi, 11—16,500 p. s. in., Heyde! ad Terba, atque trans Lanak fl. ad occidentem versus, 15—17,DD0 p. s. m.; in valle Indus fl. props Lei (spp. contra normarn ramosa ramis 4-natim verticillatis vBrticillis 2, ramis inferioris 5 cm. sum mi 4 cni. omnibus florifBris cauls apice evidenter aninialis cujusdam dente preemDrso; ad Ishomoriri ; in Kibler atque in ea vicinitate, 14—15,1)D0 p. s. m. ; ad Phalung Balda in Ruptschu ; in valle Naching ad partem Taklingse SBptemtrionalem, 1B,ODD p. s. m., *Stolivzka! Gilgit (bis), 13—1B,DDD p. s. m., Tanner ! Karakoram, 13,D)D p. s. m. (floribus albo-roseis, VBrticillis distantibus floribus longe pedicBllatis, pedicellis inferioribus 9 mm. longis calycsni supsr-antibus), Clarke!**

DISTKIB.—In Soongaria, in Tibet boreali, in Kansu occidBntali.

VAR. *isochila*; galea sulito paulo latiore labium majus cEquants. *Maxim., Mel. Biol xii, 859.*

In DniNA boreali ; Kansu prov. parte orientali, *Potanin ! (sp. ab autore benevolente comm. vidi).*

Caulibus 5—22 cm. altis rhizomate 2—5 cm. longo hoc 0.5—1 cm. crasso radicibus 3—4 cm. longis petiolis radicalibus 3—4 cm. caulinis D5—0.75 cm. laminis 2*5 x 0'75 cm. segmentis 3—4 X 1 mm. calycB 8—9 X 3/5 mm. corollse tubo 14 mm. longo galea 10 mm. longa labio VAR. *typicts* 8 mm. longo hoc 10 mm. lato VAR. *isockily* ID mm.

longo hoc 12 mm. lato, capsula IB X 5-5 mm. seminibus 2 mm. longis. Julio—Augusto floret; corolla punicea, rosea vel albo-rosea.

PLATE 32. A—Dj figs. 1—B.—*Pedicularis cheilanthifolia* Schrenk.

A—Specimen of VAR. *tyjnuu* from north side of Taklinga, in Naching valley, 1B,DDD.

B—Specimen of VAR. *lypica* from Karakoram, 13,DJD (Clarke n. 3D173).

C—,, ,, *isochila* from E. Kansu; kindly communicated by Mr. MaximDwicz.

This account of *P. vheilanthifolia* is based on the examination of 34 specimens. The intimate relationship of the species to *P. ghhifera* has been already noticed. I¹¹ Stoliczka's specimens from Kibler, in Hay's from Lahul, and in Heyde's from Pangl the inflorescence is centrifugal; in several other gatherings it is subcentrifugal, *Q> ^1B flowers in the lower verticil, removed by an interval from the spike proper, open later than those flowers uf the verticils next above which form the base of the congested part of the spike.

59. *Pedicularis ophiocephala* Maxim. 11888).

Humilis czespitosa rhizomate HgnDSD nodosD vcl elongato CDIO squamato radicibus cxspitosis fusiformibus caulibus simplicibus 2—4-fariam pilosis gracilibus foliia radicalibus csspitosis longiua petiolatis caulinis verticillatis verticillis [1—2) 2—3-phyllis breve petiolatis lineari-oblongis pinnatipartitis segmentis 5—9-jugis oblongis acutis incisoserratis floribus subsessilibus verticillis 2—3-floris paucis approximatis vel inferioribus parum distantibus bracteis foliaceis imis distincte petiolatis summis calyce brevioribus calycis pilosi campanulati antice parum fissi 5-dentati segmento summo deltoideo lanceolatove integro reliquis e lata basi lanceolatis usque ad medium dentatis corolla tubo sursum ampliato calycem distincte excedente basi infracto labio 3-lobo lobis obcordatis emarginatis lateralibus medio dimidio majoribus galea leviter arcuata tubo subcDntinua et sursum potius sensim acuminata quam rostrata staminibus parum supra summum ovarium ex adverso tubi infractions insertis filamentis inaertione villusulis ceterum glaberrimis ovario globoso-ovoideD stigmate exserto.—*P. ophiocephala*. *Maxim.*, *Mel Biol* xii, 8B7, t 5, l. 94; *Prain, Jour. As. Soc. Beng.* lviii, 2, 2B2.

In HIMALAYA occidentali :—Kamaon; in valle Ralam, 13—15,DDD p. s. m.; a jugo Rdlain ad Occident, versus, 14 — 15,000 p. s. m.; in angustis Lebang, 16—17,ODD p- s- m, ad latus vallis orientale et prope Bidang in valle Dhauli, 14—15,DDD p. s. m., *Duthie* (n. 3225, n. 322B! ! Nepal occidenta!; ad Nampa Gadh, *Reid* ! apud Barji-kang, 14,7DD p. s. m., *Strachey et Winterbottom*. Julio et Augusta floret; corolla rosea.

Caulibus 4—18 cm. altis rhizomate 1—8 cm. longo radicibus 3—B cm., petiolis radicalibus 5—B cm. caulinis 2—2*5 cm. laminis 2'5 X D5—D'75 cm. segmentis 4 X 2 ram., calyce 8 mm. longo hoc 3"5 mm. lato, corollEe tubo 12 mm. longo galea 11 mDn longi hac 3 mm. lata labio 2D mm. lato.

PLATE 33. A; figs. 1—4.—*Pedicularis ophiocephala* Maxim.

Specimen from Kalam valley, Kamaon; (*Duthie* n. 3225).

This account of *P. ophiocephala* is based on an examination of 17 specimens. The species id very closely related to *P. Rvyki*, to which it bears exactly the relationship that

F. globifera does to *P. cheilanthifolia*, that is, it repeats every character of habit, foliage, calyx and corolla tube, and is finally only diagnosed by its longer galea, which is acuminate instead of truncate, and by its lip with lobes Bmarginate instead of entire.

6D. *Pedicularis Roylei Maxim. (1881).*

Humilis vel ssepe nana nonnunquam tamen elata rhizomate lignoso nodoso vel elongato collo squamato radicibus ceespitosis fusiformibus caulibus simplicibus vel rarius ramosis 2—4-fariam pilosis gracilibus vel strictis foliis radicalibus cespitosis longius petiolatis caulinis Verticillatis verticillis (1—2) ter-quaternatimve foliatis breve petiolatis lineari-oblongis pinnatipartitis segmentis 5 — 9-jugis oblongis acutis inciso-serratis floribus subsessilibus verticillis ssepissime 4-floris nuinerosis (vel in sub-varietate "*speciosa*" paucis) approximatis vel inferioribus distantibus braL'teis foliaceis imis distinct a petiolatis suinmis calyce brevioribus calycis pilosi campanulati antice paruin fissi 5-dentati segmento summu deltoideo lanceolato ve integro reliquis e lata basi lanceolatis usque ad medium dentatis corollse tubo sursuni ampliato calycem distincte excedente basi infracto labio 3-lobo lobis orbiculatis lateralibus medio duplo majoribus galea leviter arcuata tubo subcontinua, apice subincurva erostri staminibus parum supra summum ovarium ex adverso tubi infractionis insertis filatnentis insertionB villosulis CBteium glaberrimis ovario globosu ovDideo stigmatē exserto capsula Dvata oblique acuminata triente exserta seminibus ovatis testa pallidis distincte reticulatis.—P. Roylei Maxim., *Mel. Biol.* xi, 2B8 et xii, 891, t 4, l. 122 ; *Prain, Jour. As. Sou. Bmg.* lviii, 2, 2S1.—P. verticillata BentL, *Scroph. Int.* 53 [nee Linn.] (1835); *Hook. l., Fbr. Brit. Ind.* iv, 309; *Walp., Rep.* iii, 411 [pro parte, nee Linn.] (1844); *Benth., DC. Prodr.n.* 563.—P. ammna Ad. VAR.—; Maxim[^] *Mel. Biol* x, 97 [1877).

In HIMALAYA occidentali:—K[^]maon, *Royle!* Laka, *Edgeworth!* In Chamba et in jugo Sanch, 15,0D0 p. s. m., *Ellis* [nn. 37B, 1719)! Tehii-Grarhwal ;—in Rudughera, 1B,0DD p. s- m., ad Duri Gradh in valle Nila et ad Dudu Gadh infra Srikanta, 15—15,DDD p. s. m., *Duthie* [nn. 23B, 5B4)! Pangi; 11—1B,5OD p. s. m., *Heyde!* In Himalaya orientali:—Sikkim, *regions alpina*, 11—13,D0D p. s. m., *Hooker!* Abktong, 13—15,DDD p. s. m., *Anderson !* LachoDUg ; Dholamoo, 15,D00 p. s. in. (forma nana) ; Dnglathang, infra Kinchinjanga, et Olakthang ad fines Nepalise orientalis, 15,DDD p. s. m., etiam Bijan Nepalise orientalis, 12,DDD p. s. m., *Kmgii mercenar. I* Chumbi, Yeumtong, 11,0DD p. s. m., Panka-bee-see-mo; Tanka-la j Grup-ten-de-la et Ka-poop, *Kingii mercenar. !* Phari ; (ter), *Kingii mercenar. !*

DISTRIB.—Tibet boreali; China, prov. Szetschuan.

Subvar. ^{il} "*speciosa*;" bracteis longius petiolatis foliis oppositis floribus distincte pedicellatis inulto majoribus.

In HIMALAYA orientali:—Jongri; Pey-kiong-la (bis), *Kingii mercenar. I*

Caulibus 2—25 cm. altis, rhizomate 1—B cm. longo radicibus 5—B cm. longis, petiolis radicalibus 3—B cm. caulinis 2—25 cm. laminis 2-5 X Dō—D75 cm. segmentis a__4 X 1__2 mm., calyce 8 mm. longo hoc 3"5 mm. lato, corollse tubo 11 mm. longo galea B—7 mm. longa hac 2"5 mm. lata labio 12 mm. lato, capsula 12 mm. longa B mm. lata seminibus 1-25 mm. Julio et Augusto floret ; corolla puicea.

Subvar. "*speciosa*" pedicellis inferioribus ID mm. longis, corollae tubo]B mm. longo galea 9 mm. longa labio 18 mm. lato. Septembre floret; corolla punicea.

PLATE 33. B, D; figs. 5—11.—*Pedicularis Roylei Maxim.*

B—Specimen from Pangi.

D— „ of subvar. "*speciosa*" from jDEgri.

This account of *P. Roylei* is based on an examination of 161 specimens. The species in habit and foliage closely resembles *P. verticillata*, which is, however, distinct. The diagnosis is as follows :—

bracts pinnatisB or -partitB, calyx deeply toothed hardly cleft upper tooth entire the others SBirafB, corolla tube bent in middle obtusely, filaments insert31 near middle of tube all glabrous, anthBrs ovate acute, capsule ovate acuminate half BxsertBi, seeds 25 mm., pale, distinctly reticulated *P. Roylei*;
bracts uvate subentire, calyx hardly toothed cleft to the middle margin Bntiro, corolla tubeB abruptly bent at junction of middle and lower third, filaments inserted oppositQ top of ovary anterior pair hirsute, anthers broadly elliptic mucinous, capsule lanceolate acute more than half exsBrted, seeds 2 mm. nigrescent minutely reticulate! ... *P.v»rlizill<di.*

Reichenbach's figure of *P. verticillata* [*Icon. Fl. Germ.*, t 17B2, l. 1—14), which is in other respects good, unfortunately gives the anterior filaments glabrous, which is erroneous. Lange [*BoL Tidskr. Kpb.* iv, t 2, l. 3) has given a very exact figure of the seeds of *P. verticillata*, which are remarkably unlike those of *P. Roylei* (cf. Plate 37).

I have in this case avoided giving a varietal definition of the typical plant because the striking form from Jongri, which has been received twice from the same locality (September 1887, and again September 1888), does not appear to differ by any other character than the much larger flowers. It has not yet been collected in fruit, and is only tentatively advanced as a sub-variety. It is *not*, as the artist unfortunately has indicated [fig. C), 2-denticulate below the apex.

The character of discrete or contiguous anthers (cf. figs. 8 and 9) relied on by Dr. Repele and others in the diagnosis of *P. verticillata* is, I find, of no value in this species.

61. *Pedicularis gibbera* Prain (1889).

Nana glabrata vel 2-fariam pilosa rhizomate tenui brevi vel elongato nodis squamis ggris radicanibus radicibus fibrosis fusiformibusve carnoais longioribus caulibus simplicibus vel e basi pauciramosis foliis radicalibus mox evanidis caulinis oppositis longipetiolatis late ovatis pinnatipartitis floribus pedicellatis axillaribus racemis paucifloris bracteis foliaceis calycis campanulati membranacei antice vix fissi 5-dentati segmento summo minimo deltoideo integro reliquis subaequalibus lanceolatis apice obtusis subcristatis 4-plo minore corollae tubo calyce sesquialongiore ipso apice incurvo et ampliato labio 3-lobato lobis rotundatis parum emarginatis sequilatis galea recta erecta tubo duplo latiore apice potius sensim acuminata quain rostrata Integra staminibus medio tubo insertis filamentis anticis barbatis ovario lanceolato stigmate incluso capsula oblique lanceolata acuta seminibus paucis ovatis majusculis testa nigrescentibus minutissime punctulatis.—*P. gibbera Prain, Jour. As. Soc. Beny.* lviii, 2, 2B2.

In HIMALAYA Orientali:—Sikkim; ad Esan-nan-gi; Pey-kiong-la; Tha-moo-tsa; Sikkimoral (bis); Domkerka et Bijan, 12—14000 p. s. m. (loci omnes in vel prope dist. Jongri), *Kingii merceum*.! Julio, Augusto, et Septembri floret; corolla nunc punicea nuuu alba nutitur.

Caulibus 2—15 cm. altis rhizomate 0·5—4 cm. longo radicibus 4—7 cm. longis, petiolis 0·5—1·5 cm., laminis 1 X 0·5 cm., pedicellis 1—2·5 mm., calyce 4·5 X 2·5 mm. corollae tubo 7 mm. longo galea 5 X 2·5 mm. labio 7·5 mm. lato, capsula 8 mm. longa seminibus 3 mm. longis.

PLATE 29. B; figs. 9—16.—*Pedicularis gibbera* *Praia*.

Specimen from Esan-nan-gi, Jongri.

This nomenclature of *P. gibbera* is based on an examination of 75 specimens. This interesting little species was never reported till 1887. In that and in the following season, Dr. King's collectors met with it, and communicated large suites of specimens! Perhaps its most striking character is its ovulation—(2 ovules to each placenta, 4 to each locule); it is, however, undoubtedly a *Pedimfan*. Although it has to be placed alongside of *P. polygaloides*, it is also closely related to *P. pygmaea*, which has, however, different bracts and leaves, has the corolla tube bent lower down, the galea apiculate, and all the filaments glabrous. Than the lanceolate capsule, the very large, hardly pitted, dark-coloured seeds, and the long-petioled ovate leaves recall *P. flezuosa*, and appear to indicate considerable affinity with the group to which that species belongs. One feature of interest in this species is the apparent fondness of some insect for its anthers. In nearly every gathering the upper part of the galea containing the anthers has been bitten off from some of the flowers, and in some cases almost every flower has been treated like this. The same thing has been noticed in no other Indian species.

B2 *Pedicularis polygaloides* Hook f. (1884).

Nana diffusa vel humilis multicaulis rhizomate tenui lignoso radicibus fibrosis caulibus gracillimis flexuosis 2-fariam pilosis foliis radicalibus cespitosus demum evanidis caulinis oppositis (vel rarissime 3—4-natis verticillatis) breve petiolatis vel sessilibus ovatis vel ovato-oblongis obtusis pinnatifidis et inciso-dentatis floribus axillaribus pedicellatis pedicellis inferiorum calycem superantibus verticillis summis confertis reliquis remotis bracteis superioribus pinnatifidis calycis villosi oblongo-campanulati antice triente fissi 5-dentati segmento summo minuto integro reliquis cristatis vicinis ovatis latioribus anticis lanceolatis corollae tubo calyce sesquialongiore apice ipso dilatato incurvo labio 3-lobo lobis lateralibus ovatis medio rotundato dimidio latioribus galea recta decliva tubo sesquialongiore in rostrum brevissimum apicem subacutum 2-lobum abeunti staminibus fere apice tubi insertis filamentis glaberrimis ovario ovato-lanceolato stigmate incluso capsula anguste ovata oblique acuta calycem triente superante seminibus late ovatis testa laxa cinerascens distincte reticulatis.—*P. polygaloides* Hook. f., *Flor. Brit. Ind.* iv, 317; *Maxim., Mel Biol* xii, 881, t. 5, f. 113.

In HIMALAYA orientali:—Sikkim: ad Yeum-tong, 14,000 p. s. m. *Hooker*; in transitu Ze-lep-la, *Kingii mercenar.* Chumbi: in Tang-ka-la, 13,000 p. s. m., apud Ka-poop, atque ad Ta-chey-kung; *Kingii mercenar.* !

Caulibus 2—8 cm. altis rhizomate 1·5—2 cm. longo radicibus 3—5 cm. longis, petiolis radicalibus 0·5—1 cm., caulinis 0·5—1 cm. laminis 0·75—1 X 0·25 cm. segmentis 1—2 X 1 mm., pedicellis inferioribus usque ad 8 mm. calyce 1 X 3 mm. corolla tubo 7 mm. galea 5·5 mm. labio 6 mm. longo hoc 9 mm. lato, capsula 8 mm. longa 4·5 mm. lata seminibus 2 mm. longis. Julio—Augusto floret; corolla, purpurea.

PLATE 29. D; figg. 17— 23.—*Pedicularia polygabides* Hook. /.

Specimen from Ze-lep-la.

This species is very nearly related to *P. denudata*, of which it has all the characters of the corolla except that the filaments here are glabrous, while those of *P. denudata* are all hirsute. But in habit it repeats all the characters of *P. instar* VAR. *paradoxa*, just as *P. denudata* in habit repeats those of *P. instar* VAR. *typica*.

B3. *Pedicularis denudata* Hook f. [1834].

Elata 4-fariam pubescens rhizumate brevissimo radicibus caespitosis fibrosis caule graui erecto terete simplice foliis radicalibus emarcidis caulinis sessilibus 4-natis verticillatis oblongo-lanceolatis pinnatifidis seginentis 6—7-jugis contigua brevibus ovatis et minute serratis floribus subsessilibus 4-ternis verticillato-spicatis verticillis distantibus bracteis foliaceis imis foliis caulinis longioribus calycis herbacei late breve campanulati 5-dentati segmento postico integro reliquis cristatis corollae tubo calycis subquadrilobio apice ipso dilatato incurvo labio 3-lobato lobis lateralibus ovatis medio rotundato diradialioribus galea recta decliva tubo etquilata in rostrum brevissimum conicum subacutum 2-lobum apicis staminibus medio tubo inaequalia filamenta omnibus barbatis ovario late ovato stigmate incluso capsula late ovata oblique acuminata calycem parum superante seminibus late ovatis testa laxa cinerascens distincte reticulatis,—*P. denudata* Hook. /., *Flor. Brit. Ind.* iv., 309; *Maxim., Mel. Biol.* xii, 8B7.

In HIMALAYA orientali:—Sikkim in valle Lachsn, 12—13,000 p. s. m., *Hooker*; ad Patang-la, infra Ze-lep-la, *Kingii mercenar.* ! Subtremore floret; corolla punicea.

Caulibus 35—50 cm. altis, foliis maxime 3 x 1 cm. segmentis 4 x 3 mm., calycis 7 x 3.5 mm., corollae tubo 8.5 mm. galea 5.5 mm. labio 6 mm. longo hoc 8 mm. lato, capsula 8 mm. longa hac 6 mm. lata seminibus 2 mm. longis.

PLATE 29. D; figs. 24—31.—*Pedicularis denudata* Hook. /.

Specimen from Patang-la.

There is only one gathering of this species at Calcutta, from which the present description is elaborated. It repeats in every detail the habit of *P. instar* VAR. *typica* and has the same calyx and almost the same capsule and seeds. The corolla, however, is very like that of *P. polygabides*, the only differences being a rather lower staminal insertion and hirsute filaments.

64. *Pedicularis mullis* Wall (1828).

Elata sparse pilosa rhizomate subterraneo elongato subincrassato lignoso radicibus fibrosis dispersis caule erecto terete simplici VBI ramoso polyphylo foliis verticillatis vtriusque 3—5-foliatis inferioribus breve petiolatis aequalibus laminis pinnatisectis segmentis 10—15 jugis lanceolatis pinnatifidis laciniis ovatis acute dentatis florum brevibus pedicellatis verticillato-spicatis verticillis inferioribus distantibus aequalibus confertis bracteis foliiformibus calycis pubescentia late breve campanulati profundi 5-jugati segmentis lanceolatis subacutis margine serratis corollae tubo calyce parum breviori apice incurve intus ciliato labio 2-plicato antice 3-lobato lobis lateralibus rotundatis [etquilatis] margins ciliatis galea inclinata recta tubo diradialior latior marginibus faucia ciliata apice aequalis acuminata

Integra staminibus ex adverse medii ovarii insertis filamentis glaberrimia ovario lanceolato stigmatB incluso disco antice incrassato capsula ovata Ian u eclat a oblique acuminata calycem dimidio superante seminibus ovoideis testa fulvis distincte reticulatis.—*P. mollis* Wall., *Cat* 415; *Benth.*, *Scroph. Ind.* 53; *Walp.*, *Hep.* iii, 411; *Benth.*, *DO. Prodr.* x, 554; *But. Mag.* lxxvii, t. 4599; *Hook. l.*, *Flor. Brit. lad.* iv, 3D9; *Maxim.*, *Mel. Biol.* xii, t 4, l. 12B.

In HIMALAYA occidBntali:—Nubra, *Thomson!* Ladak, st Pangi, 11,DDD p. s. m., *Stoliczka!* Kamaon; Ralam, 12—13,DDD p. s. m.; in valle Nipchang, 12—13,D0D p. s. m.; in Palang Gadh, ID—11,000 p. s. m.; et prope Kutti in Byaus, 13—14,DDD p. s. m., *Duthie!* Nepal;—infra Kawa, in valle Kali, 1 D,D0D—11,DDD p. s. m., *Duthie!* in Gossain Than, *Wallich ! Scully* (bis)! In Himalaya Drientali:—Sikkian; *reg. alpina*, ID—14,DDD p. s. m., *Hooker!* Lhasa], supra Tungu, 13,DDD p. s. m.; Jongri, 13—14,DDD p. s. m., *Kingii mercenar. !* Chumbi;—in valle ejusdum nominis; apud Ta-loong et apud Buckchim prope Dhumbi; *Kingii mercenar. ! Phari; Kingii mercenar. !*

Daulibus 3D—80 cm, altis rhizDmate B—8 cm. longo, fnliis 3—5 X D75—1 cm. segmentis 7 X 2'5 mm. calyce B mm. longo corolla tubo 5 mm. longo galea 5 mm. longa labio 5'5 mm. lato, capsula 12 mm. longa 5'5 mm. lata seminibus 2 mm. longis. Julio—Septembri floret; corolla punicea vel purpurea.

PLATE 29. A; figs. 1—8.—*Pedicularis mollis* Wall.

Specimen from Lhasal, above Tungu.

Fig. 2 from *Bot Mag.* 4599.

This account of *P. mollis* is based on the examination of 89 specimens. The colour seems to deepen as the localities are situated more and more towards the east, Jongri and Chumbi specimens having dark purple corollas, Ladak ones pale pink corollas. The species is closely allied, as Mr. Maximowicz shows, to the *Oaucasicce*; but though it has a IDW staminal insertion, the corolla tube appears to me tD deserve being spoken of as 'infract' rather than 'incurved' at the apex—tha difference after all is only one of degree; it certainly is not straight. The figure copied from *Bot. Mag.*, *I.e.*, has the advantage of having been drawn from a fresh flower.

65. *Pedicularis uollata* Train [1889).

Huinilis vel nana cespitosa glabra rhizomate nodoso vel breve horizontali collo squamis ovatis membranaceis vestito radicibus cespitDsis fibrosis fusiformibusve caulibus gracillimis brevibus debilibus foliis oblongo-ovatis radicalibus paucioribus longe petiolatis caulinis 1-paribus oppositis vel D floralibusque distincte petiolatis petiolis caulinis bractearumque margine membranaceo prorsus dilatatis laminis oblongis acutis pinnatisectis segmentis 4—7-jugis ovatis pinnatifidis et serratis racemis ssepiissime 3-floris rarius 4-floris floribus distincte pedicellatis bracteis foliaceis calycis late oblongi glabri antice vix fissi 5-dentati segmento summo lanceolato integro reliquis oblongD-ovatis pinnatilobis et serratis minore corollse tubo late cylindrico recto sursum leviter fauce ipso ampliato calyce plus dimidio longiore extus lineatim piloso intus antice glandulose barbato labio 3-lobo lobia ovatn-rotundatis supparibus galea recta tubo continua eique ^equilata acuiniiata potius quam rostrata et sub apice prope utrinque denticulata staminibus ez adverao medii ovarii insertis filamentis anticis superne hirsutis ovario late lanceolatD stigmat longius exserto disco antice incrassato.—*P. collata* *Prain*, *Jour. As. Soc. Beng.* lviii, 2, 2BS.

In HIMALAYA orientali:—Sikkim; ai finea regni Nepalise, apud Ny-e-gu, 14DDD p. s. m., atque in Dho-la, *Kingii mercenar.* ! Julio floret; corolla punicea; sp. fructigeruin nondum conimunicatum.

Caulibus 2—6 cm. altis rhizomate D—15 cm. longo radicibus 1—4 cm. longis, petiohis radicalibus 3—6 cm. longia reliquis 1—15 cm. laminis 1—2 cm. longia bis D75—1 cm. latia segmentis 4—5 X 3 mm., pediculis 3—5 mm. longia, calycis ID—12 mm. longo 4-5 mm. lato, corollas tubo 17—2D mm. lungo galea ID mm. longa 35 mm. lata 1^{abio} 2U mm. lato.

PLATE 31. D; figs. 14—17.—*Pedicularis collata Prain.*

Specimen from Ny-e-gu, Jongri.

This account is based on thB examination of 31 specimens. The speciea recalls thB habit of ths largB flowered form Df *P. Royhi* and, less rBadily, that of *P. schizorrhyncha*, but as regards its corolla structur it is unlike any Indian apscies. It appars to form a distinct monotypic group near the *Vaucasivw*.

BB *Pedicularis fragilis Prain* (1BB8).

Elongata parce hirsuta rhizomats tsnero repEnte radicibus filiformibus plus minus cespitosis caulis fragili simplice VBI parce ramoso imo terbio decumbente nodisque radican^{ts} ceterum erecto folioso foliia 3-natim verticillatis subsessilibus membranaceo-herbacBis ellipticis acutis pinnatipartitis segmsntis 5—7-jugis late lanceolatis mucronato-inciso-dentatis floribua axillaribus subsessilibus calycis campanulati membranacBi an^{icB} nee fissi 5-dentati sBgmentis intsrvallis paribus anguste lancBolatis sequilongis summo integrD reliquis minutissims aerratis corollse tubo extus puberulescentB cylindrico calycsm duplo superante labio subquadrato intus 2-plicato antice 3-lobo lobis margine ciliatis lateralibus anguste ovatis acutia medio Dbovato cucullato prDminente dimidio an^{ustioribus} galea erecta subitD in rostrum brevissimum truncatum dilatata staminibus ex adverso medii Dvaru insertis filamentis anticis apicem versus pubsrulia ovario ovato stigmate incluso capsula nee exaerta subglobosa subito acuminata sBniinibua parvulis sphsericis antics sulcatis tes^{ta} pallidis distincte reticulatis.—*P. fragilis Prain, Maxim., Mel Biol xii, 865, t 5, f 3.* *Jour. As. Sou. Bmg. lviii, 2, 2B3.*—*Pedicularia* sp., *C. B. Clarke, Jour. Linn. Sou.* « (1BB9), 51.

In alpibua ASBAMLE ;—Kliaaia, 4—BDDD p. s. m., *Mann* (n. 348)! Barêl; in Pulinabadza; 7,2DD p. s. m. et supra Siwenichika, BDDD p. s. m., *Praia!* in Manipur boreah, S5DD p. s. m., *Clarke* (n. 42DJ4).

Caulibua 15—3D cm. altia rhizomate 5—8 cm. longo radicibus 2 cm. foliis 3—4 X 1-5—2 cm. segmsntia ID X 4 mm., calycB 5 mm. longo IDC 2^{MD} mm. lato, corolla tubq 9 mm. loniTD, ffalea B5 X 35 mm. rosfro 1 mm. longo labio 55 mm. longo hoc vix mm. lato, capsula 5 X 45 mm. ssminibus 1 mm. longis latisque. Julio—Septembri floret, corolla viridi! vel alba (*Clarke I. c.*).

PLATE 31. A; figs. 1 — B.—*Pedicularis fragilis Prain.*

Specimen from Pulinabadza, near Kohima; Angami Naga Hills.

This description is based Dn the examination of 19 specimens. The species is vBiy distinct; it inhabits humid shady forests in the Assam Hills, and where I gaLherei

it was distinctly semi-saprophytic and not semi-parasitic. Mr. D. B. Clarke has very kindly verified the identification of the species with the single specimen of his n. 42D44 which is preserved at KBW. Both Mr. Maximowicz and Mr. Clarke have (independently) expressed the opinion that this species is nearl)^ related to *P. denudata*, it is therefore with considerable diffidence that I venture to think that this relationship is not at all marked. The very peculiar lower lip whereby it approaches the next species and differs from most other species at present known seems to indicate that the two form together a very distinct and natural di-typic group—as is indicated in the " Conspectus of Affinities" (part ii, chap. vi).

67. *Pedicularis Kingii* *Praia* (1838).

Elata parce pubescens rhizomate brevi repente collo paucisijuamato ex axillis squarum stolona tenera apice stjuamata emittente radicibus filiformibus caule debili gracillimo flexuoso simplice vel paniculato-ramoso folioso foliis suboppositis vel oppositis omnibus longe petiolatis laminis ovatis pinnatiseciis segmentis 5—5-jugis iis cauli propioribus petiolulatis sub-alternis obbngis pinnatifidis laciniis ovatis mucronato-dBntatis floribus versus apices caulis et ramorum brevipedicellatis calycis ovato-campanulati membranacei glaberrimi antice profunde fissi 5-dentati seginentis integris deltoldeis postico reliquis dimidio majore corollae tenerae recta; tubo late cylindrico calyceni duplo superante labio subquadrato 2-plicato antice 3-lobo lobis lateralibus acute ovatis medio prominente rotundato concavo duplo minoribus galea parum inclinata fronte rotundata staminibus ex adverso medii ovarii insertis filamentis anticis versus apicem distincte barbata ovario ovato stigmate subexserto disco antice parum incrassato.—*P. Kingii* *Prain, Mazim., Mel. Biol.* xii, 895, t 5, l. 131; *Jour. As. Sou. Beng.* lviii, 2, 264.

In HIMALAYA orientali:—Sikkim; ad Gang-tuk, *Kingii mercenar. I*

Caulibus 15—30 cm. altis rhizomate 2—4 cm. longo, radicibus 5—B cm. stolonibus squamigeris 5—ID cm. longis petiolis 2—5 cm. longis laminis 4 x 3 cm. segmentis 12 X 6 mm. laciniis 3 x 2 mm., pedicellis 1—3 mm., calyce 4 mm. longo, corollae tubo 8"5 mm. longo galea 75 X 3.5 mm. labio 45 X 35 mm.

Augusto floret; color ex sicco forsan albus.

PLATE 28. A; figs. 1—5.—*Pedicularis Kingii* *Train,*

Specimen from Gang-tuk.

This description is based on an examination of 8 specimens. This species is also a very distinct and remarkable one. Mr. Maxitnowicz looks on it as an aberrant member of the *Uaucasicce*, and this, I believe, is its true place. Owing, however, to its aberrant nature and to its evident affinity as regards lower lip with *P. fragilis*, I have placed these two in a special group apart from, bat still CDSB to, the group *Paucasiccv*.

68. *Pedicularis pycnantha* *Boiss.* (1853); *Hook. l., FUr. Brit. Ind.* iv, 310 *yn. *P. Alberti exclus.* (1884).

Humilis pubescens rhizomate incrassato carnosae extus crustaceo radicibus fusiformibus carnis colb squamis latis ovatis membranaceis vestito pluricipite caulibus ascendentibus foliis radicalibus csespitosus demum evanescentibus caulinis verticillis (2) 4-ternis vel nonnunquam verticillo inferioribus paribus 2 oppositis decussatim intervallo brevi separatis (rarius

verticillia 4-terna 3) omnibus petiolatis laminis oblongo-lanceolatis acutia pinnatifida rhachi alata serratis segmenta 13—20-jugia distantibus lanceolatis acutis serrato-dentatis floribus aequalibus densis spicata bractea lanceolata acutia inferioribus serratis reliquis subintegris calycibus lanatis subinflatis vix fissi 5-dentati segmenta lanceolata acutia omnibus vel postico excepto margine minutissimis breviter corollae tubo incurvo auram leviter ampliato calyce parum longiore labio 2-plicato antice 3-loba lobis rotundatis lateralibus medio prominulo duplo latioribus galea tubo subcontinua eique sequilata erecta. oroflora fauce medio leviter 2-incisa margins ab incisuris deorsum replicata ataminibus medio tubo vix ex adverso summi ovarii inaequalia filamenta anticis superne barbata ovario late ovato stigmate exserto disco antice incrassato capsula late ovata calycem effluente apiculata seminibus majusculis ovatis basi appendiculatis testa pallidis distincte reticulatis embryo angustato longissimo.

VAR. *typica*; bracteis subintegris labio galea manifeste brevior lobis rotundatis filamenta paullulum infra medium tubum insertis.—P. *pycnantha* Boiss. *Diagn.*, ser. i, xii, 45 et *Ffor. Orient*, iv, 484; *Maxim.*, *McL Biol* xi, 291 et xii, 295, t 4, f 127.—P. Olga; *Regel, Ada Sort Petrop.* vi, 348 (1880) et *Plant. Fedtsch. Bl.*—*Pedicularia* sp., *Aitchison, Trans. Linn. Soc.* n. s. iii (1888), 93.

In HIMALAYA occidentalis—Eriglit, 9—19,000 p. s. m., *Giles!* Afghanistan, in valle Kuram, *Aitchison* (n. 487)!

DISTRIB.—Persia boreali; Turkestan occidentalis

VAR. *Semenowi*; bractea serrata labio galeam fere aequante lobis leviter emarginatis filamentis ex adverso summi ovarii insertis.—P. *Semenowi* Regel, *Bull Soc. Mosc.* xli, i, 15 (1863) et *Plant Semmow.*, n. 810; *Maxim.*, *Mel Biol* xi, 294 et xii, 294, t 4, f 129.—P. *orthantha* Griseb. VAK.—5 *Maxim.*, *Mel Biol* x, 129 (1877).—*Pedicularis* ap., *Benth., Scroph. Ind.* 54 (1835).

In HIMALAYA occidentalis—Rantak-chu, *Falconer!* Hazara, *Stewart!* Kunawar, ad Hangoo, *Roye!* Lahul, *Hay!* Watt! in valle fl. 13hagi superioris, 9,000—13,000 p-s- m.; *Stoliczka!* PaBgi, 11—13,000 p. s. m., et in valle fl. Sutli superioris, 17,000 p-s- m., *Heyde!* Astor, 13,000 p. s. m., *Tanner!* Gilgit, *Giles!*

DISTRIB.—In alpebus Altyn et Alatau; Turkestan orientalis.

Caulibus 7—15 cm. altis rhizomate 6—8 cm. longo diam. 5—1 cm. crasso, petalis 3—5 cm. longis laminis 5—7 X 1—1.5 cm. segmentis 12 X 5 mm., calyce 12—14 mm. longo hoc 5 mm. lato, corollae tubo 15—17 mm. longo galea 8 mm. longa hac 2.5 mm. lata labio 4 mm. longo hoc 5 mm. lato, capsula 14 mm. longa 8 mm. lata seminibus 4 mm. embryone plura 2 mm. longis. Aprib—Augusto floret; corolla alba, sordide lutea, vel purpurea cent.

PLATE 28. B; figs. 6—12.—*Pedicularia pycnantha* Boiss.

Specimen of VAR. *typica* from Sergal at the base of Mt. Sika-ram in dry soil in pine glade (Aitchison, n. 487).

Fig. 12 shows the staminal insertion in a specimen of VAR. *Semenowi* from Uppur Bhaga valley.

This account of *P. pycnantha* is based on the examination of 11 specimens of VAR. *typica* and 27 of VAR. *Semenowi*. There is no doubt about the Trans-Indus plant; it is the same species as Boissier's Persian plant—to which also belongs Aitchison's "Delimitation Commission" plant fn. 573 from Khorasan, 6,000), of which quite determinate specimens have been received at Calcutta. But the Punjab Himalayan plant placed by Sir J. D. Hooker in 1884 with Boissier's Persian plant is not quite the same thing, but belongs, as Mr. Maximowicz had pointed out in 1881, to Regel's *P. Semenowi*. The diagnosis given by Mr. Maximowicz is most accurate, and while I think that *P. Semenowi* is conspecific with *P. pycnantha*, there is no possibility of mistaking the one variety for the other on dissection. Of the plant mentioned in *Mel. Biol.* x, V29, as possibly a variety of *P. orthantha*, Mr. Maximowicz has kindly sent me a drawing, as well as a leaf, a bract and 3 flowers from the solitary St. Petersburg specimen. The flowers and bract and leaf are those of *P. pycnantha* VAR. *Semenowi*. In this species the leaves, especially of the lower whorl, are subopposite rather than truly opposite, and as Mr. Maximowicz' sketch shows this plant of Heyde to be a very dwarf form, the condensation of the internodes leaves hardly greater intervals between petioles of different whorls than naturally exist between those of the same whorl, so that in this condition the species may be well enough treated, as Maximowicz, *l.c.*, has treated it, as an alternate-leaved one. In *Herb. Calcutt.* there is a gathering by Hay in Lahul, where one specimen is exactly like the drawing of Heyde's plant at St. Petersburg, while another has a stem elongated sufficiently to show the verticillate nature of the phyllotaxis. In Dr. Royle's gathering from Hunawat the same thing occurs, and Bentham in describing the plant also speaks of the leaves as alternate. The specimens being destitute of corollas, Bentham did not publish Royle's Mss. name (*P. patens* Royle in sched.) which can never therefore supplant those of Boissier or of Regel. It is, however, only just to observe that Royle and Bentham were the earliest authors to ascribe specific rank to the plant here named VAR. *Semenowi*. With *P. Alberti*, which Sir J. D. Hooker has reduced to *P. pycnantha*, the case is different. There the leaves are certainly very like those of *P. pycnantha* VAR. *Semenowi*, and in short-stemmed specimens might well be considered opposite or subopposite. But where the stems are more elongated the leaves are seen to be distinctly alternate. There are other differences, and *P. Alberti* is more nearly allied to *P. Oederi* than to *P. pycnantha*. The diagnosis is as follows:—

leaves verticillate, spikes interrupts! whorled centrifugal, anterior filaments

hirsute. *P. pycnantha*;

leaves alternate, spikes continuous spiral centrifugal, all filaments glabrous *P. Alberti*.

B9. *Pedioularis Dederi Vahl* (18DB).

Hurailis vel elatior hirsuta rhizomate incrassato radicibus fusiformibus carnis COMD squamato caulibus simplicibus oligophyllis foliis radicalibus cespitosis caulina sparsis omnibus longe petiolatis lineari-lanceolatis acutis pinnatisectis segmentis 18—25-jugis oblongis ovatisve ineiso-serratis floribus breve pedicellatis subspicatis centrifuge* ordine apertis bracteis ovatis ligulatisve apice elliptice expansis inciso-serratis calyce longioribus calycis campanulati villosi vel glabriusculi 5-dentati segmentis lanceolatis integris vel apice serratis corolla tubi cylindrico apice ipso parum ampliato labio antice 3-lobis orbiculatis uvatisve rarius parum emarginatis nonnunquam eroso subcrenatis medio

stipito proprio lateralibus duplo minDre galea tubo cantinua subarcuata apice erostri staminibus medio tubo vel parum supra medium tubum insertis filamentis antiuis hirsutis ovario ovoieo stigmatB exserto capsula oblitjue ovato-lanceolata calycem dimidb superante seminibus ellipticia testa pallide cinerascentibus iistincte reticulatis.

VAR. typica; galea tubo manifeste brevior lobo labii mediD vix prominuln calycis dentibus late lanceolatis apice acutis sequibngis.—**P. Dederi Vahl** in *Hornem. Oehn. Plantel.* ed. ii, 580 et ed. iii, 574; *Spreng.y Syst Veg.* ii, 782; *Rartm., Fhr. Skand.* 199; *Nyman, Sylhg. Fhr. Europ.* 129; *Iteichb. f., Flor. Germ.* xx, 75, t. 1759, l. 2; *Cesati, Passerini et Qibtlh Comp. Flor. ItaL* 353; *Blytt, Norges Flora* ii, 807; *Lange, NomencUL Flor. Dan.* 2; *Arcangeli, Comp. Fhr. itaL* 5^2; *Trautv^ Incrém. Flor. Boss,* iii, 77; *Caruel in Parlat, Fhr. Hal.* vi, 429; *Steming. in Uhlworm., Bot. Centralblatt* xxx, 61; *Prain, Jour. As. Soc. Beng.* lviii, 2, 275.—**P. versicobr Wahlenberg, Veg. HelveL** 113 (1813); *Ilartm., Vet Ac. Handl.* (1818), 135 et 155; *Stevtn, Monogr. Pedic.* 52; *lieichb., Flor. Excurs.* ii, 3B3 et *Iconogr., Cent* i, 17, t 14, l. 31; *Wahhnberg, Flor. Suec.* i, 389; *MoreM, Bot ItaL* 6; *Sprzng., Syst Veg.* ii, 782; *Ledcb., Flor. Altaic,* ii, 437; *Host, Flor. Aufriac.* ii, 193; *Rochl, Deutsch. Flor.* ed. iii, iv, 379; *Gaud., Flor. ffelvet* iv, 142; *Bmth., Scroph. Ind.* 54; *Koch, Synops. Flor. Germ.* 543; *BerfoL, Flor. ItaL* vi, 318; *Walp., Rrp.* iii, 428; *Bentlu, DC. Prodr.* x, 578; *Ilausm., Fhr. Tirol.* 65D; *Bunge in Ledeb., Fhr. Boss.* iii, 303; *Nyman, Sylhg. Flor. Europ.* 129; *Turcz., Flor. Bah.-Dahur.* ii, 2, 375; *Maxim., Mel Biol.* x, 133; *Nyman, Oonspect Fhr. Europ.* 555; *Hook. l., Flor. Brit. Ind.* iv, 31 Bj *Maxim., Mel. Biol.* xii, D18, t 7, l. 177.—**P. flammea Oeder, Fior. Dan. i, 7, t. 3D (1751); *Gunner, Flor. Xorvcy.* "• 247; *Allnni, Fhr. Pedem.* i, 63; *Ilcencke in Jacquin, Collectan.* ii, 79; *Wldl., Sp. Plant* iii, 215; *Lamk, Flor. Franc,* ii, 300; *Poirvt in Lamk, Encycbp.* v, 135 ; *DeVand., Fhr. Franc,* iii, 483; *Ilartm., Vet Ah. Handl.* (1814) 107; (nee *P. flammea Linn.*).—**P. liirsuta Linn., Sp. Plant,** ed. ii [1733] in parte [nec *V. hirsuta Sp. Plant,* ed. i, BOO]; *Smith in Bees, Cyclop,* xxvi [1S19] in parte.—**V. foliosa Gunner, Flor. Norveg.** n. 1111 (1766-72) [nee *P- * ^iosa Linn.*].—**P. flammea VAR. major Wahlenbery, Flor. Lappm.** 158 (1813). —**virescens Wahlenberg, Flor. Sued,** 389 (1824).—**P. Oedeii VAR. virescens Ilartm., Flor. Skand.** 199 (1843). **Pedicularis caule simplici, foliis pinnatis, pinnis dentatis, retroversis, imbricatis Ilaller, Stirp. Ilclvet** i, 138, t. *, l. 3 (1768).—**Pedicularis an nova ? Rttz, Fhr. Scand. Prodr.** ed. ii, l^45^ in notul. (1795).**

In HIMALAYA occidentali:—Kashmir, in Pyr Panjal, Boyle! et ad Guraz, Falaner ! in transitu Sanch, 12—14,000 p. s. m., Ellis! Rotang, 14,000 p. s. m ; Telira, 15—17D^D p. s. m., Stoliczka ! in transitu Lanak, 14,909 p. a. m., Thomson !

DISTRIB.—In alpihus Europaeis Sibiricisque; in arctiuis Europe, Asia; et Americæ.

VAR. foteroghssa; galea tubo fere Ee^uilonga lobo labii medio prominente calycis dentibus lineari-lancBolatis omnibus vel summo excepto ipso apice in laminam ellipticam expansis postico reliquia brevior. *Prain, Jour. As. ow-*

Beng. lviii, 2, 276 (1889).—*P. versicolor* *Eoijk*, *Illustr. ffimal* 291, t 72, l. 2 [*viz Wahlenb.*] [1839].—An eadem sp. [ac *P. asplenifolia*? *Wall.** *Lith. Cat* 415 B, p. 13 |182B).

In HIMALAYA occidentali:—Tehri-Garhwal, in valle Damdar, 14—15, DD0 p. s. m. atque in Dudu Gaih infra Srikanta 15—1B, DDO p. s. m., *Duthie* ! Kamaon; *Royle* ! *Wallich* ! prope glaciem ai Pindir, 14, DDD p. s. m., CMeft/prope BidanginDhauli, 14—15, DOD p. s. m., *Duthie* ! Nepal occidentali; ex adverse pagi Budhi, ID—11, DDD p. s. m., *Duthie* ! Nepal centrali; *Scully* !

DISTRIB.—China boreali, Tibet bDreali.

Caulibus 6—30 cm. altis rhizomate 1—3 cm. longo raicibus 3—8 cm., petiolis 3—5 cm. longis laminis 3—3 X 1 cm. segmentis 5 x 3 mm., calyce VAR. *typicce* 11—12 mm. longo, VAR. *heteroglossce* 13—15 mm., corollse tubo 13—15 mm. longo galea VAR. *typicue* 9 X 35 mm. VAR. *heteroglossce* 11—14 X 3 mm. labio 7*5—14 mm. lato, capsula 18 X B mm. seminibus 2*25 mm. longis.

PLATE 34. A— D; figs. 1—16.—Pedicular is *Dederi Vahl*

A—Specimen of VAR. *typivn* from Guraz in Kashmir (Falconer).

B— „ „ *heteroghs&a* from Tehri-Garhwal [*Duthie*, n. 232).

D— „ j, „ „ Grosain Than in Nepal [*Scully*, n. 157).

This account of *P. Oederi* is baaed on an examination of 12 Scandinavian specimens, 17 Swiss specimens, 4 Altai specimens, and 51 Panjab Himalaya and Kashmir spscimens of VAR. *typica*, flowers from 81 different specimens having been dissected: of VAR. *heterogiossa* flowers from 32 specimens of the Kamaon form have been dissected, and from 12 specimens of the Nepal form.

The species is most nearly allied to *P. Alberti* and to *P. flammea*. From the first it is easily diagnosed:—

haf Begmsnts Dvate obtuse, anterior filaments beariBii. *P. Dederi*;

leaf segments acuminate pinnatifii, all filaments glabrous. *P. Alberti*.

From the second it is not so easily diagnosed by thB naked eye, since certain forms of both have the same habit and foliage j *P. Oederi* is usually, but by no means always, larger and more robust than *P. flammea*. NonB of the earlier authors give certain diagnostic characters, and the precise diagnosis (stated chronologically) is as follows:—all stamens glabrous in *P. Jlammea*, while anterior pair in *P. Oederi* are hirsute—Bungs |1847), Keichenbach /. |18B2), Maximowicz (1H77); anthers less muticous in *P. flammea*—Reichenbach /. (18R2); seeds in *P. flammea* fulvous and narrowly Dvate, in *P. Oederi* c^Tylindric-ovate half as broad again and ash-grey—Lange 11B7D). To these characters may be added:—anthers with long axes oblique in *P. flammea*, horizontal in *P. Oederi*. The diagnosis is therefore as follows:—

anthers horizontal, anterior filaments hirsute, seBds Bylindric ovate . . . *P. Oederi*;

anthers obliquB, all filaments glabrous, seeds elongate nvoii. *P. flammea*.

The Kashmir and W. Tibet plant is the same as the Dahurian form, having the calyx hirsute with its teeth, except the upper, serrate; the lobes of the lip are entire as in the Scandinavian and Arctic form [*P. Dederi Vahl* "genuinu"), where the calyx is also hirsute, but all the calyx teeth are entire, and not emarginata as in the Swiss plant (*P. versicoliu*¹ *Wahl*, *Veg. Eelvet.* 118), wherB the calyx teeth are also entire, the calyx being glabrous.

The Kamaon form is = *Wall Cat* 41B B, which Wallich only doubtfully referred to his *P. asplenifolia*. It probably is the plant intended by Koyle [III. t 72, l. 2), since he figures a plant with a small lower lip, which is true of this, and since specimens of this obtained by him in Kamaon are preserved at Saharanpur. But the lip of his figured plant is too small even for this form, and he cites Kashmir in the text (p. 291) as one locality; his Kashmir specimens, which are from Peshawar, are true VAR. *typica* only. The various Kamaon gatherings exactly agree;—calyx hirsute, upper tooth linear lanceolate acute, lip of corolla *smaller than* in VAR. *typica*, margin crenulate, central lobe ovate lanceolate, galea *longer than* in VAR. *typica*, as narrow as tube. Dr. Scully's Nepal plant differs considerably;—calyx glabrescent, all the teeth with ovate expanded tips, corolla lip *3 times as large* as in VAR. *typica*, margin entire, lobes orbicular, galea narrower than tube. The greatest difference is in the much larger lip; perhaps VAR. *heteroglossa* should be considered a species distinct from *P. Oederi* with the Nepal plant as a definite variety of this new species. Mr. Maximowicz describes another variety in *Mel. Biol.* xii, 918. I have seen no specimen of this variety, and cannot express an opinion concerning its corolla lip; it has entire calyx teeth, however, and has a tawny-red corolla. In VAR. *heteroglossa* the corolla is uniformly yellow; in VAR. *typica*, whether from the Alps of Europe, from Siberia, or from Kashmir, the corolla is, as it is throughout the Arctic circle, yellow with upper part of palea, wherein the anthers lie, reddish-brown. This reddish-brown galeatDp may be absent and 2 red or pink spots at the edge of the throat be present instead. This variation occurs in Swiss, in Norwegian and in Kashmir gatherings alike. Not infrequently too in European and in Arctic gatherings the corolla is, as it normally is in VAR. *heteroglossa*, uniformly yellow. The species varies a good deal in habit, ranging from a dwarf condition very much resembling *P. flammea*, with which species, owing to the inadequacy of the Linnean diagnoses, many of the earlier European authors have identified it, to a tall condition not unlike *P. foliosa*, for which Runner *i.e.* mistook it. This condition—for it is no more than a robust condition of the Scandinavian-Arctic form of the type—Wahlenberg [*Fhr. Suec.* i, 389) even ventured to deal with as a species (*P. virescens*), and Hartmann [*Flor. Skand.*, 199) has kept it apart as a variety.

Those authors who have made an especial study of the genus (Steven, Bentham, Bunge, Maximowicz) agree in considering the Swiss form of this species conspecific with the Scandinavian, and this has to be borne in mind in dealing with the synonymy of the species, which is of so complex a nature and is so voluminous that I have endeavoured to give it as nearly as possible in full, consulting each work quoted when accessible to me, and getting friends in Europe to verify citations when the work quoted was not available in India. As here and there in this mass of literature a few errors of citation have crept in, I have analysed the synonymy as a whole. Briefly summarised, the result is that a line may at once be drawn between the synonymy of last century and the synonymy of the present one, the synonyms of the earlier authors being the result, of a confusion of identity, those of more recent writers being the outcome of a dispute as to priority of name. This will become more apparent if the historical method be pursued.

The species was identified by DEDER (1751) with *P. flammea* of Linnæus, nor is there anything in Linnaeus' verbal diagnosis [1753) to prevent the identification. But LINNÆUS (1753) at once detected the want of agreement between Oeder's figure and his own species. He, doubtfully however, referred Oeder's plant to his own *P. hirta*, a step in

which no European botanist appears to have followed him, except SMITH, whose description (1819) shows more evidence of compilation than of study of specimens. GUNNER (176B) again took the same Norwegian plant for *P. flammea*; HALLER (17B8) and ALLIDNI [1785] placed the Swiss form of the species under *P. flammea* also. Haller's criticism of Oeder's figure only succeeds in showing that his specimens were inadequate, and his own figure is not particularly instructive. WILLDENOW [1BDD] is doubtful about referring the Norwegian plant to *P. flammea*; neither he, nor Allioni or LAMARCK (1778) before him, nor PDIRET (1804) or DE CANDOLLE (1805) after him, hesitate about referring the Swiss plant to Linn. *P. flammea*. RETZIUS (*Flor. ficand.*, ed. i, 1779) expressed for the first time the opinion that the plant figured by Oeder was specifically distinct alike from *P. flammea* and from *P. hirsuta*, and though HÆNDK (1788) in a very lengthy and careful article rebuts this opinion of Retzius, and insists on the identity of this species with *P. flammea*, Retzius declined to agree with him, and reasserted (179*) his opinion that it may be a good species. Unfortunately Retzius did not formulate his opinion by providing the species thus recognised by him with a definition and a name. Hsencke's description is extremely accurate, but curiously he omits to mention the hairs on the anterior pair of filaments which his Judenburg specimens must have exhibited, and which after all afford the most palpable diagnostic mark between this species and *P. flammea*. It is somewhat strange that Walpers, whose citations are as a rule so correct, attributes the article by Hsencke to Wulfen, and places it in vol. i instead of in vol. ii of *Jacquin's Collectanea*; p. 7D, vol. i, which he actually quotes, is occupied by accounts of *Sisymbrium pannonicum* and *Turritis hirsuta* by Jacquin himself. Even if the citation of a wrong volume be only an oversight in reading proof the misquotation of authority still remains. Retzius' view was adopted by VAHL (18DSJ, who described the Norwegian form of the species under the name *P. Qyderi*. WAHLENBERG does not seem to have been aware of the appearance of Vahl's name in 1812, when he described the same form as *P. flammea* VAK. *major* ^ and probably was still ignorant of that name in the following year, when he gave the name *P. versicolor* to the Swiss form of the species. HARTMANN, who in 1814 was of opinion that Oeder's Scandinavian plant was the same as *P. flammea*, noted in 1818 that it is really conspecific with the Swiss *P. versicolor*. What is of greater interest for us is to know that when Hartmann wrote in 1818 he was aware that this species (*P. versicolor*) was known to Danish botanists as *P. Oederi*, but there is nothing to show whether his preference for Wahlenberg's name over Vahl's was because he thought that Vahl's name had been published between 1813 and 1818, or because of a laxity then prevalent in the matter of recognising priority. Hartmann's view received the warrant of STEVEN'S judgment in 1823, though there is no indication that Steven knew of the prior publication of a name for the Norwegian plant, and Steven's limitation was adopted by the elder REICHENBACH in the following year. In the same year (1823) SPRENGEL gave a valueless verbal diagnosis between the two forms, and NYMAN so late as 1854 kept them apart in the *Sylloge Flora Europe*. He is, so far as I can discover, the only author who has hitherto given the true date of publication of the name *P. ttaferi*. It is therefore somewhat perplexing to find in 188D the same author in his *Conspectus* according a subordinate position to what he had himself already shown was the older name. No author besides Sprengel and Nyman appears to have kept the two forms apart, and indeed in 1824 Wahlenberg himself had assented to the identity of the Scandinavian form with his own Swiss species. HB quotes Hartmann as already having expressed this view; but, though he

gives the name *P. Oederi* as a synonym, he cites it as being first published in the 3rd edition of Hornemann's *Plantd cere* in 1821, or eight years later than the appearance of his own name for the Swiss form, whereas if he had read the reference by Hartmann on page 15B of the volume of *Vet. Ah, Handl* (for 1818) quoted by him, he must have realized that the name *P. Oederi* there referred to had been in use prior to 1818. Since the species was one for which he himself was responsible, if he knew that the name *P. Oederi* had been also applied to it, it was in a peculiar sense his duty to ascertain where and when the name *P. Oederi* first had appeared. WALPERS in 18H followed Steven and perpetrated the curious misquotation already mentioned; BENTHAM also followed Steven in 1846. Neither Walpers nor Bentham quote Vahl's name, which may therefore be assumed to have escaped their notice. BUNBE, on the other hand (1S17J, deliberately excludes Wahlenberg's Scandinavian plant without saying [*Ledeb., Flor. Ross, iii*, 300) where it should be inserted, and complicates matters still more by saying that *P. Oederi* of the Danish botanists is a plant from Iceland, and that it has all the filaments glabrous. Now in the first place Wahlenberg's Scandinavian plant (there is a specimen of Wahlenberg's at Calcutta) has the anterior stamens hirsute, and certainly is the same as his Swiss *P. versicolor*, of which there are also authentic specimens here; in the second place, Oeder [*Flor. Ban. i*, 7) says his plant is from Norway, and does not mention Iceland at all; finally, if the plant that is *P. Oederi* has glabrous stamens, then *P. Oederi* should become a synonym of *P. flammula*, which Bunge has refrained from making it. TURCHANINOW (1B5B) also rejects Wahlenberg's Scandinavian synonym, in this clearly simply copying Bunge; he does not face any of these three difficulties to Bunge's note. The younger REICHENBACH'S treatment of the question (1S62) is more extraordinary still—HB accepts Vahl's name, but gives the 1821 edition of Hornemann as its place of publication. To obviate the necessity of palpably violating the law of priority, he takes the opposite course from that pursued by Bunge, suppresses Wahlenberg's Swiss synonym of 1813 [*Veg. Helvet* 118), and says that that author's *Scandinavian* synonym of 1824 [*Flor. Suez, i*, 389) is the earliest appearance of the name *P. versicolor*. STEININGER, whose careful critical revision of the European species of *Pedicularis* is the most recent (1887), has given the synonymy of this species less satisfactory treatment than he has that of any of the other European ones. He begins by adopting Vahl's name—but copies Reichenbach's error of quoting the 1821 work as its place of first publication. He follows this error by copying Walpers' one of quoting Wulfen as the author of a notice written by Hsencke, and immediately after gives Wahlenberg's name for the Swiss plant—published in 1813 — as a synonym for a name that he supposes to have been only published in 1821. Steininger also adds "*P. asplenifolia Baumg. non Flaerke*" as a further synonym. As he does not say where Baumgarten fell into this error, I have been unable to verify his citation.

To conclude: the earliest name is clearly *P. Oederi* Vahl, which appeared first in 1806 and is thus seven years older than Wahlenberg's name. There is not now, and there need never have been, the slightest doubt about the identity of Vahl's plant. As has been shown above, both it and the Swiss form have been equally mistaken for *P. flammula* while both it and the Swiss plant have been long known to be the same thing. The name given by Wahlenberg has become perhaps better known than Vahl's name, but not to so great an extent as to justify a deviation from exact compliance with the law of priority, and Vahl's name *P. Oederi* is therefore the one that must in future be accepted.

EXCLUDED AND DDUBTFUL SPECIES.

There is in the Calcutta Herbarium a gathering in leaf only of a very distinct species :—

70. *Pedicularis* sp. rhizomate lignoso ramoso foliis alternis radicalibus cespitosis petiolatis petiolis 1*5—25 cm. longia margine herbaceo prorsus dilatatis laminis 5—9 cm. longis his 1'75^—2*25 cm. latis pinnatisectis rhachi alatis supra umnino glaberrimia subtus petiob nervisque parce hirsutis ceterum glabris segmentis 10—12-jugis subalternis obtusis ID mm. longis hia 4—5 mm. latis pinnatifidis et margine cartilagineD serrato-dentatis.

Jn alpinis ASSAMLE:—Manipur boreali; in Sirohifurar, 8, DDD p. s. in. Watt (n. 6479) !

This is very distinct from any Indian species, and appears as if it must belong¹ either to the *Eusiphonanthce* or to the *Hypusiphynanthoe* subsection. Mr. Maximowicz, who has very kindly examined it [in spite of its incomplete condition) at my request, tells me that he cannot match it with any of the Chinese species, which he knows so thoroughly. He says of it—" looks like a *Siphonantha* or (less so) a *Co?nosa*;"² it should therefore bs a species yet to be described.

PLATE 35. B.—*Pedicularis* sp. indica n. 7D.

Specimen from Sirohifurar [Watt, n. 6479).

There is one Indian plant that has to be mentioned as an excluded species:—

PEDICULAEIS? AVANA Wall., Cat. 1UD7 11828); Benth., Scroph. Ind. 52 [1835). The same species was issued as an Acanthaceous plant, which it is, by Wallich in the following year. But the identity of this with that Acanthaceous plant was not made public till 1878. Up to that date therefore the synonymy must be shown in a double column.

Pedicularis? avana Wall, Oat. 1007 (1828).	Adenosma biplicata Nees in Wall, Cat. 714B [1829).
_____Benth., Scroph. Ind. 52 (1835).	_____Nees in Wall _m PL As. Ear. iii, 79 (1832).
Synnema avanum Benth., DC. Prodr. x, 538 (184 B).	_____Nees in DC Prodr, xi, 68 (1817).
	_____T. Anders., Jour, Linn. Sue. ix, 454 (1867).

Cardanthera biplicata Smth. in Gen. Pl. ii, 1D74 (1876).

Dardanthera avana, V. B. Clarke in Hook./., Fhr. Brit. Ind. iv, 405 (1884).

In DC Prodr xi, B8 (1847), Nees limits the genus *Adenosma* so as to exclude the species that formed the type' of ADENOSMA R. Br. [Pro*- Flor. Nov. Holl. i, 442-3 ilb1D)]. A* *Adenosma Brown* had just been reduced by Bentham [DU. Prodr. x, 3B0 (181B)] to STEMODIA Linn., Nees felt at liberty to retain Brown's name for the genus thus limited^ seein-that Brown himself had in the work quoted declared two Acanthaceous plants that still remained in the genus to be in his opioion congeneric with the solitary Scr.phul araceous species taken as the type. Nees mentions however, for the first time, in the same place {DC. Prodr. xi, 57) the came DARDANTHRA Ham., which he gives as synonymous with Adenoma of Nees (not of Brown).

In *Gen. Plant* ii, 949 [1876] the genus *ADENOSMA* R. Br. (1B10) is restored. The name *Adsnosma* Nees (1847) therefore falls, and Bentham has issued the alternative name *CARDANTHERA* Ham.

EXPLANATORY NOTE ON THE ILLUSTRATIONS.

The isothermal line on the MAP illustrating the geographical distribution of *Fedicularis* is translineated from a map in Keith-Johnston's Physical Atlas. It appears there as the mean summer isotherm of 59°F.

The TABULA AFFINITATUM is an attempt to represent graphically the facts expressed in Chapter VI. It possesses all the advantages over the serial disposition of the literary "conspectus" that a representation in two dimensions must possess when compared with a representation in one dimension, but at best the results obtained are merely approximate.

In the PLATES proper the figures of the various species are drawn by the native artists whose names appear in the left-hand corners. The analyses have in each case been made and delineated by the writer. These have been made as nearly uniform as possible in all the species and explain themselves. The analyses are to be understood as being made of flowers belonging to the particular plant of which a drawing is given; the instances where this is not the case are indicated in the text. In PLATE 35 D types (among Indian species) of the various subsectional corolla-forms are placed side by side as to assist the eye in understanding the passages on classification. In PLATES 35 and 37 the writer has attempted to extend to Indian species the treatment accorded to the seeds of European and Asiatic species by Dr. Lange. They fall far short of the excellent results obtained by that author, and it is to be hoped that Dr. Lange may one day provide a similar comparative view of the seeds of Chinese species. The value of seed characters is very high; not for diagnosis, since so many species have similar seeds, nor for general classification, since closely allied species have often such different ones, but for the true limitation of the natural groups so characteristic of the genus-

names of species or genera incidentally referred U are in italics.

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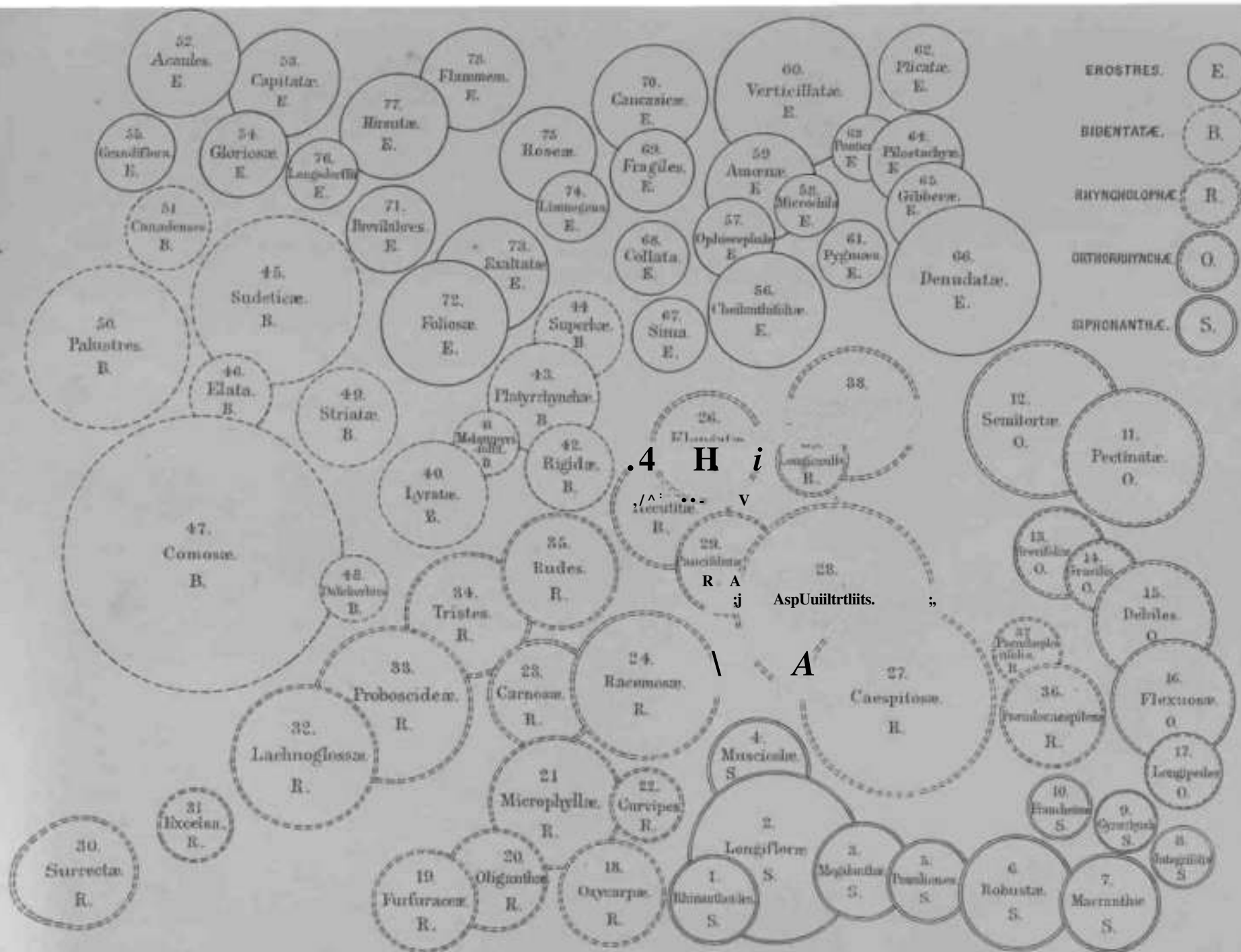
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							Zonal distribution			



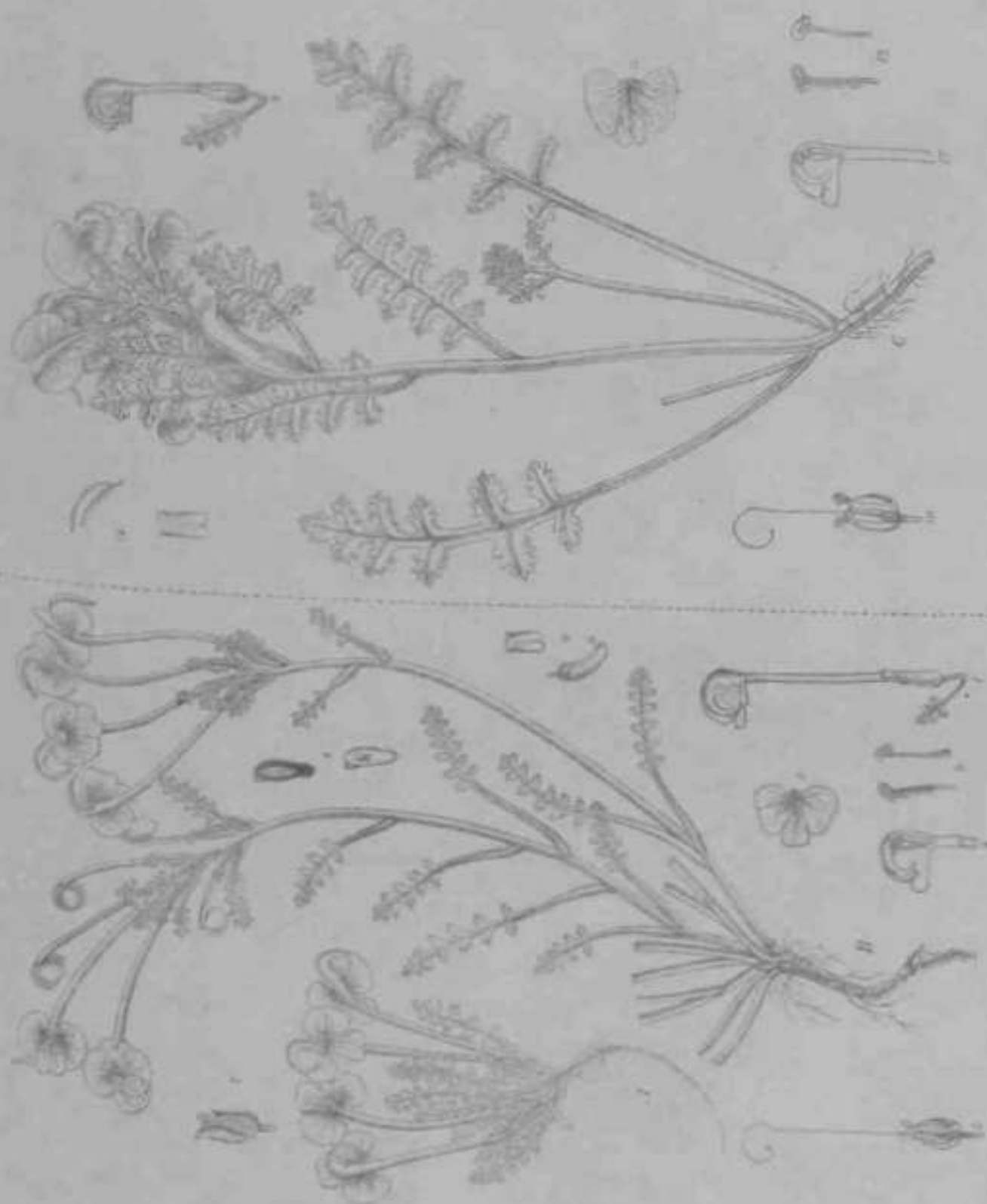
SKETCH MAP of the Northern Hemisphere to illustrate the geographical distribution of PEDICULARIS.

H. Prin del.

A. C. Mackenzie Lith.



TABULI AFFINITATUM.



Lab. by A. C. Smith, Univ. Herbar. of Am. Columbia.

PEDICULARIS BIPHONANTHIA, Don.
A. var. longistylis. B. var. brevistylis.

A. = *longistylis*, Don.



Plate 1. A. B. Philodendron bicolor, B. Heliconia, C. Heliconia.

A. B. Philodendron bicolor, B. Heliconia, C. Heliconia.

A. B. Philodendron bicolor, B. Heliconia, C. Heliconia.

A. B. Philodendron bicolor, B. Heliconia, C. Heliconia.



A. D. Muhl. del.

Lab. No. 1. J. H. H. H. H.

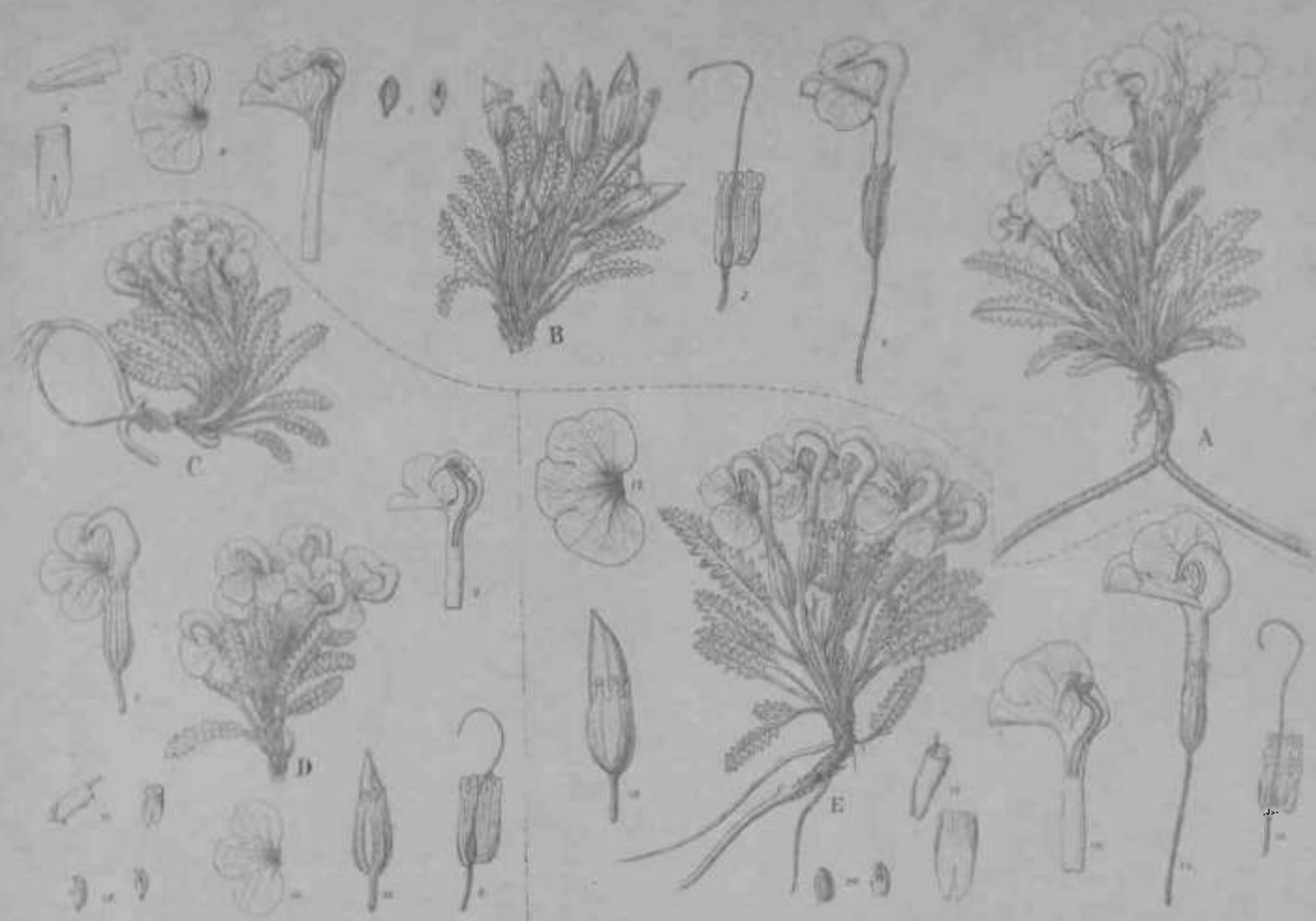
A. B. PEDICULARIS MEGALANTHA, Dea, Var. typica. C. Var. pauciflora.



Bot. Soc. J. B. Macdonald, Cam. Acad. Soc. London

A. PINGICULA GRANDIFLORA B. PINGICULA HIBERNICA C. PINGICULA VULGARIS D. PINGICULA HIBERNICA E. PINGICULA HIBERNICA F. PINGICULA HIBERNICA G. PINGICULA HIBERNICA H. PINGICULA HIBERNICA I. PINGICULA HIBERNICA J. PINGICULA HIBERNICA K. PINGICULA HIBERNICA L. PINGICULA HIBERNICA M. PINGICULA HIBERNICA N. PINGICULA HIBERNICA O. PINGICULA HIBERNICA P. PINGICULA HIBERNICA Q. PINGICULA HIBERNICA R. PINGICULA HIBERNICA S. PINGICULA HIBERNICA T. PINGICULA HIBERNICA U. PINGICULA HIBERNICA V. PINGICULA HIBERNICA W. PINGICULA HIBERNICA X. PINGICULA HIBERNICA Y. PINGICULA HIBERNICA Z. PINGICULA HIBERNICA

Bot. Soc. J. B. Macdonald



A B PEDICULARIS DALTONI, Prain. C D. ROBUSTA, Hook f. E F NEPALENSIS, Prain.

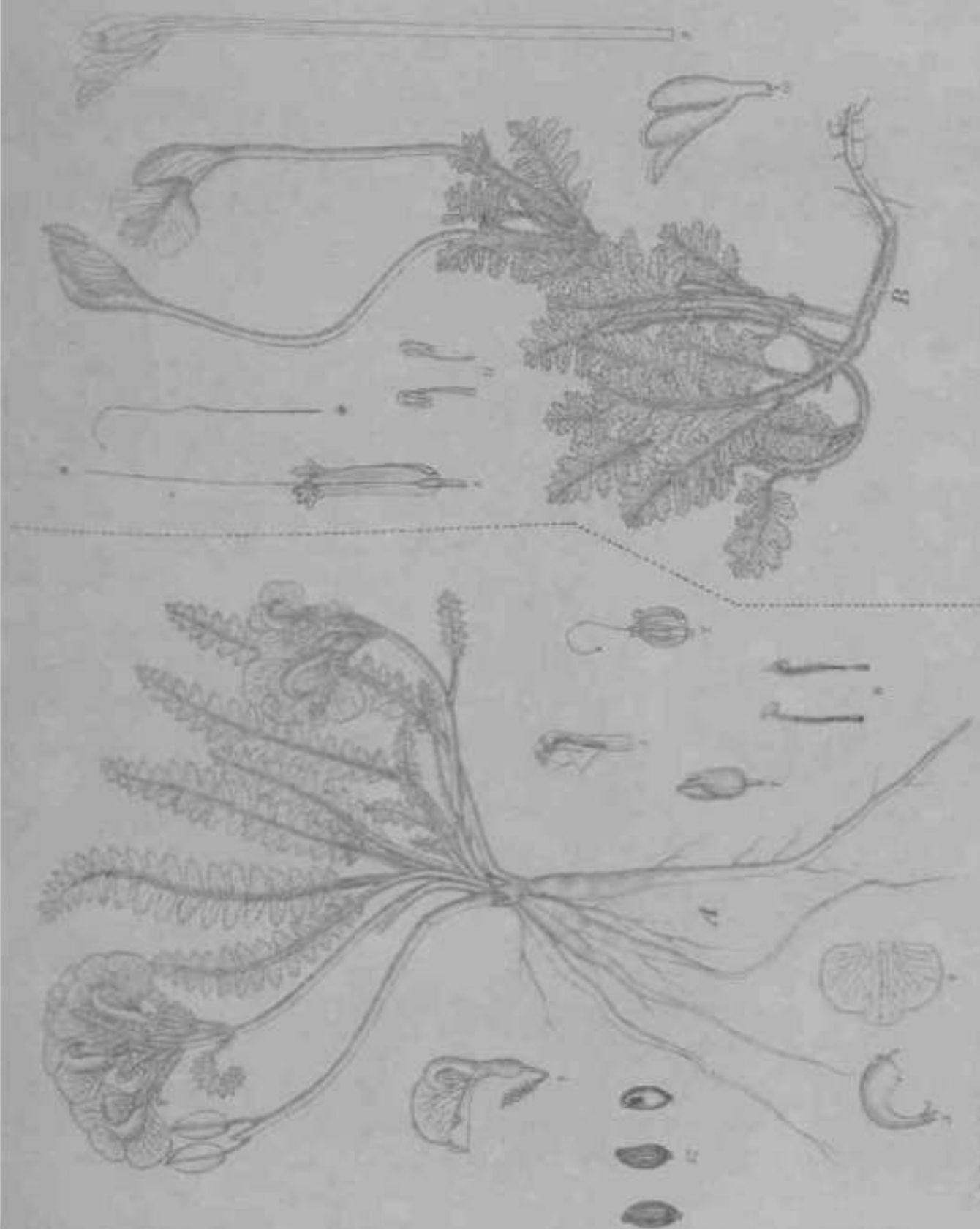


PEDICULARIS MACRAUCTIA. THAM. coll. A. B. var. typica C. D. var. macrauctia.

Figures of *A. Ghiesbreghtii* and *A. Ghiesbreghtii* var. *var. var.*
B. PEIMATARIUS PEIMATARIUS, B. B.

A. PEIMATARIUS PEIMATARIUS, B. B.

A. B. B. B.



Illustr. by A. C. Macgregor

PRICKLY PINE SCULLYANA. Penn.

H. C. Shaw. Bot.





A. D. Miller, del.

Lilist. A. C. M. del.

A. P. ULAFILIS GRUBA, P. FLAGELLARIS, C. P. REGELIANA, U. RUU ONTOPHORA.



Drawn by J. H. Sargent, from the original specimens of J. H. Sargent.

A. PELICULARIS CLARKII, Hook. & B. PEDICULARIS, Muhl.

Scale 1/2 inch.

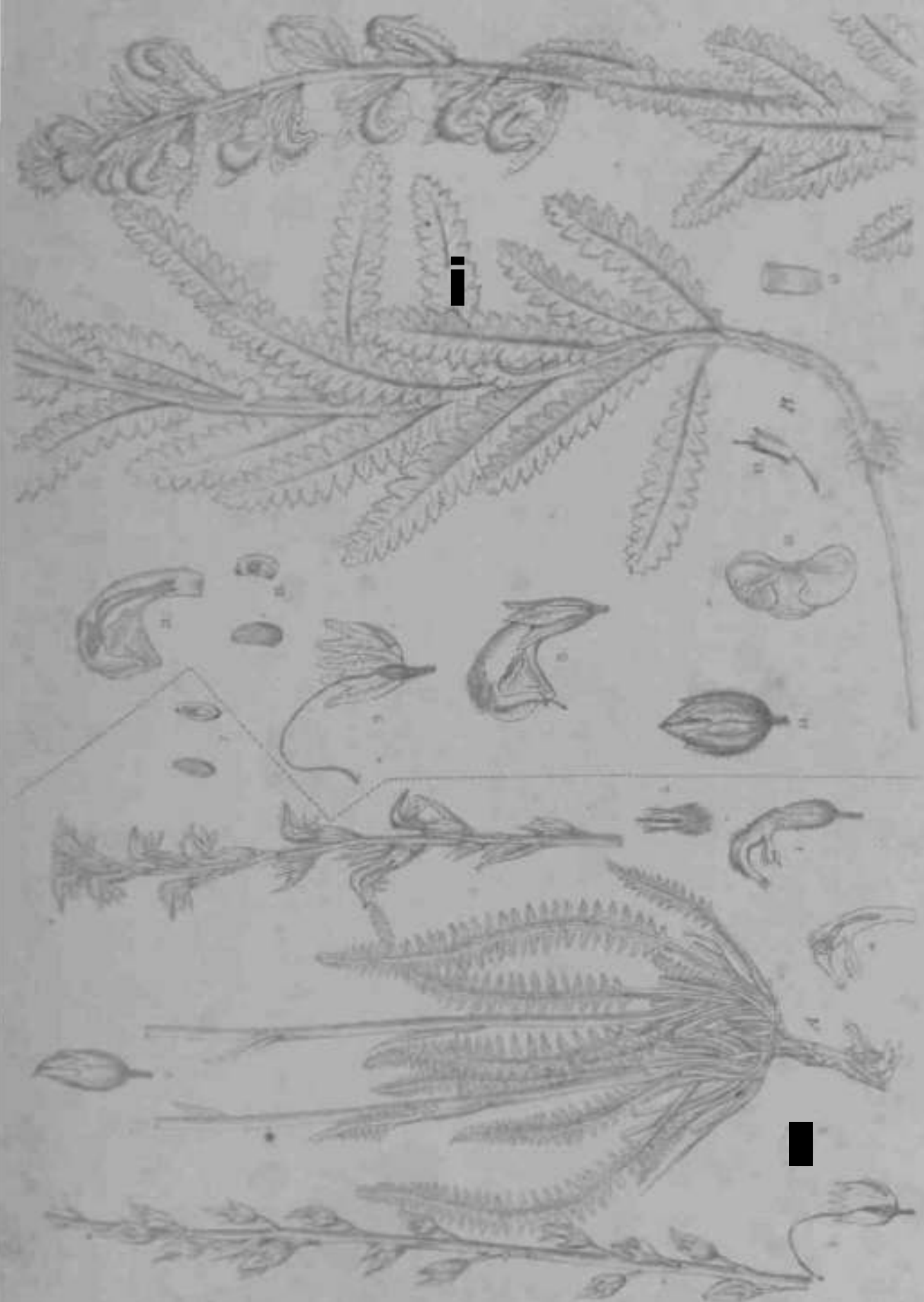


Fig. 1. - *A. trichotilapw tachnoo*, habit, showing the large, palmately compound leaves.

A. trichotilapw tachnoo (L.) (L.) *A. trichotilapw tachnoo* (L.) *A. trichotilapw tachnoo* (L.)

A. C. Smith, del.

A. C. Das, *Editor* *Indian Journal of Statistics*



Lab. by A. J. M. M. M.

A. *PEDICULARIS* CARNOSA, Wall. B. *P. CORYMBOSA* Presl. C. *P. ZEYLANICA*, Benth.

A. J. M. M. M.



A. H. Muller del.

A. PEDICULARIS COLLETTIUM B. i' Goff>Thfi

Like by A. C. Mithreyi



A. D. Hall, 445

A.B, FKDICULMU5 Wala I HTL Bomp.



Drawn by N. N. Bagchi, Govt. School of Art, Calcutta

C-JXP ALBIPLORA, tufn



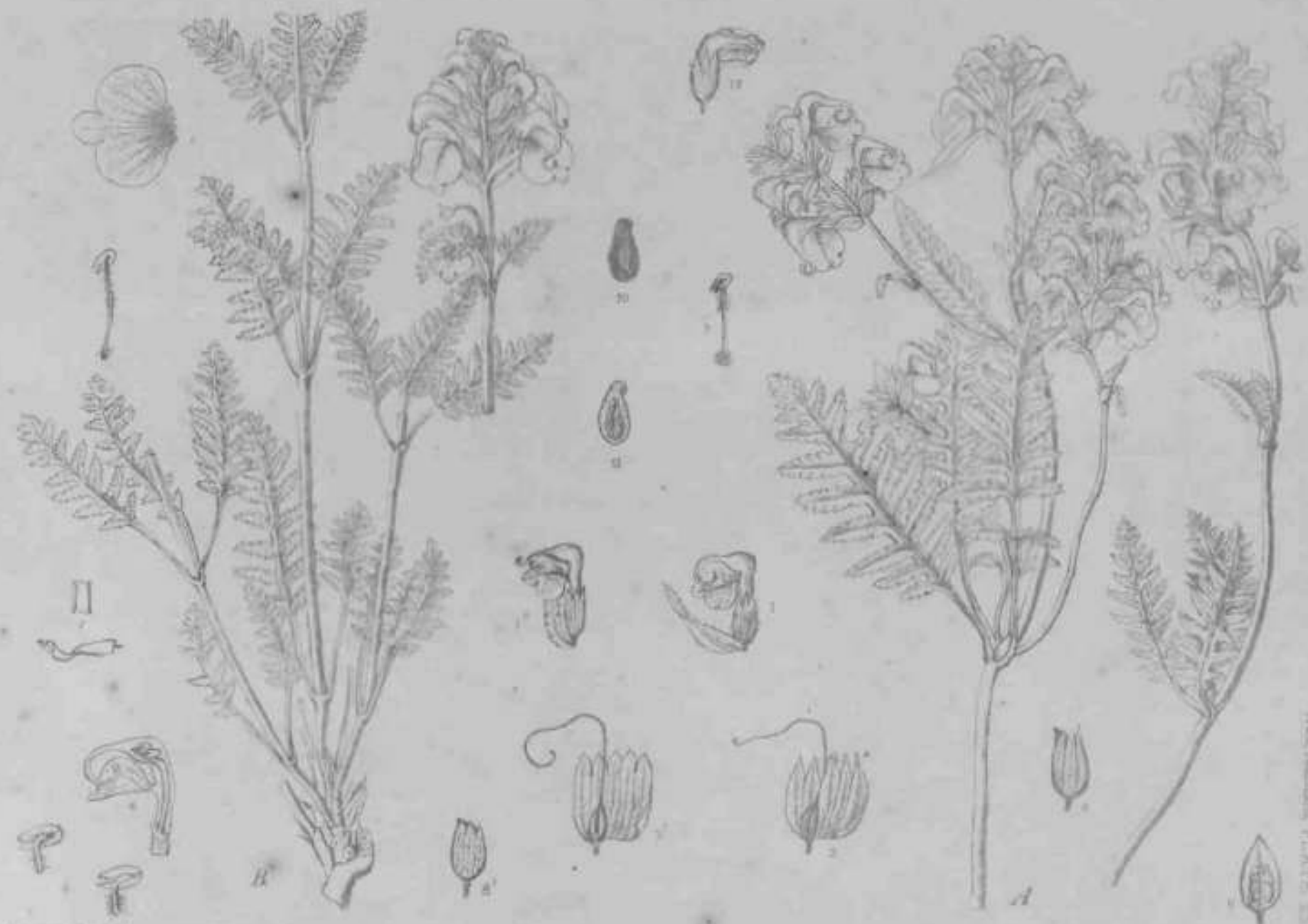


A. 2. Single leaf.

PEDICULARIS PORPHYREA, Wall.

Colo. by H. K. Clevebury, Gov. School of Art, Calcutta.

P. GRACIUS, Wall. var. *typica*.



A. L. Hough del.

1893-94 A. T. Moore, Gen. Bot. Soc. of New California

PEDICULARIS PECTINATA WALL. A. VAR. TYPICA B. VAR. PALANS.

Edw. A. Muesebeck

A. B. PELLICULARIS PYRAMIDATA, Duges. C. PELLICULARIS TRINUCIOTIS, Duges.

A. A. Muesebeck





All parts in the same position.

AR. PEDUNCULUS A. ADULTUS. M. M. C. 7. COLICIZOTOMENOSA, T. 1905.

Fig. 10. (See p. 10.)

Labridae. L. Nigra. From Jamaica. D. R. C.

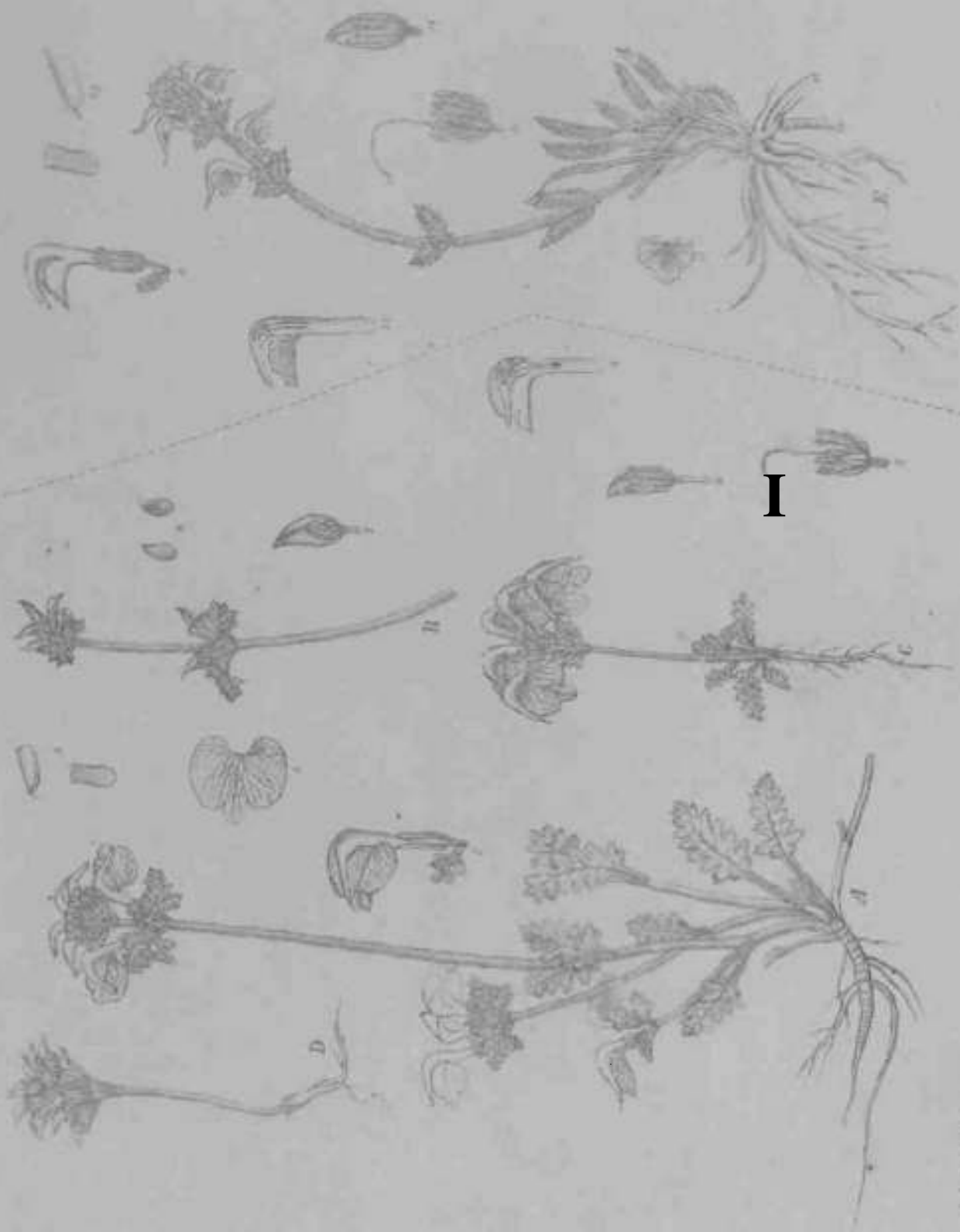
E. P. HEYDICH, Fran.

I

A-D. PEDICUL. CONFERTIORA, Fran.

en

A. C. D. R. C.





A. PHIMULARIA M. LLOYD, WALL. B. P. GIBBERA, THOM. C. P. POLYALOIDES, RICH. D. P. DENTULATA, H. B. F.

A. b. 1/2 in. 1/2 in. 1/2 in. 1/2 in. 1/2 in.





kd

ft.

it.

r

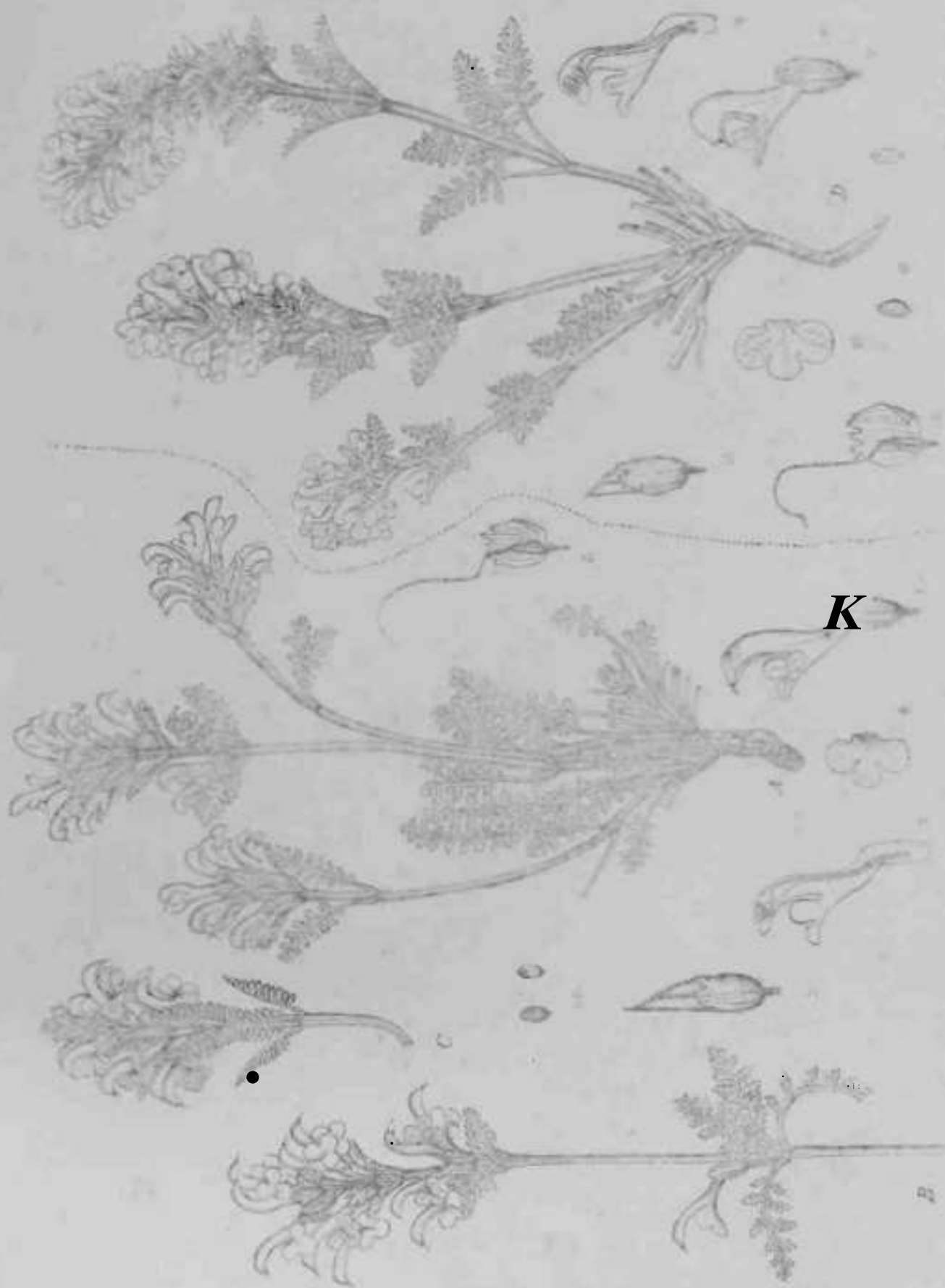
B

A.L. Smith del.

Lith. by H.L. Pelt. Govt. School of Art, Columbia.

A PEDICULARIS REX Clarke

B PEDICULARIS DOLICHOCANTHA Schrank



A. B. Peckham del.

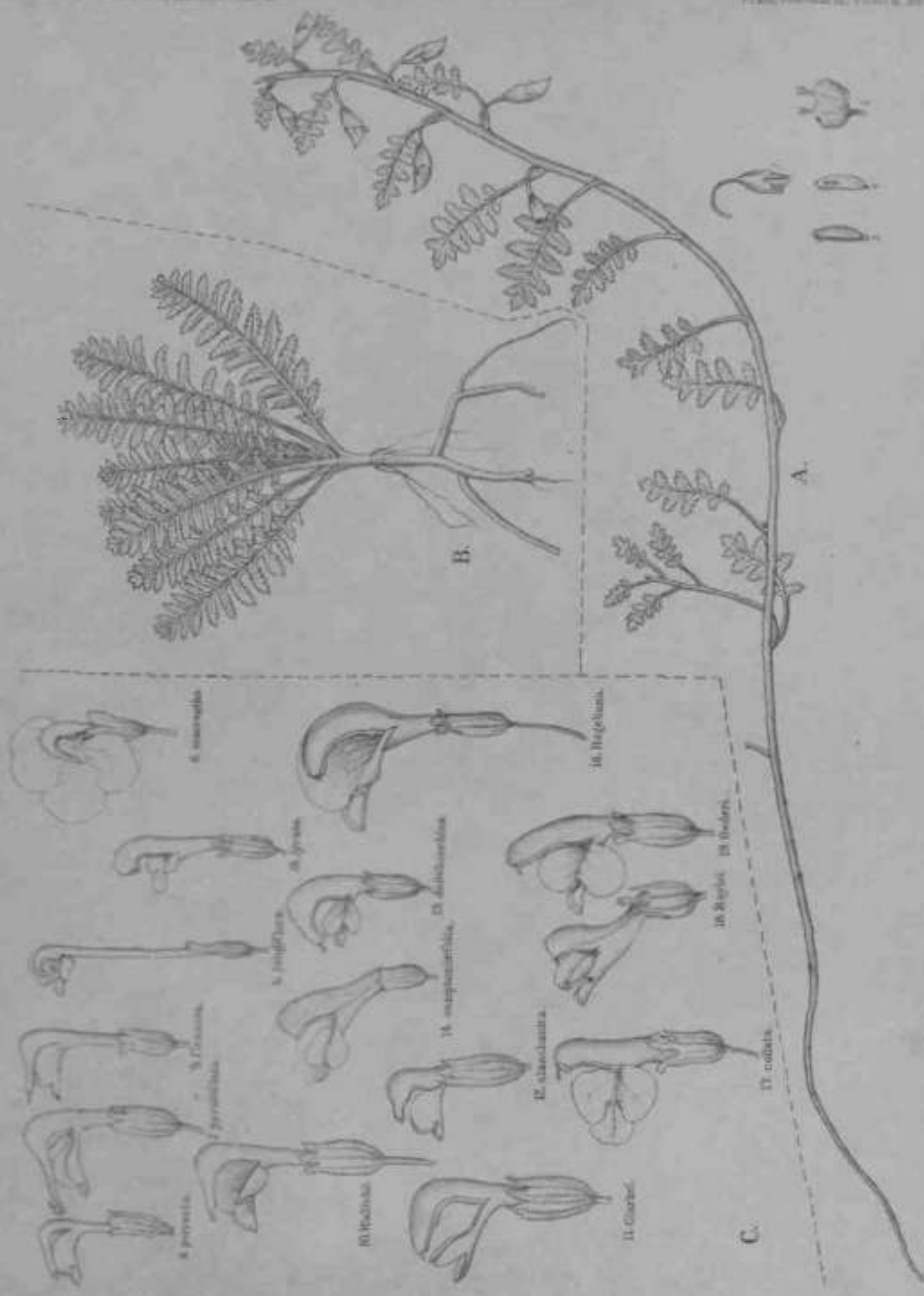
A. B. PEDICULARIS CHEILANTHIFOLIA. Hook. & Arn.

GEORGE, C. VAN BUCHANAN, D. P. CLARKE, HOOK. & ARN.

B



A. pulchellum (L.) Benth. var. *puberulum* (L.) Benth.



A. *PEDICULARIS CURVIFOLIA* Hook. f. B. *PEDICULARIS*, sp. nov. C. Inflorescences of *Pedicularis*-types.



MILIUSA THURBERIANA, S. & G.



LOPHOPHYTUM, J. & G.



EUPHORBIA, D. & G.



HERBERTA, J. & G.



HESPERIS, J. & G.



DACTYLIS, J. & G.



MEGALANTHUS, J. & G.



STOLLIA, J. & G.



REUTERIA, J. & G.



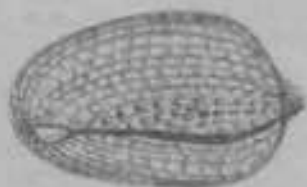
CARISSA, W. & G.



OXYRIA, J. & G.



URTICA, J. & G.



WALTHERIA, J. & G.



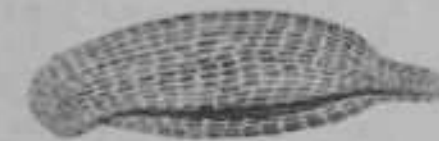
THYMUS, J. & G.



CLAVARIA, J. & G.



COMPOSITA, J. & G.



CURATELLA, J. & G.



VEPERTARIA, W. & G.



PENTSTEMON, J. & G.

SEEDS OF INDIAN PEDICULARES, No. 1.

Lith. by A. C. Mearns.



SPERMATOPHYTES



SPERMATOPHYTES



SPERMATOPHYTES



SPERMATOPHYTES



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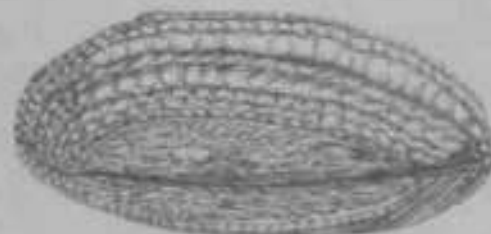
SPERMATOPHYTES



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SPERMATOPHYTES



SPERMATOPHYTES

THE
MAGNOLIACEÆ
OF
BRITISH INDIA.

BY
GEORGE KING M.B., LL.D., F.K.S., C.I.E.,
Superintendent of the Royal Botanic Garden, Calcutta.



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Printed at the Bengal Secretariat Press.
1891,

THE
MAGNOLIA CEÆ
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BRITISH INDIA,

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GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,
Superintendent of the Royal Botanic Garden, Calcutta.

I WAS led to undertake this account of the Indian species of *Magnoliaceae* on account of our very imperfect acquaintance with the species which are found in the provinces of Assam, Cachar, and Sylhet. Most of these are noble trees, and many of them yield useful timber; nevertheless they have hitherto been but little known botanically. Thanks to the kindness of Mr. Gustav Mann, Conservator of Forests for Assam, and to Mr. S. Peal, who for many years has been resident in that province, I have (in response to my appeal for help) been put in possession of excellent materials which enable me to give a fuller account than has hitherto been possible of the older species, as well as to add some new ones to the Indian Flora. Collectors sent to the Andamans and to the Province of Perak, also brought sufficient material of certain new species to enable me to give an account of, and to figure them. But amongst the Perak collections there are imperfect specimens of nearly ten species which, although apparently new, I cannot venture to name until complete material shall be obtained.

In respect of the morphology of the order, I have nothing to add to the full accounts already given by MM. Trecul, Baillon, and other botanists. The characteristic stipules of the group *Magnolia*, being very fugacious, are rarely seen in herbarium specimens, and but little use has been made of them in distinguishing species. In a good many cases I have been able to describe them. They are long, narrow, and convolute; and they completely enclose the bud of the next higher leaf, the apex of the axis, and the flower-bud (if there be any). The flower-bud is in turn covered by a large spathe-like bract which completely envelopes it. This spathoid bract often affords excellent specific characters; but as it is early forced off by the expansion of the flower, it is rarely seen in herbarium specimens.

As regards the limitation of genera of the sub-Order *Magnolice*, I think there are good grounds for the opinion of Baillon that *Michetta* and *Manglietia* should both be merged in

Magnolia. *Michelia*, as usually defined, is distinguished from *Magnolia* practically by the single character of having its gynophore stalked, while that of *Magnolia* is sessile. But, as a matter of fact, two species of Indian *Magnolia*, viz. *M. Griffithii* and *Peilii*, have distinct, although short, stalks to their gynophores; the presence or absence of a stalk to the gynophore cannot therefore be regarded as an absolute character. The ripe fruit, in many Indian species of *Magnolia*, is elongated rather than ovoid, just as in *Michelia*; and the solitary practical distinction that I can find between the *Magnolias* with elongated fruits and *Michelia* is that, in the former, the individual carpels are much crowded; whereas in *Michelia* they are laxly packed or even distant from each other. The Indian *Magnolia globosa* and many of the non-Indian species have ovoid fruits, in shape resembling those of *Manglietia*. The latter, although in other respects agreeing with *Magnolia*, is however separated off from that genus because its ovaries have three or more ovules, whereas those of *Magnolia* have never more than two. But although a difference in the number of ovules is thus considered sufficient to separate *Magnolia* from *Manglietia*, uniformity in the number of ovules is not considered necessary in the genus *Michelia*; some of the species of which have only two, while others have three or more, and one (*nilagirica*) has five or, according to some observers, as many as eight ovules. The mode of dehiscence of the individual carpels in the three genera just mentioned is dorsal; and the fact of ventral dehiscence (or of indehiscence) in a few species which otherwise have the characters of *Magnolia*, has been considered a sufficient reason for the formation of the genus *Talauma* for their reception. There is, in my opinion, more justification of the retention of *Talauma* which M. Baillon, however, would also reduce to *Magnolia*. I go so far with M. Baillon as to think that instead of keeping up the genera *Michelia* and *Manglietia*, it might be better to rearrange the species included in them as sections of the older genus *Magnolia*. In the following pages I have not, however, done anything of the kind. I have not only kept these old genera up, but I have added some species to each! This may be inconsistent; but it disturbs not synonymy, and it is really a matter of small importance whether (where large numbers of species have not to be dealt with) groups be treated as small independent genera, or as sections of one larger genus.

MAGNOLIACEAE.

Trees or shrubs, sometimes climbing, often aromatic, the wood-tissue with glandular markings. *Leaves* alternate, quite entire or toothed, stipulate or not. *Flowers* axillary or terminal, often showy, white, yellow or red; sometimes unisexual. *Sepals* and *petals* very deciduous, hypogynous, arranged in whorls of 3, rarely of 4. *Stamens* indefinite, hypogynous; filaments flattened or terete, free or monadelphous; anthers basifixed, adnate, the cells bursting longitudinally. *Carpels* indefinite, free or partly cohering in one whorl or in several, on an elongate axis; styles short or rarely long, stigmatose on the inner surface; ovules 2 or more, on the ventral suture, antrorse or amphitropous. *Fruit* baccate, or follicular, or of woody dehiscent carpels, which are sometimes arranged in a cone. *Seeds* solitary or few, sometimes pendulous from a long funicle; testa single and crustaceous, or double, the outer fleshy; albumen granular or fleshy and oily; embryo minute; cotyledons spreading; radicle short, blunt, next the hilum.

DISTRIB.—Chiefly natives of the tropical and temperate Asiatic mountains and United States; a few are Australian. Species about 60.

- TRIBE I. *Trochodendrace*.—Perianth absent. 1. *Euptelea*.
- TRIBE II. *Winterim*.—Shrubs or small trees. Stipules D. Carpels in one whorl. 2. *Illicium*.
- TRIBE III. *Magnolia*.—Erect shrubs or trees. Stipules conspicuous, D. involute and embracing¹ the half-bud, leciduoua. Carpels on an elongated axis.
- Carpels, when ripe, separating from the S.B.S. a carpophore and dehiscing ventrally. 3. *Talauma*.
- Carpels not separating from the carpophore, dehiscing dorsally.
- Carpophore usually sessile; carpels closely packed.
- Fruit elongate, Dyludric; DVUBS 2. 4. *Magnolia*.
- „ ovoid; DVUBS 5. 5. *Manglietia*.
- Carpophores stalked; carpels distant. B. *Micheha*.
- TRIBE IV. *Schizandrem*.—Climbing shrubs. Flowers unisexual. Leaves Bxstipulate.
- Carpels spicate. 7. *Schizandra*.
- „ capitata. g. *Kadsura*.

1. *Euptelea*, Sieb. and Zucc.

Shrubs. Leaves alternate, deciuous, toothed; petiole sheathing; stipules D. Flowers pedicelled, polygamo-dioecious. Sepals and petals D. Stamens 15—20, in one whorl. Carpels as many as the stamens, peicelled, obovate, much compressed, winged, indehiscent; stigma sessile, decurrent from the tip to opposite the insertion of the ovule. Fruit of indehiscent, dry, flat-winged, 1—4-seeded carpels. Seeds closely packed; testa hard, coriaceous; albumen granular; embryo minute. DISTRIB.—Two species: the following and a Japanese.

1. *E. PLEIOSPERMA*, Hook, fil *Sf Thwms. in Proc. Linn. Soc.* vii, 24D, t 2. Branches smooth, blotched with grey; leaf-buds enclosed in shining, dark-coloured scales. Leaves membranous, ovate-rotund, acute, serrate, narrowed to the base; above glabrous, beneath pale; nerves about 10 pairs, bold, oblique; length 3 to 5 in., breadth 25 to 35 in.; petiole 15 in., dilated at the base.—Hook. fil. *FL Brm Indm* i, 39.

Mishmi Hills, near the top of Mounb Thumathaga;—Griffith.

Except those collected by Griffith in 1837 [and they are rather imperfect], no specimens of this are extant; the figure which I give is therefore an incomplete one. This species does not differ very much from the only other as yet known, viz. *E. pvhjandra* Shb. *\$ Zucc. FL Japan* 134, t 72.

PLATE 3BA. *Euptelea pleiosperma*, Hook, fil *\$ Thorns*.—Twig with leaf-bud, leaf and fruit: of natural size.

2. *Illicilim*, Linn.

Evergreen aromatic shrubs or small trees. Leaves entire, pellucid-dotted. Flowers bisexual, solitary or fascicled, yellow or purplish. Sepals 3 to 5. Petals 4 or more,

3-to many-seriate, *Stamens* indefinite; filaments thick; anthers adnate, introrse. *Ovaries* indefinite, 1-seriate, 1-ovuled; style subulate, recurved. *Fruit* of spreading, compressed, hard follicles. *Seeds* compressed; testa hard, shining; albumen fleshy.

DISTRIB.—N. America, China, Indo-Malaya. Species about 10.

Carpels tapering to the apex, the beaks apical.

Petals thin, narrowly oblong, many times longer than the sepals . . . 1. *I. Manipurensis*.

Petals more or less fleshy, rotund, not much longer than the sepals.

Filaments about as long as the anthers.

Stamens 9 to 13; leaves often whorled . . . 2. *I. Cambodianum*.

Filaments shorter than the anthers.

Stamens 20 to 24; leaves lanceolate or elliptic-lanceolate 3. *I. Griffithii*

Stamens * * * * ; leaves obovate-oblong

or lanceolate . . . 4. *I. majus*.

Carpels clavate, their beaks sub-apical; flowers sessile; fruit pedunculate. 5. *I. Sunosii*.

1. *I. MANIPURENSE*, Watt MSS. in *Herb. Vale*, [in part]. A small tree (?), glabrous. *Leaves* coriaceous, rather broadly elliptic-oblong, shortly acuminate; the base cuneate; dull on both surfaces; the 6 or 7 pairs of nerves hardly visible; length 3½ to 4 in., breadth 1-5 in.; petiole from ½ to ¾ in. *Flowers* axillary, solitary, on slender pedicels nearly 1 in. long, bracteate at the base. *Sepals* 4 to 5, rotund. *Petals* membranous, about 18, much longer than the sepals, linear-oblong, blunt. *Stamens* about as many as the petals, shorter than the ovaries; the anthers oblong, blunt, about as long and as broad as the flat fleshy filaments. *Styles* much recurved. *Fruit* unknown.

Keyang and Ching Sow on the Manipur-Burmese frontier, at elevations of 7,000 to 9,000 feet,—Watt.

This is distinguished, amongst hitherto described Asiatic species, by its long pedicelled flowers with narrow spreading petals, in which respects it approaches the American *I. Fbridanum*.

PLATE 4DB. *Illicium Manipurensis*, Watt.—7, flowering branch; 8, flower dissected to show petals and stamens: of natural size; 9, bud; 10, flower; 11, anthers; 12, ovaries: enlarged.

2. *I. DAMBODIANUM*, Hance in *Journ. Bot.* 1876, p. 240. A small glabrous tree. *Leaves* opposite or in whorls of 3 or 4, coriaceous, oblanceolate or obovate-lanceolate, rarely lanceolate, acuminate, entire; length 3 to 4½ in., breadth 1 to 2 in.; petiole less than ½ in. *Flowers* red to white, ¼ in. in diam., on long, slender, axillary pedicels, solitary or in groups of 3 or 4. *Sepals* 3 or 4, rotund. *Petals* about 9, diminishing in size inwards, ovate-oblong, blunt. *Stamens* 9 to 13, in a single row; the filaments about as long as the anthers. *Follicles* 8 to 12, beaked, radiate.—*Pierre Fbre Forestiere de la Cochinchine*, t. 4; *King in Journ. As. Soc. Bmg*, vol. 53, pi. ii, 374.

Perak; in dense forests at elevations of from 3,000 to 7,000 feet.

There is some variability as to the shape and size of the sepals: sometimes they are triangular and much smaller than the petals, in other specimens they resemble the petals both in size and shape. The stamens also vary in number, but they never form more than a single row. The texture of the leaves in some plants is thin and membranous, in others almost coriaceous. It is possible there may be two species included in this.

PLATE 33B. *Illicium Dambodianum*, *Hance*.—1, flowering branch; 2, ripe fruit; 3, flower dissected: *of natural size*; 4, stamens, front and back; 5, circle of ovaries: *enlarged*.

3. I. GRIFFITHII, *Book, fit §r Thorns. Ft Ind.* 74; *Ft. Brit Ind.* i, 4D. A small glabrous tree; young branchlets with pale, shining bark. *Leaves* coriaceous, lanceolate or elliptic lanceolate, shortly acuminate; the edges slightly recurved when dry; thB base acute; upper surface shining, lower dull brown when dry; the 5 or 7 pairs of nerves obscure; length 2"5 to 3'5 in., breadth "9 to 1'4 in.; petiole about "5 in. *Flowers* solitary, axillary or terminal, pedicellate, '6 in, or more in diam.; the pedicels recurved, from -5 to 1 in. long. *Sepals* about 4 Dr 5, rotund, acute. *Petals* fleshy, about 18 or 2D, rotund, blunt, the more internal smaller. *Stamens* 20 to 24, erect, shorter than the 12 to 15 ovaries; filaments much shorter than the broad, blunt anthers. *Fruit* 1 in. in diam.; the individual carpels with a rather fleshy epicarp; endocarp woody, compressed; the style indurated and persistent and forming a terminal, sub-incurved, deltoid beak.—*Maxim. in Bull Acad. St. Petenb.* xxxii, 480.—*Illicium, Griff. Itin. Notes* 38, SO.—*Gordonia terminate*, *Wall. Cat* 7121.

Bhotan,—*Griffith*; Khasia Hills,—*Griffith, Hooker fil, Mann*; alt. 4,000 to 5,000 feet.

PLATE 43A. *Illicium Griffithii*, *Hook, fit fy Thorns*.—1, flowering branch; 2, sepals; 3, petals; 4, pedicel and ovaries; 5, ripe fruit: *of natural size*; 5, anther: *enlarged*/

4. I. MAJUS, *Booh fit § Thorns. Ft Brit Ind.* i, 4D. A small glabrous tree 3D feet high; branches rather stout. *Leaves* coriaceous, obovate-oblong or oblanceolate, sharply acuminate; above shining, below rather dull; nerves 9 to 12 pairs; length 4 to B in., breadth 1'5 to 2 in.; petiole 1 in. *Flowers* -5 in. in diam., pedicellate, sub-terminal' solitary or in fascicles; pedicels -75 to 1 in., lengthening in fruit. *Sepals* and *petals* orbicular, ciliate, the inner broadly oval. Filaments short and nearly as broad as the oblong anthers. *Ovaries* spreading. *Fruit* unknown.

Tenasserim in Burmah, alt. 5,500 feet, on the Thoung Gain Range,—*Lobb*.

The material of this at Kew consists of only two specimens from which the drawing I here give was made. The species is absent from the Calcutta Herbarium. The whorl of carpels represented in my figure may not belong to this species. It was kindly drawn by Mr. Hemsley, F.R.S., from a 10DSB specimen in the Kew Herbarium, from a different collector. It represents, however, the fruit accepted by pharmacubists as that of *I. majus*.

PLATE 39A. *Illicium majus*, *Hook, fit fy Thorns*.—1, flowering branch: *of natural size*; 2, flower; 3, stamens; 4, individual carpels: *enlarged*—drawn from a specimen in the Kew Herbarium; 5, whorl of carpels: *of natural size*—drawn from a loose specimen communicated by Mr. Holmes, of the Pharmaceutical Society, London, to the Kew Herbarium,

5. I. SIMONSII, *Maximowkz in Bull, Acad. Sc. St. Petersb.* xxxii, 483. A small glabrous tree; the young branches pale brown. *Leaves* thinly coriaceous, elliptic-lanceolate, acuminate at apex and base; lower surface dull brown; the 6 or 7 pairs of main nerves obscure; the midrib stout; length 35 to 45 in., breadth 1"2 to 1'5 in.; petiole •5 in. *Flowers* sub-sessile, crowded at the apices of the branches, "8 in. in diam. when expanded. *Sepals* about 4, rotund. *Petals* 1B to 18; the exterior broadly ovate, the

interior narrowly ovate to lanceolate. *Stamens* about 18 or 20, erect, equal; the anthers oblong, obtuse, twice as long as the filaments. *Fruit* ½ in. to 1 in. in diam., on a pedicel 1 in. long; the individual carpels clavate; the recurved styles subulate, persistent, sub-apical.

Assam; in the Naga Hills,—*Simons*.

PLATE 39B. *Illium Simonsii*, Maxim.—fig. 7, flowering branch; 8, flower (seen from below); 9, the same (from above); 10, flower dissected; 11, fruit of ovaries; 12, ripe fruit: of natural size; 13, anther; 14, ovaries; 15, individual carpels: enlarged.

3. *Talauma*, Juss.

Trees or shrubs. *Leaves* and inflorescence of *Magnolia*. *Sepals* 3 or 4, *Petals* 6 or 8 or more, in 2 or more whorls. *Stamens* very numerous, many-seriate; anthers linear, introrse. *Gynophore* sessile. *Ovaries* indefinite, 2-ovuled, spiked or capitate; stigmas distinct. *Carpels* woody, separating from the woody axis at the ventral suture, and dehiscing so as to leave the seeds suspended from the axis by an elastic cord; or spongy and indehiscent, confluent, but finally separating from the axis. *Seeds* of *Magnolia*.

DISTRIB.—Tropics of Eastern Asia, and South America; Japan. Species about 20.

Synopsis of species.

Sect. I.—EU-TALAUMA. Carpels woody, separating from the axis at, and dehiscing by, the ventral suture.

Leaves, branches and young fruit more or less tomentose 1. *T. lanigera*.
Glabrous.

Flowers not more than 15 in. long.

Flowers sub-globose; fruit globose-pyriform; carpels beaked 2. *T. Andamanica*.

Shrubby; flowers and fruit, ovoid; leaf-petioles and midribs
muriculate when dry; carpels with blunt sub-recurved beaks 3. *T. mutabilis*.

Arboreal; flowers and fruit ovoid; petioles slender, smooth;
carpels with stout, short, terminal beaks 4. *T. Kunsteri*.

Flowers 2 to 3 in. long.

Sepals and outer row of petals reflexed 5. *T. Rabaniana*.

Sepals and petals scarcely expanding 6. *T. Hodjoni*.

Sect. II.—SPONGOCARPUS. Carpels spongy or corky, indehiscent, confluent; each finally separating from the woody axis and leaving a fibrous framework.

Leaves elliptic 7. *T. spongocarpa*.

Leaves oblong-lanceolate 8. *T. phellocarpa*.

1. *T. LANIGERA*, Book. *fil. 8f Thorns. Fl. Br. Ind.* i, 40. A small tree; young leaves, petioles and branches, the peduncles, outer surface of the spathe involucre enveloping the calyx, the ovaries, and the young fruit densely fulvous-tomentose. *Leaves* sub-coriaceous, oblong or oblong-lanceolate, abruptly and shortly acuminate, narrowed at the base; when adult shining and glabrous except on the lower half of the midrib below; length of blade 9 to 12 in., breadth 2½ to 4 in.; petiole 1 to 1½ in., thickened below. *Sepals* and *petals* white, ovate, tomentose at the very base. *Ripe fruit* 3 to 4 in. long by 2 in. broad; the carpels glabrescent when quite ripe, beak 1½ in. long.—*King in Journ. As. Soc. Beng. vol. 58, pt. ii, 372.*

Perak and Malacca; in open forest on low hilla.

From Miguel's description of his *T. vilhsa* [*Fl. Ini. Bat. Suppl. 3BB*], that species and this must be very closely allied; and, if they are identical, Miguel's name, dating 1850, must take precedence of H. f. & T.'s, which was published in 1872.

PLATE 42. *Talauma lanigera*, *Hook. fil. Sif Thorns*.—1, young leaf and spathe hood; 2, adult leaf and young fruit; 3 and 4, flowers; 5, young fruit; 6, ripe fruit before separation of the individual carpels; 7, the same after their separation; 8, a single carpel: of natural size; 9, anthers: enlarged.

• 2. *T. ANDAMANICA*, *King in Journ. As. Soc. Beng. vol. 58, pt. ii, 372*. A glabrous shrub or small tree. *Leaves* sub-coriaceous, oblanceolate-oblong, rarely lanceolate; the apex (usually rather abruptly) acute, the base gradually narrowed to the petiole; both surfaces shining; main nerves 10 to 14 pairs, thin but prominent below; length of blade 7 to 10 in.; breadth 2.5 to 3.5 in.; petiole .5 to 1 in., expanded at the base. *Flowers* solitary, sub-globose, 1.5 in. long, on thick, terminal, annulate, pubescent peduncles 1 in. long; spathe hood of calyx glabrous. *Sepals* 3. *Petals* 6, ovate or obovate. *Ripe fruit* globose-pyriform, 1.5 in. long; the individual carpels rhomboid, .5 in. long and nearly as broad, beaked; seeds .4 in. long.—*Magnolia andamanica*, *King MSS*.

Andaman Islands, on Mount Harriet.

In leaf this closely resembles *T. Rabaniana*, *Hook. fil. & Thorns*., but has smaller flowers and fruit. The individual carpels of this are not more than a third the size of those of *T. Rabaniana*, which are more than 1 in. long and narrowly oblong and not rhomboidal.

PLATE 43. *Talauma andamanica*, *Eing.—l*, branch with fully developed flower; 2, a small flower spread out; 3, ripe fruit; 4, central axis with seeds attached by their podosperms; 5, single carpels, side and back views; B, seed,—all of natural size.

3. *T. MUTABILIS*, *Bl. FV. Jav. Magnol. p. 35, t. 10, 11, 12, fig. B*. A glabrous shrub. *Leaves* oblong-lanceolate, acute at either end, slightly unequal at the base, sub-coriaceous, shining on both surfaces; nerves about 12 pairs, spreading; length of blade 5 to 8 in., breadth 2.25 to 2.75 in.; petiole .75 to .9 in., thickened at the base, minutely muriculate when dry, as is the midrib. *Flowers* ovoid, solitary, terminal, on annulate peduncles about 1.5 in. long; spathe bract fuscous-villous. *Sepals* 3, broadly ovate. *Petals* 6, in 2 whorls, broader than the sepals, sometimes obovate, concave, connivent, passing from rosy-green to reddish-brown. *Ripe fruit* ovoid, 1.5 to 2 in. long, pubescent at first, ultimately glabrous; individual carpels rhomboid, lenticellate, with blunt sub-recurved beaks, .75 to 1.25 in. long.—*Korth. in Ned. Kruik. Arch, ii, 98; Hook. fil. Sif Thorns. Fl. Ind. i, 74; Hook. fil. Fl. Br. Ind. i, 40; Miq. Fl. Ind. Bat i, pt ii, 14; King in Journ. As. Soc. Beng. vol. 58, pt. ii, 373.—Manglietia Candolhi, Wall. Cat [not of Bl.]*.

In the Straits Settlements, in shady damp spots near water.

DISTRIB.—The Malayan Archipelago.

A very variable shrub of which Blume distinguishes three varieties. All the specimens I have seen from the Straits have glabrous leaves: but Blume and others describe the leaves as often pubescent or even pilose below.

PLATE 44. *Talauma mutabilis*, *Bl.—l*, branch with flower-bud; 2, fully developed flower; 3, ovary; 4, ripe fruit; 5, individual carpel, ripe; B, seeds: of natural size; 7, Stamens: slightly enlarged.

4. *T. KUNSTLERI*, *King in Journ. As. Soc. Beng. vol 58, pt ii, 373*. A tree, 25 to 30 feet high; glabrous, except the peduncle and unripe carpels. *Leaves* oblong-lanceolate, acuminate at base and apex, thinly coriaceous, both surfaces shining; nerves 10 to 14 pairs; length of blade 8 to 9 in., breadth 1.75 to 2.5 in.; petiole .5 to 1.25 in., slender; the base thickened. *Flowers* ovoid, terminal, solitary, scarcely expanding, .85 in. long; peduncles erect, pubescent, annulate, 1 in. long. *Sepals* 3 and *petals* 5, scarcely exceeding the stamens, broadly elliptic, fleshy, glabrous, waxy white. *Anthers* sessile, more than .5 in. long. *Pistils* 6 to 8, linear, pubescent. *Ripe fruit* ovoid, pointed, 2.25 in. long and .75 in. in diam.; individual carpels .75 to 1 in. long, with short, stout, terminal beaks.—*Magnolia Kunstleri*, *King MSS.*

Perak, in dense forest at elevations of from 3,500 to 4,000 feet.

PLATE 4113. *Talauma Kunstleri*, *King*.—fj, flowering branch; 7, flower-bud; 8, yDung and 9, mature fruit,—all of natural size.

5. *T. RABANIANA*, *Hook. fil 8f Thorns. FL Ind. 74*. A tall tree; young branches deciduously tawny-tomentose. *Leaves* coriaceous, elliptic-lanceolate to lanceolate, shortly and bluntly acuminate, much narrowed at the base, glabrous, shining and (when dry) conspicuously reticulate; nerves about 10 pairs; length 8 to 18 in., breadth 2.75 to 6.5 in.; petiole 1.25 to 2 in. *Flower** solitary, terminal, 2 to 2.5 in. long, Dn stout, annulate peduncles less than 1 in. long. Spathoid bract densely adpressed-fuscescent-tomentose. *Sepals* 3, sub-orbicular, rough externally. *Petals* 9, narrower than the sepals, concave, connate, the outer row reflexed after the fall of the sepals. *Fruit* unknown.—*Hook. Fl. Br. Ind. i, 40*.

Khasia Hills at elevations of about 4,000 feet.

PLATE 4ti. *Talauma Rabaniana*, *Hook. fil 8f Thorns*.—1, branch with fully-blown flower the sepals of which have fallen off; 2, flower-bud showing spathoid bract; 3, flower with sepals attached; 4, flower artificially opened up; 5 and 6, carpels and stamens,—all of natural size.

6. *T. HODGSONI*, *Hook. fil. § Thorns. FL Ind. 74*. A considerable tree; all parts glabrous except the puberulous young carpels; young branches very stout, lenticellate; the youngest glaucescent. *Leaves* thinly coriaceous, oblanceolate or lanceolate-oblong, sub-acute or obtuse, much narrowed toward the base; both surfaces shining; the reticulations distinct (when dry); nerves 15 to 20 pairs; length 8 to 20 in., breadth 3 to 5 in.; petiole 1.5 to 2.5 in., slender, with a thickened base. *Flowers* solitary, terminal, ovoid, scarcely expanding, about 3 in. long; peduncle thick with 2 or 3 rings, glabrous, .75 to 1 in. long. *Sepals* 3, ovate, obtuse, fleshy. *Petals* 6, like the sepals, the inner smaller. *Ovaries* forming a sub-globose cone much exceeding the stamens. *Fruit* ovoid, 4 to 5 in. long by about 3 in. in diam.; individual carpels numerous, warty when ripe, VBITUCDSB, narrowly and shortly beaked, nearly 1.5 in. long and (when dehiscent) .8 in. broad; the rachis woody, deeply pitted.—*Hook. fil FL Br. Ind. i, 74; Hook. fil and Uatch. III. Him. Plants, t. 6; Gamble Ind. Timb. 5.—Manglietia insipida*, Wall. *Cut. 933* (addition at p. 235), not of Blunze.—? *Mkheila macrophylla*, Don *Prod. FL Nepal 226*.

Sikkim; Khasia and Assam Hills; at elevations of 1,400 to 5,000 feet, very common. Nepal,—Wallivh ? Vern. " *Borumthuri*;¹

TALAUMA.

PLATE 47. *Talauma Hodgsoni*, Hook. *fit. Sf Thms.*-, flowering branch; 2, ripe fruit; 3, rachis of carpophore 4 and 5, individual carpels dehiscent, -^ */ natural m, (Partly copied from Hook. *JIL and Gatht. 111. Him. Plants, t 6.*)

*Sect. //-SPOKGOCAKPO**. Carpels spongy or corky, indehis[^] confluent; each separating when ripe from the cenLral woody axis and leaving the fibres cur^{ve}& process which attached it to the axis; seeds escaping by the decay of the carpels, sepals and petals about 12.

7. *T. SPONGOCARPA*, King, *n. *p.* A tr_{BB} 50 to 80 feet high; young branches minutely tawny-pubescent. *Leaves* thinly coriaceous, elliptic, gradually narrowed from about the middle to the acute apex; the base rather abruptly cuneate; the edges slightly and minutely waved in the upper half; upper surface shining, glabrous, except the rut.us-pubescent midrib; lower with sparse, sub-adpressed, white pubescence; main nerves 7 to 9 pairs, ascending, curving and intervehing freely at some distance from the margin; rather prominent beneath as are the intermediate nerves; reticulations minute, sharp and distinct on both surfaces (when dry); length of blade 5 to 6.5 in., breadth 2.0 to 3.5 in.; petiole 1 to 1.2 in., pubescent. *Flows* white, solitary, axillary, about 2.2 in. in diam. when expanded; pedicels stout, .5 to .6 in. long, pubescent like the young branches, annulate about the middle; spathoid hood of calyx tawny-pubescent; buds oblong, rather blunt; *sepals* and *petals* each 6, glabrous, oblong; the sepals obtuse when young, pointed when old: the petals shorter than the sepals and more pointed. *Stamens* about half as long as the gyncecium; the anthers with apical tails. Carpophore on a rather long woolly stalk; *ovaries* forming a narrowly cylindric conB, densely covered with white WDOI; the stigmas elongate, glabrous. *Fruit* sub-cylindric, rather blunt, much lenticillate, glabrous, 3 to 4 in. long and 1.3 in. in diam.; individual carpels cuneate, .75 in. long.

Upper Burmah, on Mymyo Hill; Calcutta Bitanic Garden collector No. 102.

The section *Spongocarpon* which I have ventured to form for the reception of the above two new species of *Tahuma* has the same kind of spongy, indehiscent carpels as Blume's genus *Aromadendron*-In&Ay reduced to a section of *Talauma* by Mr. Bentham and Sir J. D. Hooker. But in that the flowers are large; and the sepals and petals are numerous (28 to 36), whereaa in this their number is only 12.

PLATE 47 *Us.* *Talauma spongocarpa*, *Eiuc/-l*, flowering branch; 2, ripe fruit; 3, vertical section of same; 4, fibrous framework of the fruit after carpels have fallen; 5, flower dissected,—all of natural me; 6, anthers: enlarged.

8. *T. PHELLOCAEPA*, King, *n. sp.* A tree 60 to 80 feet high; young branches minutely cinereous-pubescent. *Leaves* thinly coriaceous, oblong-lanceolate, acute; the base cuneate; upper surface glabrous, sbining; the lower paler, dull, sparsely and minutely sub-adpressed-pubescent; main nerves 12 to 16 pairs, slightly prominent beneath when dry, ascending, interarching freely within the margin; reticulations minute, distinct on both surfaces; length of blade 4 to 6 in., breadth 1.3 to 2.15 in.; stipules narrowly oblong, about as long as the petioles, smooth; petiole .5 to .7 in., puberulous. *Fhwen* solitary, axillary,

3 $\frac{1}{2}$ 375 in. in diam. when fully expanded [buds not seen]; pedicela stout, with [^]eyeral rings, about '3 in. long, pubescent. Spathoid bract Dvaterotund, obtuse, glab_{RDU3}. *Sepals* and *petals* 12, yellowish-white, glabrous, oblanceolate, sub-acute; the inner smaj]er> *Stamens* slightly more than half ad long as the cylindric, glabrous gimcecium; styles rather thick, sub-recurved; anthers apiculate. *Fruit* sub-cylindric; its apex rather pointed; tr_e base rounded, glabrous, sparsely lenticellate, 3 to 4 in. long and about 1.25 in. in diam.; individual carpels cuneate, about '5 in. long,

Assam, Sibsagar district (Mr. S. Peal), where the vernacular name is *Korika sopa*; Mikir Hills,—Mr. G. Mann, who informs me that thB native nime there is *Tita sya*.

The special natr.es of the various kinds of *Soppa* seem to be rather loosely applied by the Assamese, and the term *soppa* is, moreover, not always confined to species of *Magnoliaceve*. This species was first collected by Mr. S. Peal of Sibsagar, who kindly sent me flowering specimens and drawings. The flowers much resemble those of *Michelia oblwa*, Wall., to which I was disposed to refer it. The receipt, however, from Mr. G. Mann of good fruiting specimens made it impossible any longer to think of it HA a *Michelia*. Mr. Mann's specimens were collected at some distance from Sibsagar. The species has, therefore, probably a wide distribution in the province.

PLATE 47 *ter*. *Talauma phellocarpa*, King.—1, flowering branch; 2, section of flower; 3, petal from outer row; 4, ripe fruit; 5, axis and its processes after the carpels have fallen,—all of natural size.

I here subjoin a description of a new species from Sumatra.

TALAUMA FDRBESII, King in *Journ. As. Soc. Beng.* vol. 5B, pt. ii, 373. A small tree or shrub; glabrous except the peduncles which are adpressed-villose. *Leaves* oblong-lanceolate, acuminate both at base and apex, green and shining on both surfaces, thinly coriaceous; nerves 12 to 15 pairs; length of blade 4'5 to B in., breadth 1 to 1.5 in. *Flowers* terminal, solitary, erect, .75 in. long, on stout peduncles. *Spathoid bract* of calyx densely covered with adpressed, fulvous, silky hair; buds pointed. *Sepals* and *petals* about equal in length, white, nearly glabrous. *Ripe fruit* 1.25 in. long; the individual carpels .B in. long, ovate, rugose, with short terminal beak. *Setis* '4 in. broad by '3 in. long; tha basa compressed.—*Magnolia Forbesii*^ King MSS.

Sumatra, on Kaiser's Peak, &c, at elevations of 5,000 to 6,500 feet. Forbes, Nos. 1853, 2DBB and 2204.

This resembles *T. pumila*, Bl., but its leaves are not glaucous beneath, and they have more nerves; moreover the flowers are smaller and not drooping, the petals ovate and not obovate, and the carpels are only about half the length of those of that species.

PLATE 45A. *Talauma Forbesii*, King_m—1, twig with ripe fruit; 2, bud with spathoid bxacj; 3, flower; 4, young fruit; 5 seeds,—ail of natural size.

4. *Magnolia*, Linn.

Trees or *Bhruba*. *Leaves* evergreen or deciduous; buds enveloped in the convolute stipules, which are connate in pairs. *Flowers* large, usually terminal. *Sepa*U 3. *Petals* 6

to 12, 2- to 4-seriate. *Stamens* numerous, many-seriate; filaments flat; anthers adnate, introrse. *Gynophore* sessile or shortly stalked. *Carpels* many, imbricated on a long axis; 2-ovuled, persistent; stigmas decurrent on the ventral suture. *Fruit* an elongated axis, with persistent, adnate, 1-2-seeded, dorsally dehiscent follicles. *Seeds* pendulous from the carpels by a long cord; outer walls of testa fleshy; albumen oily.

DISTRIB.—Temp. N. America, temp, and trop. E. Asia and Japan. Species about 18.

Synopsis of species.

Gynophore sessile.

RipB fruit oblong; carpBls with long, coriaceous, apical

beaks. 1. If. *ptrocarpa*.

RipB fruit ovoid-cylindric. 2. *M. globosa*.

RipB fruit narrowly cylindric, elongate.

Sepals and petals 12 to 15. 3. *M. Campbelii*.

Sepals and petals 9

L'arBls villous. 4. *M. Maingyi*L

„ smooth. 5. If. *Gustaci*.

Gynophore shortly stalked.

Lsavs 9 to 13 in. long, densely sericeous when young • 5. *M. Griffithii*.

6'5 to 8 in. long, pubescent when young . , • 7. If. *Pwliana*.

1. *M. PTERIDOCARPA*, *Ryxl. Vorom. PL* iii, 62, t 265. A large tree; the young parts adpressed-tawny-pilose; the branchlets annulated, ultimately all parts glabrous. *Leaves* coriaceous, obovate-oblong, sub-rhomboidal, narrowed to the rather obtuse apex, and much narrowed to the acute base; both surfaces glabrous when adult: the upper shining, the lower rather dull and darker in colour; the reticulations conspicuous (when dry); nerves 12 to 17 pairs, prominent beneath; length 8 to 16 in., breadth 4.5 to 6 in.; petiole 1 to 1.5 in., thickened at the base; stipule narrowly convolute, about 3 in. long. *Flowers* solitary, terminal, 3.5 in. in diam. when expanded (rarely expanding); the bud ovoid-rotund and enveloped in a rotund, concave, coriaceous, cinereous-pubescent, caducous, spathoid bract. *Peduncle* stout, 1.5 to 2 in. long (longer in fruit), with many rings, tawny-pubescent or glabrescent. *Sepals* 3, coriaceous, broadly oval or obovate, concave, reflexed, green externally, white within, caducous. *Petals* 6, like the sepals in shape but broader, fleshy, white. *Ovaries* in a conical head, exceeding the stamens. *Ripe fruit* oblong-conic, 5 to 7 in. long and 1.5 to 2.5 in. in diam.; individual carpels narrowly ovate, rugose, 6 in. long, with long, spreading, lanceolate, coriaceous, apical beaks almost twice as long as themselves. *Seeds* 1 Dr 2, with orange-coloured testa.—If. *sphenocarpa*, *Wall. Oat* 975 (p_m 27); *Book, fil \$ Thorns. Fl Ind.* 78; *Hook, fil FL Br. Ind.* i, 41.—*Linodendron grandiflorum*, *Roxb. Hort. Beng.* 43; *FL Ind.* ii, B54.—*Sphenocarpus*, *Wall, Cat* 970 *corny.*, p_m 238.—*Talauma Roxburghii* ff. *Don Gen. Syst* i, 85.

Forests tropical Himalaya from Nepal eastward; Assam Range, Khasia and Jaintia Hills; at low elevations. *Vern.* "Boramthuri soppa."

Dried specimens of this both in leaf and flower much resemble the much commoner *lalaum* *ffodgsoni*.

Pteridocarpa, *Roxb.*—1, branch with flower artificially expanded to show the parts; 2, bud with its spathoid involucre; 3, stamens and ovaries; 4, ripe fruit [of small]

2, II. *BLOBOSA*, Hook. *fil. if Thorns. FL Ind.* 77. A small tree; the young branches deciduously rufous-sericeous. *Leaves* membranous, ovate; the apex acute, or rounded and mucronate; the base rounded or minutely cordate; upper surface smooth, except the puberulous midrib; lower, especially when young, glaucous and sparsely covered with straggling rufous hairs; the midrib and 8 to 10 pairs of nerves rufous-sericeous; length 5 to 8 in., breadth 3 to 5 in.; petiole 1.5 to 1.75 in., rufous-tomentose, as is the narrow, 1.5 in. long, stipule. *Flowers* solitary, leaf-opposed, pedicellate, 4 or even 5 in. in diam.; the spathoid bract purple, fugaceous; pedicel 2.5 in. *Sepals* 3, obovate. *Petals* 6, like the sepals, but smaller. *Ripe fruit* ovoid-cylindric, 2.25 in. long; the individual carpel elongate, slightly rugose, with short, recurved, deciduous beak.

In Sikkim; at elevation of from 9 to 10,000 feet. The flower represented in the accompanying plate is a small one. Many flowers are found at least 2 in. more in diameter. Their usual colour is white.

PLATE 50. *Magnolia globosa*, Hook. *fil. if Thorns.*—1, flowering branch; 2, ripe fruit: of natural size.

3. *M. CAMPBELLII*, Hook. *fil. & Thorns. FL Ind.* 77. A large tree; the young branches glabrous, annulate. *Leaves* deciduous, membranous, Elliptic-oblong, sub-obovate to ovate, acute, slightly narrowed to the rounded or minutely cordate base; upper surface glabrous, the reticulations distinct (when dry); lower densely covered with pale tomentum when young, glabrous when adult, except the pubescent nerves and midrib; nerves 14 to 16 pairs; length 4 to 12 in., breadth 2 to 3 in.; petiole 1.75 in. *Stipules* pilose. *Flowers* solitary, terminal, 6 to 10 in. in diam.; when in bud enveloped in 2 or more broadly ovate, externally pilose, spathoid involucres. *Sepals* and *petals* 12 to 15, similar, broadly ovate to obdovate, the interior smaller. *Ripe fruit* cylindric, 8 to 10 in. long and about 1 in. in diam.; individual carpels 2-ovoid, obtuse, compressed, 1-2-seeded.—Hook. *fil. FL Br. Ind.* i, 41; Hook. *fil. and Cathart's Illust. Himal. Plants*, t. 4 and 5; Gamble *Ind. Timb.* 5. *Vern.* "Lai Champ."

Bhutan and Sikkim Himalaya, at elevations of from 8,000 to 10,000 feet.

This is in every respect one of the most superb trees of the semi-temperate forest zone of the Eastern Himalaya. Specimens of it, 150 feet in height, used to be common at the time of Sir Joseph Hooker's visit to the province in 1849: most of these larger examples have long since been converted into timber; for the wood is of excellent quality, and is known as "Lai Champ." The flowers are of the most lovely rose colour (occasionally they are white), and are sweetly scented. They appear while the plant is leafless, an arrangement which detracts much from their effectiveness.

PLATE 51. *Magnolia Campbellii*, Hook. *fil. & Thorns.*—1, flower-bud showing the spathoid involucre; 2, fully expanded flower: of natural size; 3, flower with calyx and corolla removed to show the stamens and spike of ovaries: enlarged. [Copied from Hooker *fil. if Cathart's Must. Himal. Plants*, t. 4 and 5.)

PLATE 52. Fig. 4, branch with young fruit; 5, ripe fruit; 6, spathoid bract; 7, seeds,—all of natural size.

4. *M. MAINGAYI*, King in *Journ. As. Soc. Beng.* vol. 53, pt. ii, 359. A tree; young branches and inflorescence densely clothed with pale shaggy hair. *Leaves* membranous, oblanceolate-oblong or obovate, acuminate, narrowed to the rounded base; upper surface glabrous, the lower glaucous; the midrib sparsely villous; nerves 16 to 20 pairs; length

of blade 6 to 8 in., breadth 2.5 to 3 in.; petioles .3 in. *Flowers* terminal, solitary, shortly pedunculate; buds ovoid; the spathoid bract villous like the pedicel. *Sepals* 3, oblong. *Petals* about 5, of the same shape as the sepals, but smaller, yellowish-white, glabrous, 1 to 1.3 in. long. *Ovaries* villous. *Ripe fruit* cylindric, 1.5 in. long by .6 in. diam.; the individual carpels ovoid, not beaked, .35 in. long, villous.

Malacca (Maingay No. 17); Perak; Penang; in dense low forest up to 2,500 feet.

PLATE 45B. *Magnolia Maingayi*, King.—5, branch with flower; 7, leaf stipules; 8, flower-bud; 9, anthers; 10, ripe fruit,—all of natural size.

5. *M. GUSTAVI*, *Einri*, n. sp. A tall tree; all parts quite glabrous; the branchlets slender, dark, not lenticellate. *Leaves* membranous, oblong-lanceolate or oblanceolate, acuminate; the base much narrowed, unequal; upper surface shining; the lower dull, subglaucous; the minute reticulations distinct on both; nerves 10 to 14 pairs; length 5 to 7 in., breadth 1.5 to 1.75 in.; petiole .25 in. Stipules not seen. *Flowers* terminal and axillary, solitary, on slender peduncles 1.5 to 2 in. long, 3 to 4 in. in diam. when fully expanded; buds oblong-ovoid, 1.25 in. long; spathoid bract broadly ovoid, coriaceous, smooth. *Sepals* and *petals* 9, nearly equal in size, oblanceolate, blunt; the petals coriaceous, the sepals membranous. *Stamens* little more than .5 in. long, much shorter than the densely imbricate gynoecium. *Ovaries* sessile, smooth; the styles recurved. *Fruit* (even when half-ripe) clavate (from the abortion of the lower ovaries); when ripe, 2.5 to 3.5 in. long and 1.5 in. in diam.; individual carpels very little compressed, sub-orbicular, not beaked, sessile, glabrous, about .75 in. long.—*Miehelia Gustavi*, King MSS.

Makum Forest, Upper Assam, at elevations of 1,000 to 2,000 feet,—ff. Mann.

A species hitherto found only by Mr. Gustav Mann in the botanically little-known Makum Forest in Assam, and named in his honour. It approaches *Miehelia Cathcartii*, Hook. fil. & Thorns., very closely in many respects, and notably in its leaves, which are, however, longer and have minuter reticulations than those of *M. Cathcartii*, and at all ages are glabrous. There is also great similarity in the flowers of the two plants; but the sepals and petals of *Magnolia Gustavi* are narrower, and the stamens are much shorter than the same organs in *Miehelia Gustavi*. This moreover has no gynophore. *Magnolia Gustavi*, is found at quite low elevations (1,000 to 2,000 feet); whereas *Miehelia Cathcartii* never occurs lower than 5,000 and it ascends to 7,000 feet.

PLATE 46. *Magnolia Gustavi*, King.—1, branch with fully expanded flower; 2 and 3, buds enclosed in their spathoid bracts; 4, half-opened bud; 5, gynoecium; 7, twig with very young fruit; 8, fruit at an older stage; 9, ripe fruit: of natural size; B, stamens: slightly enlarged.

6. *M. GRIFFITHII*, *Hool* fil. 6f *Thorns. Fl. Br. Ind.* i, 41. A large tree; the young branches densely covered with deciduous, yellowish, silky hair. *Leaves* sub-coriaceous, elliptic-oblong or elliptic, very shortly acuminate, minutely undulate; the base sub-acute; upper surface smooth, except the sometimes pubescent midrib; the reticulations minute, distinct (when dry); lower surface at first sericeous-tomentose, finally pubescent or glabrous; nerves 10 to 20 pairs, rather prominent beneath; length 9 to 13 in., breadth 4 to 5 in.; petiole .75 in., stout; stipules narrow, 4 in. long, externally sericeous. *Flowers* solitary, leaf-opposed, 3.5 in. in diam. when fully expanded. The buds enveloped in a spathoid bract, which, like the pedicel, is covered with whitish, silky, appressed hair; pedicel 1.5 to 2 in. long. *Sepals* 3, narrowly oblong, obtuse; *petals* 6, like the sepals

but smaller; *gynoecium* much longer than *filament* stamens, vermicular. *Ripe fruit* 3.5 to 6 in. long; individual carpels without beaks, 1.5 in. long and nearly as broad, rugose externally, 1- rarely 2-seeded.

Assam, near Sadya,—*Griffith*; Sibsagar,—*S. E. Peal*; Makum Forest, Rengma-Naga and Mikir Hills,—*G. Mann*; Sylhet,—*Wallüh*; Cachar,—*E. Mann*. *Vern.* "*Bor Gahori Soppa*"

Sir Joseph Hooker described this species from the imperfect material in the Griffithian collection, and he expressed a doubt whether it might not be a *Manglietia*. Through the kindness of Mr. S. E. Peal, a resident in the Sibsagar district of Assam, I have been furnished not only with excellent specimens, but with notes and drawings made by himself from fresh flowers. I have also received very full materials from Mr. G. Mann. I am thus able to state that the ovaries have only two ovules, and that the plant is therefore not a *Manglietia* (which has six ovules). There is a very distinct stalk to the gynophore, at least after the ovaries have been impregnated. The presence of a stalk to the gynophore therefore loses its value as a diagnostic mark of the genus *Michelia*. This appears to me to be in the order *Magnoliaceae*, rather an insufficient generic distinction; and in my humble opinion the two genera, although both are Linnæan, should be merged in one, and *Michelia*, being the later of the two, should be reduced. Two sets of specimens, collected respectively by Mr. Mann in the Katakul Forest, Dachar, and in the Makum Forest, Upper Assam, which apparently belong to this species, have leaves quite glabrous.

PLATE 48. *Magnolia Griffithii*, Hook. fil. & Thorns.—1, young leaf with stipule; 2, flower-bud enveloped in its spathe involucre; 3, fully expanded flower; 4, stamens and carpophore; 5, carpophore further advanced and showing a stalk; 6, ripe fruit: of natural size.

PLATE 49. Adult leaves, and fruit after dehiscence of its carpels: of natural size.

7. *M. PEALIANA*, King, n. sp. A tall tree; young branches rather slender, at first densely covered with adpressed, pale yellow, silky hair, but speedily glabrous. *Leaves* thinly coriaceous, oblong-elliptic, sometimes slightly obovate, shortly and abruptly acuminate, both surfaces minutely but distinctly reticulate: the upper shining, glabrous; the lower at first puberulous, but quickly becoming glabrous; main nerves 15 to 18 pairs, prominent beneath, ascending, curving, interarching freely towards the apices; length 6.5 to 8 in., breadth 2.5 to 3 in.; petiole 2 to 2.5 in.; stipules very narrow, 1.25 in. long, sericeous outside. *Flowers* solitary, leaf-opposed, on long peduncles, 3 to 4 in. in diam. when fully expanded; *filament* buds covered by a pointed spathe involucre which, like the pedicel and stipules, is covered with pale yellow, adpressed, silky hair; pedicel 1.5 in. long, half an inch longer in fruit. *Sepals* 3, coriaceous, linear-oblong, sub-acute; the edges slightly undulate near the apex. *Petals* 5, of the same shape and texture as, but smaller than, the sepals; *gynoecium* more than twice as long as the stamens, cylindric. *Fruit* 3 to 5 in. long and about 1.5 in. in diam.; individual carpels 1.5 in. long by about 1.25 in. broad, outside slightly lenticellate, inside smooth and shining; seeds 2. *Mivhelia Pealiana*, King MSS.

Assam, Makum Forest,—*G. Mann*. *Vern.* *Gahori Soppa*.

This species has been named in honour of Mr. S. Peal, of Sibsagar, who has given much friendly help in working out the Magnoliads of Assam. It is closely allied to *M. Griffithii*, Hook. fil. & Thorns., and, as in that species, there is a distinct

though short, stalk to the gynophore. It is best distinguished from *M. Griffithii* by the smaller size of its leaves, which, moreover, are at most puberulous even when young, whereas those of *M. Griffithii* are densely sericeous when young.

PLATE 59. *Magnolia Pealiana*, King.—1, branch with flower; 2, bud; 3, flower dissected to show all the parts; 4, gynoeceum; 6, ripe fruit; 7, seeds: of natural size; 5, stamens: enlarged.

5. Manglietia, Blume.

Trees; foliage and inflorescence of *Magnolia*. Sepals 3. Petals 6 or more, 2- or more seriate. Stamens very numerous, many-seriate; anthers linear, adnate, introrse. Gynophore sessile. Ovaries many, cohering in an ovoid head; stigma decurrent on the ventral suture; ovules 5 or more. Fruit ovoid; carpels persistent, dehiscing dorsally. Seeds as in *Magnolia*. DISTRIB.—Mountains of tropical Asia. Species 5.

Synopsis of species.

Shrubby.

Young branches and petioles villous; spathoid hood of calyx fulvous-sericeous. 1. if. *Sebassa*.

Arboreous.

Flowers 3 to 5 in. in diam.

Leaves oblanceolate to lanceolate-oblong, 4½ to 7 in. long; flowers 4 to 5 in. in diam.; carpels 3- to 4-angled. 2. if. *insignis*.

Leaves elliptic or elliptic-oblong, 4 to 10 in. long; flowers 4 in. in diam.; carpels 1-3-angled. 3. if. *Caveana*.

Leaves oval or obovate-oblong, 5 to 7 in. long; flowers 3 in. in diam.; carpels 2-angled. 4. if. *glauca*.

Flowers less than 1 in. in diam.

Leaves lanceolate, rufous-pubescent beneath. 5. if. *Kunstleri*.

1. *M. SEBASSA*, Miy. Ann. Mus. Lugd. Bat. iv, 71. A shrub; adult branches with pale shining bark; young tawny-villous, as are the petioles. Leaves coriaceous, oblanceolate, acute, much narrowed at the base, glabrous and shining on both surfaces, bullate; nerves 14 to 20 pairs, prominent; length of blade 11 to 14 in., breadth 4-5 to 7 in.; petiole 1 in., much thickened at base. Flowers solitary, terminal, on villous peduncles 2 to 3 in. long. Spathoid bract densely adpressed-fulvous-sericeous. Sepals and petals about 9, fleshy, pale yellow, from obovate to oblong, abruptly contracted into a claw at the base, nearly 2 in. long. Stamens with very stout filaments. Pistils about 20. Bipe carpels [fide Miquel] oblong, lenticellate.—Miq. FL Ind. Bat. Suppl. 357; King in Journ. As. Soc. Beng. vol. 58, pt. ii, 37D.

Perak,—Kunstler; in dense jungle, at elevations of about 1,500 feet: only Druce collected.

DISTRIB.—Sumatra.

The specimens collected by the late Mr. Kunstler are without fruit. They agree in other respects with the Sumatran specimens on which Miquel founded the species.

PLATE 54. *Manglietia Sebassa*, Miq.—Flowering branch: of natural size.

2. *M. INSIGNIS*, Bl. FL Java Magnol 23. A large tree; leaf-buds, young branches, petioles, and pedicels fulvous pubescent; all other parts glabrous; branches annulate. Leaves thinly coriaceous, oblanceolate to lanceolate-oblong or elliptic, acute or shortly

acuminate, narrowed gradually from the middle to the base; reticulations minute, distinct; upper surface shining, lower pale dull, sub-glaucous; nerves 12 to 15 pairs, not much more prominent than the secondary nerves; length 4-5 to 7 in. [9 in. in var. *anyustifolia*], breadth 2 to 3 in.; petiole .75 to 1.25 in. Stipules 12 in., cinnamonous-pilose. Flowers solitary, axillary or terminal; when fully open 4 to 5 in. in diam.; buds ovoid-cylindric, 2 in. long; spathoid bract smooth, glaucous. Sepals 3, oblanceolate or oblong, obtuse, reflexed. Petals 9; the outer larger than, but like, the sepals in form, the inner smaller; column of ovaries exceeding the stamens. Ripe fruit ovoid-oblong, obtuse, 3 to 5 in. long; individual carpels compressed, ovate-oblong, with short blunt beaks, .5 to .75 in. long, dehiscing dorsally; seeds 3 or 4.—*Hook. fil. & Thorns. FL Ind.* 7B; *Bot. fil. FL Br. Ind.* i, 42.—*Magnolia insignis*, *Wall Tent FL Nep.* 3, t 1; *FL As. Bar.* 78, l. 1K2; *Cat* 973 (in part).

Nepal; Sikkim; Assam and Khasia ranges from 3000 to 6000 feet. Rengma-Naga Hills,—ff. *Mann. Vern. "Fhul Soppa."*

In Sikkim this species is rare; it has, so far as I know, been found there only on the Singa-Ie-la spur.

A very tall, handsome tree; the petals whitish-yellow, tinged with pink, or pure white; the calyx dull red with greenish veins. The ripe fruit is erect, of a purple colour, the suspended seeds being scarlet. There is considerable variability in the shape of the leaves. Wallich, who had living trees under observation during his residence in Nepal, says that on the older branches of the same tree the leaves tend to the elliptic form; on luxuriant branches they are more elongate and oblanceolate. The vernacular name in the Naga Hills is [I am informed by Mr. S. E. Peal, of Sibsagar] *Phul Soppa*, and trees there often attain a girth of 12 or 14 feet.

VAR. *angustifolia*: leaves 3 to 9 in. long by 1 to 2 in. broad.

Khasia and Assam.

Only leaf specimens of this variety are known as yet. It may probably prove to be a distinct species.

PLATE 55. *Manglietia insignis*, BL—1, branch with newly-opened flower; 2, flower showing the reflexed sepals; 3, flower-bud; 4, section of flower; 5, ripe fruit,—all of natural size. [Partly copied from *Wallkts Tentamen Florae Nepalensis*.] Unfortunately the branch selected for figuring has not very characteristic leaves. They are a good deal broader than is usual.

3. 11. CAVEANA, *Hook. fil. & Thorns. FL Ind.* 7B. A large tree, glabrous in all its parts; young branches dark-coloured, annulate. Leaves thinly coriaceous, elliptic or elliptic-oblong, slightly obovate; the apex shortly and abruptly acuminate, slightly narrowed at the base; both surfaces minutely and distinctly reticulate: the upper shining, the lower rather dull and slightly paler; main nerves 13 to 15 pairs, spreading, thin, but distinct when dry; length 8 to 10 in., breadth 3.2 to 3.8 in.; petiole 1.25 in., slender. Flowers solitary, axillary, when fully open 4 in. in diam.; buds narrowly ovoid or cylindric, 2 in. long; spathoid bract smooth, sub-glaucous. Sepals 3, oblanceolate, obtuse; the edges undulate. Petals 7 to 9, the outer larger than the inner, but all smaller than the sepals and of the same shape; column of ovaries much longer than the stamens. Ripe fruit ovoid, blunt, 2.5 to 3 in. long; individual carpels much compressed, shortly and bluntly beaked, profusely lenticellate on the back, smooth inside, 1-seeded, .75 in. long.—*Hook. fil. FL Br. Ind.* i, 42.

Khasia Hills: at elevations of from 2,000 to 3,000 feet,—*Hook, fil. \$ Thorns.*; at 3,500 feet,—(7. *Mann*; Assam, in the Makum Forest, Lukimpore District,—(? *Mann*.

Mr. Mann describes this as a tree attaining, in the Khasia Hills, a girth of 10 feet. It is closely allied to *M. insignis*, Bl., but differs from that species by its larger leaves and 1-seeded carpels. In my own opinion it would be better treated as a variety of *insignis*. The vernacular name is the same as for the last, viz. "Phul Soppa."

PLATE 57. *Manglietia Caveana*, *Hook, fil. if Thorns.*—Branch with nearly ripe fruit: of natural size. 1, section of a ripe carpel: slightly enlarged; 2, seed: considerably enlarged.

PLATE 57 bis. *Manglietia Caveana*, *Hook, fil. 6f Thorns.*—Branch with bud. 1, flower artificially opened, and 2, ripe fruit,—all of natural size. [NOTE.—The stamens have been removed from the flower in order to show the whole of the gynvecium.]

4. *M. GLAUCA*, *Bl. Bat Verh.* ix, 149. A tall glabrous tree. *Leaves* coriaceous, oval or obovate-oblong, slightly acuminate; the edges slightly recurved when dry, glaucescent beneath; nerves 12 to 14 pairs, not prominent; length of blade 5 to 7 in., breadth 2½ to 3 in.; petiole 75 to 15 in. *Flowers* about 3 in. in diam., terminal, solitary, on annulate peduncles 1 to 15 in. long, yellowish. Spathoid bract broadly orate, glabrous. *Sepals* and *petals* 9, greenish-yellow, oblong, sub-acute, those internal smaller. *Filaments* short. *Pistils* numerous. *Ripe fruit* ovoid, the size of a hen's egg, glabrous; carpels 2-seeded. *Seed* with a red fleshy arillus.—*Bi/dr.* 8; *FL Jav. Mat/nol* 22, t 5; *Miq. FL Ind. Bat i, pt 2, p. 15*; *King in Jmnn. As. Soo. Beng, vol. 58, pj.*

Perak at 3,000 feet.

DISTRIB.—Java.

PLATE 56. *Manglietia glauca*, *Bl.*—Branch with bud, flower and young fruit. 1, young flower-bud; 2, stamens and ovaries; 4, ovaries after fertilization; G, young fruit: of natural size; 3, stamen, inner face; 5, vertical section of carpophore; 7, single carpel-enlarged. (Partly copied from *Blume's Flora Javce.*)

5. *M. SUOKTECHINI*, *King in Journ. As. Soc. Bmg. vol. 58, pt. ii, 370*. A tree—the young branches, stipules and under surfaces of the leaves, minutely rufous-pubescent. *Leaves* thinly coriaceous, lanceolate, narrowed to base and apex, the latter sub-acute; upper surface shining; reticulations minute, distinct on both surfaces; nerves about 12 pairs; length of blade 35 to 4 in., breadth 1-25 in.; petiole 3 to 11 in. J W, rather IBM than 1 in. m diam., solitary, axillary, on annulated pedicels shorter than the petioles; stipular hood rufous, silky. *Sepals* and *petal** about W, similar 5 in W W r-lanceolate. *Stamens* linear. *Fruit* ovoid (young 5 in. long), on a short gynophor^u, rufous-pubescent. *Carpels* 6 to *S.-Magmlia Scortechini*, *King MSS.*

Perak,—*Father Scortechini*.

The only specimens of this have unripe fruit. The ovaries have only 1 Ovule but apparently it is a *Manglietia*, and I therefore put it into this genus provisionally. The all of the 8, hiding on the upper surface, and small axillary flowers mark it as distinct from any other Indo-Malayan *Magnolia*.*

ofn^J^' M-Slietia Sc.rtehiuii, ^ ^ . - ^ 2, flowering branches; 3, unripe fruit:

6. *Michelia*, Linn.

TrBBS. *Leaves* as in *Magnolia*. *Flowers* axillary, solitary or terminal *Sepals* and *petals* similar, D to 15 or more, 3- or more-seriate. *Stamens* as in *Magnolia*. Gynophore stalked. *Carpels* in a loose spike; stigma decurrent; ovules 2 or more. *Fruit* a niDrs or less lax elongate spike of coriaceous dorsally dehiscent carpels. *Seeds* of *Magnolia*.

DISTRIB.—About 1B species; temp, and trop. mountains of India.

*Synopsis of the species.***Carpels numerous.**

Flowers mostly terminal. 1.1/. *Cathcartii*/

Flowers axillary.**Young parts, spathe bracts, and stipules pubescent.**

Leaves underneath densely covered with grey tomentum, BVBO

when adult. 2. *M. lanuginosa*.

Leaves and young parts densely rufous-tomentose, ultimately

glabrous; flower 4 to 5 in. in diam., white 3. if. *excefa*.

LBavDS Df ten with grBy pubescence beneath.

Leaves morB than 4 in. long; flower yellow. 4. *M. Ckampaca*.^J

„ 2 to 4 in. long; flower white 5. *M. nilagiriva*.

Leaves glabrous.

Flowers 1 to 1.5 in. in diam., pale yellow; bavBS with

roundel bases. B. *M. kuopa*.

Flowers 1 "25 to 1.5 in. in diam., white; petals Dbvato-

cuneate; leaves acute at the base. 7. if. *pwiduana*.

All parts quite glabrous.

FloWBrS 3 to 4 in. in diam.; petals linear-lanceolate or

oblong-lanceolate; leaves thinly coriaceous, obovate-oblong . 8. *M. oblonga*.

Flowers about 3 in. in diam.; sepals small, linear; petals

oblong-lanceolate; leaves coriaceous, obovate-elliptic, blunt . 9. *M. Mannii*.

Carpels only 2 Dr 3, often solitary, very large. 10. if. *montana*.

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1. *M. DATHDARTII*, Hook. fil. *6f Thorns. Fl. Ind.* 79- A tall tree; the young branches, peduncles, and midribs of leaves on both surfaces finely sericeous, but ultimately glabrous; other parts glabrous. *Leaves* thinly coriaceous, shining, oblong-lanceolate, acuminate; the base slightly narrowed or rounded; reticulations distinct on both surfaces, rather fine; nerves 10 to 13 pairs, thin, forming wide intra-marginal arches; length 3 to 5 in., breadth 1.25 to 1.75 in.; petiole 1.25 in.; stipules narrow, sericeous, .6 to .75 in. long. *Flowers* usually terminal, solitary, pedicellate, when fully open 3 to 4 in. in diam., white; buds oblong, blunt; peduncle 1 in. long. *Sepals* and *petals* 9, oblong, obtuse, the inner narrower. *Stamens* more than 1 in. long. *Column of ovaries* densely imbricate, narrow, shorter than the stamens. *Fruit* cylindric, 3 to 4 in. long and .75 in. in diam. when ripe; individual carpels sessile, compressed, sub-orbicular, beaked when young, but not when ripe; the wall thin, woody, lenticellate externally, .35 in. across; *seeds* 2 or 3.—Hook, fil. *III Him. FL*, t. 7; *FL Br. Ind.* i, 42; *Gamble Ind. Timb.* B.

Sikkim Himalaya, alt. 5,000 to 7,000 feet, common. Assam, Naga Hills,—Watt, Prain.

PLATE 60. *Michelia Dathcartii*, Hook, *fil Sf Thorns*.—1; branch with flower-bud; 2, fully expanded flower; 3, 4 and 5, carpels in various stages: *of natural size*; 6, anthophore with the stamens removed and carpophore; 7, stamens: *enlarged*. [*Partly copied from Hook, fil Sf Cathc. Ill Him. Plants.*)]

2. *M. LANUGINOSA*, Wall *Tent. Fl. Nep.* 3, *t* 5; *Cat* B493. A tall tree; the young parts, petioles, the under surfaces of the adult leaves, stipules, and spathoid bracts densely covered with pale grey tomentum. *Leaves* sub-coriaceous, oblong or lanceolate, acute; the base acute or rounded; upper surface glabrous; the reticulations minute but distinct; nerves 14 to 17 pairs, prominent beneath; length 5 to 9 in., breadth 2.5 to 3 in.; petiole .75 in.; stipules narrowly oblong, 1 to 2 in. long. *Flowers* solitary, axillary, shortly pedunculate, when expanded 2.5 to 3 in. in diam.; buds oblong, .125 in. long; spathoid bracts 2, oblong, densely sericeous-tomentose externally; peduncle .2 in. thick. *Sepals* and *petals* varying from 12 to 18, oblanceolate; the inner smaller, yellowish-white. *Stamens* shorter than gynoecium, very caducous. *Ovaries* densely lanate; the styles glabrous. *Fruit* 4 to 5 in. long; individual carpels distant, shortly stalked, obovoid-compressed, woody, lenticellate, not beaked, .6 to 1 in. long; *seeds* 1 or 2, large.—*Wight III* i, 14 j [*look, fil Sf Thorns. Fl. Ind.* 80; *Hook, fil Fl. Br. Ind.* i, 43; *Gamble Ind. Timb.* 7.—*M. velutina*, DC. *Prod.* i, 79.

Temperate Himalaya, Nepal to Bhotan, alt. 5,000 to 7,000 feet; Khasia Hills.

This species has a grey soft wood not so useful for building as that of some of the other species. Its Nepalese name is *Gogay Champ*.

PLATE 62. *Michelia lanuginosa*, Wall.—1, flowering branch; 2, young leaf and stipule; 3, ripe fruit,—*all of natural size*.

3. *M. EXCELSA*, Bl *Fl Jav. Magnol* 9. A large tree; the young parts densely covered with brown ferrugineous tomentum; the branchlets stout, dark, lenticellate. *Leaves* thinly coriaceous, ovate-elliptic to oblong or oblong-lanceolate, acute; the base slightly narrowed or rounded; upper surface when adult shining, glabrous; the lower glaucous, silky brown when young, glabrescent and dull when old; nerves 7 to 8 pairs, thin but prominent on the lower surface; the reticulations distinct on both; length 5 to 8 in., breadth 2 to 3.5 in.; petiole .75 to 1 in. *Stipules* oblong, acuminate, sericeous externally, 1.5 to 2 in. long. *Flowers* white, sub-sessile, axillary, solitary, when fully open 4 to 5 in. in diam.; buds ovoid-cylindric, 2 in. long; spathoid bracts oblong, brown, densely silky-tomentose outside. *Sepals* and *petals* 12, white, obovate-spathulate, the inner smaller. *Stamens* much shorter than the gynoecium. *Fruit* 4.5 to 8 in. long; individual carpels rather distant, obliquely ovoid, shortly beaked, .4 to .6 in. long, thinly woody, 1- to 2-seeded.—*Wight III* i, 14; *Hook fil Sf Thorns. Fl. Ind.* 80; *Hook, fil Fl. Br. Ind.* i, 43; *Gamble Ind. Timb.* 6; *Griff. Ic.* iv, 655.—*Magnolia excelsa*, Wall *Tent Fl. Nep.* 5, *t* 2; *Cat.* 6494.

Temperate Himalaya from Nepal to Bhotan, alt. 5,000 to 8,000 feet; Khasia Hills.

The wood of this, although soft, is very durable, and is largely used for building. It is known to the Nepalese as *Bara* or *safed Champ*.

PLATE 53. *Michelia excelsa*, Bl.—1, branch with flower-buds enclosed in their spathoid bracts; 2, expanded flower; 3, stamen; 4, gynoecium; 5, ripe fruit *of small size*; 6, carpel; 7, seeds,—*all of natural size*.

4. *W. DHAMPADA*, Linn. A tall tree; the branchlets pubescent. *Leaves* membranous, ovate-lanceolate, acuminate, rather abruptly narrowed to the base, shining above, pale and glabrous or puberulous beneath; main nerve thin, 12 to 15 pairs; length of blade 4.5 to 9 in., breadth 2.5 to 3.5 in.; petiole 1 to 1.5 in. *Flowers* yellow, solitary, axillary or terminal, shortly pedunculate; bud narrowly ovoid; the spathe bract silky. *Sepals* oblong. *Petals* about 1.5, narrowly oblong, 1 in. long. *Ripe fruit* 3 to 4 in. long; individual carpels ovoid, lenticellate, woody.—*DO. Prodr.* i, 79; *Roxb. Fl. Ind.* ii, 556; *W. Sp. Pl.* i, 103; *Wight III* i, 13; *Wall. Cat.* 959 except K; *Blume Fl. Jav. Magnol.* t i; *Bijdr.* 7; *Hook. fil. Thorns. Fl. Ind.* 79; *Hook. fil. Fl. Br. Ind.* i, 42; *Miq. Fl. Ind. Bit.* i, pt. ii, 1B; *(Rumbl. Ind. Timb.)* 5; *Brandt's For. Flora* 3, t 1; *King in Journ. As. Soc. Beng.* vol. 53, pt. ii, 371.—*M. rufinervis*, *DO. I c.* 79; *Bl. Bijdr.* 8.—*M. daddasapa*, *Ham. ex DO. I v.*; *Don Prodr.* 22B; *Wall. Tent. Fl. Nep.*, t 3; *Wight III* 13; *Wall. Cat.* 971.—*M. aurantiaca*, *Wall. Cat.* 64, 92; *Plant. As. Rar.* t 147; *Wight III* VI.—*M. rheedi*, *Wight III* 14, t. 5, f. 5.—*M. pubinervis*, *Bl. Fl. Jav. Magnol.* p. 14,

India; sub-temperate forests in the Straits Settlements, but not common.

A tree much esteemed on account of the sweetness of its flowers, and often planted near Jain and Hindu temples. This is the "Uthamp" par excellence: its wood is very durable, and is useful for cabinet work as well as for building.

PLATE 64. *Michelia Champaca*, Linn.—1, flowering branch; 2, flower fully expanded; 3, spathe bract; 4, gynoecium; 5, stamen; 6, ripe fruit: of natural size; 7, stamen; 8, ovary: enlarged.

5. *M. NILAGIRICA*, Zenk. *Pl. Ind.* t 3D. A tree or large shrub; young branches, stipules, peduncles and spathe bracts pale-sericeous. *Leaves* elliptic, obovate-elliptic or oblanceolate, acute or very shortly acuminate, narrowed to the petiole, puberulous on the midrib, otherwise glabrous; upper surface shining, lower dull; reticulation open, distinct; main nerves 7 to 9 pairs, thin; length 2 to 4 in., breadth 1 to 2 in.; petiole .5 to .75 in.; stipules equal to the petioles, sericeous, narrowly oblong. *Flowers* axillary, solitary, shortly pedunculate, 3 to 4 in. in diam., white; buds ovoid, pointed, .5 in. to 1 in.; spathe bracts ovate-rotund, pale-sericeous; peduncles thick, .25 in. long. *Sepals* and *petals* 9 to 12, white, oblanceolate, the inner smaller and more acute. *Stamens* shorter than the gynoecium; anthers silky; styles glabrous. *Ripe fruit* 2 to 3 in. long; individual carpels not crowded, sessile, finely rugose, lenticellate, woody, ovoid, sub-compressed, shortly beaked, .5 in. long; ovules 2 to 5.—*Wight III* i, 14; *fr.*, t 33S; *Hook. fil. Sp. Thorns. Fl. Ind.* 82; *Hook. fil. Fl. Br. Ind.* i, 4; *Bedd. Fl. Sub.*, t. 62; *Thwaites Enum.* 5.—*M. pulneyensis*, *Wight III* i, 14, t 5 [except figs. 5 and B].—*M. ovalifolia*, *Wight III* i, 13.

Higher mountains of Southern India; alt. 5000 to 8000 feet,

VAR. *WALKERI*: leaves 2—3 by 1—1.5 in., oblong or obovate-oblong, glaucous below; segments of perianth usually 9; ovules 2, superposed.—*M. Walkeri* and *M. goudouii*, *Wight III* i, 13, 14.

PLATE 55, *Michelia nilagirica*, Zenk.—1, flowering branch; 2 and 3, stamens and gynoecium; 4, stamens; 5, ovary; 6 and 7, fruit; 8, leaf and gynoecium of VAR. *Walkerii*,—a?? of natural size.

6. *M. HISOPA*, *DO. Prodr.* i, 79. A tall tree", the young branches thin; their bark dark, sparsely lenticellate, greyish-pubescent at first, but soon glabrous, as are all other parts, except the spathoid bracts. *Leaves* coriaceous, elliptic, oblong or oblong-lanceolate, acute or shortly acuminate; the base narrowed or rounded; both surfaces quite glabrous when adult: the upper shining, the lower dull, sub-glaucous, puberulous when young; reticulations distinct; nerves 10 to 12 pairs, faint; length 5 to 6.5 in., breadth 1.5 to 2.25 in.; petiole about 1 in., slender; stipules narrowly oblong, grey-pubescent externally, "5 in. long. *Flowers* solitary, axillary, sub-sessile, pale yellow, when expanded 1 to 1.5 in. in diam.; buds ovoid, "5 in. long; spathoid bracts 2, fleshy, ovate-rotund, grey-pubescent externally; peduncles "1.5 in., stout, *Sepals* and *petals* from 12 to 15, narrowly obovate, acute; the inner smaller, pale yellow. *Stamens* not so long as the gynoecium. *Ovaries* sericeous-villose; styles recurved. *Fruit* 3 to 4 in. long; individual carpels sessile, rounded, compressed, lenticellate, "4 in. in diam.; *seeds* 3 or 4.—*Wall. Tent. FL. Nep.* B, #. 4; *Cat.* 67D; *Don. Prod. Nep.* 223; *Wight III* i, 13; *Hook. fil. Thorns. FL Ind.* 81; *Book, fil. FL Br. Ind.* i, 43.

Temperate Himalaya from Kumaon to Nepal; alt. 5000 to 7000 feet, common; Sikkim, rare.

PLATE 5BB. *Michelia kisopa*, *Ham.*—1, flowering branch; 5, buds; 6, gynoecium and one stamen; 7, ripe fruit: of natural size; 8, stamens: enlarged.

7. *M. PUNDUANA*, *Hook. fil. Thorns. FL Ind.* 81. A tall tree; the youngest branches, stipules, spathoid bracts and peduncles rufous-pubescent; all other parts glabrous. *Leaves* thinly coriaceous, glabrous, oblong, oblong-elliptic, rarely elliptic, shortly and abruptly acuminate; the base acute; the reticulations wide, distinct on both surfaces; the upper shining, the lower dull; nerves 9 to 11 pairs, not prominent; length 3 to 5 in., breadth 1.75 to 2 in.; petiole "5 to "7.5 in.; stipules narrowly oblong, about as long as the petiole. *Flowers* axillary, solitary or in pairs, sub-sessile, when fully expanded 1.25 to 1.5 in. in diam.; buds ovoid, apiculate, "1.5 in. long; spathoid bracts ovate-rotund; peduncle "2 in. *Sepals* and *petals* about 9, in three rows: the outer 8 obovate-cuneate; the inner 3 or 4 much smaller, oblanceolate, acute. *Stamens* nearly as long as the gynoecium. *Ripe fruit* 3 to 4 in. long; the individual carpels distant, sub-globose, compressed, not beaked, lenticellate, woody, "4 in. in diam.—*Hook. fil. FL Br. Ind.* i, 43.—*Magnolia punduana*, *Wall. Cat.* 974; *Cat.* 6494 in part?

Khasia Hills, alt. 3000 to 5000 feet.

This resembles *M. oblonga*, *Wall.*, so much that Wallich himself confused them; his specimens from Cherra Punji [*Cat.* 972A), although issued as *oblonga*, being in fact this species. The best characters to separate the two are found in the expanded flower, which in this is only about 1.25 in. in diameter, and has its outer segments obovate, cuneate; while the flower of *oblonga* measures 3 to 4 in. and has all its segments narrow.

PLATE BB. *Michelia punduana*, *Hook. fil. Thorns.*—1, flowering branch; 2, ripe fruit: of natural size.

8. *M. DBLUNGA*, *Wall. Cat.* 972 in part). A tall tree; all parts quite glabrous. *Leaves* thinly coriaceous, obovate-oblong, shortly and abruptly acuminate, gradually tapering from above the middle to the slender petiole; upper surface shining, the lower dull, rather pale; the reticulations lax, distinct on both surfaces; the nerves 7 to 9 pairs, rather prominent on the lower; length 3.5 to 5.5 in., breadth 1.5 to 2.5 in.;

petiole .75 in.; stipules narrowly oblong¹, about as long as ihB petiole. *Flowers* axillary, solitary, shortly pedunculate, 3 to 4 in. in diam. when expanded; buds elongate-ovoid, pointed; spathoid bracts leathery, smooth; peduncle "3 in., stout, annulated. *Sepals* and *petals* 12, linear-lanceolate or oblanceolate, nearly eijual. *Stamens* shorter than gynoecium. *Ripe fruit* 6 to 7 in. long; the individual carpels lax, sessile, Dbovoid, lenticellate, woody, not beaked.—*Book, fil &f Thorns. FL Ind.* 81; *Hook, fil Fl Br. Ind.* i, 43; *Gamble Ind. Timb.* 7.

At the base of tha Khasia Hills,—*Wallich*; Sibsagar district, Assam,—*Mr. S. E. Peal*; Sylhet,—*Mann*.

This is one of tha largest trees of this family in India. It is known to the Assamese as the *Bor* (large) *Soppa*. Until quite recently good specimens of this species were in no herbarium, and tha description given by Sir J. D. Hooker in the Flora of British India was drawn up on imperfect material. Through the kindness of Mr. S. E. Peal, of Sibsagar, a splended suite of specimens in all stages of flower and fruit has been sent to the Calcutta Herbarium; and from these, as well as from Mr. Peal's drawings of the fresh flowers and fruit, the accompanying figura has been prepared. The flowers of this much resemble those of *Talauma phellocarpa*, King, the petals in both being yellowish-white, The bark (Mr. Peal informs me) is whitish-grey in colour.

PLATE 67. *Michelia oblonga*.—1, flowering branch; 2, fully expanded flower; 3, section of flower; 4, petal; 5, spathoid bract; 6, ripe fruit,—*all of natural size*.

9. *M. MANNII*, King, *n. sp.* A glabrous tree; the young branches with dark, smooth, sparsely lenticellate bark. *Leaves* coriaceous, obovate-elliptic, blunt, Dr with an abrupt short blunt point, gradually narrowed in the lower third to the stout petiole; shining on the upper, rather dull on the lower surface; main nerves 8 to 10 pairs, rather prominent; reticulations wide, very distinct; length 5 to 7 in., breadth 35 to 4*5 in.; petiole 1 in.; stipules narrowly oblong, smooth, about as long as, or shorter than, the petiole. *Flowers* axillary, solitary, shortly pedunculate, about 3 in. in diam. when fully expanded; buds oblong, 1.25 in. long; spathoid bracts broadly ovate, smooth, coriaceous; peduncle "25 in., rather stout, annulated. *Sepals* 3, linear, half the length of the petals. *Petals* 6, oblanceolate, the inner 3 slightly smaller. *Stamens* as long as the gynoecium. *Ovaries* on an elongate rachis, sessile, smooth; the style short, thick, recurved. Eipe fruit 5 to 7 in. long; individual carpels woody, rather distant, oblong, slightly apiculats, glabrous, sparsely lenticellate, "75 to 1 in. long, 2-sseded.—*Magnolia Mannii*, King MSS.

Makum Forest, Upper Assam,—*Gr. Mann*.

The leaves of this resemble those of *M. montana*, Bl., but they are of thicker texture, with stouter nerves and petiole, and wider reticulations. The flowers, however, differ from those of *M. montana* in the shortness of the peduncle and of the sepals. This species has been collected only by my friend Mr. Gr. Mann, Conservator of Forests in Assam, a distinguished forester and enthusiastic botanist, to whom I dedicate it.

PLATE 7D. *Michelia Mannii*, King.—1, flowering branch; 2, flower dissected; 3, stamens; 4, ripe fruit: *of natural size*.

ID. *M. MDNTANA*, Bl in *Verh. Bat Gen.* ix, p. 153. A glabrous tree. *Leaves* thinly coriaceous, shining, obovate or obovate-rotund, shortly and abruptly apiculate, rather suddenly narrowed to the base; nerves ID to 12 pairs, thin, spreading; length

of blade B to 75 in., breadth about 4 in.; petiole slender, 75 in. Flowers white, 1.5 in. in diam., solitary, terminal or axillary, on annulate peduncles about 5 in. long. Buds cylindric. Sepals and petals about 8, oblanceolate or lanceolate. Pistils 3 to 4. Carpels usually single, sub-globular, compressed, 1.5 in. long; the walls lenticellate, woody, .5 in. or more thick.—*Bl. Bijdr.* 7; *FL Jav. Magnol* p. 15, t. 5; *Mig. FL Ind. Bat* i, pL ii, 17; *King in Journ. As. Soc. Bang*, vol. 58, pt. ii, 371.

Sikkim Himalaya. ? altitude,—ff. King; Sylhet, in the Langai Forest,—G. Mann. Perak, King's collector. DISTRIB.—Java.

Only once collected in Sikkim. The fruit of this is not strictly that of a *Michelia*. TIIB ovaries are few and are not inserted on an elongated axis, and usually only one develops into a carpel.

PLATE 68. *Michelia montana*, BL—1, flowering branch; 2, ripe carpel; 3 & 4, dehiscent carpels; 5 seeds: of natural size; 6, ovaries; 7 anthers: enlarged.

7. *Suhizandra*, *Mkhau*.

Climbing glabrous shrubs with exstipulate, punctate leaves. Flowers unisexual, axillary, or in the axils of scales near the base of short, lateral, leafy branches. Sepals and petals 9 to 12, white, yellowish or reddish, imbricate, in 3 whorls, gradually increasing in size inwards. Male flowers with 5 to 15 or more stamens; the filaments short, free or sub-connate, often fleshy; anthers free or sub-immersed in the fleshy mass of confluent filaments; the cells round, remote. Female flower with many densely imbricate ovaries; the stigmas sessile; ovules 2. Fruit a slender spike of globose, 1- to 2-seeded berries. Seeds suspended; albumen fleshy; testa crustaceous. DISTRIB.—North America, mountains of temperate and tropical India and Java. Species about B,

Synopsis of species.

Filaments monadelphous below, free above.

Flowers more than 1 in. in diam.; fruit B to 9 in. *hug* j carpels beaked . . . 1. & *grandiflora*.

Flowers less than 1 in. in diam.; fruit 3 to 4 in. long; carpels

not beaked. 2. *elongata*

Anthers sessile in cavities of the mass formed by the connate fleshy filaments;

flowers about .5 in. in diam.

Leaves ovate-lanceolate, 3-5 to 4-5 in. long 3. *S. propinqua*.

Leaves narrowly lanceolate or oblong-lanceolate, 2.5 to 3 in. long 4. *axillam*.

1. *S. GEANDRDEA*, *ffool fil ty Thorns. Fl. Br. Ind.* i, 44. A woody climber with rugose brown branches. leaves membranous, oblong-lanceolate, acuminate, with minute distant teeth; the base cuneate, often unequal; lower surface paler than the upper and with the reticulation distinct; main nerves 7 to 8 pairs; length 3 to 5 in., breadth .25 to 1.75 in.; petiole .5 to .75 in., slender. Flowers 1-2.5 in. or more in diam solitary. Peduncles slender. Sepals and petals 9 to 12, white, yellowish or reddish, imbricate, in 3 whorls, gradually increasing in size inwards. Male flowers with 5 to 15 or more stamens; the filaments short, free or sub-connate, often fleshy; anthers free or sub-immersed in the fleshy mass of confluent filaments; the cells round, remote. Female flower with many densely imbricate ovaries; the stigmas sessile; ovules 2. Fruit a slender spike of globose, 1- to 2-seeded berries. Seeds suspended; albumen fleshy; testa crustaceous. DISTRIB.—North America, mountains of temperate and tropical India and Java. Species about B,

obovoid, shortly beaked.— *Wall. Tent. Fl. Nep., t. U.*—*Sphxrostema, grandiflorum, Book, fil. if Thorns Fl. Ind. 81.*

Temperate Himalaya from Ghurwal to Bhotan, at elevations of from 6,000 to 10,000 feet.

PLATE B9A. *Schizandra grandiflora, Hook. fil. if Thorns.*—, flowering branch with female flowers; 2, female flower; 9, male flower; 4, ripe fruit: *of natural size.*

2. *S. ELONGATA, Hook. fil. Sf Thorns. Fl. Br. Ind. i, 44.* A woody climber with thin, lenticellate branches. *Leaves* membranous, oblong-lanceolate to ovate, acuminate or acute; the edges cartilaginous, entire, or minutely and remotely dentate; base cuneate or rounded, slightly unequal; beneath glaucous, the reticulations faint; main nerves 4 to 5 pairs; length 2 to 3.5 in., breadth 1 to 1.5 in.; petiole .5 to .7 in., slender. *Flowers* .5 to .75 in. in diam., yellowish, axillary, solitary, or in fascicles of 2 or 3 on slender, bracteolate pedicels 1 to 1.5 in. long. *Sepals* 3, orbicular. *Petals* 6, larger than the sepals, ovate-orbicular. *Stamens* as in *S. Rozburyhiana*. *Fruit* 2 to 3 in. long; the rachis very slender, swollen at intervals; *carpels* sub-sessile, globose, grooved on one side, not woody.—*Sphxrostema elongatum, Blume Fl. Jav. Syhiz., t. 5; Hook, fil. & Thw. Fl. Ind. 85.*—*Sphoerostema grandiflrum, Wall. Vat. 4983, A in part Sf V.*

Temperate Himalaya from Nepal to Sikkim, alt. 5,000 to 6,000 feet; Rhasia Hills. DISTKIB.—Java.

PLATE 69B. *Schizandra elongata, Hook. fil.*—5, branch with male flowers; 5, branch with fruit: *of natural size*; 7, female flower dissected to show the three sepals, six petals, and gynoecium: *enlarged.*

3. *S. PROPINQUA, Hook. fil. if Thorns. Fl. Br. Ind. i, 45.* A woody climber; young branches with slender, pale brown, lenticellate bark. *Leaves* slightly fleshy, ovate-lanceolate, acuminate; edges with minute distant teeth or sub-entire; the base rounded or cuneate, slightly unequal; under surface slightly pale; the reticulations wide, not prominent; main nerves 5 to 7 pairs, faint, anastomosing far from the margin; length 3.5 to 4 in., breadth 1.25 to 1.4 in.; petiole .4 to .6 in. *Flowers* .8 in. in diam., yellow or orange, axillary, solitary, on bracteolate pedicels as long as, or shorter than the petioles. *Sepals* and *petals* broadly ovate or obovate; anthers 12 to 15, embedded in the conjoined globose fleshy mass of filaments. *Fruit* 6 in. long; the axis cylindric fleshy, rough; *carpels* sub-sessile, globose, baccate, 2-seeded—*Hook. Ic. p. 1, 1715.*—*Sphxrostema propinquum, Bl. Fl. Juv. Schizandrex 15; Hook. fil. if Thorn. Fl. Ind. 85.*—*Kadsura propinqua, Wall. Tent. Fl. Nep. 11, t. 15.*

Western Himalaya from Gharwal to Nepal, at elevations of 4,000 to 6,000 feet.

PLATE 41 A. *Schizandra propinqua, Hook. fil. Sf Thms. l.*, branch with male flowers; 2, petals and androecium of a male flower, dissected; 3, ripe fruit: *of natural size*; 4, anther; 5, calyx: *enlarged.*

4. *S. AXILLARIS, Hook. fil. Sf Thorns. Fl. Br. Ind. i, 45.* A slender woody climber; the young branches angular, smooth. *Leaves* thinly coriaceous, narrowly lanceolate or oblong-lanceolate, much acuminate, distantly and minutely dentate or sub-entire; the base acute; lower surface pale; the reticulations wide, not prominent; nerves 5 or 5 pairs; length 2.5 to 3 in., breadth .6 to 1 in.; petiole .5 to .65 in. *Flowers* .5 in. in diam., scarlet, axillary, solitary, sessile or on bracteolate pedicels shorter than the petioles.

Sepals orbicular; *petals* ovate-rotund. *Anthers* as in *S. propinqua*. *Fruit* 1 to 2 in. long; the rachis slender, smooth; *carpels* globose, sub-sessile; seeds 1 or 2.—*Sphw?ostema axillare*, *Bl. Bijdr.* 22; *FL Jav, Schizand.* 14, *t* 8; *Hook, fil 6f Thorns. FL Ind.* 85.

Khasia Hills, alt. 4000 to 5000 feet; Shan Hills, Upper Burmah, 4,000 feet,—*General Oolkt.*

DISTRIB.—Java and Sumatra.

Specimens from Java have leaves from 1 to 1½ in. broad, and the pedicels of the flowers are much longer than in those from the Khasia Hills.

PLATE 74A. *Schizandra axillaris*, *Bl*—7, flowering branch: *of natural size*; 8, flower; 9, stamens: *enlarged*.

8. *Kadsura*, *Kaempfer*.

Climbing glabrous shrubs. *Leaves* exstipulate. *Flowers* unisexual, white, yellow or reddish, axillary or in the axils of scales near the base of short, lateral, leafy branches. *Sepals* and *petals* 9 to 12, imbricate in about 3 series. *Stamens* 5 to 15 in a spiral series; filaments very short, free or sub-connate, often fleshy; anthers free or sub-immersed in a fleshy head of confluent filaments; cells small, remote. *Ovaries* many, densely imbricated; stigma sessile; ovules 2 to 4. *Fruit* a globose head of indehiscent, fleshy, 1-seeded carpels. *Seeds* 1 or 2, suspended; albumen fleshy; testa crustaceous; embryo minute. DISTRIB.—Temp, and sub-trop. Asia. Species about 10.

Synopsis of species.

In dividual carpels mucronate or beaked.

- Leaves broadly ovate to ovate-oblong; flowers and fruit mostly axillary . . . 1. *K. scandens*.
- „ ovate-rotund; flowers and fruit usually on the stem below the leaves . . . 2. *K. caudiflora*.
- „ ovate-lanceolate or oblong-lanceolate; filaments mostly connate . . . 3. *K. Roxburghiana*.

Individual carpels truncate, not beaked.

- Leaves broadly ovate; filaments all free . . . 4. *K. Wightiana*,
- „ lanceolate to ovate-lanceolate . . . 5. *K. knoeolata*.

1. *K. SCANDENS*, *Bl. FL Jav. Schizandrece*, p. 9, *t* 1. A woody, glabrous climber, 10 to 40 feet long; the bark dark-coloured, irregularly striate. *Leaves* coriaceous, broadly ovate to ovate-oblong, shortly acuminate, entire; the base rounded, very slightly decurrent along the petiole; main nerves about 5 pairs, sub-erect; length of blade 1 to 6 in., breadth 2 to 4 in.; petiole about 1 in., expanded at the base. *Flowers* axillary, with a few from the trunk below the leaves, solitary, on bracteolate peduncles; those of both sexes similar. *Calyx* of 3 triangular sepals much shorter than the petals and united at the base. *Petals* ovate-oblong, blunt, fleshy, erecto-patent, sub-concave. *Male flowers* with numerous short, cuneate, equal stamens, densely packed on an oblong, fleshy receptacle; the connective fleshy; the anthers sub-truncate, 2-celled. *Female flowers* without stamens; the ovaries numerous, compressed; the stigmas sessile, elongate, fleshy. *Bipe fruit* sub-globose, 2 to 2½ in. in diam.; the individual carpels sessile, globose or sub-compressed, fleshy, mucronate or beaked, less than ½ in. in diam.—*Miq. Fl. Ind. Bat.* i, *pt* ii, 19; *King in Journ. As. Soc. Bmg.* vol. 58, *pt* ii, 375.—*Sarcocarpon scandens*, *BL Bijdr.* 21.

Perak, Penang; at low elevations.

DISTRIB.—Java, Sumatra, and probably in the other islands of the Archipelago.

PLATE 71. *Kadsura scanrtens*, Bl—1, flowering stem; 2, stem with nearly ripe fruit of natural size,

2. K. DAULIFLORA, BL Fl. Jav. Schizand. 11, 12. A stout, woody climber, 30 to 40 feet long; bark of young shoots dark, smooth; that of the main stem corky, furrowed, lenticellate. Leaves ovate-rotund or broadly ovate, slightly and rather abruptly acuminate; the base broad and rounded; nerves 5 to 7 pairs, ascending; length of blade 5 to 7 in., breadth 3.5 to 4.5 in.; petiole 1 to 1.5 in. Flowers usually from the stem below the leaves, solitary or fascicled, on bracteolate peduncles; rarely axillary. Sepals and petals as in the last, but larger and more ovate. Carpels on pedicels 5 in. long. Miq. Fl. Ind. Bat i, pt. ii, 19; King in Journ. As. Soc. Beng. vol. 58, pt. ii, 375.

Perak,—Scortechini and King's collector.

This is very near *K. szandens*, but has corky bark, larger leaves, larger and less orbicular petals, and the flowers are mostly on the old wood, and rarely axillary.

PLATE 72. *Kadsura cauliflora*, Blume.—1, leafy stem; 2, stem with flowers; 3, stem with unripe fruit; 4, a flower; 5, a flower dissected,—all of natural size.

3. K. ROXBURGHIANA, Am. in Jard. Mag. Zool and Bot ii, 545. A strong, woody, glabrous climber, with rugose brown bark. Leaves slightly fleshy (membranous when dry), ovate-lanceolate or oblong-lanceolate, acute or shortly acuminate; the base acute; nerves 6 to 9 pairs, not prominent; reticulations minute, obscure; length 3 to 5 in., breadth 1.75 to 2 in.; petiole 5 to 7.5 in., slender. Flowers 5 in. in diam., axillary, solitary, on short, stout, bracteolate pedicels which, when the fruit is ripe, lengthen to 1 in. or more. Sepals and petals 12, orbicular. Outer filaments short, free above the connate. Ovules 2. Fruit 1 to 2 in. in diam., globular; carpels succulent, numerous, globular or oblong, shortly beaked.—Hook. fil. Sp. Thorns. Fl. Ind. 83; Hook. fil. Br. Ind. i, 45; King in Journ. As. Soc. Beng. vol. 58, pt. ii, MS.—*Kadsura japonica* Wall. Tent Fl. Nep., t. 12.—*Uvaria heteroclita*, Roxb. Fl. Ind. ii, 6B3.

Tropical forests of the base of the Eastern Himalaya; Assam Hill ranges as far as 5,000 feet.

The bark of the older stems is often very rugose. The leaves when fresh are slightly fleshy, but when dry they are thin and membranous: in young plants they are often serrate-dentate, in old plants almost always entire.

PLATE 73A. *Kadsura Roxburghiana*, Am.—1, flowering branch, 2 to 4, gynoecium at various stages; 5, ripe fruit,—all of natural size.

4. K. WIGHTIANA, Am. l. c. ii, 546. A glabrous, woody climber, with rugose greyish-brown bark. Leaves slightly fleshy, broadly ovate, obtuse or acute, sometimes oblique, often denticulate in the upper half; the base cuneate; the under surface pubescent. Nerves 7 to 9 pairs; length 2 to 3 in., breadth 1 to 2 in.; petiole 5 in. or less in diam., on stout bracteolate pedicels which lengthen in fruit. Sepals 3, small, unequal, orbicular. Petals 9, oval, obtuse: the inner smaller. Filaments all free. Ovules 3 or 4. Fruit as in *K. Roxburghiana*, but the carpels truncate and without beaks.—Hook. fil. Sp. Thorns. Fl. Ind. 84; Hook. fil. Br. Ind. i, 45.

Malabar, Ceylon, at elevations of 2,000 to 3,000 feet,

Closely allied to *E. Rozburghiana*, Arn., but with a more rigid habit, and smaller, more ovate leaves. The chief difference in the flowers is the distinctness of the filaments in this, and in the fruit the absence of beaks in the truncate carpels.

PLATE 74B. *Kadsura Wightiana*, Am.—1, branch with flower and fruit: of natural size; 2, flower; 3, stamens; 4, pistils; 5, single carpel; 6, ripe fruit: enlarged.

5. *K. LANCEOLATA*, King in Journ. As. Soc. Beng. vol 58, pt ii, 375. A slender woody climber, 20 to 30 feet long. Leaves thinly coriaceous, lanceolate or ovate-lanceolate, slightly unequal-sided, acuminate; the base cuneate or rounded; edges slightly recurved when dry; nerves obscure, about 12 pairs; length of blade 3 to 4 in., breadth 1½ in.; petiole ½ in. Flowers solitary, axillary, globular, 3½ in. in diam., on minutely bracteolate peduncles shorter than the petioles. Sepals about 3, triangular, much smaller than the petals. Petals about 9, rotund or broadly ovate, cream-coloured, fleshy, slightly concave. Stamens as in *K. scandens*. Ripe fruit globular, 1½ in. in diam. or less. Pistils numerous; the stigmas minute, sub-terminal. Carpels ovoid; the apices truncate; the minute lateral stigmas persistent.

Perak, at elevations of from 500 to 1,000 feet.

A smaller plant than *K. scandens*, with smaller carpels.

PLATE 73B. *Kadsura lanceolata*.—(3, flowering branch; 7, young fruit: of natural size; 8, carpel; 9, a dissected flower: enlarged.

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A

Euphylea flecosperma, Hook. & Thunberg.
 Thunb. & Thunb. by W. H. Smith



B

Illium canaliculatum, Thunberg.
 Thunb. & Thunb. by W. H. Smith

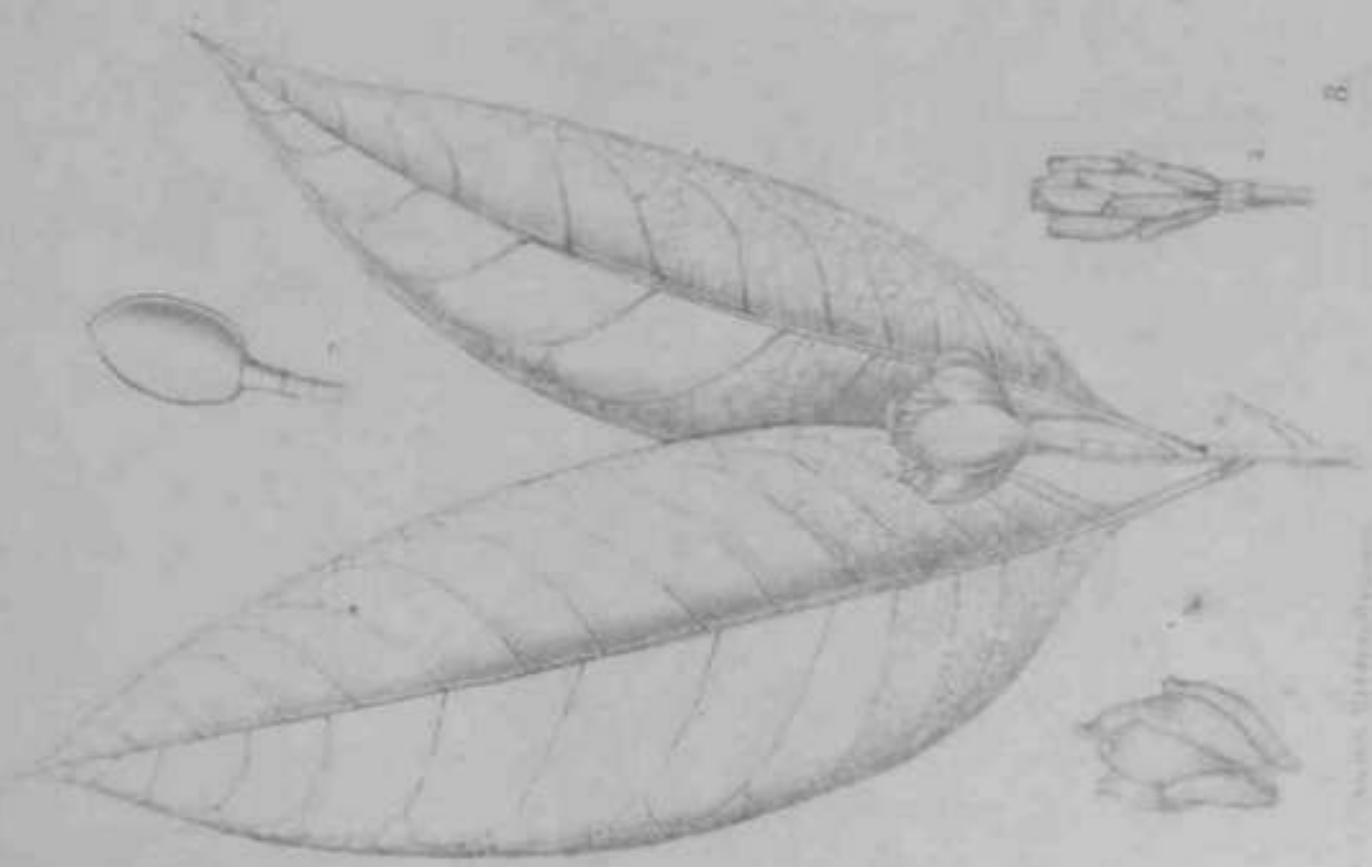
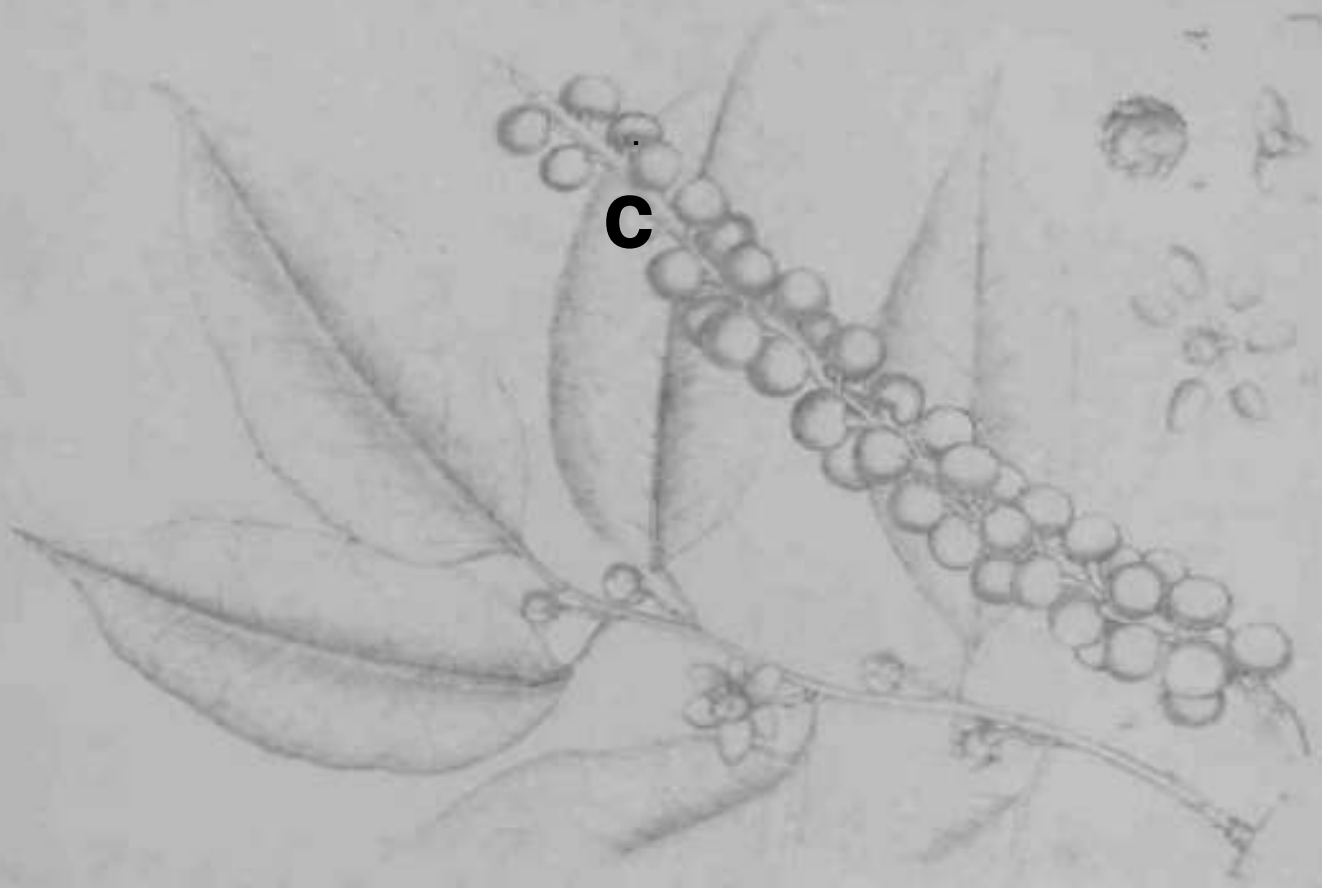
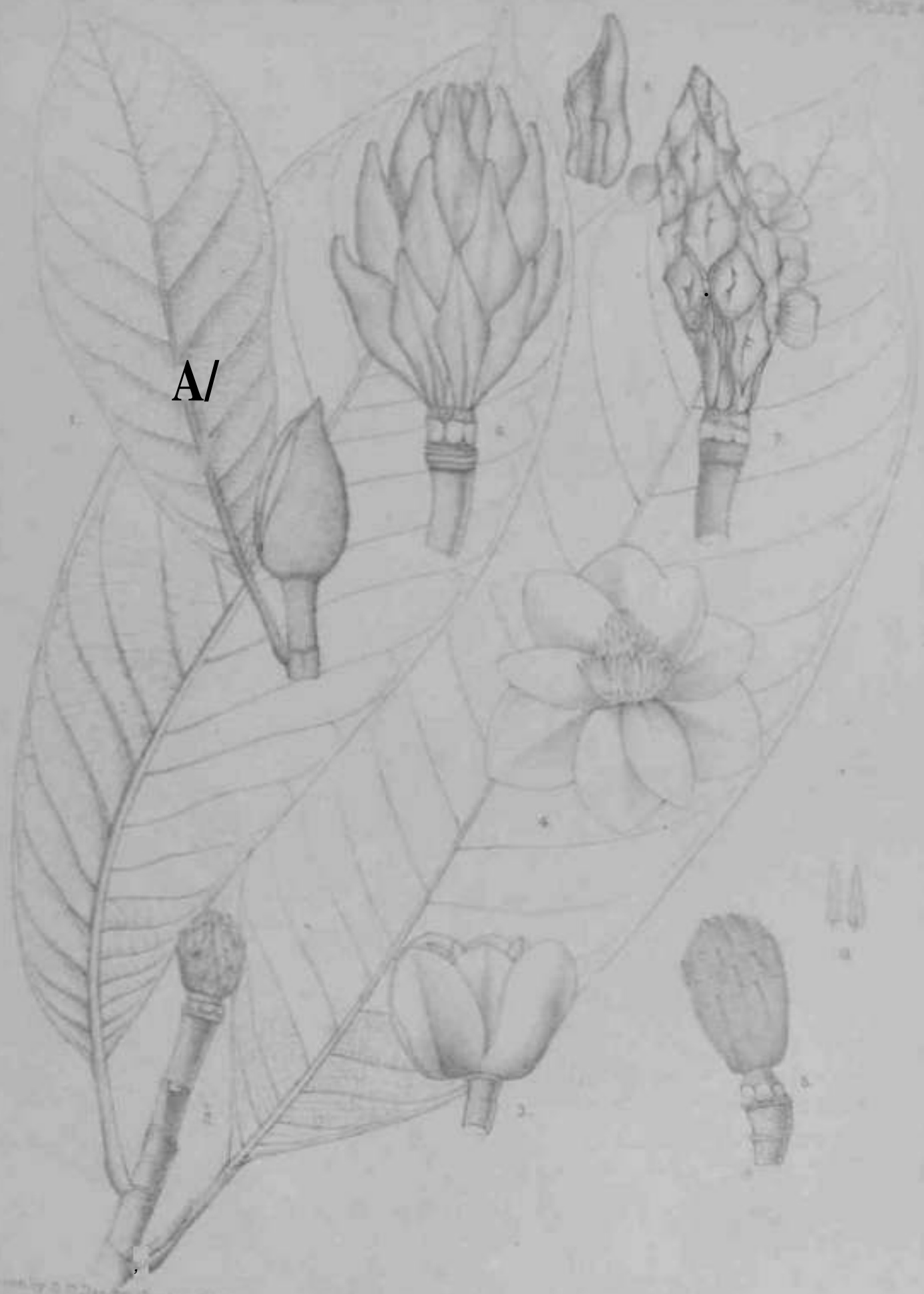


PLATE 41
C
B
THALASSIA, PHOTINELLA, PINE
THALASSIA, PHOTINELLA, PINE

A/



Collected by S. H. Davis, San Diego, California.

TALAUIMA LANIGERA, Hook. Fil. and Thoms.

Coll. and drawn by S. H. Davis, 1904.



Drawn by A. D. Mulla, Bot. Garden, Calcutta.

TALAUMA ANDAMANICA, Kunt.

Engr. and Printed by H. G. G. G. G.





Ann. Roy. Bot. Gard. Calcutta, Vol. 3

PLATE 15.

Drawn by H.C. Datta. Bot. Gard. Calcutta.

MAGNOLIA MAINGAYI Hong

TALAUMA KOHBESIL Hong

Photo-Lith. & Printed by W.H. Irving



Drawn by A. C. Sengupta, Bot. Garden, Calcutta.

TALATMA PABANIANA, Hook. Fil. and Thunb.

Edw. and Thunb. by K. Sengupta, 1904.



1
r

Drawn by A. D. M. S., Bot. Garden, Columbia

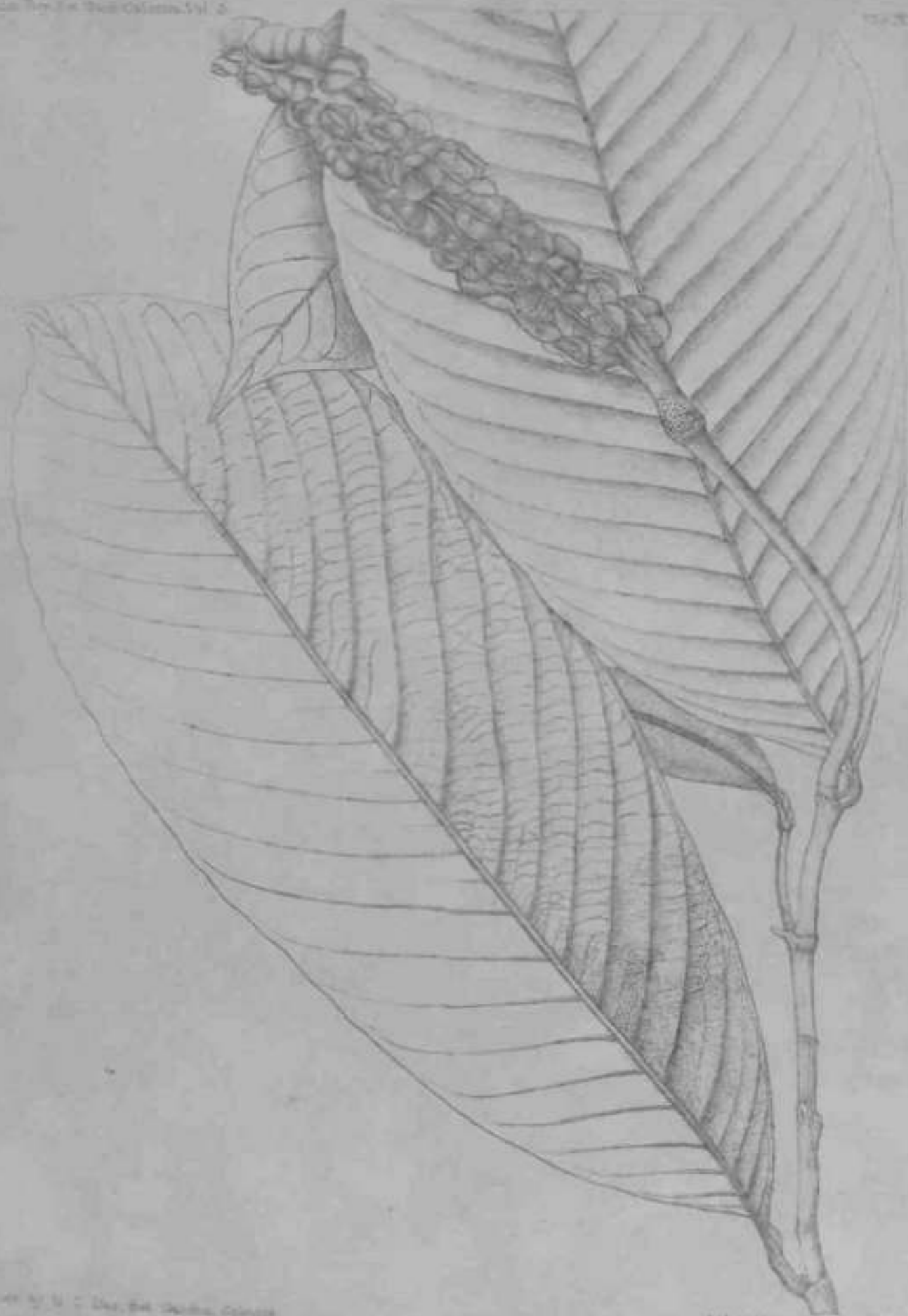
Left and Frontal by H. S. Gentry

TALAUMA BOEGSONII, Hook. f. and Thunb.





MAIRALIA GRIFFITHII Hook. f. et Thoms.



Drawn by H. C. Day, Bot. Garden, Colombia

MAGNOLIA GRIFFITHII, Hook. f. et Thoms.

Leaf and branch by K. Schumacher, 1911



Drawn by A.L. Nash

MANIHOT - 3EBASS; M.

Col. by A.C. Martyn



Drawn by A. L. Sargent

MANGLIEIA INSULENSIS. Blume

Life by A. C. Mearns



Drawn by A. Miller

MANOLIBTIA GLADCA, Bna.

LiihrJLCWui-200



Drawn by W. Smith.

MANGLIETIA CAVEANA, Hook. II. and Thoms.

Lith. by G. C. Shoberg.



Drawn by A. C. Moore

MANIHOT CARIBAEA, Hook. f. and Thoms.

Engr. by A. C. Moore



Drawn by A. D. White, San Carlos, Caliente.

Engraved by J. C. Smith, N. Y.

MAGNOLIA GLOBOSA, Hook. Fil. and Thoms.



Drawn by W. P. Davis

MAGNOLIA CAMPBELLII, Hooker and Thoms.

Engr. by A. C. Mearns



i 1

Fig. 1. by A. L. Smith.

MAGNOLIA PTEROCARPA, J. A. P. A., 1892.

tn.h> by A. L. Smith.

Fig. 10. Garden, Cambridge.



an. by G. P. P. S. S.

MAGNOLIA CAMPBELLII, Hook. fil. and Thoms.

Leaf by A. C. M. S.

PLATE 65

Drawn and engraved by W. H. Jones

FOR THE STAMENS, MYLETERIA

MYLETERIA, STAMENS, 1864

Drawn by W. H. Jones, Engraved by J. Jones





L. Walp. del.

MAGNOLIA FEALIANA, Walp.

L. Walp. del.



Drawn by G. C. Davis, Bot. Mag. Soc. Amer. Trans. Vol. 2.

Photo. Taken & Printed by W. H. Seelye.

MICHELIA CATHARTICA, Pursh, Fl. & Trees.



Drawn by G. T. Dyer, San Carlos, Arizona

Engraved and Printed by Spencerian Press

ALONSOA GUYSTAVI, King



Drawn by G. C. Davis, Rep. Bot. Gard. Calcutta.

Plants Cult. & Printed by W. L. Seng.

MICHELIA KUEHNA, Thunb.

MICHELIA CHAMPACA, L.

V



Drawn by D. C. Davis

MICHELIA CHAMPACA, L.

Lith. by A. D. P. [unclear]



Drawn by J. L. Gregg - Key Bot. Gard. Columbia

Plate taken & colored by W. H. Harvey

MICHELIA PONDEANA Hook. & Thoms.



SCOLYTURA GRANDIS, H. & T. 1917
Platanus latifolia, H. & T. 1917

SCOLYTURA ELONGATA, H. & T. 1917



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Drawn by W. H. Sargent, Det. by Dr. J. S. Burdett

MICHELIA MANNII Yag.

Leaf and flower by C. S. Burdett, 1925



Drawn by A. D. Macle

Talk. by A. C. Macle



T

Drawn by E. F. Tuck, Bot. Garden, Calcutta.

Engraved by G. S. S. S. S.

HEAD: "ABA GAULPITVORA, BK™



KADISURA LANCEOLATA, K.

KADISURA ROXBURGHIANA, A. DC.

Photos Lith. & Engraved by W. H. Frising.

Leaves of *Wrightia* from the *Wrightia* tree

WRIGHTIA *AXILLARIS* (Lam.) DC.

WRIGHTIA *WRIGHTIANA* (Lam.) DC.

Dr. Smith & Co.



AN
ACCOUNT
OF THE
GENUS GOMPHOSTEMMA WALL.

BY
BAUD TRAIN,
Curator of the Herbarium, Royal Botanic Garden, Calcutta;
Surgeon, Indian Medical Service.

CALCUTTA :
Printed at the Bengal Secretariat Press.
1891.

PREFACE.

IN 1889 Dr. KING, F.R.S., D.I.E., Superintendent of the Royal Botanic Garden, directed me to arrange the Indo-Malayan *Labiates* preserved in this Herbarium in accordance with Sir J. D. HOOKER'S article "LABIATE" in the *Flora of British India*. While examining the material of the genus *Grindelia*, it was found that there were some new forms (mainly Malayan) that appeared to throw light on the natural disposition of its species. At Dr. King's suggestion an examination of all the material of the genus available was undertaken. The results are embodied in this paper.

The generosity of Mr. THURSTON DYER, CM.&, F.R.S., DIRECTOR of the ROYAL GARDENS, KEW, who has kindly directed a number of specimens illustrating the genus to be sent to the Calcutta Herbarium, has enabled me to render the paper more complete than it otherwise would have been, but it could never have been prepared at all had I not had the benefit of much kind assistance from Mr. HEMSLEY, F.R.S., formerly Assistant for India (now Principal Assistant) in Kew Herbarium, who has taken infinite pains to answer in detail many queries regarding particular specimens, and has carefully compared a set of specimens that correspond with the examples of the *Wallian* and *Benthalian* Herbaria at Calcutta with the types of Dr. WALLICH'S species preserved in the Herbarium of the Linnean Society of London, and with the examples of the *Wallian* and *Benthalian* Herbaria at Kew.

Mr. FORD, F.L.S., of Hong-Kong, has very generously communicated a duplicate of the only Chinese species, and Mr. E. BAKER, F.L.S., has kindly replied to enquiries regarding some specimens contained in the British Museum.

The time has not yet arrived for a final revision of this genus: some forms already reported are still inadequately represented; many localities likely to yield examples are still inadequately explored. This paper therefore does not claim to be complete either in form or in matter: it is simply, as its title implies, an account, as uniform as possible with previous accounts, of the various forms hitherto reported. Reductions not warranted by the presence of the necessary intermediate forms have not only not been effected, but some forms which it may be hoped ultimately to merge in previously named species have been provisionally advanced to specific rank. The disadvantages of this method of treatment will, it is hoped, be more than counterbalanced owing to the limits of hitherto recognised species having been left unaltered. At the same time, since it is only just to future students of the genus that all the results of a somewhat prolonged study of the material now available should be put on record, the reductions indicated by structural characters as *probable* have been duly set forth in a tabular form in the introduction, and in a subordinate form in the text-

DAVID PRIN.

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GDMPHDSTEMMA;

§ PDgosiphon;

* *Strobilina* ;

** *Semsleyanum* ;

[*** *Anthocoma*]:

§S Ste^iostoma;

* *Niveum*;

** *Paniflora*;

*** *Eriocarpon*:

1

§§§ Eugomphostemma;

* *Lutida*;

** *Pedunmlata*;

*** *Melimfolia* 242—245

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AN ACCOUNT OF THE GENUS *GOMPHOSTEMMA* WALL.

CHAPTER I.—INTRODUCTION.

THE name of the Labiate genus *GOMPHOSTEMMA*¹ first appeared in the lithographed catalogue of the Indian Herbarium distributed by Wallich² in 1828 and subsequent years. Wallich had, however, recognised the genus (as appears from a MS. note in the Calcutta Herbarium) eight years before to accommodate two species—*Dne* [ff. *ovatum*), collected by himself in Nepal, and another (*£. mdmifolium*)^ introduced into the Calcutta Garden from Silhet by Roxburgh. This latter species Roxburgh had in 1814 referred to the genus *PRASIUM*;³ the same was done by Blume in 1826 with two Java species described by him;* *GOMPHOSTEMMA* of Wallich is thus equivalent to *PRASIUM* of Roxburgh and of Blume, but not of Linnaeus. In 1828 Wallich issued along with these two species seven others,⁵ and in 1829 he added two more.⁸ Bentham described all these in 1831,⁷ re-described them in 1835,⁸ and described them a third time in 1848.⁹ Meisner in 1837¹⁰ and Endlicher about 1838¹¹ published definitions of the genus, Walpers in 1845 reprinted Bentham's account of 1836,¹² Moritz described a Java species in 1845,¹³ Wight figured the two S. Indian species in 1850,¹⁴ and Miguel described the species of the Dutch East Indies in 1855.¹⁵ Bentham defined the genus anew in 1875,¹⁸ Oliver described a Chinese species in 1884,¹⁷ and Hooker those of the British East Indies in 1885.¹⁸

¹ *GOMPHOSTEMMA*, *yofifj>os* (a nail), *aTefi/ia* ; the two species to which the name was first applied have prostrate sterna rooting at the interdodea.

² *Lith. Cat.* p. 39.

³ *Roxb., Hort. Benj.* 45; *Flor. Ind.* iii, 2S.

⁴ *Blume, Bijdr.* B4D.

⁵ *Lith. Oat.* nn. 2151—2169.

⁶ *Lith. Cat.* no. 2709, 2710.

⁷ *Wall, PL As Bar.* ii, 12, 13.

⁸ *Lab. Gen. et Sp.* 645—65D.

⁹ *DC, Prodr.* xii, 560—552.

¹⁰ *Meisn., Gen. Pl. Vase*, i, 2B9; ii, 197-

¹¹ *Endl., Gen. Pl. B3D, fasc. 3).*

¹² *Walp., Sep.* iii, 896—898; vi, 684.

¹³ *Zoll. et Moritz., Syst. Verzeihn.* 54.

¹⁴ *Wight, Bot. Beechey, t. 1455, 1457; III. 222, t. 176&, f. B.*

¹⁵ *Flor. Ind. Bat.* ii, 985—9B9.

¹⁶ *Benth. et Hook. f., Gm. PL* ii, 121B.

¹⁷ *Hwlc., Icon. PL* xv, 54, t. 1458.

¹⁸ *Fur., Brit. Ind.* iv, 595-B9».

The genus *GUMPHOSTI-MMA* belongs to the Labiate tribe PRASIEJE. It consists of coarse perennial herbs, sometimes ((*G. lucidum*) almost shrubby, with obscurely 4-angled stems, sometimes deeply grooved [*G. strybilinum*). The rootstock is woody, the roots usually being fibrous, sometimes, however, with fusiform tubers interspersed [*G. Maatersii*). The leaves are always opposite, generally petioled, but sometimes the petioles are short [*G. tsvortzhinii*) or almost absent [*G. niveum*). The lamina is usually large and generally ovate or elliptic, less often lanceolate or oblanceolate; the margin is usually serrate or crenate, rarely [*G. niveum*) subentire, nearly always acute at the apex and cuneate at the base. The stems are either sparsely scabrid or densely tomentose with stellate hairs; the petioles are the same, but are often softly tomentose when the stem is scabrid only; the under surface of the leaf is tomentose with stellate hairs, usually uniformly so, though sometimes [*G. Mastersii*) the tomentum is confined to the nerves only; the upper surface is very rarely stellate-hirsute [*G. velutinum*, *Maatersii*], but is usually hirsute or hispid with simple hairs, very rarely glabrous [*G. niveum*, *melissifolium*). The bracts are nearly always small, but are usually foliar, tomentose externally with stellate hairs, hispid or hirsute above or less often glabrous, especially in the centre. The bracteoles, to which the following remarks apply, are small and usually linear or lanceolate, and shorter than the calyx. The flowers, which are large for this order, are whorled; the whorls are either condensed into terminal spikes or else are axillary and distant, in the lower nodes or along the stem below the leaves, the upper axils being barren. The calyx is generally sessile, and the whorls are generally crowded; in some species with crowded flowers the calyx is pedicelled [*G. scorovhina*] in a few species the whorls are occasionally [*G. Mwterm*^ *G. trubilinum* VAR. *acaulis*), or as a rule [*G. parviflorum*^ *G. pedunculatum*) laxly cymose with pedicelled flowers. The calyx is campanulate, 10-nerved and 5-toothed, the teeth being almost equal and varying from broadly triangular [*G. pedunculatum*) to linear [*G. crinitum*]* the outside is even or ribbed, and always distinctly stellate-tomentose; the inside of the tube often is glabrous within (*G. Uurtisii*, *mitans*): the teeth are, however, hirsute; usually both tube and teeth within are uniformly hispid or hirsute with straight hairs. In most cases the calyx is some shade of green; in two [*G. pedunculatum*, *Curitii*], it is claret-red; in one [*G. MuBteraii*) it is purplish. In two species [*G. Ilcyncanum*, *Ilcys-Iryanum*) the corolla hardly exceeds the calyx; in all the rest it is distinctly, and in most cases much, longer than the calyx. The corolla tube below is slender and uniform, and where it is enclosed in the calyx is glabrous externally. This uniform portion is hirsute anteriorly within in § PDUOBIPHON; in the other divisions of the genus the tube within is quite glabrous. The upper portion of the tube is always enlarged; in § STKND-BTDMA this enlargement is slight and the whole tube is nearly straight; in the rest of the genus the enlargement is considerable, and the inflated part of the tube is distinctly incurved. The limb is 2-lipped, the lips being larger in § EUGDMHIDSTKMMA than in the other divisions of the genus; the upper lip is vaulted and usually entire, rarely emarginate, the lower is patent and 3-fid with a subtruncate mid-lobe larger than the others. The corolla is generally yellow, rarely white, still more rarely pink or purplish. The 4 stamens ascend under the upper lip, the anterior pair being the longer, the filaments are always pubescent with simple hairs, and are inserted at the top of the uniform portion of the tube; the anthers approach each other in pairs; their culms are transverse, equal, parallel, and naked. The disc is subequal or is slightly swollen behind; the ovary is 4-partite, glabrous or (less often) hirsute with simple hairs; the style is glabrous or rarely [*G. scorovhina*, *htci-*um*) hirsute with simple spreading hairs near the apex; the stigma is 2-fid with subulate

lubes, the lower being slightly the longer. The fruit consists of drupaceous or baccate nutlets of considerable size with a fleshy or (rarely) corky pericarp and a broad, somewhat oblique hilum ; the nutlets are generally glabrous, though in most cases where the ovary is hirsute they are hispid with simple hairs. All four nutlets develop as a rule in § EUGDBIPHOSTEMMA, in § POGOSIPHON it is usual for one or more to be aborted, and in § STENDSTOMA only one of the four nutlets becomes normally developed. The usual shape is broadly ovate or oblong with generally the upper end wider than the lower, in one group (*Parviflorvt*) they are ovoid and narrowed upwards ; in one species (*Cr. eriocurpon*) they are globose. The colour of the nutlets has been little noted; in two species (ff. *lucidum*; *vblmjum*) the fruit is white, in another [*G. mylissifolium*) it is dark red or orange. The embryo is straight and hardly fills the nutlet, the cotyledons are usually somewhat unequal.

There are distinguishable in this genus three *divisions* or *series*, which, however, hardly deserve to be recognised as SECTIONS, Although in the text these are provided with distinctive names and definitions, this has been done rather for the sake of convenience than because sectional or even subsectional rank is claimed for them. The divisions are :—

§ PDGOSIPHON, which includes species where the corolla tube is hirsute within ; in this it is usual for one or more of the nutlets to be abortive:

§§ STENDSTOMA, where the throat of the corolla is comparatively narrow and the tube is nearly straight; in this it is very unusual for more than one nutlet to be developed:

§§§ EUGDMPHOSTEMMA, with an incurved tube as in PDGDSIPHON, but glabrous within and very much longer and larger; in this all the four nutlets usually become developed.

The most compact and natural of these divisions is the second [STENDSTOMA).

Much more natural than these divisions are the ^{IC} groups" of species into which the genus separates itself. In some instances [e.y., *Parviflora*, *Lucida*) it might be convenient to deal with the constituent "species" as only somewhat distinct forms or varieties of one very variable plant. In the meantime, however, and until the whole area occupied by the genus shall have been more fully explored, it seems preferable to give descriptions of the whole of the separable forms as yet reported and (provisionally at least) to recognise these as "species." In doing this the lines laid down by Mr. Bentham and by Sir Joseph Hooker in their admirable accounts of the genus have been followed as closely as possible. But while this has been done, it may not be out of place to indicate briefly the reductions which a somewhat prolonged study of the material at present available suggests. These can be best shown in a tabular presentation ; the details are given in each case in the text that refers to the *group* involved.

TABLE I.—Comparative view of artificial and probable natural species.

Group.	Artificial " species " of present papBr.	Probabb natural position.
Strobiliua ...	1. <i>G. Wallichii</i> ...	C BUB-BP. 1. gi'nuina; tar. a. Blatius Bmth. (<i>G. Wallicfni</i>). ,, p. typioa [(7. <i>strobili-</i> ;iii/i var. <i>typien</i>). ,, 7. nun a (rnrs. <i>viridis</i> and <i>ac(wlis)</i>).
	2. <i>G. strobilinuum</i> { a. var. <i>typica</i> ...	
	3. <i>G. nutans</i> { 0. var. <i>viridis</i> ...	
	4. <i>G. Heyneanum</i> { a. var. <i>typira</i> ...	
Hemsleyanum	5. <i>G. Hemsleyanum</i> ...	BUB-BP. 2. nutans [<i>N. nutans</i>].
[Anthocoma]...	— <i>G. (Anthocoma) flavescenta</i> ...	b. <i>G. Heyneanum</i> { var. a. <i>typica</i> . var. /9. <i>Rottleri</i> .
NivBum ...	6. <i>G. niyeum</i> ...	c. <i>G. Hemsleyanum</i> .
	7. & <i>microcalyx</i> ...	[— <i>G. Pflayesrpns</i> .] d. <i>G. nivsum</i> . P. <i>G. microcalyx</i> .
Farviflora ...	8. <i>G. Thomsoni</i> ...	car. a. <i>farinosa</i> (9. <i>parviflo-</i> rum var. <i>farinosa</i>). var. /9. typioa (3. <i>parviflo-</i> rum var. f/vll and <i>G. dichotomum</i>). mr. 7. <i>crinita</i> [0. <i>ennitum</i> y/vi. <i>typica</i> and <i>G.</i> <i>Thoniioni</i>). rar. 6. <i>Griffithii</i> (0. <i>minYum</i> var. <i>Griffithii</i>).
	9. parviflorum (a. rar. <i>typica</i> ...	
	10. var. <i>farinosa</i> ...	
	10. ft <i>crinitum</i> (a. tar. <i>typica</i> ...	
Eriocarpon ...	11. <i>G. Briocarjjon</i> ...	f. <i>G. parviflorum</i> .
Lucida ...	12. <i>G. Philippinarum</i> ...	SUB-BP. 1. genuina; var. a. <i>typica</i> [0. <i>Phil-</i> iiv, 0. <i>Scor-</i> <iii, and 0. <i>oblongum</i>). far. 0. <i>parvifolia</i> [(? <i>Yara-</i> <i>nmim</i> and ff. <i>num</i> •urn). BUB-BP. 2. <i>leiocarpon</i> var. 7- <i>lucilla</i> [<i>G. lucidum</i> var. <i>typica</i>). «"• B. CBDBscenB [W. <i>luci-</i> <i>dum vir</i> , ran«rfiw).
	13. <i>G. Scortechinii</i> (a. rar. <i>typica</i> ...	
	14. <i>G. oblongum</i> ...	
	15. <i>G. javanicum</i> ...	
	16. <i>G. rugosum</i> ...	
	17. <i>G. lucidum</i> { a. par. <i>typica</i> ...	
	18. <i>G. phlomoidea</i> ...	
Fadunculata 1	19. <i>G. peduncalatum</i> ...	h. <i>G. peduncula-</i> tum. (SUB-«P. 1. <i>genuina</i> [<i>G.</i> /*rfMFICMtd«f; . SUB-«P. 2. <i>CurtiMi</i> [<i>G.</i>
	20. <i>G. Curtisii</i> ...	
Melissifolia ...	21. <i>G. chin ense</i> ...	^ <i>G. ohinense</i> . w. <i>G. Mastersii</i> . » <i>G. velutinuin</i> . 0. <i>G. D?atum</i> . P- <i>G. melissifolium</i> .
	22. <i>G. Mas tarsi i</i> ...	
	23. <i>G. velutinum</i> ...	
	24. <i>G. ovatmn</i> ...	
	25. <i>G. melissifolium</i> ...	

From this table it will be seen that there are only 16 species which are separable from each other by unexceptionable characters. At the same time it has to be admitted that the

intermediate forma necessary to support the decisive reductions indicated in the right-hand column have in few cases yet been reported.

The account of the genus by Dr. Miguel in *Flor. Ind. Bat* ii, 985—9, is somewhat unsatisfactory.¹ But reference to it as regards Malayan species is absolutely essential, and to facilitate this a tabular view of its synonymy is presented.

¹ This account is unsatisfactory mainly owing to the inclusion by its author of three plants that plainly do not belong to the genus [*O. jirfiriar* B., *membranifolium*, *macrophyllum*], and one [*G. flavescens*] the position of which is doubtful. These must be considered in detail, and in discussing them the best known will be first dealt with. This is *O. membranifolium*, of which the synonymy and distribution [as evidenced by specimens in HEBB. DALDUTT.] are given below:—

PHLDMB BUGDSA Benth. in Wall. Cat. n. 2D57 [1B2B], PL As. Bar. i, 63 [1B3D], Lab. Gen. k Sp. 634 [1834] e*DD. Prodr. xii, 545 [1B4B]; Walp., Kep.iii, B99 [1H45]; Hook. f., Flor. Brit. Ind. iv, B3 [1B85].—*Somphostemma membranifolium* Miq., Flor. Ind. Bat. ii, 985 [1B5B].

AHEA [JEDBE. HIMALAYA; Sikkim, Hooker! Clarke! Kurz! King! ASSAM; Mishmi, Griffith! Hhasia, Wallich! Booker! Thomson! Ularke! Mann! MALAYA; Perak, Sc. ortechini! Kunstler! Java, 'Horsfield! Philippines, Vidal n. 344B!

This is an aberrant *Phlomis*, and the specific name [as Sir J. D. Hooker U. has remarked] is inappropriate. Besides being SD unlike other *Phlomis* in general appearance, it differs from most other species of the genus in the posterior filaments being inappediculata. Dr. Miquel's description is remarkably inadequate, and notices neither the *divaricate* anthers, the *glabrous* filaments, nor the *annulate* corolla—three characters exhibited by no species of the genus in which he has placed the plant.

After Benthams *Phlomis rugosa* we may consider *G. macrophyllum* Miq., [of which there are specimens at Calcutta]. It is a plant undoubtedly congeneric with *Phlomis rugosa*, differing only in having the calyx rather longer and distinctly incurved, the corolla tube included, the lips shorter [the lateral lobes of the lower lip are besides acute, instead of obtuse], the galea externally much more densely tomentose, and the anterior style-lobe longer. In habit the two species agree exactly and their nutlets are not distinguishable. If therefore the preceding species is truly to be referred to *Phlomis*, this also must be; its synonymy and distribution are then as follows:—

PHLOMIS DBLDN&IFDLIA—*Leonurus oblongifolius* Blume, Bijdr. B2B (1825); Benth., Lab. & p. & g 552 [1B33] et DC. Prodr. xii, 5D2 (1B4B); Walp., Eep. iii, 812 [Mh]—*Gomphostemma mavroyhMum* [Vr] Fbr. Ind. Bat.ii, 9B8 [1N55]. * * * 9B7

ABEA QEDBE. MALAYA; Java, Blume! Kurz! Celebes, FvrsUr.

We can now consider the first of these species, *O. petiolare*, of which there is no specimen at Calcutta. Miquel expressly admits that he had only seen an imperfect specimen, but states that as regards habit it approaches *Q. membranifolium*; i.e., *Phlomis rugosa* Bth. Blume, whose description is much too brief, made it congeneric with his *Leonurus oblongifolius*, which is Miquel's *G. macrophyllum*, and which we know to be congeneric with Benthams *Phlomis rugosa*. If therefore Blume is right in making this congeneric with his *Leonurus oblongifolius*, and if at the same time Benthams plant is correctly placed in the genus *Phlomis*, this also is a *Phlomis*. Blume, it should be noted, did not consider it related to *Gymphostemma*, a genus which he did not recognise since, like Roxburgh he treated the species of it that he knew as *Prasia*. The synonymy and area of this plant are therefore—

PHLDMIS JAVANICA.—Jwniimj *javanicus* Blume, Bijdr. 82B [182B]; Benth., Lab. Gen. & Sp. 652 [1B33] et DC. Prodr. xii, B2 [1B48]; Walp., Eep. iii, B12 [Mh]—*Gomphostemma petiolare* Miq., Flor. Ind. Bat. ii, 9B7

ABEA GEDBK. MALAYA; Java, Blume.

Finally, we have to consider the doubtful species *p. flavescens*. This plant was described by Zollinger in Java and was by him made the type of a new Labiate genus *ANTHOVOMA* in 1845. In the absence of specimens it is only possible to discuss the descriptions that have been given of the plant. The original amount has not been accessible, but Hasskarl's description [1B47], which, judging from his account of the nutlets, to have been made from a specimen, has been accessible and is tolerably full. All references to the plant subsequent to Hasskarl's have had to be made without seeing specimens. Hasskarl suggests [Flora m., BSB] that this maybe the same as Zollinger and Moritz's *GomphnUmmu* [Verzeih. B4]; this suggestion A. de Dandolle adopts in an editorial note. Benthams description of *G. dichotomum* [Prodr. v, pp. 562 ff 7DD]. De Dandolle says that neither Zollinger's generic nor specific description of *A. flavescens* can separate this plant from *P. dichotomum*, but, as Miquel points out [Fl. Ind. Bat. ii, 1H], this is far from being the case. *O. dirkotomum* "tubo corollino subfiliformi faucem versus titum [palma] dilatato [nec ut in reliquis Gomphostemmatis supra medium inflato]" is clearly a member of the division *STEJTOSTOMA*, and therefore must differ greatly from *Intkocma javatctn* in having a corolla-tube with 4 lobes, the calyx and quite glabrous within as well as in having normally only one nutlet developed. Then Benthams

TABLE II.—*Synonymy of the article GOMPUDSTEMMA in Miyusi, ti*n\ Int. h.*

<i>Miqueliana</i> name.	Name in present paper.	KK.MARKB.
1. <i>G. phlomoidea</i>	... <i>G. phlomoidea</i> Bth.	
2. <i>G. oblongum</i>	... <i>G. javanicum</i> ZM.	... Miquel under <i>G. rAlwr\um</i> includes three plant* :— 1. <i>G. oblongum</i> Wull. Cot. n. 21'14, apparently not yet found in the Dutch territory; 2. <i>G. obtusum</i> Moritzi, Byht. Vincichn., 54, not of WtUil-L.—which is = <i>G. javanicum</i> Benth.; 3. [7. iY>^i'm Wight, ID. iv, t. 1457, not ul Wallich-wlnuh is = <i>G. eriocarpum</i> Benth.
3. <i>G. javanicum</i>	... <i>G. javanicum</i> Bth.	
4. <i>G. dichotomum</i>	... <i>G. parviflorum</i> Wall.	... This plant cannot be distinguished by its description from <i>G. ptilor*</i>
5. <i>G. parviflorum</i>	... <i>G. parviflorum</i> Wall.	... Miquel has not distinguished it by its description, and does not claim the presence of either in the Dutch territory.
6. <i>G. crinitum</i>	... <i>G. crinitum</i> Wall.	... Nor (OPB) Miquel claim this as present in the Dutch territory.
7. <i>G. petiolare</i> Miq.	...	Certainly it is a new genus; is almost certainly new Benth.
P. <i>G. flavescens</i> Miq.	... <i>B. P. flavescens</i> Miq.	... Somewhat differently, i.e., it is a new genus.
D. <i>G. membranifolium</i>	...	This plant does not belong to the genus <i>R. ...</i>
19. <i>G. macrophyllum</i> Miq.	...	A plant undoubtedly known with <i>Phyllanthus ruyola</i> Benth.
11. <i>G. stramineum</i>	... <i>G. stramineum</i> Wall. VAB. typica.	Not found as present in Dutch territory.
12. <i>G. viride</i>	... <i>G. stramineum</i> Wall. VAR. viridis.	Ditto. ditto.

seen 5. rfrAu^mitm, speaks of it as very nearly related to 9. *parviflorum*; it is not so, it should therefore be *glabrous* and elliptic, and thus altogether unlike those of *Anthocomajavicum* as described by Hassk. & Karst.

So far, indeed, does Hassk. & Karst's description differ from the accounts of *G. dichotomum* that it is doubtful whether Zuccarini's *ANTHOCOMA* has not been gratuitously referred to this genus. UornoBTEiisA by Hs. Karl De Coudolle, and Miquel; Benth. (*Gin. Pl. ii*, 12W) thinks that the account refers rather to a *Pkhu* (ban to a *C. ...*). But if Hajari's description is in all points exact, this will hardly be the case, as *Pkhu* has a different anther-cells, while the account of the corolla of *AKTHOCOMA* is precisely that of the corolla of *Oomphocoma* of the PDDDSIPION, in which division it is a *hk*, so far as this is concerned, but accommodated with *G. ...*. The "arAawiV" however, "dorso wntxa et hirsute" (Hs. Karl) are not an *h* might D. !*, * to § EcooHPHmTmiiA. X-rirfa, and the before if, after formation of the account of the anther-*h*, the plant is referred indubitably to *Gomphocoma* it must at least be considered representative of a separate group. H ^ ^ ^ *spes* ... of this plant are obtained an authoritative opinion on its true position cannot be pronounced. Its synonymy is as follows. the different genera proposed being placed in separate columns :-

ANTHOCOMA FLA^BICBHS Zucc. Nit en, GoinnoSTEMMA FLAVBICBHS Miq., Flor. Ind. Gt-neek. Arch. ii, 5B9 (1846); Hassk. & Karst, Flora xx\, 5% (1917).	Bfitt.ii.987 (Sott).—9. <i>dichotomum</i> ? [111k, Flora xxx, 596 (1847).—0. <i>dichotomum</i> , A. DC. Prodr. xii, 652 et 700 (1818). n.c. Zucc. Mor. in Syst. Verzeichn., nee Walp. Rbp. vi, wrc Benth. in DC. Prodr. xii.	Ptosis p. Benth. in Oen. Pl. ii, 1210 (1870).
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The type specimens of the Wallichian Herbarium are preserved in the Herbarium of the Linnean Society of London. They have formed the basis of all the accounts of the genus prior to the most recent and the bBsb (that by Sir Joseph Hooker in the *Flora of British India*). Mr. W. B. Hemsley has very kindly compared a set of specimens that agree with the various Wallichian numbers at Calcutta, with the specimens that correspond to these numbers in the type Herbarium, with the present condition of which the writer has thus become acquainted. For convenience of reference the Wallichian names, as indicated by these specimens, are in the subjoined table presented alongside of those that the same plants bear in the present paper:—

TABLE III.—*Eeducthns of the Wallkhian Herbarium.*

2151/1.	GDrnphestenimastrobilinum Wall	.	=	S. strobilinum Wall. VAR. typica.
2151/2.	G. strobilinum Wall VAR. Blatius Benth.	-	=	G. Walliuhii Praia.
2152/1.	G: Heyneanum Wall	.	=	&. Heyneanum Wall. VAU. typioa.
2152/B.	G: HByneanuni Wall	.	=	G. Heyneanum Watt. VAR. typica.
2152/D.	G. HeyDeanum Wall.	.	=	G. Heyneanum Wall. VAR. Rottleri Prain.
2153.	G: viriie? Wall.	.	=	G. strobilinum Wall. VAR. viridis Hook. l.
2154.	G: obloogum Wall	.	=	G: obbngum Wall.
2155.	Q. ovatum Wall.	.	=	Gk Dvatum Wall. VAR. typica.
2155/1.	B. lucidum Wall	.	=	B. rugosum Prflm.
2155/2.	G. lucidum Wall.	.	=	G. lucidum Wall
2157.	0. meliseifolium Wall.	.	=	{ G: melissifDium Wall., hi part. a- Mflstersii Benth., in part.
2158/1.	G: parviflorum Wall.	.	=	G. parviflorum Wall VAR. typioa. &. parviflorum Wall. VAR. fariuosa Piam, in part.
2158/2.	G. parviflorum Wall.	.	=	! G: orinitum Wall. VAR. typica, in port.
2158/D.	G. parviflorum Wall, (same plant as 2159/1)	=		G: crinitum Wall. VAR. typica.
2158/D.	&- parviflorum Wall.	.	=	G. parviflorum Wall VAR. farinosa Piam.
215B/E.	G: parviflorum Wall	.	=	G: parviflorum Wall VAR. typica.'
2159/1.	3. crinitum Wall (afterwards 215LS/D)	.	=	G: crinitum Wall VAR. typica.
2159/2.	G. crinitum Wall	.	=	G. crinitum Wall VAR. typioa.
2709.	3. velutinum Benth.	.	=	G: VBlutinum Benth.
271D-	G. Briocarpon Benth.	.	=	G: Bliocarpon Benth.

The following table exhibits the species that have to be excluded from the genus; besides these, G: flavescens Mirj. [*Anthocoma flavescens* Zoll.] is only doubtfully referable to it.

TABLE IV.—*Excluded Species.*

G: petiolare Miq.	.	=	Phlomis javaica [<i>Leonums javanicus</i> Bl.]
3. membranif Dium Miq.	.	=	Phlomis rugosa Benth.
G. maDrophyllum Miq.	.	=	Phlomis oblongifolia <i>Leonurns oblongifolius</i> Bl.)
G: insuave Hanoë, Jvur. Bot. (1381), p. 231	=		Miorotoena cymosa Prain; Hook. Io. Pl. t. 1872.

So far as is at present known, the genus is confined to the phytogeographical province of South-Eastern Asia. Species have been reported from the South-Indian Peninsula, the central and eastern portions of the Himalaya, Yunnan, South-East China, the Indo-Chinese Peninsula, the Andaman Islands, the Malay Isthmus (Tenasserim) and Peninsula, Java, Madura, and the Philippines. No species has been reported either from Sumatra, from Borneo, or from Celebes (the Celebes' *G. macrophyllum* of Miguel does not belong to the genus). But as one species occurs in the Philippines, wne four are reported from Java and Madura, and four occur in the Malay Peninsula, we maj

TABLE V.—Distribution of the Genus GTDMPIIDSTEMMA—concluded.

DIVISION.	GROUP.	SPECIES.	S. E. China.	Yunnan.	Burma.	Assam.	E. Himalaya.	C. Himalaya.	Andamans.	Tenasserim.	Siam.	Tonquin.	Malaya.	Sumatra.	Java.	Borneo.	Philippines.	S. India.
EUCOMPHOSTEMMA.	Lucida	<i>h. G. Dbbngum</i> , SUB-SP. <i>gemmum</i> ; var. <i>typica</i> ; foim = <i>G. Philippinarum</i> [12. <i>G. Philippines um</i>) foim = <i>G. Scortechinii</i> (13. <i>G. Scortechinii</i>) foim = true <i>G. ublongum</i> [14. <i>G. oblongum</i>) var. <i>parvifolia</i> ; foim = <i>G. javanicum</i> (15. <i>G. javanicum</i>) form = <i>G. rugosum</i> [lg. <i>tf. tugoswni</i>) SUB-SP. <i>leiocarpon</i> ; <i>izr. lucilia</i> [17. <i>9. lucidum</i> type) ... <i>var. caneacena</i> [17. <i>do.</i> var. /S)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>j. G. phlomoideg</i> [18. <i>9. phlomoides</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>h. G. pBduncuiatum</i> , STTB-SP. <i>gBduina</i> (19. <i>G. pedunculatum</i>) BUB-SP. <i>Durtisn</i> (20. <i>9. Durtisn</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>l. G. chinanss</i> (21. <i>G. chinense</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>m. G. Maatersii</i> (22. <i>G. Mashrii</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>n. G. TBlutimim</i> (23. <i>9. velutinuin</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>o. G. Dvatum</i> (24. <i>Gr. overturn</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
		<i>p. V. muliBsifohum</i> [25. <i>O. mehssifohum</i>)	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
			...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
			...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...

The district of South-Eastern China has only one species (*G. chinense*). This is however widely distributed in the district, occurring in the island of Hainan and in the provinces of Kwangtung and Fokien, and is, besides, very distinct. South-Eastern China may therefore be considered a district phytogeographically distinct.

In South-Western Yunnan two species have been found (*G. Wallivhii*, *9. lucidum*); both appear in precisely the same form in Upper Burma. Siam has hitherto yielded only one (ff. *parviflorum* var. *typica*) which also appears in Burma. Both districts must therefore be annexed to Burma. Burma (including Upper Burma of political geography, but excluding Martaban-Tenasserim—or the Malay Isthmus) has yielded eight forms, but these are of very unequal morphological value. Besides the three mentioned already, which all of them extend to Assam, these include *G. HemsUymmm*, which is very distinct and is endemic; *G. nutans*, which extends to Assam; *Gr. crinitum* (ftyP^e) which extends to Assam on the one hand and to the Malay Isthmus and Peninsula on the other; ff. *strobilinum* (type) and ff. *strobilinum* var. *acaulis*. The last two are endemic, and are confined to Lower Burma (Pegu and Arracan), but belong to a species very nearly related to the Upper Burma, Assam and Yunnan *G. Wallichii* while another variety of the same species, *G. strobilinum* var. *viridis* [which is indeed hardly varietally separable from var. *acaulis*] occurs in the Malay Isthmus (Tavoy).

The subjoined table shows the distribution of the species of Burma, Yunnan, and Siam :—

TABLE VI.—Table of distribution for Burma (including Yunnan).

NAME OF SPECIES.		Endemic.	Tenasserim	To Tenasserim
<i>G. Brobilinum</i> (2 vars.)	...	3	1	
<i>G. Wallichii</i>	...	1	1	
<i>G. nutana</i>	...	1	1	
<i>U. parviflorum</i> (1 var.)	...	1	1	
<i>G. rrinutini</i> (1 var.)	...	1	1	
<i>G. Henisbyanum</i>	...	1	1	
<i>G. lucidum</i> (1 var.)	...	1	1	
Totals of artificial species	...	11	31	1
Percentages of ditto	...		67.7%	
Totals from probable natural species	...	...	1 1A	i
Percentages of ditto	...	48.8%	11%	12.5%

The degree of isolation indicated by the endemic percentage of the district is considerable, and is markedly increased when approximately natural units are employed in calculating it. At the same time the use of this method decreases instead of increasing the percentages marking connection with Assam, thus indicating the possibility of these being districts that are phytogeographically distinct. But the percentage of species extending to Assam still outbalances the endemic percentage; we cannot therefore from the evidence of the Burmese species alone propose to recognise them as separate districts. The use of approximately natural units brings out on the other hand a rather greater degree of connection between Burma and Tenasserim, but not in itself sufficient to justify the annexation of the two districts.

In the Central Himalaya (Nepal) only one species (*G. ovalum*) has been found; as this also occurs in Sikkim, the Central Himalaya must be united with the Eastern Himalaya. In the Eastern Himalaya besides *G. ovalum* two other forms (*G. parviflorum* var. *farinosa* and *G. lucidum* var. *canadensis*) occur; but as all three extend eastward across the Brahmaputra and occur in the Assam range of hills, the Himalayan districts must, so far as this genus is concerned, be annexed to Assam.

In Assam itself, limiting the term to the mountain range, i.e., that run from north-east to south-west between the Brahmaputra and Upper Burma, fourteen forms have been found. These include all the species that occur in the Himalaya, and all but two of the species that occur in Burma; six of them are endemic. As indicating the central position of this range so far as forms of *Gomphoitemma* are concerned, it may be noticed of two species [*G. parviflorum* and *G. lucidum*] that two very distinct varieties of each occur in the district, these varieties being severally distributed; *G. parviflorum* var. *farinosa* occurs both in the Eastern Himalaya and in the Khasia hills, but does not extend to Burma, while *G. parviflorum* var. *typica* extends from the Khasia hills to Manipur, Lushai, Chittagong,

Arracan, Pegu, and Siam, but does not occur in the Himalaya; *G. lucidum* var. *typica* extends from Silhet to the Jaintea hills, Upper Burma, and Yunnan, but does not cross the Brahmaputra, while *G. lucidum* var. *canescens* occurs in the Eastern Himalaya and the Mishni and Eastern Naga hills, but does not extend to Burma or Yunnan. As showing further the validity of the annexation of the Himalaya to the district, it should be noted that the two forms of *G. ovatum* that occur in Sikkim both appear in it; var. *typica*, extends from Nepal to Upper Assam, while var. *flaccida*, which apparently does not occur in Nepal or in Upper Assam, reappears both in the Jaintea and in the Khasia hills. Of the six "endemic" forms it should be noted that *G. Thomsoni* is hardly separable from typical *G. vrinum*, and certainly cannot be kept apart for phytogeographical purposes; that *G. pedunculatum* has a very distinct, but still a representative species (*G. Vurtmi*) in the Malay peninsula; that *G. Mastersii* is (perhaps) the representative in the district of the quite distinct, but still nearly related, Eastern Chinese *G. chinense*. The three remaining endemic species [*G. niveum*, *G. velutinum*, and *G. melissifolium*] are however very distinct and well-defined. The subjoined table shows the distribution of the Assam species:—

TABLE VII.—Table of distribution for the Assam Range.

NAME OF SPECIES.	Endemic.	To Himalaya.	To Burma, including Siam and Yunnan.
<i>G. Wallichii</i> ...	...	...	1
<i>G. nutana</i> ...	...	...	1
<i>G. parviflorum</i> (2 vara.) ...	...	i	*
<i>G. crinitum</i> (1 var.) ...	...	...	i
<i>G. Thomaoni</i> ...	1	...	...
<i>G. lucidum</i> (2 vara.) ...	...	I	t
<i>G. pedunculatum</i> ...	1	i	...
<i>G. niveum</i> ...	1	i	...
<i>G. ovatum</i> (2 vara.) ...	...	1	1
<i>G. Mastersii</i> ...	1	i	...
<i>G. velutinum</i> ...	1	i	...
<i>G. melissifolium</i> ...	1	i	...
Totals of artificial species ...	6	2	3½
Percentages of ditto ...	52.1%	17.47%	30.4
Totals from probable natural species ...	4½	1½	1½
Percentages from ditto ...	60.6%	20.2	19.1%

The degree of isolation indicated by the endemic percentage seems in this case quite sufficient to justify us in looking on Assam as *a priori* a distinct phytogeographical district; and as in this case again the amount of connection with Burma is decreased instead of increased when approximately natural units are employed in computing it, it becomes necessary to look upon the two as separate.

In the Andaman islands only one species (*G. oblongum*) has been found. As this occurs in precisely the same form in Tenasserim, the Andaman group, so far as this genus is concerned, has to be annexed to that district. In the Martaban-Tenasserim district itself—the district of the Malay Isthmus—four other forms have been found. These are *G. strobilinum* var. *viriditum* which is not specifically, and is perhaps hardly varietally, different from the Arracan *G. strobilinum* var. *acutula*; *G. crinitum* var. *typicum* which extends to Burma and Assam on the one hand and to the Malay peninsula on the other; *G. Scortechinii* var. *Helpferi*, a plant that is apparently a variety of a Peninsular species, and *G. rugosum*, a species that also appears in Java. The subjoined table gives the distribution of these Tenasserim-Andaman species:—

TABLE VIII.—Table of distribution for Tenasserim-Andamans.

NAMES OF SPECIES.	Endemic.	To Burma.	To Malay Peninsula and Andaman Islands.
<i>G. oblongum</i>	1	...	...
<i>G. Scortechinii</i> (1 var.) ...	1	...	...
<i>G. rugosum</i> ...	...	...	1
<i>G. strobilinum</i> [1 var.]	1	...	...
<i>G. crinitum</i> [1 var.]	...	1	1
Totals of artificial species ...	4	1	1
Percentages of ditto ...	55.7.	15.7.	45.7.
Totals from probable natural species ...	1	1	1
Percentages from ditto ...	49.7.	13.7.	36.6.

In this case the degree of isolation indicated by the endemic percentages is somewhat decreased when approximately natural units are used in computing it. This prevents our feeling justified in considering the district phytogeographically distinct; as the same process increases both the Burmese and the Malayan percentages, causing the latter to exceed the endemic percentage, the annexation of the district to Malaya is strongly suggested.

From the Philippines one form has been reported (*G. Philippinarum*); this is endemic in the group, but for phytopographical purposes it cannot be separated from the Andaman-Tenasserim ff. *oblongum*. Though it is therefore necessary to look upon the Philippines as forming a separate district, this must be considered merely a tentative measure. From Borneo no species has as yet been reported, and the same is true of Sumatra, but from the Malay Peninsula five forms have been obtained. These are *G. microcalyx*, endemic and morphologically distinct; *G. Curtisii*, also endemic and distinct, but apparently the representative here of the Assam *G. pedunculatum*; *G. Scortechinii* var. *typica*, also endemic, but rather a local manifestation of the protean *G. oblongum* than a distinct species; *G. crinitum* var. *typica*, extending to Tenasserim, Burma, and Assam; and 17, *G. crinitum* var. *Griffiths*, which is endemic.

The subjoined table shows the distribution of these Peninsular species:—

TABLE IX.—Table of distribution for the Malay Peninsula.

NAME OF SPECIES.			ENNAMIO.		TD TENASSERIM.	
<i>G. microcalyx</i>	...	...	1	i	...	...
<i>G. crinitum</i> (2 vars.)	...	...		i	1	i
<i>G. Curtisii</i>	...	...	1	*	...	...
<i>G. Scortechinii</i> (var.)	...	...	1	*	...	...
Totals of artificial species	...		3		i	
Percentages of ditto	...		65.7%		14.2%	
Totals from probable natural species	...	...		144		1
Percentages from ditto	...	...		88.4		11.5

The degree of isolation indicated by the endemic percentages is so great that we are justified in considering the district phytogeographically distinct, more particularly since it is found that a union of this district with the only one to which its species are known to be distributed, while increasing the total number of species, would decrease the endemic percentage for this conjoint area from 85.7% to 76.3% if calculated from the artificial species, and from 88.4% to 76.4% if calculated from probable natural units.

From the island of Java five forms have been reported. These are *G. phymoides*, morphologically very distinct, and though extending to the island of Madura not reported from any other part of the Malay archipelago; "*G. flavescens*" (*Anthocoma flavescentis* Zoll), also endemic, but only doubtfully to be referred to the genus "*G. dichotomum*" which is almost certainly the same as typical *G. parviflorum*, and which certainly

cannot for phytogeographical purposes be separated from that species; *G. ruyosv.m.*, which occurs in the same form in Tenasserim; and *G. javanicum*, which, though endemic, cannot for phytogeographical purposes be separated from ff. *oifonyum*, a plant that extends in various local manifestations to the Malay Peninsula and Isthmus, to the Andamans, and to the Philippines. The subjoined table gives the distribution of these Java species:—

TABLE X.—*Talk of distribution for Java (including Madura).*

NAME OF SPECIES.	Endemic.		To Tenasserim,	
<i>G. phlomoidea</i>	1	1	...	...
(<i>G. flavescens</i>)	1	1	...	...
<i>G. parviflorum</i> (1 var.)	...	...		1
<i>G. rugosum</i>	...	...	1	1
<i>G. javanicum</i>	1	1	...	...
Totals of artificial species ...	3		1	
Percentages of ditto ...	66.6%		33.3%	
Totals from probable natural species	...	2		1
Percentage of ditto	...	75%		16.7

From the degree of isolation indicated by the endemic percentage in this case, we must look upon Java and Madura as constituting a separate phytogeographic district.

Southern India has yielded two species (*J. Ilcyncanum* and *G. triocarpum*); both are morphologically very distinct and both are endemic, so that, like Eastern China, Southern India must be looked upon as constituting a distinct phytogeographical district.

The following table shows more compactly the various districts that are delimited by this genus, with the number and endemic percentage of the species reported from each:-

TABLE XL-Districts of S. E. Asia indicated by the genus *GDMPHDS* TEMMA.

NAME.	Political components.	Number of species.	Percentage endemic.	Number of natural units.	Percentage endemic.
1. S. E. China ...	Kwangtung, Fokien, Hainan.	1	100-0	1	100-0
2. Burma ..	Siam, Shan Plateau, Pegu, Arracan, Upper Burma, S. W., Yunnan.	7	32-2	4	48-8
3. Assam ...	Assam ranges, Brahmaputra valley, Eastern and Central Himalaya.	12	52-1	9	80-6
4. Malay Isthmus ...	Martabun, Tavoy, Tenasserim; Andamans.	5	55-0	3	40-0
5. Malay Peninsula ..	Perak, Penang, Malacca, etc.	4	85-7	4	88-4
6. Malay Archipelago...	Java, Madura ...	5	66-6	4	75-0
7. Philippines ...	Philippine Islands ...	1	100-0	...	...
B. S. India ..	Deccan, Carnatic ...	2	100-0	2	100-0

By adding together such of these districts as give a markedly increased endemic percentage for the conjoined area, we obtain an approximation to the natural phytogeographical divisions of the area inhabited by the genus. There is no difficulty with any of the districts except that of the Malay Isthmus (Tenasserim and the Andamans). By adding together Assam and Burma, we obtain an area yielding 19 artificial species in 10 natural units with endemic percentages respectively of 92-47 and 94-5%. If to this conjoint area we proceed to add Tenasserim, we obtain totals of 17 and 15 respectively, but reduce the corresponding endemic percentages to 84-3% and 90%, results which are clearly less natural than those obtained * excluding Tenasserim from Indochina. If, on the other hand, we add Tenasserim to the rest of the Malayan districts, we obtain totals of 12 and 7 respectively with endemic percentages of 95-7% and 90-6%; whereas if we exclude Tenasserim from Malaya, we reduce the Malayan totals to 10 and 6, with respective endemic percentages of only 77-7% and 85%, obviously less natural results than those obtained by annexing Tenasserim to Malaya.

The subjoined table shows the various divisions delimited by the genus, with the districts composing each :—

TABLE XII.—*Divisions of S. E. Asia indicated by the genus GOMPHOSTEMMA.*

DIVISION.	Districts.	Number of species.	Percentage endemic.	Number of natural unitB.	Percentage enJemic.
I. DHI>A ...	1. S. E. China ...	1	iinr/d	1	1«B7.
II. INDD-UHISA ...	2. Burma; 3. Assam	14	82-47.	ID	94-57,
III. MALAYA ...	4. Malay Isthmus; 5. Mnlfiy Peninsula ; 6. Malay Archipelago; 7. Philippines.	12	9D-77o	-	9D'67D
IV. INDIA ...	B. South Indian Peninsula.	2	1DD7.	2	1DOV.

CHAPTER II.-CONSPECTUS SPECIERUM.

GOMPHOSTEMMA Wallich.

Calyx campanulatus ID-nervis squalis 5-dentutus uxius ssepe costatus. *Corollæ* tubus basi tenuis sspisaimB essertus sup em B in fduccm sicpius amp] am influtus intus fispigsime glaber et semper exannulatus, limbus 2-labiatua labio postics erecto forniatu integro vel eaiargiati antico patents latB 3-filio. *Stamina* 4, pubiSLentia unticis lungioribus sub gula ascendentia; ant^crx per paria approxiroatic 2-louularuH loculis parallelis tranaversis nudis. *Discus* subsqualis vel pustice in glanilulam turn ens. *Ovarium* glabrum vel rariua pubescens 4-partitum. stylus glaber vel rorissiniB apico pilifl divergentibus ornatus stigmate 2-fido lobis subulatis poatico parum breviorc; *nuculæ* obuvDidea3 uvoideLc vel rarissime globose siccitate ru^nsuLx, glabnc vel hirautir arcDlû latiusculâ parum oblique affixæ pericarpium crusaiuiculo carnoao vel fere subcroso nonnunquam colorato; *smina* nurnalia teatu, crassiuscula cutyledonibua plus minus infⁱqualibus.

Herbw suffruticesve caulibus erectis vel decumbentibus humilibus vel elatis elongatisve Bsepiissime simplicibus subscabris vel inilumento stellato tomentosis. *Folia* opposita nnipla StepB rugosa dentata vel integra, floralia conformia vel summa ad bractæas reducta, bubtus iuduoiento stellato plus minus tomentosa supra pilis Btrickis raro stellatis hispido-pubus-icntiu rarius glabra. *Vertivillastris* G—24-flori, mine scaailes et densi nune pedunculati et cymis utrinque evolutis laxi, s^pissiniu axillares remuti in axillis foliorum inferiorum vel secus caulem aphyllum dispositi, nDiinunqutim in spicara densem bracteata turminalm conferti; *bracteolæ* lauceulatx vel linBares B2;pius calyce breviurea; *flores* majusculi sæpius sessiles corollis s^epius flavis extus fere semper stellatD-pubescentibus, calycibus hLpe L 08 tat is extus stellatD-tomentosis intus sæpisaime pilis strictis binpidis viridibus ruru bracteisque rubidis vel purpurascensibus.

§ POGOSIPHON:—Corollas tubo incurvo intus hirsute, parts sequali calycBm nee Bxcedente, limbo ktu.sculo, labiis rminoribus, nuculis 2-3.

Strobilina:—*Verticillastris in spicam terminahm congesiis, calyce intus tubo glabro dmtibus hirsute nuculis ovato-obhngis glabris rugosis.*

a_m Corolla lutea [raro punicea) calyca multo loDgiore :—

herbce robustse spicia erectia:—

bracteis DDrdatia spicia interruptia . . . 1. *G. WallkhiL*

bracteia cuneatis spicis CDntinuus . . . 2. *Q_m btrobiinum.*

herbse gracihs spicis nutantibua . . . 3. *G_m nutans.*

b. Corolla purpurascens calyDsm vix excBdentB . . . 4. ff. *Heyneanum.*

** *Henisleyanum* :—*Verticillastris remotis axillaribus, calyce intus tubo dentibmque hirsutv, nuculis late oblongis glabris rugosulis.*

c. Corolla Dalycem vix exDBdente, VBrticillastris

densis, tvmento brevnmimo denso cinereo . . . 5. ff. *Hemshyanum.*

[*** *Anthocoma*:—*Verticillastris remotis axillaribus, calyce intus tubo [dentibusque] glabro, nuculis oblongis hirsutis [sublvvibus).*

— Corolla calycBm vix excedente, VBrticillastria

laxia cymosis. —. *Q_m flavescens.*]

§§ STENDSTDMA :—Corolla tuho recto intus glabro, parts tequaK calyce longiore, limbo anffusto, labiis parvulia, nuculis SDlitariis laevibus.

* *Niveum* ; *calyce haud costato intus tubo dentibusque hirsuto, ovario glabro, nuculis oblongis apice obtusis glabris.*

d. tomento perbreii densissimo albo, fDIIS sessilibua

supra glaberrimia , . *. B. (? *niveum.*

** *Parviflora*; *calyce parum costato intus tubo dentibusque hispidulo, ovario glabro, nuculis ovoidm apice angustatis glabris.*

e. DODIEB tubo fauce vix inflato, calysis dentibua

brevissimis. 7. *Q. micromlyx.*

f. corolla tubo faucB distinctB inflato, calycia dentibus elongatis:—

veTticillastria dan sis axillaiibua et seuus

caulem aphyllum dispotsitis. 8. *G. Thomsom.*

verticillastris laxia omnibua axillaribus cymia

multifloris BVDlutis:—

bracteia omnibua latiusculia calyce

Ion gi Drib us, tubo calycis dsntibua

cequilongD VBI longiurg, tomentD

densiorB albescentB. 9, ff_m *parviflorum.*

braotsia lextBrioribua Bxcspitia) angustia

calyco brBvioribua, tubo calycis dsntibua

brevioribus, tomBnto laxo cinsraflDBnte. 10. *Q. mhitpim.*

*** Eriocarpon; *calyct parum costato intus tubo dmlibusque glabro, ovario pubescente, nuculis globosis hirsutis.*

g, foliia petiolata supra (glabrescentibus . . . 11. (7. *eriocarpon*.

§§§ EusomPHOSTEMMI:—Corollas tubo incurvo intus glabro, parto aequali calyce luniore. limbo, ample), labiis majusculis, nuculis late ovatis 4.

* Lucida; *valyce prominenter costato intus tubo dentibusque hirsutis, vvano dense villosa, nuculis Icevibus.*

h. cDrollro tubo calyce multo longiore:—

calycis dentibus acuminatis, nuculis maturis hirsutis:—

foliis majusculis baud rugosis breve petiolatis:—

Btylo hirsuto:—

calyce tubo denfibul longioribus . . . 12. *Q. Philippinamm.*

calyce tubo dentibus brevioribus . . . 13. *0. Scurt?chvni,*

stylo glabro. 14. *U. obhntum.*

foliis minoribus longioribus petiolatis:—

Btyli lobis elongatis recurris, foliis hand

rugosis. 15. *9. javaninm.*

styli lobis brevibus, foliis rugosis . . . 16. *0. rugotum.*

calycis dentibus brevibus triangulis, nuculis

maturis glaberrimis. 17. *0. luvidium.*

j. corolla) tubo calycem parum excedentibus . . . 18. (*. nlhnn,;.,!^*

•• Pedunculata; *calyce haud costato intus tubo yhbrosius dnV. .<in;c /tirsuh, ovario yhbrosius, miculis punctulatis; cymia laxa.*

h. corollis tuum calyce parum longioribus, bracteis

filamentibus alternis:—

bracteis obtusis serratis, calycis filamentibus

triangulis tubo brevioribus 19. *C7. pydunrntum.*

bracteis acutis integris, calycis filamentibus

lanceolatis tubo longioribus 20. *0. CurtUi.*

L cDrollro tubo calyce multo longioribus, filamentibus

floribus oppositis. 21. <>. .-n^.

*** Helissifolia; *valyce parum costato intus tubo dentibusque hirsuto, ovario glabro, nuculis Icevibus.*

Bracteis calycem haud exsuperantibus, foliis supra pilis

stylis hirsutis, corollis lobis postico integris:—

m. bracteis exterioribus obtusis, calycis tubo dentibus

multo brevioribus, dentibus tubo calyce multo

longioribus, foliis subtus (nervis exceptis) glabrescentibus,

verticillatis (nervis exceptis) obovatis

evolutis multilobis. 22. *0/ Mastfrsü.*

n. bracteis omnibus acutis, calycis tubo longioribus

exsertatis, corollas tubo calyce paulo longioribus,

filamentibus utrinque demum evolutis, verticillatis

paucafloris. 23. *0. reclutium*

BracteiB Bxterioribus calyce IDDgioribus, Dorollre tubo
calycB multu loDgiora :—

o. bracteis exterioribus ovatia obtusis, oalycia dentibus
tubo brevioribus, corollse labio postico integro
foliis majusDulia obtusis *supra pilis strictis*
hirsutis, vertiuillastris multifloris. . . . 24. *G. ovatum*.

p. bracteis exterioribus obloDgia acutis, calycis
dentibus tubo sequilongis, corollsB labio postico
emarginato, foliis minoribua acutia *mpa glaber-*
rimis, verticillastris pauoifloria. . . . 25. *G. melissifolium*.

[The *letters* to the left indicate the probable limits of the *natural spevies* existing in the genus.]

CHAPTER III.—DESCRIPTIONS OF SPECIES.

GOMPHOSTEMMA Wall. (1B2B).

Calyce aequali 5-dentato campanulato extus tomentoSD, *corolla?* tubo basi tenui superne "in faucem amplam dilatato, labio posticiD fornicato antico patens 3-lobo, *filamentis* pubescentibus, antherarum loculis parallelis transversis nudis, *ovario* 4-partito, stylo apice 2-fido, *nuculis* areola latiuscula parum DWIJUB affixis, pericarpio crassiusculo, *cotyledonibus* inseijualibus.

§ PDGOSIPHON Prain (189D); corollae tubo Intus hirsuto, partB ^equali calycis brevior, limbo latiusculo labiis minoribus, nuculis 2-3.

I. StrDbilina; *verticillastris* in *spicam Urminahm conyestis*, *cali/ce* nee *costato intus tubo glabro dentibus hirsuto*, *vvario glabro*, *nitwits ovato-oblongis*.

1. Gomphostemmtt Wallichii Prain (1890).

Elata erecta caule robusto vix sulcato, *foliis* rigide rugDsis petiolatis basi truncatis vel subcordatis ovatis apice acutis margine serratis, supra hispidis subtus petiolis caulibusae densa floccoso-tomentosis, *spka* erecta plus minus interrupta, *bracteis* sessilibus basi⁴ late cordato-ovatis margine regulariter serratis, sursum decrescentibus, calyceai superantibus, *calycis* pallide viridis tubo dentibus longi3re, *corolla* sulphurea alba vel raño punicea calyce 3-plo longiore, apice parum incurva, tubo medio intus antice hirsuto, labio postico extus parce puberulo corolla ceterum glabrescente, *stylo* glabro, *nuculis* nigris rugosis glabris.—Gr.¹ strobilinum VAR. elatius *Benth. in Wall Cat* n. 2151/2 (1828) et *Pi- ds. Bar.* ii, 12 (1831).—Gr.¹ strobilinum *Benth., Lab. Gen. et Sp.* 517, in *parU* 11635) et *DO. Prodr.* xii, 55D, in *parU* [1848]; *Walp[^] Rep.* iii, 890, in *parte* (1845); *Miq., F¹or¹, Indm Batm nJ ** 98 S¹, in parte* (185B J5 *Ularke₃ Jour. Linn. Soc_m* xxv, 68 (1B89J ; *fiw Wall.*—G- strübilinum VAR. typica *Hook. l., Flor. Brit Ind.* iv, B9B, in *parte* [1885]; *nee Wall.*—Gr. elatius *Wall, in sched. in Herb. Calcult. servat !*

In ASSAM superiore; in collibus Naga apud Kohima, 4,500 p. s. m. et prope Phesama, 4 ODD p. s.-m., *Clarke, Prain!* In BURMA superiors; in collibus Taong-doung, *Wallich* n. 2151/2! in Karenee, *VRiley!* in collibus Shan apud Pwehla, *Collett!* apud Maymyo, 4,DD) p. s.-m., *Kingii mercenar. !* prope Kendat, *Prazcr !* In YUNNAN occidental[^] *Anderson!*

Caulibus 200-250 cm. altis obtuse tetragonis, petiolis 1—2 cm. longis, laminis 11—15 cm. longis his 7—9 cm. hinc basi abrupte truncatis, bracteis inferioribus 40 mm. longis his 20 mm. latis, reliquis sursum decrescentibus 12—15 mm. longis 14—19 mm. latis, bracteolis lanceolatis 10 mm. longis, calyce 11 mm. longo hoc 5 mm. lato—tubo calycis 10 mm. longo, dentibus 5 mm. longis hinc basi 3 mm. latis, involucri tubo 22 mm. longo—parte tubi aequali 10 mm. longo, limbo 8 mm. lato, labio postico 9 mm. longo hoc 8 mm. lato, lobis antico 8 mm. longo hoc 10 mm. lato, nuculis maturis 5 mm. longis his 3 mm. latis.

PLATE 75. *Somphoatemma Wallichii* Prain. Specimen from Uaymyo, Upper Burma; Kinfs Collector.

This species resembles ff. *Heyneanum*, but is at once distinguished by its much larger corollas, its different bracts, and its interrupted spikes. Its nearest ally is however (? *nutan**, which has the same calyx, and, except for its slightly denser tomentum, the same corolla. From *0. nutan* the large broad-based bracts, the long erect interrupted spikes, and the stout stems distinguish it. It is much less like *G. strobilinum*, with which it has since 1835 been associated. That species* differs in tomentum, has much larger leaves which taper to the base, a calyx softly tomentose with long hairs, a shorter merolla and smaller bracts which are cuneate at the base and eubequal along the spine.

In 1821, as is shown by a manuscript note in *Ilarb. Calcutt.*, Dr. Wallich considered the plant entitled to specific rank. In 1825 (*Lith. Cat.* n. 2151/2) it was issued, in deference to Mr. Dnithara's judgment, as a variety of *G. strobilinum*, and in 1831 [*PL As. Ear.* ii, 12] Mr. Dentham continued this treatment. But in 1835 [*Lab. fen. et Sp.* B47], though no further examples are quoted, it was unconditionally reduced to *G. atripilinum*, a treatment which has been followed in all subsequent works. Numerous examples of both plants have been communicated since the Wallichian distribution, and these show that Dr. Wallich's original opinion was just; in order, however, to avoid the inconvenience of issuing a name that did not originally find acceptance, the species has been so named and dedicated to that botanist.

One circumstance in connection with this species has to be mentioned. This, which corresponds to n. 2151/2 of the Wallichian catalogue has been more frequently collected and distributed than the plant which corresponds with *Cat.* n. 2151/1. The name "*G. strobilinum*" having been applied to both has thus become more associated with this species than with the plant to which that name really belongs and to which it has in this paper been limited.

2. *Gomphostemma strobilinum* Wall [1825].

Elata vel humilis caulis robusto sulcato scabro, foliis subsessilibus vel breve petiolatis basi attenuatis elliptico-ovatis apice acutis margine serratis supra hispidis subtus petiolis utrinque tomentosis vel glabrescentibus, spica erecta basi tantum interrupta, bracteis supparibus ovato-lanceolatis calycem viridius superantibus basi cuneatis attenuatis, calycis tubo dentibus longiore, corolla flava calyce 2-plo longiore parum incurva, tubo merolla intus antice hirsuto, labio postico extus pares vestito corolla ciliata glabra, stylo glabro, nuculis brunnea rugosa glabris.

VAR. *typica*; clatior caulo profundo sulcato, bracteis apice acutis antice irregulariter dentatis basi integris, foliis rugosis subtus tomentosis.—*G. strobilinum* WulL, *Cat.* n. 2151/1 (1828;; *Benth.*, Wall. *PL As. liar.* ii., 12 (1831), *Lab. Sen. et Up.* B47, in parte (1835) et *DC. Prodr.* xii, 550, in parts (1848); *Walp.*, *Hep.* iii, BDD, in parte (1845); *Misc. Fur. hid. Bat.* ii, 98y [185B].—*G. strobilinum* VAU. tunc *Hook. l., Flor. Brit. Ind.* iv, BDD, in parte (1885).

In BURMA; Meaong, ad ripas fl. Irrawady, Wallich n. 2151/1! Pegu in Yomah Kurz nn. 597! 2412! 2413! apui Mingin, Prazer !

VAR. *viridis*; humilior caule distincte sulcato, bracteis acutis antice basique integris foliis haui rugosis subtus nervis parce puberulis ceterum glabris ^{G*} strDbilinum VAE. *viridis* Hook. l., *Fhr. Brit. Ind.* iv, 696 (1885).—Q- viride?, " *G. strobilino* valde affine ^{B³} Wall., *Oat.* n. 2153 [1828] ^{Gr} viride Wall, ex Benth., *Wall. PL As. Bar.* ii, 12. (1831), *Lab. Uen et Sp.* 547 (1835) et *DO. Prodr.* xii, 555 (1848) Walp., *Rep.* iii, '89S (1845); Miy., *Fhr. Ind. Bat.* ii, 989 (1855).

In BURMA inferiors; Tavoy, Gomes [Wall., *Oat.* n. 2153)! Pegu, Kurz n. 595!

VAR. *acaulis*; humilis caule iniistincts sulcato, bracteis apice acutis vel obtu ^{''*} antice regulariter dsntatis basi integris, foliis subrugosis subtus tDniBntDBi⁸ verticillastris imis nonnunquam plus minus laxis subcymosiru evolutis — G. *acale* Kurz ex Hook. l., *Fhr. Brit. Ind.* iv, 69B (1885).

In BURMA inferiore; Arracan, in CDIB Mingoo in Boronga ins., in sylvis, Kw fb¹⁸!

Daulibiu VAR. *typice* 4D—13D cm. VAR. *viridis* 7—25 cm. VAR. *asaulis* 3—jo altis crassioribus obtuss tetragonis, petiulis in VAR. *tt/pica* D—2 cm., in rslicjuia 3—g ^{cm.} longis, basi SEEpissime persensim sed in VAR. *acauli* nonnunquam abruptius atten ^{cm.} lanTiniB 14—40 cm. longis his 9—14 cm. latis, bracteis omnibus 15—18 mm. ^{ta} longiTh- 2D—22 mm. latis, bracteolis linBari-lancBolatis 6—8 mm. longis, *cahjce* 11 mm ^{h¹} h¹ 5 mm. lato—tubo calycis 6 mm. bngo, isntibus 5 mm. longis his basi 3' m¹ lat¹ corollce tubo 14 mm. longo-parts tubi sequali ID mm. longa, limbD 7 mm. lato, Jab¹⁸ postico 8 mm. longo hoc 8 mm. lato, labio antico 7 mm. longo hoc 13 ^{m¹} j¹ [^] [^] nuculis maturis 5 mm. longis his 3 mm. latis. ^{''} ^{°>}

PLATE 7B. Gomphostemma strobilinum Wall. VAR. *typica*. Specimen from P Kurs n. 2142. ^{- B¹⁸u,}

PLATE 77. B. strobilinum Wall. VAR. *viridis* Hook. f. Wallkhian Herbarium u. 2153 at Calcutta.

PLATE 78. G. strobilinum Wall. VAR. *acaulis* Prain. Specimens df ^{SamB} gathering from Boronga, Kurz.

ThB relationship of 9. *itnHlinmn* VAR. *typiw* to 9. *Wallkhii* has been discussed under tt, f On the sheet of n. 2153 Dr. Wallich has written » 9. *viride?* while in the catalog ^{itfibu} T T added the remark "9. *stnbilino* valde afflne." Mr. Benthams in all his accounts has consistently ^{was} the plant specific rank, but makes his diagnosis largely depend on the character "corolla-tube¹ slfT" than in 0. *strobilinum*." The corolla-tubB of VAR. *viridis* is indeed shorter than that of 9 ^{jp¹⁸} (which Mr. Benthams induced in 9. *strobilinum*), but not than that of 9. *strobilinum* proper Th character therefore fails, and tha reduction effected by Sir Joseph Hooker \Flor. Brit. Ind iv 69S) ^{was} very just. The namB given by Mr. Kurz to the third variety is somewhat unfortunate, only 3 ^s ^{S Bems} in the two largB gatherings that represent it being stemless. Though at first sight it appears ^{V ^ n i} species, study of the extensive material at Calcutta convinces me that the plant might al ^{at} considered a state of VAK. *viridis* rather than a separate variety. It is of interest as ^{DDmbin¹⁸} dwarf habit, few-flowerad spikes and petioled leaves of VAK. *viridis* with the harsher leavBs ¹⁸ bracts, and closer tomentum oi VAR. *typica*, but it differs from both in having SQUIB of the bract's ^{at} and in having the lower whorl's sometimes cymose, thus making the inflorescence thyrsoid inleadT¹⁸ s-nicate.

3. *Gromphostemma nutans* Uook. l. (ISSI).

Elata ascendens caule gracili parura sulcato, foliis subaequalibus basi cuneatis ovatis apice acutis; latis margins serratis, supra hispidia subtua petiolis caulibusque dense molliter tomentosis, spica brevi densa nutante, bracteis supparibus ovatis VDI ovato-lanceolatis margins subintegris basi cuneatis altricuatis calycis superanlibus, calycis viridia tubo dentibus longiore, corolla flava calycis 3-plo longior apice antica parura incurva, tubo medio intus antica hirsuta extua rarius hirsuta, stylo glabro, fiuculis nigrescentibus rugosis glabris.—Gr. nutans Hook. l., *Flor. Brit. Ind.* iv, B97 (1885).

In ASSAM inferioribus; in montibus Khassia, 2,000—3,000 p. B. m. f. Lobb, Simons! Jfunn! apud Nunklow, 3,500 p. s. m., Vlarke; & Nya Bungalow, 2,500 p. a. m., Clarke n. 40B45! In BURMA superiore; in collibus prope Kendat, Praxer n. 374!

Caulibus 3D—90 cm. altia gracilibus Kubterctibus, petiolia 0—1 cm. longia, lamina 5—9 cm. longia hia 25—4 cm. labia, bractecolia linearibus 4 mm. longia, catyce 13 mm. longo hue 5 mm. latu—tubo calycis 6 mm. longo, dentibus 7 mm. longis hia basi 3 mm. latis, corollae tubo 2S mm. longo—parto tubi sequali 9.5 mm. longa, limbo S'5 mm. lato, labio postico 7 mm. longo hoc S mm. lato, labio antico 10 mm. longo hoc 13 mm. lato, nuculis maturis 5 mm. longia hia 3 mm. latis.

PLATE 81. *Gomphostemma nutans* Ilwh. J. A—Specimen from Khassia, Simons. B—Also from Khasia, Clarke n. 4DS45.

A species diagnosed from all the other members of the *Strvlinia* group by its short drooping or nodding spikes and its bleeder stem. Its nearest ally is *Q. Wallicfuii*, from which it differs in leaves and bracts, but with which it quite agrees in calyx, corolla, mid nutlets. The Kondat specimen closely resembles Caohar specimens of *G. melissifoliu* in habit, having slender sprawling stems 6—9 feet in length which root at the nodes when they rest on the ground! but do not require to do so if they climb over adjacent bushes.

4. *Gomphostemma Heyneanum* Wt. (1328).

Elata erecta caulo robusto sulcato, foliis elliptico-ovatis lamina basi abrupta in petiolum aequaliter attenuata, rugosa, supra molliter hirsuta subtua petiolisque donata flocculosa-tomentosa, spica erecta basi tantum parum interrupta, bracteis appuribus ovatis vel ovato-lanceolatis calycem superantibus, calyce viridis tubo dentibus longiore, corolla purpurascens calycem icquante apice antico incurva, tubo medio intus antica hirsuta, labio postico brevi, parts tubi infundibuliformi labiisque (lobo labii antici medi.) nixto deorsum tomentosa, stylo glabro, nuculis nigra rugosa glabris.

VAR. *tjpin*; caulibus vix sulcatis densa tomentosa, foliorum laniis... uili. uui acuminatis attenuatis margine nixto serratis, bracteis ovato-lanceolatis basi obtusis apice acutis.—G. Heyneanum Wall., *Vat.* n. 2152/1 118*8) et 2152/B [1829; *Benth. in Wall., Pl. Atm. Rar.* ii, 8. 1831 | ^ b ^ et Sp. U7 (1835) et DV. l. xii, 551 [184B; f i L i j ^ i (B. i5); W*. i. i. il. 1. 222, t. 17<> f. \ (185'D) B t ^ t ' HDO 11850).—& strobilinum VAK. HdynBasft Uool of ^ ^ ^ Ind iv 6DB (IBBSj—Btachy. tomentosa // ^, le jvlf. s n. ex ^ ^ ^ 2152/1 (1828); Berth, in Wall., PL As. Rar. ii, 12 (1851).—S. Cat. indic. Wym Mas., syn. in Wall. Cat. quoad n. 2152/B tantum (1829).

In INDIA Australi; Courtallam, Heyne, Perrottet, Wight! in tractu Doncan, Stocks!
in cDilibus Anamallai, 40DD p. s. m., Gamble n. 14528 !

VAR. *Rotileri*; caulibus distincte sulcatis subscabris, fuli^rum laminis apice obtusia
margins crenatD-serratis, bracteis ovatis basi cuneatis apice obtusia —EJ-
Heyneanum Wall, Cat n. 2152/D (1829).—*Stachys indica* Wall, syn. in
Cat quoad n. 2152/D, viz Wight [1829].—S. *Dorientalia* Bottler Mss!in Herb
Madr.!

In INDIA Australi; Dourtallain, Bottler ! in cullibus Mudumallai, 2DDD p. si m Gamble
n. 17983!

Caulibus 5D—1DD cm. altis crassioribus obtuss tetragonis, petiolis 4 cm. hun-is laminis
IB—24 cm. long-is his 10—15 cm. latis, bracteis inferioribus 25—35 mm. longisliis 15—20
mm. latis, reliquis 15—ID mm. long-is his ID—5 mm. latis, bructeolis linBaribus 4 mm.
longis, wlyce 11 mm. longo hoc 5 mm. lato—tubo calycis [i mm. long-o, dentibus 5 mm.
longis his basi 3 mm. latis, corolla tubo ID mm. longo—parts tubi sequali B-5 mni. lon^a
limbo B mm. lato, labio postico 4 mm. longo hoc 7 mm. lato, labio antico 6 mm!
IDH^O hoc 11 mm. lato, nuculis maturis 5 mm. longis his 3 mm. latis.

PLATE 79. *Gromphostemma Heyneanum* Wall VAR. *typica*. Specimen from Anamal-
lai hills, Gamble n. 14B28.

PLATE 80. *G. Heyneanum* Wall VAR. *Rottleri* Prain. Specimens from Dourtallam
Bottler [Wall. Cat n. 2152/D).

ThB most distinct species of the *Strobilina* group; diagnosed from all the other numbers by its small
blue-purple corolla. Its two varieties differ very considerably in stem and in foliaga, but in both thB
calyx, corolla, and nutlets are precisely the same.

ThB separable forms constituting the group *Strobilina* ar, of very unequal rank, and possibly tha
next revision of the genus may demonstrate that it is sufficient to recognise within its limits only
two species. These will probably bB limited somewhat as follows :__

A. GK STUDBILINUM Wall aitgm.; corolla lutea, raro punicea calyce multo lon^iora.

SUB-SP. 1. gsnuina; herbre robustso spicia erectis.

VAR. *a. elatiuaBmtii*.; bracteis cordatis, spicis elongatis interruptis caulibus
ebngatis = Et. *strobilinum* VAR. *elatus* Benth in Wall, Vat,
2151/2 (a. Wallichii Prain itti supra).

VAR. *fi. typka*; bracteis cuneatis, spicis elongatis continua, caulibus elongatia
= G. *strobilinum* Wall Cat. 2151/1.

VAR. *y. nanaj*; braoteis cunsatis, spiois brevioribus densis, caulibus brevisus =
&. *viride* Wall Vat. 2153 8f H. *acaule* Kurz ex Hook. l, Flor
- Brit. Ind. iv, 59 B.

SUB-SP. 2. nutans; herb» graciles, spicis nutantibus brevioribua densis, braDteis
cuneatis = Et. *nutans* Hook. l., Flor. Brit. Ind iv, 597.

B- G. HEYNEANUM Wall.; corolla purpurascence caljcem vix excedentB = a. *Heyneanum*
Walf. Cat. 2152.

In the meantime, hDWBVer, in ths^ibsencc of the necessary intermediate forms, it is impossible to
formally propose these reductions.

IL *Hemsleyanum* ; *vertidlhstris remotis azillaribus, cali/ue nee costato intus tubo denlibusgne*
hirsutv, ovariv glabro, nuculis late vblongis.

5. *Gromphostemma Hemsleyanum* Prain (18DD).

Elata erecta caule sulcato robusto, *foliis* rugosia pctiolatis basi attenuata, elliptico-ovata acutia marline argute serratis, lamina supra pares hiapidulis subtua pctiolis caulibusque brevissine dense cinureo-touientcmā, *verticillistris* multifloria duns is, *bracteti* lanceolata linearibusve calycB brevioribus, *calycis* pallide viridia tubD dentibua multo braviore, *corolla* flava adunca extus hirauta culyce vix lung-iore, tubu medio intua hirsuto, *nuvulis* ~~nigris~~ rugosulia glabria, intua pallidia lucDntibua.—G. Hemaleyanuni Prain Mss. ex Voll. et *Hemsl.*, *Jour. Linn. Soc.* xxviii, 115 (1890).

In BURMA superiorB; apud Meiktila, *Cyllett* nn. 17! 8B7!

Caulibus plus quam 6D cm. altia tetragonia, pctiolia 1—3 cm. longis, laminis basi abruptius attenuata ID—13 cm. longia his 4—7 cm. latia, bracleis 14—25 mm. longis his y—7 mm. latis, *calyce* 14 mm. longo hoc 5 mm. luto—tubo calycis 5 mm. longo, dentibua 9 mm. longia his basi 3 mm. latis triangularibua, *wrvllvc* tubo 10 mm. long3—parte tubi icquali 5 mm. longa, limbo 5 mm. lato, labio postico 3'5 mm. longo hue 5'5 mni-lato, labio antico B'5 mm. longo hoc 9'5 mm. lato, *iwnrlis* maturia |1—3) subglobDsis U mm. longis his 5 mm. latis.

PLATE 82. *QomphosLcmma*, *Hcmslcyanum* Prain. Specimen from Mciktila, Upper Burma, *Colhtt* n. 837.

A very distinct species; agreeing with *Strobijina* in having ~~the~~ *Lube* hirsute witain, uut differing from these in general habit EU to which it agrees with tho rest of the genus. It ~~no~~&t closely resembles (? *niceuin* ia foliage and tomentum, but its included, distinctly incurved, and internally hirsute corolla, its much larger calyx which has longer teeth, aud its gray (in place of white) torn en turn, amply distinguish it. Tho species is dedicated to Mr. W. 13. H emshy, but *ior* whose kind assistance it would have been impossible for me to have prepared this account of the genus.

If *Gomphostemma foreseen** Miq., Flor. Ini Bat. ii, 987 [1856] *Anthocomi* /an^./n Zull, *Nat. en* Qeneesk. Arch, ii, 559 [194BJ] is truly rferablo to this genus, it must stand next to *U. Uymsteyannum*. The hirsute nutlets, however, indicate a hirsute ovary, and imply a relationship with *Lucida*, similar to that indicated by *Enomrpon* among the BTBNDSTOMATV. It would therefore be neecasy to give it the rauk of a group which might be defined as follows:—

lib. An tho coma ; *tertiHiastris remotis axillaribu**, *calyce intus glabro*, *ovarfo hiranto*, *nuculia vb long is*.

But iu the absence of authentic specimens it is impossible to looalfuo this Bperios definitely, ani in VLBW of the doubtB as to tho generiu pDBition of tho plant [already fully discussed, p. 231, footnote) this must be looked on as a purely tentative definition.

§§ STENDSTDMA Prain (1800); corolke tuba iuUm glubri), parto aiquali calycB longiurc, limbo angu^to labiis purvulis, *nuculia aingulia*.

III. Niveum; *verticillastris remotis axillaribus*, *catyce ncc costatv intus tubo dentibusque hirmto*, *wario glabrv*, *nuculis oblongti*.

6. *Bomphostemma nivBum* Ihok. / (1S85).

Elata erecta cnuh robust^ sulcato, *folxis* 8ub^{ae8a}ilibu3 ~~ru~~ ^u ~~is~~ ^{is} ~~biwi~~ ^{biwi} attenuati* elliptico-mcBDlatia ~~acuminata~~ ^{acuminata} margine B^{rt}tis, ~~su~~ ^u ~~glaberrimia~~ ^{glaberrimia} subtua pctiolis caulibuaq^{uo} dense albo-tomentosis, *vertmllattris* multiioria donsia, *brazhis* Dvattia lancuulatin linearibusve calycem angustiorecm superantibua, *alycis* albo-tomentosi tub. duntibua L^RiorBⁱ *nrolh* flava fere r^Ecta calyub vix Z-pb longi^ ^{M t u 3} porco pubcrub, **t*lo*

glabro, *nuculis* pallide brunneis glabris vix rugosulis.— *G. niveum* Hook. l., *Fbr. Brit Ind.* iv, B97 (1BB5).—GL parviflorum *Herb. Ind. Or. II f. et T.T., nee Wall.*

In ASSAM superiors et inferiores; in montibus Uishmi, *Griffith*; in montibus Khasia, 3—4, DO Dp. s. Di., *Hooker et Thomson! Mann I*

Daulibus crassis BD—123 cm. altis obtuse tetragonis, petiolis D—2 cm. longis, laminis basi persensim attenuatis 15—40 cm. longis his 6—13 cm. latis, bracteis 9—22 mm. longis his 2—12 mm. latis, *calyce* 10 mm. longo hoc 3 mm. lato (*calyce* fructifero 45 mm. lato)—tubo calycis B mm. longo, dentibus 4 mm. longis his basi 2 mm. latis, *corollae* tubo IS mm. longo—parts tubi sequali 11 mm. longa, limbo 4 mm. lato, labio postico 4 mm. longo hoc 3.5 mm. lato, labio antico 5 mm. longo hoc 8.5 mm. lato *nuculis* sepius solitariis, nDnnunjuam tamen 2 vel 3, oblongo-ovatis 5 mm. longis his 2.75 mm. latis.

PLATE 83. *Gromphostemma niveum* Hook. l. Specimen from Khasia, *Mann*.

A VBy distinct species; recognisabla at once by its close short white tomentum.

IV. Parviflora; *verticillastris remolis azillaribus vel secus caulem aphyllum dispositis, calyce parum costato intus tubo dentibusque hispidulo, vario glabro^ nculis ovoidem versus apicem angustatis.*

7. *Gomphostemma microcalyx* *Praia* (189D).

Elata erecta caule robusto sulcato, *foliis* petiolatis oblongo-ovatis acutis basi attenuatis margine integris vel minute late dentatis, supra hirsutis subtus nervis tantum vel equabiliter tomentosis, petiolis caulibusque scabris, *verticillastris* paucifloris iensis in axillis inferioribus et sepius secus caulem aphyllum tantum dispositis, *bracteis* ovato-lanceolatis integris *calyce* brevioribus, *calycis* viridis dentibus brevibus triangularibus tubo multo brevioribus, *corolla* aurantiaca fere recta calycem 4-plo excedente *fauce* parangusta, extus pates puberula, *stilo* glabro.

In peninsula MALAYANA; Perak, in Larut, 1, BOD—2DDD p. s. m., *Eunstkr* n. 2155! *Scortechini* n. 842! *Wray* n. 835! in Ulu Bubong, *Kunsth* n. 10455!

Caulibus BO—15D cm. altis, petiolis (summa brevioribus exceptis) 4—5 cm. longis, laminis 12—15 cm. longis his 7—9 cm. latis, basi abruptius attenuatis, *verticillastris* sub-6-floris, bracteis S—7 mm. longis his 2—3 mm. latis, *calyce* 7 mm. longo hoc 4 mm. lato—tubo calycis 5 mm. longo, dentibus 2 mm. longis his basi 2 mm. latis, *corollae* tubo 26 mm. longo—parte tubi sequali 22 mm. longa, limbo 2.5 mm. lato, labio postico 4 mm. longo hoc 2 mm. lato, labio antico 7 mm. longo hoc 5.5 mm. lato, *nuculis* maturis ignotis, immaturis glabris brevibus.

PLATE 84. *Gomphostemma microcalyx* *Praia*. Specimens from Larut, *Kunsth* n. 2155.

Mr. Hemsley has suggested that this may be only a starved form of ff. *parviflorum*. But the suites of specimens at Calcutta are very large and very uniform, and the much smaller and shorter calyx with diminutive teeth, together with the much narrower-throated corolla, appear to make it very distinct from any of the other forms of the *Parviflora* group.

B- *Gomphostemma Thorns* *Smth.* (1885).

Elata erecta caule gracili subterete, *foliis* petiolatis oblongo-ovatis acutis basi attenuatis margine crenulatis, supra hirsutis subtus petiolis caulibusque tomentosis,

verticillastris multifloris densa in axillis inferbribus et secus caul cm aphyllura diap ositia, *brachis* lineari-lanceolata integra calyco parum br&vbribus, *calycis* viridia dentibua basi triangulari lineiiri-lanceolata tubo longioribus, *corolla*, sulphurea fere rocta calycem 3-plo exceiente, extua parce puberula, *styfo* glabro, *nuculia* brunneis glabrig loevibud.—
Gr. Thomsoni *Benth. Mss. ex Hook. l.; Flor. Brit. Ind. iv, B9B* [1885).

In ASSAM inferiors; in montibus Khasia apud Clicrrapunji, 3,500 p. a. m., *linker et Thomson!*

Caulibus BO—100 cm, altis, petiolia (aummia brevinribua uxceptis) 4—7 cm. bngis, laminia 12—25 cin. longis his 7—12 cm. latis baai abruptius attenuatis, **verticillastris** Bub24-flori3, bracteis 9—12 mm. longia hub-1 mm. latis, *catyce* H mm. longo hoc 4 mm. lato—tubo calycia 5 mm. longo, dentibua 9 mm. longia his baai 2 mm. **latis**, *corolloB* tubo 25 mm. longo—parto tubi aiuiuali 19 mm. lunga, limbo 35 mm. **lato**, labio postico 4 mm. longo hoc 3 mm. lato, labio antico 7 miu. lon^o \vw l' 5 mm. \aio, nuculia iQaX.wia ^ mm. \ong\ a Y\ a 3 mm. \at\ a.

PLATE 85. Bompbostemma Thomson! *Benth.* Specrimena from Clicrrapunji, **Uaoker** if Thomson.

DnB specimen [fruiting] of th» ngrinEil gathering of thia H_{periBa} in tho Dtt>culia H B r W ium hafi bBen figured. Another (in fbwar) haa been very kindly commuiDgt*! by the Dir.ctor. Royal Qanlen.. KBW. The unly charctctBrs wherBin the plant differs *hum Wall. Vat* 5 1 mea and th, f..l tb.t «». rf tb. wkrf. m ,h. fmt,,, ,p.cipleo ... m lh, lh— below the "»»»*. There is BO littla douot that thesB plants are conBpecifu that it is DDIV the fc of gathering from M» to% showing b*th bx and d_a...e whorls that has pr^ntm]I Lh. fn!!>T i " being proposed. The ^ true natul posUi. ,1 ft. plant is . h j in fc note at th ? of the account of the

9. GomphDstemma parviflorum Wall. (1828).

Elata erecta caule robust., Bubteret, yb<i petiDltu ru?osis elliptiC0-ovatis acutw basi attenuatia margine serratis, supra hirautis subtus caulibuB potiolisque laiu albo-tomentosa, *vartieiUatru* multifloris laxis utrinque cymia evolutis, rariBsimc donaia, **bracteie** lanceolata ovaisve calyca brera peJicdlato longiaribu... *cabjd** d_{Bn8e} d_{Bn8e} albo-tomentosi dentibua lanceolata tubo brevionbus, *corolla* flava f_{erB} recta calyce p_{1U8} 2.p b **longiore** extua parcB puberula, *stylo* glabro, *nuculis* brunnlua glabriB lxvibua.

VAAB. i>pi_M; bracteia lance^ktia acutis, calycia dentibua lanceolata tub_B for₉ scquilongia-G. parv.florum Wall., *Cut.* n. 2158/1 [ifcrf. *UnmX* \W6) Bt n. 2158/E (1629); *Bent., Wall. Pl. Ar.* ^ a^L . 12. in n. ^ i' f 11.

Nor., Sjfft. Verzcichn. oi (184B); >r_B(p., *R_{ip}* vi> m f l M 7). *Benth., DC. Proir.* <i, 552 (IMS); *Mig., Flor. Ini. Bat.* ii, >8_B (1B5_B)-G mulfr florum 7/er5. *Zinn. *Soc, gtdorf Wall. dt.* nn. 21:38/1 cfc gl^{58/E} ^
Gr niul uiflunum i?cn^.

IQ ~~Assam~~ inferiDre; in montibus Khaaia, 4,DD0 p. s. m., *Uaoker et Thomm! AnItrm* *A msnenar!* Oldham! Mann! apuil Mausmai, *Clarks* n. 1BO[3]! in collibua Manipur 3-4 00) p. 8. m. *Watt*, n. 73001 ID colUbua Luahai apud Lengti, P_r<<<r (bi.) i' n^{co} ub^{us}

Chittagong, apud Kasalong, *Vlaiké* n. S241 ! et ad Kodala, *Kingii mercenar.* nn. 512! 564! In SIAM; *Finlayson.* In BURMA superiors; in collibus Tanglakon prope Kendat, 3DDD p. s. m., *Prazer!* In BURMA inferioribus; Arracan, in YDMah, *Kurz!* In MALAYA; Java, prope Kiamis in sylvis, 3,20 D p. s. m., *Zollinger.*

Speciminum typicorum a eel. *Wallich* BX "*Herb. Heyne*" sub *Vat lith.* n. 2158/1 distributorum in Brta manst sfidss; vix tamen ex India Australi cum spp. *Heyneanis* plurimis nsque, uti dicit ill. *Bentham [Lab. Gen. et Sp.]*, BX *Napalia* recipi possint; forsan *Birmannica.*

VAR. *farinosa* J bractBis ovatis acutis VBI obtusis, calycis deutibus triangularibus tubo manifests brevioribus.—Gr. parviflorum *Wall. Cat.* n. 2158/2 in parte (1828) Bt n. 2158/D (1829); *Benth., Wall PL As. Bar.* ii, 12, in parts (1831); *Hook. l., Flor. Brit Ind.* iv, 697, in parte (1885).—*G. multiflorum* *Benth., Lab. Gen. et Sp.* B48 [1835] st *DO. Prodr.* xii, 552 (1W48); *Walp., Bep.* iii, 897 (1845).—*Leonurus farinnaus* *Ham. Mss.* BX *Wall., syn. in Vat. LitK* [n. 2158/D] [1829].

In HIMALAYA orientali; Sikkim, 4DD0 p. s. m., *Hooker!* Punkabari, 2DD0 p. s. m., *T. Thomson!* *Kurz!* Nagres, 3DDD p. s. m., *T. Anderson!* Mungpoo, 3D0D p. s. m., *King!* ad ripas riv. Ryang, 2DD0 p. s. m., *Kivg!* in vails fl. Teesta, 1D0D p. s. m., *Clarke u.* 13674! apud Badaintan, 2D0D p. s. m., *Gamble!* In ASSAM inferiore; in collibus Mikir, *Jenkins!* in montibus Khasia, *Griffith* n. 241! *Mann!* apud ChBrapunji, 3DDD p. s. ID., *Gallatly!* Silhet, *DeSilva* [*Wall. Cat.* n. 2158/2 in parte]! GrDalpara, *Hamilton* [*Wall. Cat.* n. 2158/D] (bis)!

Daulibus 255—300 cm. altis crassia lignosis, pstiolis 2—4 cm. longis, laminis 18—25 cm. longis his 7—10 cm. latis, VBrticillastris raro condensatis saepissimB cymis 4—5 cm. longis Bvolutis, bractsis 14—18 mm. longis his in VAR. *typical* 2—3 mm. latis in VAR. *farinosa* 7—10 mm. latis, psdicsllis 1 mm. longis, calyce adpiesss tomentoso ID—12 mm. longo hoc 4 mm. lato—tubo calycis 7 mm. longD, dsntibus VAR. *typizce* 5 mm. longis VAR. *farinosce* 3 mm. longis his basi 25 mm. latis, corollce tubo 20—22 mm. longo basi 2 mm. lato—parte tubi eequali IB—IB mm. longa, limbo 3'5 mm. lato, labio pDstico 5 mm. longo hoc 1'5 mm. lato, labio antico 6 mm. longo hoc 7 mm. lato, nuculis maturis 5 mm. luugis his 3 mm. latis.

PLATE 85. *Gromphostemma parviflorum* *Wall.* VAR. *typica.* Specimsn from Manipur, *Watt* n. 7395,

PLATE 87. Gr. parviflorum *Wall.* VAR. *farinosa* *Praim.* SpBcimsns from Assam, *Wallichian Herbarium* nn. 2158/2 and 2158/D at Calcutta.

TLIB ByDDDmy of this species is somewhat involved, and the confusion extends to its nearest ally *U. crinitum*, in connection with which the question will be found fully discussed. The two varieties are ordinarily quite easily distinguished by their bracts, but intermediate forms are VBry common, and the specific rank (ff. *multiflorum*) given by *Bentham* to VAR. *farinosa* canDot be sustained. In the Linn. SDD. Herbarium the whole species now stands as "*G. multiflorum*"; herbaria, therefore, which follow the arrangement adopted there know *G. paniflorum* *Wall.* (1828) as Gr *multiflorum* *Benth.* (1835), and know as "*G. parviflorum*" another Bpecies. But Sir Joseph Hooker has pointed out (*Flor. Brit. Ind.* iv) that *G. multiflorum* *Benth.* is really *G. parviflorum* *Wall.*, and has abandoned Mr. *Bentham's* Bpecific name in favour of thB true one. The typical variety sometimes much resembles typical *G. crinitum*, but a diagnosis is usually easily effected by means of the whiter timentum, the shorter not Bubulata calyx teeth, and the different bracts.

10. Gomphostemma crinitum Wall. (1828).

Elata erseta caule paniin sulcato, *foliis* pctiolatis hand rugu.M- uiipticD-Dvatu ucutis vel oblanceolatia baai attenuatia marline serratis integrisvc, supra birautia subtus caulibus petioliaque cinereo-tomontoais, *verticillaBtris* multifloria Btcpisaimc cymia laxia utrinijue pvolutis, nonnunruiam densis, *bracteis* `terioribua lanccolatia rcliquis lincaribus calyce brevioribus, *calyce* laxe cinerBO-pubescente vel glabreacnte brBVB poJicellato, dentibua pruelou^is lineari-aubulatia aetaceo-hiapidia tubum longe excedentibua, *corolla* flava fire recta calyce 2-plo longiore, extua parco puborula, *stylo* glabro, *nuculis* brunnea glabris Kxvibua.

VAR. *typica*; bracteis omnibus lanceolatis acutia linuaribuavo calycem fure rcquan-
tibus, foliis aubito in pctiolum longiorcm alatuin attenuitia laminis cllip-
tico-ovatis subrugwis subbua densiua tomentoaia.—Gt. nrinilum Wall., *Cut.*
n. 2159/1 (1328) et 2159/2 (1828 et 1829); *Benth.*, Wall. *PL Js. Bar.* ii,
12 (18-11), *Lab. Gen. et Sp.* 548 (IW5) et *DU. Prodi.* xii, 552 (1843);
Wtilp., *Rep.* iii, 897 (1845); *Miq.*, *Fbr. Ind. Bat.* ii, 087 (1355); *Il^ok.f.*,
Ihr. Bnt. Ind. iv, 698, in park |18S5).—Gr.' parviflorum Wull., *Cat.* n.
2158/2 in *parts* (1828) ct n. 215B/C [upp. eadem ac n. 2159/1 11*23)!]
[1829] *haulqunquam* G. parvifloruin Wull., *Uat.* n. 2158/1; *Benth.*, Wall-
Pi. As. Bar. ii, 12, in *parte* (1831); *Hook. f.*, *Fbr. Brit. Ind.* iv, 697, i«
parte (1885).—G. parviflorum *Benth.*, *Lab. Gen. ct Sp.* C48 (1985) ut *DV.*
Prvdr. xii, 551 (1848); *Walp.*, *Rep.* iii, B97 (1543); *J|%*, *Fbr. In>l*
Bat. ii, 987 (185B) *nee* Gr. parviflorum Wall.

In AaaAM iof eriorB; Silhet, *DeSilva* [Wall *Cat.* n. 2158/2 in *parte*)! In UUKJU
inferiore; Pegu, *Kurs* n. 596! Attaran, *Brandts!* TavDy, *Gomez* [Wull. *Cat.* n. 2159/2)!
In peninaula MALAYAN; Tub Penang, *Wallish* (*Cat.* n. 2159/1 [Ib28], anno sequent
infauate ai *G. parviflorum* [2168/D] relata)! Perak, apud Kampong Kota (bis), *Wray .'*
Sun"-ei Uÿovg, *Ridleyi mcrecnar.* n. 1B73 !

VAR. *Griffithii*; bracteia exterioribua ovato-lanReolatis obtusis calyco distincte
brevioribua, foliia aensim in petiolum perbrevev attenualia laminis oblan-
ceDlatia membranaceis subtua niDlitter pubcacentibus.—G. crinitum *Hook./.*,
Fbr. Brit. Ind. iv, 698 [1885] *tyu.* Wall. *Uat.* 2159 *txrtns.*, *vix* Wall.

In peninsula MALAYANS ; Malacca, in nionte Dphir et in sylvia Chebu, *Griffith* n. 4D42 !
Perak, in Gunong Ijok, *Scortechini* n. 5! apud Hulu Kwansa, *Scortechini* n. 928 !

Caulibua 4tt—60 cm. altia, petiolia VAK. *typing* BUD-4 cm. lonpa, YAR. *Unfitliii*
1—2 cm. longif, lamini VAR. *typicte* 25—30 cm. longia Inš 8—12 cm. latia, VAK.
Griffilhii 20—25 cm. longia hia B—B cm. latia, pedicellia 1 mm. longis, *culyce* 17—20
mm. longo hoc 4 mm. lato, hispido-tomentoso vel brevissime puberulo—tubo culycis
5—7 mm. longo, dentibua VAR. *typical* 9—13 mm. longia VAR. *GriJJithii* ID Lim. luiigia
hia baai 2-5 mm. latia, Biibito in acumon prselonguin subuUtum atttnuatis, *corullw*
tubo 20—25 mm. longo—parte tubi icquali IB—20 mm. longa basi 2 mm. lata, limbo
3-5 mm. lato, labio postico 5 mm. longo hoc 3-5 mm. lato, labio antico D nun. longo
hoc 7 mm. lato, *nuculis* 6 mm. longia hia 3 mm. latis.

PLATE 88. Gomphostemma crinitum Wall. VAR. *typica*. Specimen from Perak, Wray.

PLATE 89. A— B. crinitum Wall. VAR. *typica*; Wall. *Cat.*, n. 2150/2, at Calcutta.
B—G. crinitam Wa'l. VAR. *Griffithii* *Pram.* Specimen from Malacca, *Griffith*.

This species is very closely allied to *G. parviflorum*, but is easily recognised by its thinner leaves, ash-grey tomentum, smaller bracts and very long subulate calyx teeth. The Tavoy gathering [Wall. *Vat.* n. 2159/2) differs from n. 2159/1 (2158/D) in having only condensed whorls—a character of no importance, since in other gatherings denser and lax whorls occur in the same specimen, and in having glabrous calyces—a simple accident, the specimens being fruiting ones and the tomentum being deciduous in fruit; the gathering is not specifically distinct from 2159/1, which should not have been referred by Dr. Wallich to *G. parviflorum* unless he was prepared to suppress the species & *G. crinitum* altogether. This is a course which has much to be said in its favour, but it is not followed here, mainly because of the necessity for uniform treatment throughout the genus; partly also because the diagnosis between *G. crinitum* and *G. parviflorum* is not very difficult, and because the writer has not as yet seen any good connecting specimens, even though the geographical areas of the two species overlap: moreover, the synonymy of the two species, which has become rather involved, is more easily disentangled if they be kept apart. The process is simplified by tabular presentation, and in TABLE XIII are given the names that the Wallichian specimens bear in the Lithographed Catalogue, and in Mr. Uentham's, in Sir Joseph Hooker's, and in the present treatise respectively. The information in column 5 has been very kindly supplied by Mr. Hemsley. The references of Dr. Walpers (1845) being an American reprint of those of Mr. Bentham of 1835, and those of Dr. Miquel (1851) being an adaptation of those of Mr. Bentham of 1848, possess no intrinsic value, and are therefore omitted. The use of the name "*G. multiflorum*" in *Herb. Linn. Soc.* to designate typical *G. parviflorum* is evidently a change that has been made since 1848, for in that year (as in 1835, when Bentham founded the species *G. multiflorum*), Mr. Bentham only included in *G. multiflorum* specimens that belong to *G. parviflorum* VAILL., *farinosa*; those that belong to *G. parviflorum* VAR. *typica* were left by him to serve, in part, as types of *G. parviflorum*, though he included in that species (as Dr. Wallich had previously done) two gatherings that belong to *G. crinitum*. It should further be noted that there is nothing in the description of *G. dichotomum* ZDII. et Mor. to separate that plant positively either from *G. parviflorum* or from *G. crinitum*. In the absence of specimens and for reasons detailed below, I have ventured tentatively to suggest its inclusion in *G. parviflorum*.

TABLE XIII.—*Synonymy of the Wallichian specimens of G. parviflorum and G. crinitum.*

An- THDR.	WALLICH.		BEXIHAM.		—	HDDKER.	PHAIX.
Work.	Lith. Cat. p. 60.	Lith Cat. p. 92.	Pl. As. Ear. ii, 12.	Lab. 9en. & Sp. BB DO. Prodr. xii; BJ1-2.	Herb. Linn. Soc.	Flvr. Brit. Xnd. iv, 897-8.	Present paper.
DutB.	1823.	1929.	1831.	1855 & 1848.	Bet. 1848 & USJ.	1885.	1890.
So.	1	2	3	4	5	6	7
1	2158/1: " Herb. Heyne:" G. parviflorutn.	—	(3. parviflorum.	B. parviflorum. [" Napalia.")	G. multiflorum. [Sheet 4.)	G. parviflorum.	GL parviflorum, VAH. typira.
2	2158/2: Sylhet; (G. parvifloruoj.	—	G. purviflDrum.	B. multiflorum. [" prov. Silst.")	G. multinurum. [Sheet 3 a.)	G. parviflorum.	G. parviflpruin, VAE. farinDsa.
3	2158'2: " Gentea Jits. ; " G. parvifloruui.	—	G. parvifl Drum.	G. parviflorum. [" Silbt.")	G. parviflorum. [ShBBt3E.)	G. parviflDrum.	G. crinitum, VAB. iypica.
4	2U9/1:PpnnnglS22; G. trinitum.	2158/D: Penan*, 1822, ra-edirHd; G. parviflorum.	G. parviflDrum.	G. parviflorum. Tins. PBnans.")	G. purviflorum. [ShBet 1 a.)	G. parviflDrum.	G. crinitura, VAR. typica.
5	2159/2: Tavpy, W. T';; G. crinitum.	—	G. crinitum.	R. urinitum. ["Tavoy.")	G. criniium.	G. crinitum. ^Tavoy, Gomez).	G. crinitum, VAR. typica.
6	—	2153/U : Leonurus farinwus, Gvab- puni, July and Uct. 1H1B9; G. parviflorum.	G. purviflRurum.	(G. multiflDrum.) Nut cited.	D. multiflorum. [ShPHt2.bDthEa. iherin^s).	G. parviflorum.	B. purviflQrum, VAB. furinosa.
7	—	2155/E: "Herb. Fmlaysan." "Herb. fl. phRvillurum.	G. pirviflorum.	(G. ptirviflDrura.) Not cited.	G. multijlorwn. [Sheet 1 E.)	0. purviflDrum.	G. parvifl arum, VAR. typi^a.

This table shows that in 1828 Dr. Wallich issued two gatherings of *G. parviflorum*, one belonging to Heyne's Herbarium and one obtained by his Collector, DeSilva, in Silhet. The former, being n. 2158/1 in the *Catalogue*, is of necessity the true type of *G. parviflorum*. Its exact locality, it ought to be observed, is unknown. Did it had, like nearly all Heyne's other specimens, been collected in Southern India, it is extremely strange that it should never have been met with by subsequent collectors. And Mr. Bentham's opinion that it is from Nepal is undoubtedly unfounded; Wallich does not state that Heyne's plant came from Nepal, indeed Heyne had no means of obtaining Nepalese plants; Wallich does not himself appear to have obtained any form of *C. parviflora* in Nepal, nor does he anywhere say that he did; finally, if any form of *C. parviflora* is ultimately found in Nepal, it is reasonable to expect that it will be *YAL. farinosa* (Bentham's *G. multiflora*) that will be met with there, since this is the only form that has hitherto been reported from Sikkim or the Eastern Himalaya. So far as is known, *YAL. typica* is confined to Indo-China—the east of the river Brahmaputra; all the gatherings up to 1890 are from Lower Aram, Manipur, the Lushai hills, Chi Wangons, the Chindwin valley, Lower Burma, and Siam; as Heyne obtained plants from both the Indian peninsulas, it is almost certain that his plant came from some part of the area indicated above. The second gathering forms only part of Cat. n. 2158/2; it is the part marked "Billet" in the type Herbarium and, though conspecific with n. 2158/1, it constitutes a distinct variety and is the same as 2108/D (*Leonurus farinosus* Ham. Mss.) described above as *G. parviflorum* *YAL. farrina*. This is the plant that was by Mr. Bentham (1833) accorded specific rank under the name *G. multiflora*. The remainder of Cat. n. 2159/2, marked in the type Herbarium "Gentia Mts.," agrees exactly with the plant issued as Cat. n. 2159/1 (1828).

In the same year (1828) Dr. Wallich issued two gatherings of *G. crinitum*, one collected by himself in Penang in 1822, the other obtained by his Collector, Gurnez, in Tavoy. These were published as 2109/1 and 2109/2 respectively. But in 1829 Dr. Wallich had noticed that n. 2159/1 was the same as the "Gentia Mts." portion of Cat. n. 2158/2. He therefore re-issued it in that year (as he explains in *Lith. Cat.* p. 92) as *G. parviflorum* Cat. n. 2158/D. So that in 1829 only 2159/2 was left as the type of *G. crinitum*. But 2159/2 differs from 2159/1 (converted into 2158/C) only in having conduplicate whorls—a character of no value—and in having glabrous calyces—an accident and not a character at all—and the two are certainly conspecific. If, therefore, Dr. Wallich rightly referred 2159/1 to *G. crinitum*, there is no room for the Benthams' *G. crinitum* at all. But if there be a species *G. crinitum*—and it must be here repeated that 2158/1 and 2159/2 are undoubtedly conspecific—then there was no room for the re-issue of part of that species as *G. parviflorum* because it happens to agree exactly with the "Gentia Mts." portion of n. 2158/2. For this very "Gentia Mts." plant agrees badly with 2158/1, which is the type of *G. parviflorum*, and agrees still less with the rest of 2158/2, along with which it was issued. At the time that Dr. Wallich made this change in the designation and number of 2159/1, he issued three more gatherings as *G. parviflorum*. Two of these appear as 2158/D, both collected by the same botanist (Buchanan-Hamilton), at the same place (Goalpara in Assam), at different seasons of the year. Dr. Buchanan-Hamilton named both "*Leonurus farinosus*," that is a matter of fact they are identical, and are moreover the same as the "Billet" portion of 2158/2. The other specimens of *G. parviflorum* VAR. *farinosa*, and therefore of true *G. multiflora* DC. The third gathering belonged to *Herb. Finlayson* from Siam; it is the same as 2158/1, and therefore is typical *G. parviflora*.

In P. L. Bar. (1831)—TABLE XIII, column 3—Mr. Bentham followed Dr. Wallich's illustration of 1829, so that no remark is called for regarding this work. But in *Lab. Gen. et Sp.* (1843) Mid I in w DC. Prodr. xii (1848)—TABLE XIII, column 4—Mr. Bentham notes the confusion introduced by Dr. Wallich into *Cut.* n. 2158/2, and to rectify it raises to specific rank the "Siuet" portion of that gathering as *G. multiflora* & D. V. rather strangely he does not mention the Goalpara plant which exactly agrees with the type of *G. multiflora*. Having departed off *G. multiflora*, Bentham therefore confines to *G. parviflora* three gatherings; n. 2159/1 (which he supposed to be Nepalese, but which in reality came from Heyne's Herbarium and the exact locality of which cannot now be certain) n. 2158/D (which was originally named as n. 2109/1), and the "Gentia Mts." portion of n. 2158/2. Which is conspecific with n. 2109/1. In these works therefore—and Drs. Walpen and Miquel have both followed his arrangement—Bentham has advanced the principle

But thB fact that n. 2158/1 and n. 215B/E are, even if variably separable, still donsp3diffc with n. 2158/D and with the "Sillet" portion of n. 2158/2 could not long pass undetected, so that it is not surprising to find that in the typB Wallichian herbarium—preserved by the Linnean S_{DD} T of London—the necessary reduction has been effected. There, however, in place of *G. multiflora* having been again merged in *G. parviflorum*, typical *G. parviflorum* Wall., UaL n. 2158/1 11828) ^*^* been named *G. multiflorum* Benth., a name that dates from 1835; and the name » *Q. paniflorum* hZ been restricted to n. 2158/D and thB part of n. 2158/2 that is the samB as 2158/D—to the o-athe " in fact, that do not belong to *G. parviflorum* at all. ThB species to which they do bebnff—fd/th ^' gatherings arB undoubtedly conspecific with n. 2159/2—is thus provided with two names, *G. p. rvi- florum* and *G. ormitum*. This result is masked, so far as thB Type-Herbarium is concerned, by "the manner in which the specimens have been there glued down, for n. 2158/D, the transfer of which t *G. paniflorum* may bB said to havB given risB to thB confusion, occurs on sheet 1, while n. 2158/° occupies sheet 4. This being thB case, and further because true *G. parviflorum* has become familiarly known as *G. multiflorum*, it almost seems advisable to allow the names indicated in T^* 5 to stand. But thB practical objections arB insuperablB. For first, there is no room f ^JTM¹¹ " *G. parviflorum*,³⁹ as understood in thB Linn. SOD. Herbarium, and (? *crnifum*. Asain a" ik Linn. Soc. " *G. parviflorum*³⁹ is based on 2158/D, which only received thB name *G. i fTM vyivnmi* 1U 1829, it is ths name *G. cnmtum* (which in any casB dates from 1828) that must stand. This being so, the suppression of the Wdlichian name *G. paniflorum* in favour of Bentham's nams *G. mult. florum*^ has nothing left to justify it. For even in 1828 Wallich's *G. parviflorum* contained two gatherings pf that species as against one gathering that should have been excluded, and even after nis readjustment of 1829 contained £VB gatherings of the speoies against only two of another. And, further, though it is tUB that all the specimens named £. *multflorum* in thB Linn. Soc. Herbarium are conspecific, WB know that Mr. Bentham himself in thB two woiks in which he described *G. multi- florum* only applied thB naniB to one varirty of that species. Sir Joseph Hooker in *Ihr. Brit. Ind.*, iv (1885) is thus amply justified in suppressing Bentham's name *G. multtflorum*. And as his treatment—TABLE XIII, column B—restores Wallich's arrangement of 1829 and Bentham's of 1831, thus remov- ng all the confusion subsequent to these dates, it is only necessary fuither to eliminate from *G. parviflorum* those gatherings of *G. criniUm* that were unfortunately included in it by Wallich and restorB them to the latter species.

Specimens from Java (9. *didiotum* Zoll. et Mor.) have unfortunately not been available for study. But, the position of the Java plant hardly admits of a doubt. The Original description of the species by its authors is quite satisfactory, and (unconsciously) lays emphasis on the Dorolline characters that indicate its position in § STEUDSTOMA "tub, coro/lwo niftlifmni Jauwi versus tar.dwt {tardum} dilatato {"nee ut m rehjms Gomphuttmmtis ivpm medium i.flao)." Bentham, writing of authentic specimens in Herb. DC, says "valde affine & parvifloro; calj/cis denies minu* acuminati," while Miquel further "calycis dmtilus mmus acuminat U. parvifloro dtfert cui jw-nm mmis affi.,e." That is to say, according to both Bentham and Miguel, 9. *dichotum* mly differs from 67. *parviflorum* in having less acuminate calyx teeth. Neither Bentham nor Miguel state precisely whether the calyx teeth are or are not shorter than the calys tube, but the original description says "calyabu* 5-fidi*" which implies, unless the term is loosely appltd, that the teeth are shorter than the tube is. But Bentham and Miquel, however, mention a character omitted by Zollinger and Moritz "bract calyces mquantihm." This makes it differ both from G. *parviflorum* and ff. *crinitum*, but only to the extent of almost assuring that 9. *parviflorum* and 9. *crinitum* are not specifically distinct, and that in 9. *dichotum* exists the intermediate form necessary to support the formal union of

*» also the annals of the paranthetic remark which follows. And [Mi, ue], who M l ^ m the genus—the *Repertorium* is, as its Lamb implies. Only a compulsory work —reeds & the true meaning of the sentence and makes (Fhr. Ini. Bat. ii, 9BS) ft. gbTiously wreBt alteration.

these two Wallichian species. In the absence, however, of specimens of *G. dichotomum* it is necessary either to recognise that as a species, or to join it to one or other of its nearest allies. Now from what has been demonstrated above it will be seen that under the name "*G. parviflorum*" it is in reality a form of *G. crinitum* that Benth and Muell (who follows Benth closely) are comparing with *G. dichotomum*. And as the character wherein *G. dichotomum* is said by them alone to differ from this form of *G. crinitum*, coupled with the character implied in the original description gives us two out of the three points wherein true *G. parviflorum* alone differs from this form of *G. crinitum*, it appears manifest that *G. dichotomum* must at present be looked upon as synonymous with true *G. parviflorum*.

With the gathering of *E. crinitum* from Tavoy, to which since 1829 that name had been restricted, Sir Joseph Hooker has (IBB5) associated a somewhat different-looking but undoubtedly conspecific plant collected by Dr. Griffith in Malacca. This is *G. crinitum* VAR. *Griffithii* of the present paper.

In the group *Parviflora* there is evidently a very great difference in the rank of the various forms separated. The only distinctly separable plant is *G. microcalyx* (though even as regards this—p. 231—union with another form has been suggested), and it is very probable that only a few more gatherings from intermediate localities will be required to provide the intermediate forms necessary to prove that all the others are simply local manifestations of one protean species. And while the absence of these prevents the writer from formally proposing the necessary reductions, the time appears to have come for indicating the probable nature of these. If only floral characters are attended to, we can recognise but two species, viz.—

A. *G. MICROCALYX* Prain; corollae tubo fauce vix inflato, calycis dentibus brevissimis.

B. & *PARVIFLORUM* Wall. *Cat.* 1829 (1823) *parum emend.*; corollae tubo fauce distincte inflato, calycis dentibus elongatis.

VAR. *a. fixrinwi*; foliis petiolatis subtus firmiter tomentosi?, bracteis omnibus ovatis = *S. multiflorum* Benth., *DO. Prodr.* xii, 552.—*Leonurus farinosus* Ham. Jf. in *Walt. Vat.* 2158/D. (3. *parviflorum* VAR. *farinosa* Prain uti supra).

VAR. *f. tipica*; foliis petiolatis bracteis lanceolatis = *G. parviflorum* Wall. *U. & V.* 2108/1, 2158/E.—3. *dichotomum* Ztt. 8f Jfor., *Verzeichn.* 54. (5. *parviflorum* VAIL tipica uti supra).

VAR. *7. crinita*; foliis petiolatis bracteis (exterioribus exceptis) lanceolatis = 3. *crinitum* Wall. *Cat.* 2159/1, 2159/2.—B. *Thomsoni* Benth. in *Herb. Ind. Jf. IL I. Sf T. T. [& crinitum VAR. typica et Cf. Thomsoni uti supra).*

VAR. *B. Griffithii*; foliis sessilibus bracteis (exterioribus exceptis) lanceolatis = *G. crinitum* Hook. l., *Fbr. Brit. Lid.* iv, DD3, ayf. Wall. *Cat.* 2153 *wlts.* (H. Griffithii Prain uti supra).

V. *Eriocarpum*; *verticillata* Ranou* *axillifera*, calyx par urn cottafo intus tubo dentibusque glabro, ovario puberulo, nucibus glabris.

11- *Gomphostigma* *Eriocarpum* Benth. (1823).

Eluta erecta caule gracili subterecto, foliis pectinatis basi attenuatis ullipiliobus acutia grosse dentatis, supra parvis hispidulis subtus potius caulibusque tomentosis, verticillata paucifloris densa, bracteis ovatis dentatis vel linearibus integris superius glabris, catycia viridia tubo dimidiata antherato lanceolata apice filiformibus recurvatis, corolla flava fere recta calyce 3-plo longiore, extus villosa, stylo glabro, nucibus nigrescentibus dense tomentosis licibus.—*G. eriocarpum* Benth. in *Will Cat.* D. 371D (1820)

et *Pl. As. Ear.* ii, 12 (1831).—Gr.¹ *eriocarpum Benth., Lab. Gen. et Sp.* 649 (1835) et *DO. Prodr.* xii, 552 (1848); *Walp., Rep.* iii, 897 (1845); *Hook, f. Flor. Brit. Ind.* iv, 693 (1885).—&. oblong-urn *Wight, Icones* iv, t. 1457 (1850); *Miq., Flor. Ind. Bat* ii, 986, *in parte* (185E5); *nee Wall*—*Leonurus tomentosus* *Herb. Madr.*³ *syn. in Wall. Vat.* 11829).

In INDIA Australi; Dourtallam, *Wight!* Darnatiu, *G. Thomson!* in collibus Anamallai et in Tinivelli, *Beddome*.

Daulibus 9D—120 cm. altis, petiolis 125 cm. longis, laminis sensim attenuatis 7—11 cm. longis his 3 cm. latis, supra pilis nunc simplicibus nunc stellatis ornatis, verticillastria sub-IU-floris, bracteis ID—14 mm. longis hia 2—5 mm. latis, *calyce* 12 mm. longo hoc 4 mm. lato—tubo calycia 5 mm. longo, dentibus B mm. longis his basi 2 mm. latis dimidio superiore subuhitis, *corollae* tubo 20 mm. *longo*—parte tubi ^{aequali} 15 mm. longa, limbo 4 mm. lato, labio postico 7 mm. longo hoc 4 mm. lato, labio antico 7 mm. longo hoc 8 mm. lato, *nuculis* maturis 5 mm. longis his 4*5 mm. latis.

PLATE 90. Gomphostemma *eriocarpum Benth.* Specimens frDm Dourtallam, *Wight*

A very distinct species forming a monotypic group most nearly allied to *Parviflora*. Though undoubtedly a member of § STENOSTOMA, its hirsute ovary allies it to *Lucida*, with one member of which group it has been confounded. It thus helps to connect § STENOSTOMA with § EUGOMPHOSTEMMA.

§§§ Eugomphostemma Prain (1890); *DorollBe* tubo intus glabro, parte ^{aequali} calyce longiore, limbo ^{aequali} labiis majusculis *nuculis* 4.—*PRASIUM* Roxb. (1814); Blume (182B); *nee Linn.*

VI. *Luuida*; *verticillastria remota axillaribus* ^{aequali} *wilyce* prominenter costato intus tubo parce dentibus densius hirsuto, ovario ^{aequali} *nuculis* late ovatis.—*PRASIUM* Blume, *Biogr.* 540 (182B) *nee Linn.*

12. Gomphostemma Philippinarum Benth. (1848).

Elate erecta caulis parum sulcato, foliis breve petiolatis elliptico-obovatis apice acutis basi attenuatis margins breve serratis, supra scabro-hispidulis subtus cuilibusque floccoso-tomentosis, verticillastria multifloris floribus singulis pedicellatis, bracteis parvulis lanceolatis, calycis dense tomentosi dentibus triangularibus breviter acuminatis tubo multo brevioribus, corolla lutea antice incurva calyce plus 3-plo longiore, extus (basi labii antici exceptis) pubescente, stylo versus apicem pilis divergentibus perpaucis ornato, *nuculis* immaturis hirsutis.—*Gomphostemma Philippinarum Benth., DO. Prodr.* xii, 551 (1848). *Vidal, Phaner. Gumim.* 71 et 13B (1885) et *Plant. Vase. Filipin.* 214 (188B) *numen*.

In archipel. PHILIPPINARUM; in ins. Bohol, *Owning* n. 184D! [icon, *tt* sp., ex *herb. Kew.* benevolenter comm. vidi).

Caulibus circa 5D cm. altis, petiolis 1*5—3 cm. longis, laminis 11—18 cm. longis, his 4—7 cm. latis, subtus caulibusque parcius tomentosis, a medio sensim attenuatis, verticillastria sub-B-floris, pedunculis propriis sub-2 mm. longis, bracteis 8 mm. longis his 2 mm. latis, pedicellis 3—5 mm. longis, bracteis 2—3 mm. longis, *calyce* 11 mm. longo hoc 5 mm. lato—tubo calycis 8 mm. longo, dentibus 2 mm. longis

his basi 2'5 mm latis, *wroKa* 32 mm. longa—parts tubi requali 15 mm. longa, limbo 8 mm. lato, labio postico marginB integro 5 mm. longo hoc 8 mm. Into, labio antic3 8 mm. longo hoc IB mm, lato, *styli* lobia perbrevibus; *nuculis* nonduni maturis.

PLATE 101. *Gromphostemma Philippinarum Bmth.* Specimen from Bohol, *Gaming* n-1640.

This plant is very nearly reload to *G. obhngum*, differing principally fram th3 types of that specia in having shorter calyx teeth, and hairs Dn the style. Though it is hBre allowed to retain tha Tank given it by Mr. Bentham, it is probably no more thau a form of *G. obhngum*, hardly separable even as a variety,

13. *Gomphostemma Scortechinii* *Praia* (IBC0).

Elata erecta caula subterste, *foliis* subsessilibus elliptico-oblongia yel obovatis aciitis basi attenuatis marline subserratis vel integris, supra sparse hirsutis subtus caulibua pBtiolisque brevissimis parcius tomentosis, *vertioillastris* multiflDris, floribua singulis pedicellatis, *bracteis* subulatis pedicellis rufo-t9mentosis sequilongis, *calycis* rufescentis dentibus lanceolatis acutis tubum exDedentibus, *corolla* majuscula flava anticB incurva calycB 3-pio bngiore, extus toinentosa, *stylo* versus apicem pilis divergcutibua parce hirsuto, *nuculis* brunnea apiie hispidis sublaevibus,

VAR. *typica*; lamina margins serratis vel integra.

In peninsula MALAYANA; Perak, in Bunong Tujok, *Scortecfiini* (bis)!

VAR. ? *Hrlferi*; lamina margins crenatis.—*G. obbngum* VAR.? Helferi *ITook*. /., *Ftor. Brit. Ind.* iv, B97.

In BURMA inferiors; Tenasserim, *Heifer* n. 4043! (calyces 3 ex *Herb. Kew.* bsnevolenter comm. tantum vidi).

Caulibus 60—100 cm. altis, petiolia 0'5—1 cm. longis, lamina 20—30 cm. bngis his 12—16 cm. latis, subtus parce tomentosis vel nonnunquam glabriusculis, basi sensl'm attenuatis, verticilkstris sub-20-floris, bracteis B mm. longis his 0'5 mm. latis, pedicellis 8—10 mm. bngis, *calyce* 22 mm. bngo hoc 7 mm. lato—tubo calycis ID mm. longo, deniibus 12 mm. bngis hia basi 4 mm. latis, *corolla* BO mm. longa—part3 tubi sequali 35 mm. longa, limbo 11 mm. lato, labio postico margine sub-2-dentatim emarginato 9 mm. longo hoc 12 mm. lato, labio antico 12 mm. longo hoc 21 mm. lato, lobo medio obbngo margine truncato, *nuculis* 8 mm. longis hia 5'5 mm. latis.

PLATE 103. *Gouiphostemma Scortechinii* *Praia*. Specimen from Perak, *Scortechini*.

The typical form of this plant seems very distinct, and is chrncterisBd by hnvuig dense whorls, the individual flowers of which are pedicelled. Its nearest ally is *G. obhngum*, from the typo of which it diffeTS in having serrate leaves, a maty tomBntum and a hirsute style.

The crenate leaves of the plant here considered a possible variety at once bring it near to *G. oblongum*, with which species Sir Joseph Hooker has tentatively placed it. But the calyx is unlike that of typical ff. *obbngum*, and thB 3 calyces examined by me agree so precisely with those of *Q. Scortechinii*— one of them, moreover, has a pedicel 4 mm. long—that in spite of the fact that the leaves are crenate (a character ^hich does not hold good in any other membeT Df the *Litcida*) it BBens preferable in the meantime to remove it from (*G. obfongitm*).

14. *Gomphostemma oblongum* Wall (1828).

Elata erecta caule substragone, *foliis* breve petiolatis elliptico-oblongis acutis basi abruptius attenuatis vel subtruncatis margins crenatis VBI crenato-serratis, supra hispidulis subtus pBtiolis caulibusque dense tomentosis, *vericillastris* paucifloris densis, *bracteis* ovato-lanceolatis brevissimis, *calycis* sessilis ciner&D-tDmentosi dentibus lanceolatis acutis tubum ffijuantibus, *corolla* alba antice incurva calyce 3-plo longiore, extus (h)bo labii antiui medio excepto) pares seijuabiliter pubescente, *styfo* glabro vel juvenili hirsuto, *nuculis* albidis apice pilosis Isevibus.—B. Dblongum Wall, *Cat* n. 2154 (1828); *Benth.*, Wall *PL As. Ear.* ii, 12 (1831), *Lab. Gen. et Sp.* B48 (1835) et *DO. Prodr.* xfi, 551, in *parte* (184B); *Walp.*, *Rep.* iii, 89B (1B45); J/^., *Fhr. Ind. Bat* ii, 9Bfi, in *parte* J1B5B); *Book./.*, *Flor. Brit Ind.* iv, B97 f1S85).

In BUKMA inferiore; Tavoy, *Gomez* [Wall *Cat.* n. 2154)! Attaran, *Brandts*, n. 84B! Moulmein, *Falconer*! Tenasserim, *Heifer*, n. 4D41! In insulis ANDAMAN; in CDIB "Mt. Harriet" prope Port Blair, 5DD p. s. ni. et ad Boplakabang, 1 DO p. s. m., *Kingli mercenar.* ! Kangachang, IDD p. s. m.^ *Prain* !

Caulibus BD—IDD cm. altis, petiolis 1—2"5 cm. longis, laminis 15—3D cm. lon^Is .to his 5—9 cm. latis, a medio petiolum versus attenuatis basi ipsa tam^n saepisMLne truncatis verticillastris sub-B-floris, bracteis 7 mm. bngis his 2 mm. latis, *calyce* 15 mm. longo hoc B'5 mm. lato—tubD calycis 7'5 mm. longo, dentibus 7'5 mm. longia his basi 4 mm. latis, *corolla* 45 mm. longa—parte tubi aequali 27 mm. longa, limbo 11 mm. lato, labio postico apice rotundato integro 9 mm. longo hoc 12 mm. lato, labin antico 15 mm. bngo hoc 20 mm. lato, lobi) medio oblongo antice sub-emarginato, *nuculis* B mm. longis his 4 mm. latis.

PLATE 95. *Gomphostemma oblongum* Wall. Specimen from South Andaman, *King's Collector*.

Nearly related to ff. *lucidum* and to ff. *Scortechimi*, but usually easily distinguished from both by its glabrous style. The Java locality which appears in *DV. Prodr.* xii, 551, and which Miquel has copied in *Flor. Ind. Bat.* ii, 985, has been omitted by Sir Joseph Hooker. TIIB opinion that *G. ohlongum* occurred in Java seems to have arisen, not from Moritzi having identified Zollinger's plant erroneously, but from his considering *Prasimn jdvanimm* Dume, which Zollinger's plant appears to be, conspecific with *Gomphodemma obhngum* Wall, which is only the case if the limits of the species are much extended. Miguel's *Gomphostemma oblongum* is a mixture of three plants:—

1. *G. obhngitm* Moritzi=Gr. javanicuni *Benth.*,
2. Et. Dblongiim Wall., and
3. *G. oblongum* Wight=Gk Briocarpon *Benth.*

15. *Gromphostemma javanicum* Bcnth. (1835).

Elata erecta caule parum sulcato, *foliis* distincte petiolatis elliptico-ovatis obbngis vel lanceolatis acuti3 basi attenuatis margins breve serratis vel integris, supra sparse hirsutis subtus caulibus petiolisijuB parcius tomentosis, *verticillastris* multifloris floribus singulis pedicellatis, *bracteis* anguste ovatis, bracteolis subulatis pedicellis parum long-ioribus, *calycis* rufo-hirsuti dentibus late lanci?olafis acutis tubo dimidio brevioribus, *corolla* flava antice incurva calyce duplo longiore, extus tomentosa, *stylo* glabro, *nuculis* brunneis apice hispidis]^vibus.-&. javanicum *Benth.*, *Lab. Gen. et Sp.* B5D (1835); *Walp.*, *Rep.* iii, 8D8 (1B45); *Bmth.*, *DC. Irodr.* xii, B53 (1848); *Miq.*, *Flor. Ind. Bat* ii, D8B (185 5).— &. oblongum *Mor,*

Spt. Verztidn. 53 (184B); *Benth., DC. Prodr.* xii, 551, in y%rU (1848); *Miq. Flor. In I Bat.* ii, 98B, in parts (1858), nes TFaff.—*Prasium javanicum* Blume, *Bijdr.*, 8JD (1825).—*P. phlomoides* Reinw. in sched. fide Miq., *Flor. Lid. Bat* ii, 986 (185B), nee Blume.

In archipel. MALAYAN; in ins. Java, in sylvis montanis humidis, frequens, Blume, Reinwardt, Zollinger n. 1990, Horsfield n. 38! Teysmann! Kurz! Forhs!

[>_1u] bu3 50—80 cm. altis, basi subteretibus ("suffrutex," *Forbes in sched.*), pstiolis 1—3 cm. longis, laminis 8—14 cm. longis hia 3—6 cm. latis, subtus caulibusque pilis flavescentibus³ divergentibus pmissime tomentosis, a medio sensim attenuatis, verticillastris sab-12-floris, pedunculis propriis sub-4 mm. longis, bractea 10 mm. longia his 2 mm. latis, pedicellis 4—7 mm. longis, bracteolis 10 mm. longis, calyce 16 mm. longi, tubo calycis 10 mm. longo, dentibus 6 mm. longis hia basi 4 mm. latis, corolla 35 mm. longa—parte tubi sequali 10 mm. longa, limbo 9 mm. lato, labio postico margini integro 7 mm. longo hoc 8.5 mm. lato, labio antico 10 mm. longo hoc 11 mm. lato, lobo medio oblongo margine integro, styli lobis distincte recurvis, nuculis 7 mm. longis hia 5.5 mm. latis.

PLATE 102. *Gouphostemma javanicum* Benth. Specimen from Java, Reinwardt.

This is nearly allied to *G. Scortechkii* although by the much smaller leaves and flowers, the shorter calyx teeth and the glabrous style it is sufficiently easily distinguished from that species. The leaves are sometimes serrate, sometimes crenate, sometimes entire. This is the plant intended in Blume's description of *Prasium javanicum*, but Dr. Miquel informs us that this, according to a sheet sent to him by Dr. Blume himself, is the plant that was named by E. Binwarit *Prasium phlomoides*. It is not impossible that both species may have borne the same manuscript name in Reinwardt's Herbarium; however, this may be, Blume's description of *Prasium phlomoides* does not apply to this plant. The nearest ally of the plant is the following, which, though easily distinguished by general habit and appearance, is perhaps hardly variably from it.

15. *Gomphostemma rugosum* Prun (189D).

Erecta caule terete lignoso robusto, foliis distincte petiolatis elliptico-ovatis acutis marginibus serratis, supra lucidis brevissime hirsutulis mox glabrescentibus subtus petiolis caulibusque densissime rufo-lanatis, verticillastris multifloris densis brevissimo pedunculatis, bracteis exterioribus ovato-lanceolatis reliquis lanceolatis calyce brevioribus, calycis dense rufo-lanatis dentibus tubo brevioribus, corolla flava apice antice incurva calyce 3-plo longiore, extus (lobo labii antiqui medio excepto) villosa, stylo glabri, nuculis brunneis apice pilosis subulatis.—*G. lucidum* Wall., in parte et quoad C+t. n. 215B/1 (1828) vix Benth. in *PL As. Ear.* ii, 12.

JAVA, in HORT. BDGOR. cult., Kurz n. 1154! In BURMA infusore; Amherst, Falconer n. 1033! Tenasserim, in Chappadong, Wallich, Cat. n. 215B/1.

Caulibus 60—100 cm. altis, petiolis 3—6 cm. longis, laminis 18—25 cm. longis hia 3—9 cm. latis, basi attenuatis, verticillastris sub-20-floris, bractea 10 mm. longia exterioribus ovato-lanceolatis marginibus serrulatis 5 mm. latis, reliquis subulatis integris 1.5 mm. latis, calyce 14—15 mm. longo hoc 6 mm. lato—tubo calycis 9 mm. longo, dentibus 6 mm. longis hia basi 3.5 mm. latis, corolla 45 mm. longa—parte tubi sequali 25 mm. longa, limbo 10 mm. lato, labio postico obtuso 9 mm. longo hoc 11 mm. lato, labio antico 15 mm. longo hoc 19 mm. lato, lobo medio antice integro, nuculis 6 mm. longis hia 4 mm. latis.

PLATE 103. *Gomphostenima rugosum* Pratin. Specimen from HDRT. BDGDR., cult., Eurz n. 1154.

Under the next species the relationship of this to *Gomphostemma lucidum* is discussed; the reasons both for separating it specifically from *G. lucidum* and for retaining that name to designate Wall. Cat. n. 2155/2 in place of using the name for this plant are there fully stated. This species bears to *G. lucidum* much the same relationship that *G. oblongum* bears to *G. Pluripinnarum*, but its nearest ally is *G. javanicum*, of which it is probably only a form with larger and harsher leaves; in the wider view which will reduce all the forms of the *Lucida* group, except *G. phymoides*, to an amplified *G. oblongum* this will hardly be separated as a variety from *G. javanicum*. In the meantime, however, it cannot be included in that species without inconveniently extending its limits. Like *G. javanicum*, it differs from the other species of *Lucida* in having a glabrous style; *G. vblvnywn*, however, to which all but one of the "Lucida" are probably reducible, is in this respect itself a connecting link since it includes plants in other respects identical, but some of which have styles glabrous even in bud, while others have hirsute styles at least in young flowers.

17. *Gomphostemma lucidum* Wall ex Benth. [1831].

Elata erecta caule terete lignoso robusto, foliis breviter petiolatis elliptico-ovalis vel oblanceolatis acutis margine serratis, supra lucida piloso-hispidis demum glabrescentibus subtus petiolis caulibusque hirsutis, verticillatis multifloris densis, bracteis lanceolata subulatisve calyce sessili brevioribus, calyce dense rufo-lanati dentibus triangularibus tubo plus 3-plo brevioribus, corolla flava apice antice incurva calyce sub-3-plo longiore, extus (lobo labii antici medio excepto) dense villosa, styli versus apicem pilis divergentibus barbato, nuculis albidis glabra sublevibus.

VAR. *typica*; laminis oblanceolatis vel lanceolatis, subtus nuda densius ceterum laxe rufotomentosis.—*G. lucidum* Wall, Oat. n. 215B/2 [182BJ; Jenth., Wall PI As. Bar. ii, 12 (1931), Lab. Gen. et Sp. B48 (1335) et DO. Prodr. xii, 551 [1848]; Walp., Rep. iii, 897 (1845); Hook. f., Fhr. Brit. Ind. iv, B97 (1885).

In ASSAM inferiore; in collibus Jaintea, Olatce, n. 595D! in montibus Khasia, DeSilva [Wall. Vat u. 215 B/2)! Griffith, n. 4D38 Em. Dist. fin parte)! Hooker et Thomson! Olatce, n. 14279! Gallaty, n. 243! Oldham! In BURMA superiore; apud Poneline, Anderson! In YUNNAN occidentali; prope Momien, Anderson!

VAR. *canescens*; lamina elliptico-ovatis, subtus requabiliter albo-tomentosis.

In HIMALAYA orientali; in collibus Daphla, Lister n. 83! In ASSAM superiore; in Lakhimpur, Griffith n. 4038 Kew. Dist. fin parte et quoad n. 29B Herb. Griff. propr.) Masters! apud Dibrugarh, Clarke, D. 37719!

Stem BD—ID0 era. altis, petiolis 1—3 cm. longis, laminis 18—25 cm. longis his 4—9 cm. latis, basi sessilae sensim attenuatis, verticillatis sub-lanceolatis, bracteis ID mm. longis lanceolatis vel subulatis integris 1.5—25 mm, latis, calyce 14—15 mm. longo hoc 6 mm. lato—tubo calycis ID mm. longo, dentibus 4 mm. longis his basi 3-5 mm. latis, corolla 4D mm. longa—parte tubi aequali 25 mm. long-a, limbo 9 mm. lato, labio postici medio acuminato 9 mm. longo hoc ID mm. lato, labio antico 15 mm. IDngo hoc 18 mm. lato, lobo medio antice integro, ovarii tomento nix caduco, nuculis B mm. longis his 4 mm. latis.

PLATE 94. *GrDrnphostemma lucidum* Wall Specimen of VAR. *typica* from Khasia, Gallatly n. 243.

This species is nsarly related to *G. oblongum*, and may usually be distinguished by its serrate (not crBnate) leaves which OTB narrower and smaller, as WBII as by its distinctly smaller flowers, the tomentum on which is generally rufous, and is always much denser than Dn those of *G. oblongum*. But the leaf character fails, since Aniamans gatherings of *Gr. oblongum* shew crenata and serrate leaves on the same branch. Mr. Bentham has used as diagnostic the character "Dalyribus . . . dentibus . . . abbreviates" for *G. lucidum*, and "dsntibus lanceolato-linearibus acutis" for *G. oblongum*—*u,n* expression which makes his description D' *Gr. lucidum* refer exclusively to Wallioh's *Silhet* plant, and which Excludes WallicVs *Trnasserim* one. There is no specimen of Wall. Cat. n. 215C/1 at Calcutta, but Mr. Hemsley has very kindly compared for me at the Linnean Society's rooms a specimen from Amherst [*Falconer* n. 1D33] which agrees with it exactly, and *Falconer* n. 1D33 in turn is precisely thB BUIDB as a plant (from the herbarium of the latB Mr. Kurz) cultivated in the Buitenzorg garden. This plant is mDrB nearly related to *G. javanicum*, with which it agrees (at the same time differing from ff. *lucidum*) in having a glabrous style and in having a calyx with bng teeth and distinct pedicels. But though from these specimens it is evident that Wall. Vat. n. 215G/1 is specifically distinct from Cat. n. 215D/2, I have refrained from restricting the name *G. lucidum* to Wnllich's n. 215B/1. For *Falconer* n. 1D33 and *Kurz* n. 1154 differ from true *G. javankum* mainly in being densely tomentosB, and might well be treated as a variety of that plant. But were this reduction madB it would bB necessary to submerge *G. javanicum* (1833) in *G. lucidum* (132S)—a course that would bs highly inexpedient; for while it is true that *G. lucidum* (1828) did include Wall. Cat. n. 215G/1, it is equally truB that *G. lucidum* (1831) as described in Wall. PL As. liar, and in all subsequent works refers precisely to n. 215C/2 and exploitley excludes n. 2153/1 by the character "dentes calycini vix lineam longi." In the prBsnt paper therefore a figurB has been given of, and the name *G. lucidum* is hereby expressly limited tD, the plant which forms Wall. Cat. n. 210G/2.

As in the case of *G. Heyneanum*, the two varieties are very distinct, and yet there is no character of calyx Dr corolla wherein they differ.

18. *Gomphostemma phlomoides* Benth. (1835).

Elata erecta caule parum sulcato, foliis longius petiolatis late ovabis apice acumirmilis basi abruptius attenuatis margins DrenatD-dentatis, supra molliter breve hirsutis subtus petiolis caulibustjue dense floccosD-tomentosis, verticilhstris paucifloris, bracteis majusculis ovato-lanceolatis acutis, bracteolis minimis, calycis breve pedicellati dense toniBntosi dentibus triangularibus tubo duplo brE3viDribus, corolla lutca antice incurva calyce duplo longiore, extus (lobo labii antici medio excepto) parce sequabiliter pubescente, styli summo triente parce pilis diver^entibus hirsuto, nuculh immaturis nigrGsuentibus apisi^ pilosis sublsevibus.—*Gr. phloroides* Benth., Lab. Gen. et Sp. 619 (1835) et DC. Prodr. xii, 551 (1848); Walp., Rep. iii, 898 (1845); Moritzi, 8y*h Verzeichn. 53 (1845); Miq., Flor. Ind. Bat. ii, 985 (185fJ).—*Prasium phlomoides* Reiniv. ex Blume, By'dr. 840 (1326).

In archipel. MALAYANO ; in ins. Java in sylvis montDsis altioribus, Blume, Udmuardt, Horsfield n. 13 5! Hasskarl n. 1597! in ins. Madura, apud Petjoeden, Teysmann ii. 1BU!

Caulibus BO—100 cm. altid, petiflis 35—B cm. bng-ia, laminis 13—IB cm. longia his 8—11 cm. latis, verticillastris nunc iensis nunc ia ramos foliolatulos excrescentibus, bracicis 15—25 mm. longis his 3—5 mm. latis, bracteolis 5—7 mm. longis linearibus, pedicellis 2—3 mm. longis, vahjce 12 mm. brigo IIDC 6 mm. lato—tubi) culycia 8 mm. longo, dentibus 4 mm. longis his basi 35 mm. latis, corolla, 25 mm. lDnga—parte tubi cequali

13 mm. longa, limbo 9 mm. lato, labio postico integro 5 mm. longo hoc 8 mm. lato, labio antico 9 mm. longo hoc 19 mm. lab. b. lateralibus majusculis, nuculis maturis nondum communicatis.

PLATE 1Di. *Tomphostemma phlomoides* Benth. Specimens from Java, Hertsfeld.

This species is very distinct from the others of the group in often having the whorls disposed on short axillary branchlets with smaller leaves than those of the main stem. In this respect therefore it approaches the group *Pedunculata*. But its whorls are axillary and not on the old wood, and it is further distinguished by its hirsute ovary and its calyx prominently ribbed. Even when the whorls are condensed it is at once distinguished from the remaining *Lucida* by its smaller corolla very abruptly and considerably widened at the top; and from *G. oblongum*, with which Mr. Benth. and Dr. Miquel particularly compare it, it is further distinguished by its sparingly hirsute style. The slender part of the tube, though shorter than in any of the other *Lucida*, is not, as Miquel says, shorter than the calyx.

The various forms that are here included in the group *Lucida* have been in this paper kept apart in order to maintain as uniformly as possible the treatment adopted by the late Mr. Benth. But though the intermediate forms which would warrant a reduction of these forms have not as yet been reported, there is evidence enough to show that reductions will ultimately be necessary, and it does not seem out of place to indicate here those that may have to be effected. Abandoning all reference to differences in the leaf edges and in the style, which even in some of the forms now differentiated are found to fail, and relying solely on differences in flower and fruit, we find that only three plants are at all clearly separable. These are:—

A. *G. DBLONGUM* Wall., *ampl.*; corolla tubo calyce multo longiore, nuculis maturis hirsutis.

VAR. *a. typha*; foliis majusculis hand rugosis breviter petiolatis = *G. oblongum* Wall. Cat. 2154. — *G. Philippinarum* Benth. — *G. ScDitchinii* Prain.

VAR. *ft. parvifolia*; foliis minoribus subrugosis vel rugosis distincte petiolatis = *G. javanicum* Benth. — *G. rugosum* Prain [*G. lucidum* Wall., *quoad* Cat. n. 215S(1)].

AREA GED&R.; Andamans, Tenasserim, Malaya, Java, Philippinae.

B. *G. LUCIDUM* Wall., *emend.*; corolla tubo calyce multo longiore, nuculis maturis glabris.

VAR. *a. tjpica*; foliis oblanceolatis vbi lanceolatis = *G. lucidum* Wall. Uat. 215B/2 tantum.

VAR. *ft. canescens*; foliis elliptico-obovatis subtus albo-tomentosis = *G. lucidum* VAR. *canescens* Prain *uti supra*.

AREA GEDGR.; Himalaya Orientalis, Assam, Burma superior, Yunnan.

D. *G. PEILOMOIDES* Benth.; corolla tubo calyceoem parum excedentem.

AREA GEOBTL.; Java, Madura.

Even if the whole reduction indicated above has been effected, it will be noted—1, that *G. lucidum* is manifestly only the Indo-Chinese representative of the Malayan *ft. oblongum*; and 2, that the only tangible character which separates these two is that the ovarian tomentum is altogether deciduous in *G. lucidum*, whereas it persists to some extent in *G. oblongum*. The two species therefore do not differ from each other so much as do *G. pedunculatum* and *G. Curtisi* (which two—Mr. Hemsley in *ML* has suggested the advisability of uniting), and, as in the case of these latter, it may be suggested that ultimately *G. lucidum* would be quite sufficiently differentiated if regarded as a local sub-species of *G. oblongum*, as has been indicated already in TABLE I [p. 23D).

VII- *Pedunculata*; *vermillastris* remittit axillaribus vel seorsim caulem apophyllum dispositis, catyve haud confato intus tubo dentibusque fimbriato, ovario multifido, nutribus ovatis.

19. *Gomphostemma peiunculatum* Benth. [1885].

Elongata caule basi prostrato, foliis lunge petiolatia ovatis acutis basi parum attenuatis margins serratis, supra hirsutia subtus caulibus petiolia pedunculisque dense tomentosis, verticillastris multifloris cymis laxis utrinque evolutia, bracteis rubiis latis ovatis inargine serratis calycibus brevioribus, bracteolia oblongo-lanceolatis, calycis rubiis extus bracteisque molliter hirsuti, dentibus latius ovato-triangularibus tubo brevioribus, corolla sulphurea antice incurva calyce plus 2-plo longiore, extus glabrescente, stylo glabro, nuculis pallidis glabris punctulatis.—*G. pedunculatum* Benth. *Mss. ex Book. 1., Flor. Brit. Ind. iv.* B9B (1885).

In ASSAM inferiors; in montibus Khasia, infra Nurtiang, 2—3,009 p. a. m., *Hooker et Thomson!*

Caulibus plus 100 cm. longis flexuosis, prostratis, basi radicanibus apice tantum ascendentibus, foliis longe distantibus, petiolis 3—5 cm. longis, lamina 7—30 cm. longis his 4—15 cm. latis, cyma 2—8 cm. longa in axillis inferioribus et secus nervum dispositis, bracteis 1.5—1.5 cm. longis hinc 0.5—1 cm. latis alternis bracteolis 5—15 mm. longis hinc 3—8 mm. latis, calyce 12 mm. longo hoc limbo 5 mm. lato—tubo calycis 1.5 mm. longis, dentibus 55 mm. longis hinc basi 3 mm. medio 4 mm. latis, corollas tubo 25 mm. longo—parte tubi aequali 15 mm. longas hac 3 mm. latis, parts inflatis 9 mm. longas, limbo 8 mm. lato, labio postico 5 mm. longo hoc 9 mm. lato, labio antico 8 mm. longo hoc 15 mm. lato, nuculis latis ovatis 5 mm. longis hinc 4 mm. latis.

PLATE 91. *Gomphostemma pedunculatum* Benth. Specimen from Nurtiang, Khasia, *Hooker et Thomson.*

The specimen figured in B.H. Humph. of the original gathering, but is evidently (of the original description) not very typical. The species is nearly allied to *G. Urtiui* from Penang and Perak; but its peduncles, bracts and calyces are more hirsute, its bracts are much larger, and its calyx teeth are very different, being much wider and a good deal shorter; the leaves are also much larger than in the Malayan plant.

20. *Gomphostemma Durtisii* Prain (1831).

Elongata caule ascendente scabro, foliis longe petiolatia oblongo-ovatis acutis basi parum attenuatis margine denticulatis, supra hirsutia subtus petiolis adpressis tomentosis, verticillastris multifloris cymis laxis utrinque evolutis, pedunculis glabris, bracteis angustis ovatis longe acuminatis marginibus integris calycem aequantibus rubidis, bracteolis lineari-lanceolatis, calycis rubidi extus bracteisque parvis puberulis dentibus e basi triangulari longe lineari-lanceolatis tubo exsertentibus, corolla alba antice incurva calyce 2-plo longiore, extus puberula, stylo glabro, nuculis pallidis glabris punctulatis.

In Peninsula MALAYANA; Penang, *Urtis* n. 1310! Perak, in Larut, *Scorlechini* n. 924! Wray n. 1233!

Caulibus flexuosis basi haud radicanibus 9—12 cm. altis, foliis distantibus petiolis 3—12 cm. longis, lamina 8—12 cm. longis hinc 5—7 cm. latis, cyma 5—8 cm. longis sepibus caubus aphyllum tantum dispositis, bracteis 10—15 mm. longis hinc 4—5 mm. latis, altemis, calyce 14 mm. longo hoc 5 mm. lato—tubo calycis 1.5 mm. longo, dentibus 75 mm. longis hinc basi ipsa 3 mm. latis, triente imo subito attenuatis ceterum lanceolato-eubulatis, wrothe tubo 25 mm. longo—parte tubi aequali 14 mm. longis, parte inflata

11 in m. longa, limbo 8 mm. lato, labio postico 4 mm. longo hoc 8 mm. lato, lobus antico 7 mm. longo. I.D.D. 1 B mm. lato, *nuculis* B mm. longis his 3 mm. latis, oblongis-DVatis apice rotundatis basi trijuetris.

PLATE 92. *G-Dinphostemma Curtisii* Prain. Specimen from Perak; Wray n. 1233.

This species is so nearly allied to *G. pudunrvlatum* that Mr. Hemsley remarks of it "without dissection would be called *G. pedunculatum*." It is, however, as analysis shews, very distinct as species go in this genus; the diagnosis has been given already. The species is named in honour of Mr. D. Curtis of Penang, whose enthusiasm as a collector is only equalled by his obliging attention to the requests of correspondents. In this thB cymes seem only to occur on the stem a long way below the leaves.

21. *GtamphDstemma chinense* Oliv. (1884).

Elongata caulis prDstrata vel ascendens, foliis bngiuscule petiolatis ellipticis vel DvatD-ellipticis apice Dbtusis vel subacutis basi cuneatis rotundatisve margins undul a₁₀-ienticulatis, supra breve hirsutis subtus petiolis caulibusque cano-pubescentibus verticillastris multifloris cymis laxis utrinque evolutis, bracteis anguste ovatis acuminat^{is} margins integris calycem sequantibus, extus pedunculisque tomentosis intus dabr d^{is} catyois purpurascens extus pubescentis dentibus lanceolatis acuminatis tubo serfTilon^{is} corolla alba antice incurva calyce 4-plo longiore, extus puberula, stylo glabro, nuculia pallidis glabris punctulatis.—Gr¹ chinense Oliv. in *Hoolc, Icon. Plant*, xv, 54, t, 14BS (1884); *Ilance in Jour. Bot.* xxv, 12 (1887).—*B. chinensis* Forbes et Hemsl¹, *Jwr. Linn. Soc.* xxvi, 3DB (1890).

In CHINA Australi; Fokien, apud Amoy, *Swinhoe*; Kwangtung, in collibus Lo-fan-shan, *Faber*! in ins. Hainan, ad Faii-luii, *B. O. Henry*.

Daulibus gracilibus basi subteretibus sspB radicanibus 4D—50 cm. altis, foliis distantibus petiolis 1—3 cm. longis, laminis B—9 cm. longis his 3*5—4 mm. latis, supra sequabiliter stellato-tDmentDsis pilis longioribus simplicibus interspersis, cymis 4—5 cm. longia secus caulem aphyllum vel B basi caulis quasi radicanibus, bracteis 9—10 mm. longis his 5—8 mm. latis, oppositis, calyce 12 mm. longo hoc 5 mm. lato—tubo calycis b¹ mm. longo, dentibus 5 mm. Ipngis his basi 3 mm. latis, corollae tubo 45 rum. longo —parte tubi sequali 30 mm. longa, partB inflata 15 mm. longa, limbo 8 mm. lato, 1 a₁₀ pDstico 4 mm. longo hoc 8 mm. lato, labio antico 7 mm. longD hoc 15 mm. latD, *nuculis* 5 mm. Ipngis his 3*5 mm. latis.

PLATE 97. *Gromphostemma chinense* Oliv. Specimens from Lo-fan-shan, *Faber*. A—comm. Ford; B, D—vx *Icon. Plant*, xv, t. 14BB.

A species very distinct from thB other numbers of thB group owing to its longer cord¹¹ and its leaves with stellatB tomentum on the upper surface; by both characters it connects the *Peduncula* with the *Melissifolia*. The upper lip of thB corolla is shown in Mr. Oliver's plate as slightly emarginat^{is}, just as it is in *Gf. pDdiunculatum* and in *G. Uurtisii*. The cymes in this species are bornB on the lowest portion of thB stem in thB few specimen; in one (of thB Bams gathering) kindly communicated to Calcutta by Mr. D. Ford, F.L.S., of Hong-Kong, they occur along the stem, BXactly as in *G. P. f.*

It may ultimately be possible to unite as sub-species the two first species of this ST¹¹ lip; in thB meantime the necessary intermediate forms OTB' altogether deficient. If, moreover, the character of the inflorescencB bB found to fail in any of the three forms herB defined, it will perhaps become possible to unite thB two groups *Peduncidata* and *Melissifolia*.

VIII. *Melissifolia*; *verticillastris* *remitis* *axillarihus*, *calyce* *inlustinck* *costab* *intu** *tubo* *dentibusque* *hirmto*, *ovario* *glabro*, *nuculis* *sutylobosis*. *PRASium* Roxb., Hort. Beng. 45 (1814), nee Linn.

22. *Gromphostemma Mastersii* Benth. (1885).

Humilis vel elatior caule gracili parum sulcato scabro, *foliis* longB petiolatis Dvnto-oblongis apicB acutia basi intBgra cuneatis vel raro truncatis marginB ceterum minute crenato-serratia, supra beve hirsutis subtus nervis dense ceteruui parce tonientosis, petiolis subscabris, *verticillastris* paucifloris densis vel raro VBrticillis inferioribus parum evolutis, *bracteis* exterioribus oblongia obtusis, reliquis lanceolata, omnibus calyce brevioribus, *bractealia* linearibus brevibua, *wlycis* purpurascents costis densius ceterum parcB hirsuti dentibus lineari-lancBDlatis apice subulatis tubo multo longioribus, *corolla* flava, extus brevissime puberula, calyce plus 2-plo bngiore, *slyh* glabro, *nuculti* nigresDentibus glabris extus ltevibus intus rugosulis.—G. *Mastersii* Benth. in *Herb. Ind. Or. II. 1. §f T.T.* ex Hook. 1., *Flor. Brit Ind.* iv, B99 (1885)—G. *melissifolium* Wall., *Cat* n. 2157, *pro parte* *et syn.* *Prasium melissifolium* Roxb. *exct* (1828).

In ASSAM inferiore; in collibus Jaintea, 2—3, DD0 p. s. m., *Q. Mann!* In Silhet, *DeSilvn!* *Clarke!* in montibus Khasia, 3—4,000 p. s. m., *Hooker et Thomson!* *Clarke* n. 44437! in collibus Lushai apud Lengti, *Prazor!* In ASSAM superiore; *Masters* n. 32D in *Herb. Kew.*, *Jenkins!*

Caulibus aacendentibus inio basi tantum radicanribua, VGI proatratia ramis ascendentibus, B—25 cm. altis, radicibus fibn>sis tuberia fuaiformibus interspiirsis, petiolia 3—7 cm. longis, laminis supra aequabiliter atellato-toaiBntQsia pilia longioribus aimplicibus interspereia, 7—14 cm. longis hia 3—9 cin. latis, verticillaatria sub-10-ttoris nnnnunquam cymis laxis utrinque evolutis, bractBis 16 mm. bngia his exterioribus 8—12 mm. latis reliquis 2—4 mm. latis, *calyce* 18 rum. longo hoc 5 mm. lato—tubo calycia 7 mm. longo, dentibus 11 mm. longis his basi 3 mm. latis, *corolla* 40 mm. long-a—parts tubi requali 25 mm. bnga, limbu 8 mm. Into, labio postico margine integro B mm. longo HDR 8 mm. lato, labio antiuo 8 mm. longo hoc IB mm. lato, *nuculis* maturis B mm. longia hia 1 mm. latis.

PLATES 98B and 99. RompliDstemma *Mastersii* Benth. 9313. Specimen frnni Jaintea liills, *Mann.* 99. Specimen froin Khasia, *Hooker if Thomson.*

This is a very distinct species marked by the presence of tubers amongst its roots. The ~~14~~characteristic tomentum of the upper Surface oi its leaves, consisting oi n uniinrm, though not dense, ~~and~~ ~~sub~~Yubescence, throughout which longar¹ and stouter simple hairs are uniformly scattered, is very distinctive. This peculiar character the species shares with *Q. chinenne* (which has to bf) placed in the group *Prdunvulata* owing to the flowers there being in lax cymes borne on the old wood below the leaves). Its flowers too are very like tlmse of *Q. chnivw.* and it further shews its affinity with the group *Pvrtnnvhta* in having a cobured calyx alld in having its whorls, as Sir Joseph Hooker has pointed irat. Sometimes lax-" shortly pedunRld ns in fj. *jm-latam*" \F. Ji. / jv, W.I) RHll the whorls ~~are usually ienge,~~ and in any CME the calyx is distinctly, though not prominently," ribb«l.

Small forms of the q,mPa . good dp»l rBSemble *Bi retoinum*, to which it i. perhaps most nearly allied; that spmes is at one, distinguished by its velvety tomentum as dense on th.Mipper as on the under surface of thp leaves, by its shorter corollas, and by its roots uithn-u tubers. Its reduction to

G. ovatum has been suggested, but in external krgB forms of this species do a good deal resemble specimens of *G. ovatum* VAB. *flaccida*. The tubers among the roots, the coloured and much loEger-toothed calyx, the shorter narrower bracts, and the stellate hairs on the upper surface of the leaves (a character never exhibited by either variety of *G. cavanthii*) amply distinguish this species from *G. ovatum*. Dr. Wallich originally gave this plant the name of *ff. radicans*, but afterwards issued it as *G. melissifolium*, the remaining member of the group to which it belongs; it is so unlike that species that the diagnostic points do not require to be dwelt upon.

23. *Gomphostemma velutinum* Benth. (1829).

Humilis caule gracili distincte sulcato dense velutino, foliis longe petiolatis ovatis basi integra cuneatis vbi subtruncatis margine ceterum obtuse ciliatis apice acutis, utrinque densissime stellato-velutinis, verticillastris paucifloris densis, bracteis exterioribus ovatis oblongisve, reliquis lanceolatis, omnibus calycis brevioribus, bracteolis linearibus brevibus, calycis viridis dense nudiater birsuti dentibus lanceolatis tubo Eequilongis, corolla flava antice incurva, extus villosa, calyce 2-plo longiore, stylo glabro.—*G. velutinum* Benth., Wall. Cat. n. 2709 (1829), Wall. Pl. As. Bar. ii, 13 (1841), Lob. Gen. ft Sp. 649 (1835) et DO. Prodr. xii, 552 (1848); Walp., Bot. iii, 598 (1845); Book. I., Fbr. Brit. Ind. iv, 699 (1885).

In ASSAM inferiors; in "Maitibua Silhet," Bruce [Wall. Cat. n. 2709] in montibus Khasia, 4,000 p. s. m., Hooker et Thomson! Oldham! apud Mansinai, 4,000 p. s. m., Clarke n. 45942!

Stem 12 cm. longis ascendentibus vel prostratis, ramis ascend. Stems, radicibus omnibus fibrosis, petiolis 1—4 cm. longis, laminis 3—5 cm. longis hinc 2—5—35 cm. latis, verticillastris sub-4-floris, bracteis 5—8 mm. longis hinc 1—3 mm. latis, calyce 13 mm. longo hoc 4 mm. lato—tubo calycis 6 mm. long. D, dentibus 7 mm. longis hinc basi 2 mm. latis, corolla 30 mm. longa—parts tubi squali 14 mm. longa, limbo 8 mm. lato, labio postico 6 mm. longo hoc 8 mm. lato margine integro, labio antico 8 mm. longo hoc 10 mm. lato, nuchis maturia nondum communicatis.

PLATE 98A. *Gomphostemma velutinum* Benth. Specimen from Silhet, Bruce [Wall. Cat. n. 2709].

A very distinct species, easily recognisable by the dense tomentum on both surfaces of the leaves, and remarkable in having a uniform stellate tomentum on the upper surface as well as the underside. This is the smallest species of the genus.

24. *Gomphostemma ovatum* Wall. (1828).

Humilior caule gracili subsulcato scabro, foliis longis petiolatis membranaceis supra parce hispido-pubescentibus subglabrisve, lamina ovatis late ellipticis apice obtusis basi truncatis vel raro cuneatis margine crenato-dentatis, verticillastris multioris densis, bracteis exterioribus foliaceis ovatis obtusis margins crenato-serratis calycem exsertentibus, reliquis ovato-acutis calycem sequantibus, bracteolis linearibus brevibus, calycis viridis dentibus lanceolatis tubo brevioribus, corolla flava apice antice incurva calyce sub-4-plo longiore, extus puberula, stylo glabro, nuchis brunneis glabris extus laevibus intus rugulis.

VAR *typica*, foliis subtus, bracteis extus, petiolisque uabiliter molliter tornentosis-B. ovatum Wall. Cat. n. 2155 (1828); Benth., Wall. Pl. As. Rar. ii 12 [1631], Lah Gen. et Sp. B19 [1835] et DC. Prodr. xii, 552 (1848); Walp., Rep. iii, 897 [1845]; Hook, f., Flor. Brit. Ind. iv, 599 [1885].

In HIMALAYA centrali et orientali; Nepal, in colle Dhanduagheri, Wallich! Sikkim, ad Rishap 2,000 p. s. m., Clarke n. 12498! ad ripas riy. Ryang, 5. Gammie! In ASSAM superiors; Masters!

VAR. *flaccida*; foliis lase viridibus, flaccidis, subtus bracteisquo extus (nervis puberulis exceptis) glabris, petiolis parce puberulis.

In HIMALAYA orientali; ad ripas fl. Rangiet, 2,500 p. s. m., Anderson! infra Darjiling, 2 500 p. s. m., Kurz! ad Sittong, 3,000 p. s. m., King! In ASSAM inferiore; in collibus Jaintea, Simons! in montibus Khasia, 4,000 p. s. m., Minn!

Daulibus 15—30 cm. altis ascendentibus imo basi radicanibus, petiolis 2—4 cm. longis, laminis 11-16 cm. longis his 10—12 cm. latis, verticillastris 12—30-floris, bracteis exterioribus 18 mm. longis his 12 mm. latis, reliquis 12 mm. longis his 3—4 mm. latis, *nalis/cevkr. typTM & 11) mm. longis n^oc * mm. lato ~ tul)0 calycia* B mm. longo, dentibus 4 mm. longis his basi 2 mm. latis, calyce VAR. *flaccidie* 12 mm. longo-tubo 7 mm. longo, dentibus 5 mm. longis, *corolla* 41) mm longa—tubi parte aequali 30 mm. longa, limbo 10 mm. lato, labio postico integro B mm. longo hoc 12 mm. lato, labio antico 18 mm. longo hoc 18 mm. lato, bbo medio amplissimo, *nuculis* 6 mm. longis his 4 mm. latis.

° PLATE 90. Gomphostemma ovatum Wall. Specimen from Nepal, Wallich [Cut. n. 2155).

Most nearly allied to *G. melissifolium*, from which it differs in having larger leaves, the outer bracts somewhat larger and all obtuse, the whorls many-flowered and the upper lip of corolla entire, not emarginate. The habit also is usually different in *G. ovatum*; the stems are ascending and only rooting near the base, in *G. melissifolium* prostrate or scandent and longer, often rooting below for half their length. The varieties differ a good deal in appearance, but there are no good diagnostic marks except absence of pubescence in *VAE. flaccida*, which bears to the type precisely the relationship borne to *B. rirabim* by its VAR. *viridii*.

25. Gomphostemma melissifolium Wall. [1828].

Elongata, rarissime nana, caule gracili distincta sulcato scabro, *M⁸ p⁸biolati- membranaceis supra glabris subtus nervis petiolibus stridentibus, *entosis* *Ceterum* glabris, laninis *B⁸uptirii* basi *cunabatis* apice *adu* marginibus minutis *verticillastris* paucifloris densis, bracteis exterioribus catis acutis margin, *illtegris* calycem paulo longioribus, reliquis lanceolatis nlyse brimbu., bracteis linearibus brevibus, *nip** Jidis dentibus lanceolatis tubo *uiliongu*, corolla flava vel purpurea, antice incurva, extus puberula, calyce plus 3-pb longioribus stylo gibbo, *nuculis* rubris glabris, extus intusque *l⁸vibus.-^* *m⁸sifolium* Wall., Cat. n. 2157 (1828); Benth., Wall. Pl. As. Rar. ii, 12 (1831); pro parte et quoad V. *TM⁸ melurifolium*, R⁸h.-<3⁸ *m⁸Bliss⁸folium* Benth., Lab. Gen. et Sp. B49 [1835] **D⁰f⁸*- &*, 552 [1845]; Walp., Hep. iii, 81 *pro parte.-^* *m⁸Bliss⁸folium* Hook //, *Fl. Brit. Ind.* i. 119. *^ m ^ ' ^ - { w } melissifolium* Roxb., Hort. Ben. 4t, [1814], *ivr. Ind.* iii, 2B (1832) *et hon. ined.* x, t. 119.*

In ASSAM inferiors; Khasia, apud Jheria, 25D p. s. m., *Clarke* nn. 44945! 44953! Silhet, *Roxburgh*, *DeSilva*! Cachar, *Prazer*! In HDRT. BOT. CALCUTTA, cult., *Roxburgh* (icon.)! *Falconer*!

Daulibus 5D—250 cm. longis, gracilibus, scandentibus vel prorsus prDstratis et a medio deorsum radicanribas, rarissime brevibus (ID—3D cm. altis) suberectis, lauiinis 7—10 cm, loDgis his 35—5 cm. latis, verticillastris sub-B-floris, bracteis exterioribus imis 2D mm. longis his 8 mm. latis, reliquis plurimis 10—12 mm. longis his 5—5 mm. latis, calyce 10 mm. longo hoc 4—5 mm. lato—tubo calycis 5 mm. longo, dentibus 5 mm. longis Ids basi 2—5 mm. Jatis, corolla 35 mm. longa—tubi parts eequali 2D mm. longa, limbo 8 mm. lato, labio postico 7 mm. longo hoc 9—5 mm. lato margins emarginato, labio antico ID mm. longo hoc 145 mm. lato, nuculis 4 mm. longis his 3 mm. latis.

PLATE 1DD. *Gromphostemma melissifolium* Wall. A—Specimen from Jheria Ghat, *Clarke* n. 44853. B—Ex *Roxburgh*, *Icon. ined.* x, t. 110.

This species is distinguished from *G. ovatum*, to which it is most nearly allied, by its whorls being fewer-flowered, its bracts acute, its upper lip of corolla emarginate, its leaves smaller and narrowed to both extremities and perfectly glabrous above. From *G. Mastemii*, with which it was distributed by Dr. Wallich, it also differs in having smaller leaves, fewer-flowered whorls, longer bracts, upper lip of corolla emarginate, and leaves quite glabrous above.

The plant figured by Dr. Roxburgh (PLATE 1DD—copied from *Roxb., Icon. ined.* x, t. 119) grown in the Botanic Garden at Calcutta is dwarf and stunted, and though the plant has been long lost to cultivation, the type is preserved in the Calcutta Herbarium a cultivated specimen collected subsequent to the distribution of Dr. Wallich's East Indian Herbarium, which shows that after being in cultivation during a quarter of a century it continued to be erect in habit and dwarfed. In one Cachar gathering—that by Prazer—the plant is described as having stems about 8 feet long, rambling over adjacent bushes; some of the specimens communicated by this collector are tops of stems 2—3 feet long with no sign of rootlets. These specimens thus corroborate Dr. Roxburgh's statement that the species is scandent—a habit which it shares with *G. nutans*. In Dr. Wallich's gathering and in all subsequent gatherings except that of Prazer, the stems are, as described by Sir Joseph Hooker, prostrate and rooting below for half their length.

The flowers in Dr. Roxburgh's figure are yellow: this is the colour noted in most field gatherings; Prazer's Cachar gathering has, however, blueish corollas with purple lips and a white throat. On the page bearing the original figure of Roxburgh's plant there is brick-red stain, which in Dr. Roxburgh's handwriting is noted as having been made by the fresh "bright red" nutlet; the ripe nutlets of a dried specimen (*Clarke* n. 44946), noted as "drab brown," impart to paper a stain precisely the same as the stain referred to, which was made in 1813!

There are not at Calcutta any specimens from Sikkim, and there are no Assam ones from an elevation of over 3000 feet above sea-level.

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G. C. Datta del.

A. G. Sinha. lith.



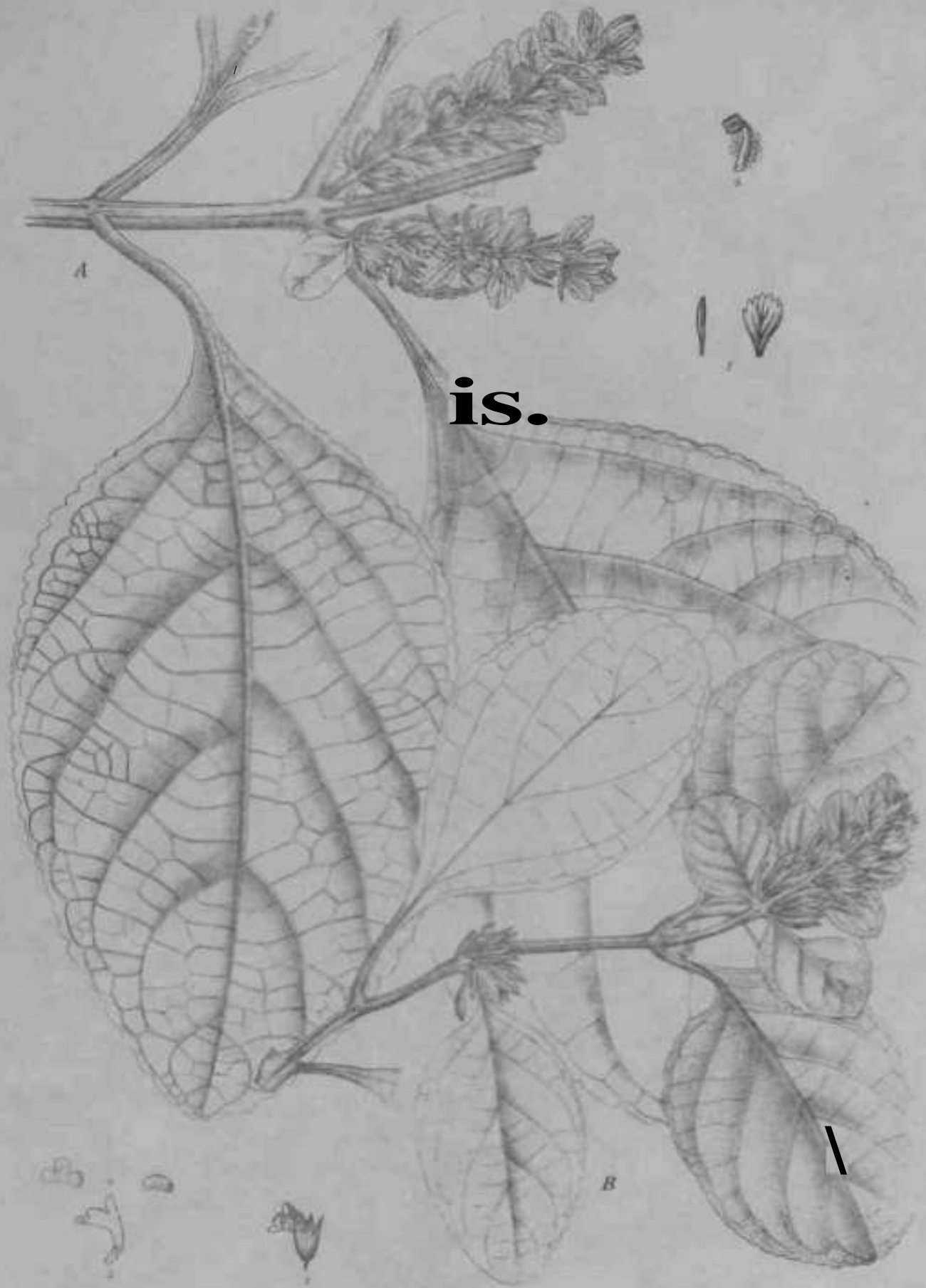
COMPTOSIA STRACHEYI Wall. ex TUCKER.



A. L. Hughes del.

GOMPHOSTEMMA HEYNEANUM Willd. var. TYPICA.

Callos. Sep. 15-20



is.

1

K.D. Chandra

K.D. Chandra lit.

GOMPHOSTEMMA HEYNEANUM WILDM. ROTTGER, Frax.





A. C. Sargent del.

A. C. Sargent del.

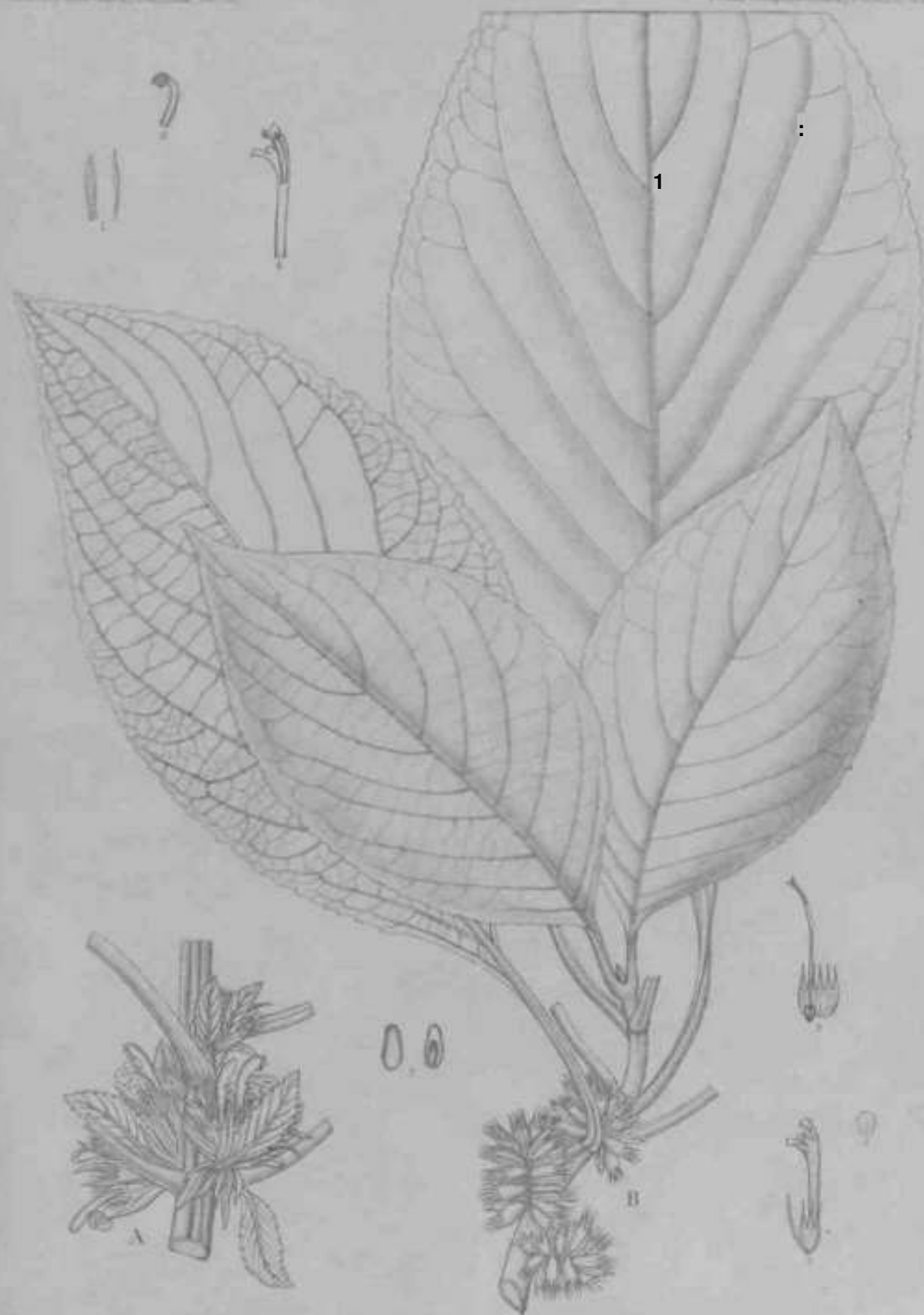
GOMPHOSTEMMA NIVEUM Hook. & Arn.



A. C. Smith del.

GOMPHOSTEMMA MICROCALYX Benth.

A. C. Smith del.





GOMPHISTEMMA PARVIFLORUM WELSH TYPE



A. C. Smith del.

GOMPHOSTEMMA PARVIFLORUM WALT. var. FARINOSA Presl.

Chambers, J. & G. det.



A. L. Sargent del.

F. C. Chamberlain, Inc.

GOMPHOSTEMMA CHINTUM WALL. & ARTHUR, R. GRIFITH II. Bot.

11

v

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4

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GOMPHOSTEMMA PEDUNCULATUM Benth.

KH. & L. 1891



ft



GOIA' HOSTEMMA SCORLECHINUM Frax.

A C Mukerji



A. C. Sargent

A. C. Sargent

GOMPHOSTEMMA LUCIDUM WAIL.



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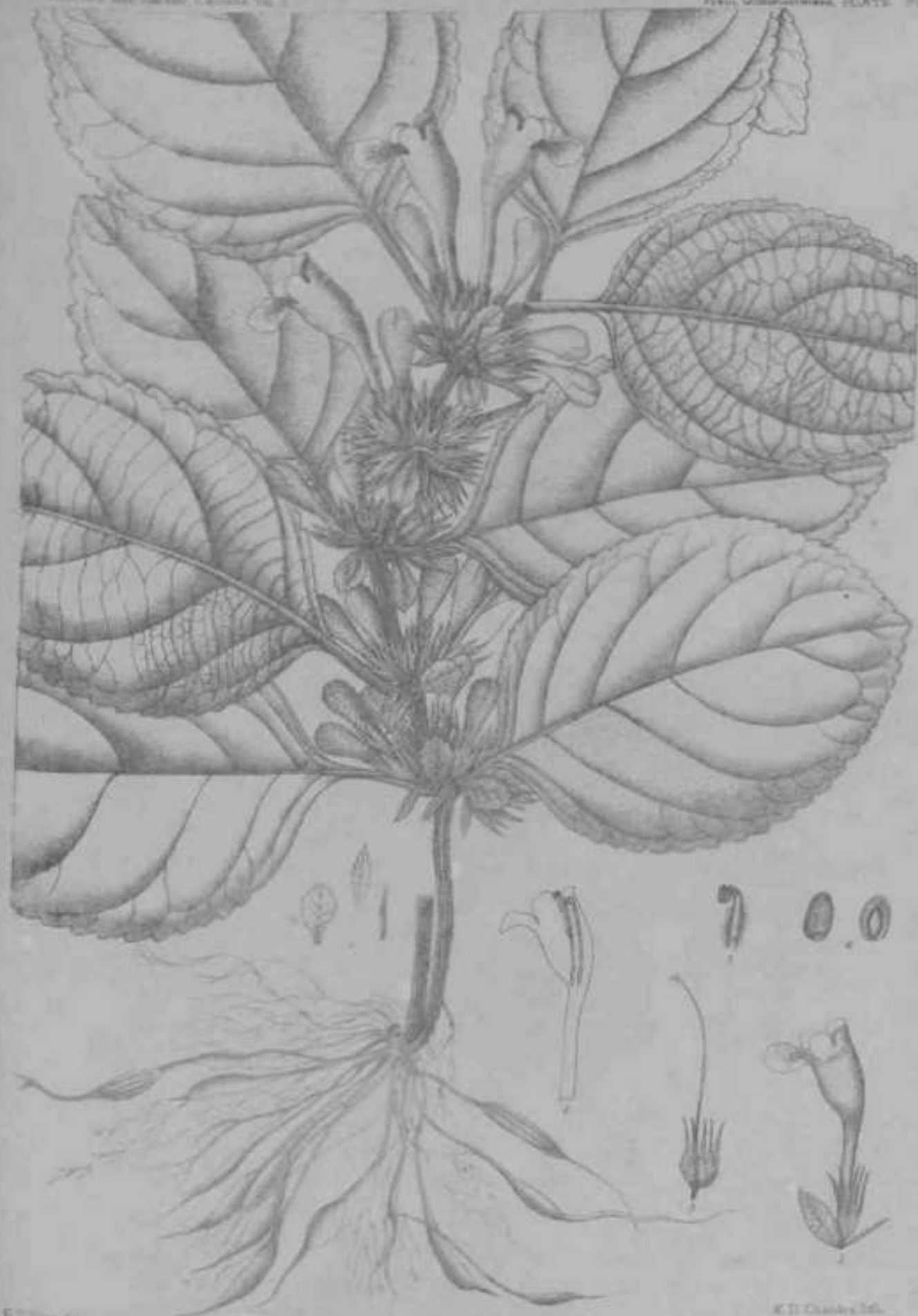
AMPHISTEMA OVATUM Wal.



GOMPHOSTEMMA CHINENSE, Ouf.



A. OCHROPHYSA VELUTINA (Benth.) R. G. MASTIPOLI Benth.



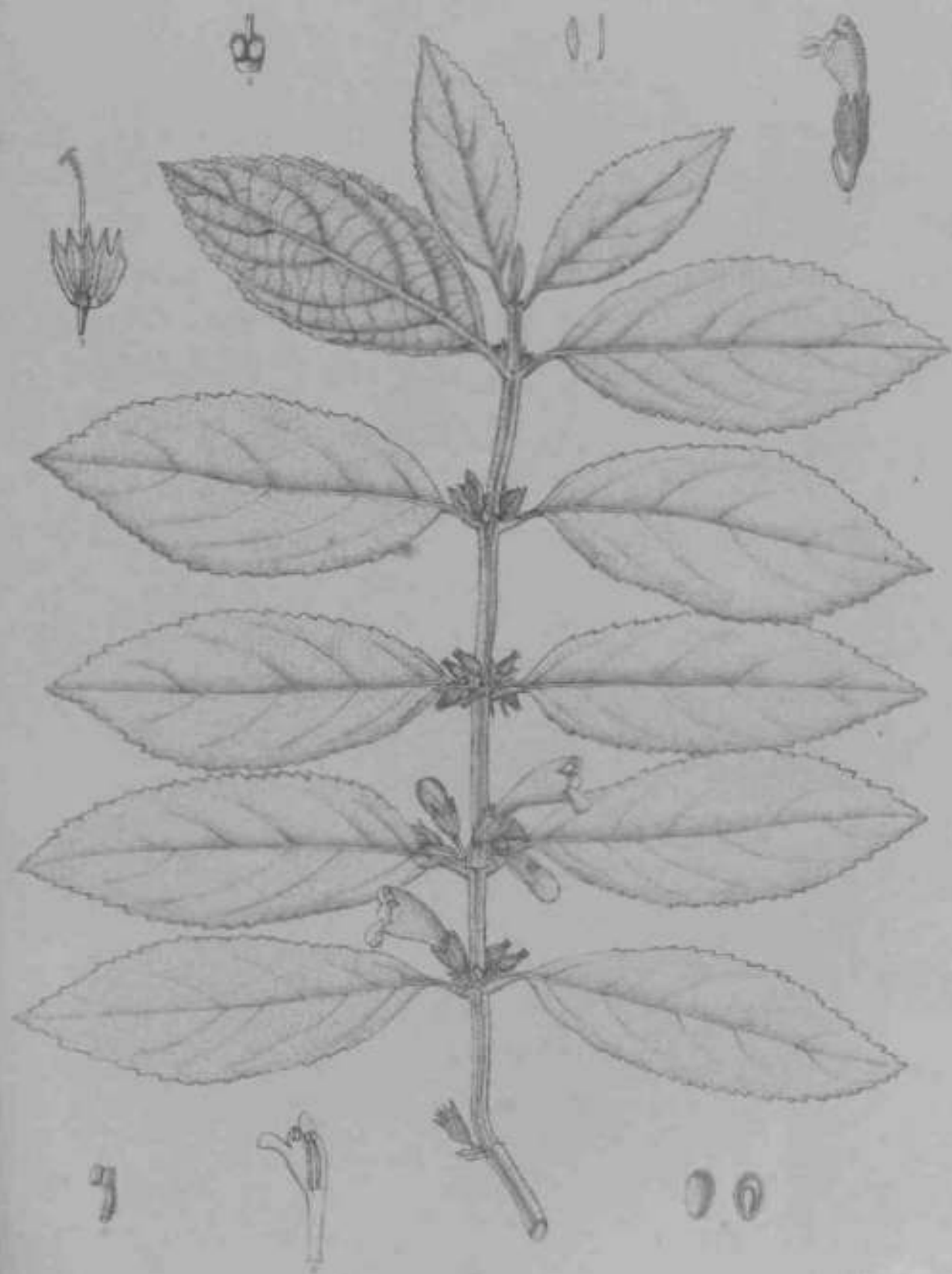
C. D. Clarke del.

C. D. Clarke del.

GOMPHOSTERNA MALTERREI Benth.









THE
SPECIES *OF* MYKISTICA
OF
BRITISH INDIA.

BT
GEORGE KING, M.B., LL.D., F.R.S., C.I.E.,
Superintendent of the Royal Botanic Garden, Calcutta.

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1891.

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THE morphology of the genus *Myristica* has been so excellently discussed by the late Mr. Bentham (1); by Sir J. D. Hooker and the late Dr. T. Thomson (2); by MM. Alph. DeDandolle (3) and H. Baillon (4); and by Professor Prantl (5), that it seems superfluous to enter into an account of it here. But, as the present monograph, of the British Indian species may fall into the hands of Forest Officers whose libraries are usually very limited, I venture to give a short account of it for their benefit. All the Nutmegs are either trees or bushes; some of them attaining great size, e.g., *M. gigantea* and *M. magnifica*; while a few (e.g., *M. fragrans*) rarely exceed thirty feet in height. The leaves are always simple, entire, exstipulate, alternate, feather-nerved, and very often aromatic—at least when bruised—the fragrant principle being in some species contained in special glands situated within the tissues of the leaf. The flowers are generally small, and they are invariably unisexual—usually dioecious, but in one species at least [*M. canarioides*] monoecious. The male flowers are variously arranged in axillary or supra-axillary fascicles, racemes, umbels, panicles, or cymes; and the inflorescence is often bracteate. The male flowers are produced in much larger numbers

[1] Hooker's *Journal of Botany* for 1853, p. 1-

[2] *Flora Indica*, by Hooker and Thomson, vol. I, 1855.

[3] *Ann. des Sciences Naturelles*, Ser. IV, vol. IV, p. 20.

[4] *Histoire des Plantes**, II, 498.

[5] *Die Natürlich Pflanzfamilien*, von Engler und Prantl.

than the females ; and as a fact the latter are usually very scantily represented in most collections. In the flowers of both sexes the perianth is single, coriaceous, more or less globose or urceolate or tubular; usually 3-toothed, but in some species 2- or even 4-toothed ; the aestivation of the teeth being always valvate. The anthers, which are in shape either ovate or linear, have two parallel cells, and they are invariably collected on a central column, which may be stalked or sessile, and to which they are attached in one of two ways. In the majority of the species the column is cylindric or angled. It may be not much longer than broad, or it may be much elongated ; but the anthers are always attached to it by their backs, through their connectives, the edges, and, sometimes, the apices of the anther-cells being free. In some species the anthers are also united to each other, as well as to the column. In the section *Knema*, however, the column is cylindric below; but at its apex it expands into a flat, concave or slightly convex, orbicular (or somewhat 3-cornered) disc, to the edges of which disc the anthers are attached by their bases, either directly or by the intervention of short filaments. In some species the connective of each anther is prolonged at the apex into a short, free point; in others the projecting connectives of all the anthers of a flower are conjoined into a single conical appendage; while, in a third set, the connective is not prolonged at all. In all cases the dehiscence of the anther-cells is longitudinal, and it is invariably extrorse, *i.e.*, the pollen escapes outwards, or in many of the *Knemas*) downwards. In number, the anthers of the Asiatic species vary from six to eighteen; but in one species [*M. bivalvis*) they number thirty, and in another [*M. Ourtisii*) forty-five. Many of the South American species have, however, only three anthers, and these alternate with the lobes of the perianth. As will be understood from the preceding account of the anthers, there is considerable diversity in their arrangement. And these differences, together with the nature of the inflorescence in which the male flowers are disposed, and the presence or absence of bracteoles, have been taken as characters for the division of the genera into groups or sections.

The female flowers are, in all the species known to me, fewer in number and larger in size than the males. As a rule they present less variety than the males. The perianth is more inflated than that of the male; it is sometimes campanulate with a constricted mouth; it is also thicker in texture, and has shorter teeth than that of the male. I have only in one species found any trace of staminodes in a female flower. The ovary is single, usually sessile, more or less ovoid; it is invariably one-celled with a single, basal, anatropous ovule. The style is either very short or quite absent, and the stigma is flattish and slightly divided or lobed. The ripe fruit has a pericarp which often tends to split up, when ripe, into two valves; it is often succulent and brightly coloured. The solitary seed is invariably covered, more or less completely, by a usually lacinate, but sometimes entire, brightly coloured, fleshy or membranous, often aromatic arillus. The exact nature of this arillus has been much discussed; some observers regarding it as an arillus proper, proceeding from the funiculus at or just below the hilum; others, as an arillodea originating around the micropyle; while a third set believe it to originate from both hilum and micropyle. As in the seeds of *Myristica* the hilum and micropyle are approximated, the third view is probably the right one. The testa of the seed is smooth and hard; the albumen copious, ruminant, and often aromatic. The embryo is small, basilar and straight; the cotyledons being sub-foliateous, divaricate, and flat or rugulose-plaited. The radicle is short, cylindric, and inferior.

The ^enua *Myristica* was founded by Linneus in the second edition of his *Genera Plantarum*, published in 1742, the single species known to him being the Nutmeg of commerce. The genus was omitted in the third edition; but the Nutmeg reappeared in the younger Linneus's supplement as a newly-described species. Gsertner, in his Treatise *De Fructibus et Seminibus Plantarum* (published in 1788), described and figured, from material which he probably obtained from Ceylon, the common Nutmeg and three species besides, -viz., *M. dactyloides*, *M. Irya*, and *M. Iryaghedhi*. Gartner's *M. Irya*, readily identified by its almost perfectly globular seeds, stands as a species to the present day. His *M. Iryaghedhi* I believe to be *M. Eorsfieldii*, ISA. \ and his *M. dautyloides* (and in this I am at one with Dr. Trimen, F.R.S., the present Director of the Peradeniya Botanic Garden) to be *M. laurifolia*, H. f. & Th. The next writer who added much to our knowlpdge of the Asiatic species was Blume, who, in his *Bijdragen* (published in 1825), gave an account of seven species, in addition to the common Nutmeg. In the first volume of his *Rumphia* (published in 1835), the same author added five morB novelties, and also rB-described four previously known species- In their *Flora Indiva* (published in 1855), Drs. J. D. Hooker and T. Thomson made the next great addition to our knowledge of Asiatic Nutmegs. In that admirable fragment, twenty-three species of *Myristica* were described, of which a very large proportion were quite new. A little later (1856-57) there appeared (in his *Prodronms*) BI. Alph. DeCandolle's excellent monograph of the whole order. Df the eighty-one species therein described, one is African; twenty-eight [viz., the entire sections *Virola*, *Sychoneura*, *Otoba*, *Compsonneura* and *Iryanthera*) are South American; one is Australian; five are Polynesian; one is doubtful, and forty-fivB are Asiatic. Miquel contributed largely to the literature of the genus. In 1859 appeared the first Volume of his *Flora of Netherlands India*, in which IIB describes fifty-eight species (of which, however, three are non-Asiatic), and of these nine are new. In his Supplement fur Sumatra (IBBD), the same ^author contributed five additional species from that island. And in his *Annals of the Leiden Herbarium* (*Ann. Mus. Lugd. Bat.*, vol. I, 2D5, 1853-34; and vol. II, 45, 1865-66) he adds eleven Hew species from Malayan countries. These bring the number of Asiatic species recognized by Miquel up to sixty-nine—a number which, from Miguel's inveterate habit of founding new species oa imperfect materials, is doubtless capable of considerable reduction. In vol. III of their *Genera Plantarum* (18BD), the late Mr. Bentham and Şir Joseph Hooker estimate the total number of species at about eighty, Df which about fifty are Asiatic. Sir Joseph Hooker's *Flora of British India* contains the most recent account of the Indian species, and in that work thirty-two species (3D in the text and 2 in the appendix) are described; while several more are alluded to, but (for want of full material) are not named. The activity which has characterised the work of botanical collecting within the sphere of influence of the Calcutta Botanic Garden during the past few years, brought to the Calcutta Herbarium specimens of several species which I believed to be new. " And the desirability of describing these, joined to the difficulty which all who are not botanical experts have in distinguishing *any* species *ui Myristica*, suggested the idea of publishing figures, accompanied by descriptions, of all the British Indian species known at the present date. It was at Sir Joseph Hooker's suggestion that I undertook the present memoir, and during its elaboration I have had the benefit of his most kind and invaluable advice and encouragement. To prevent misunderstanding, I may explain that, by the phrase *British India*, I understand

political British India (including the Nicobar and Andaman Islands), and the provinces of the Malay Peninsula which, together with the islands of Singapore and Penang, are administered by the Government of the Straits Settlements.

By Aiton, *Myristica* was regarded as part of the family of *Pistachiaceae*, and by Jussieu it was considered to be part of the *Lauraceae*. Robert Brown was the first to recognize that, for the genus, ordinal rank is necessary; and he placed his order *Myristiceae* between *Proteaceae* and *Laurineae*, believing, however, that it is not closely allied to either. This is pretty much the position assigned to the family by the late Mr. Bentham and Sir Joseph Hooker, who, in their *Genera Plantarum*, place the family with *Piperaceae* and *Monimiaceae* in a group next to that which contains *Laurineae*, *Proteaceae*, and *Thymeleaceae*. M. DeDandolle, however, in his *Prodromus*, places *Myristiceae* between *Polygonaceae* and *Proteaceae*. Besides the similarity in leaf-type and in habit, the affinity with *Laurineae* lies in the unisexual apetalous flowers. There is no doubt that (as Endlicher, Lindley, Sir Joseph Hooker, and Dr. T. Thomson pointed out) there is an alliance with *Anonaceae* on account of the trimerous, valvate perianth; extrorse anthers; apocarpous fruit; ruminant albumen, and minute embryo. And, in their *Flora Indica*, Messrs. Hooker and Thomson actually put *Myristiceae* next to *Anonaceae*. There appears to me to be little doubt that the Anonaceous genus *Strobilanthus* also affords a connecting link, not only by its dithecous flowers, but by its dotted aromatic leaves. Nutmegs, however, differ from Anonads in the great development of the arillus in their seeds, and in their unisexual flowers. In the *Flora of British India* Sir Joseph Hooker, however, gives the order a place near *Laurineae*. In Lindley's opinion, *Myristiceae* are, however, more closely allied to *Menispermaceae* than to any other family; and so impressed was he with this view that he placed the two orders in his Menispermal alliance (along with *Monimiaceae*, *Schizandraceae* and two other small families) at a considerable distance from his Ranal Alliance, which includes *Anonaceae*; his chief argument for this arrangement being the unisexual character and trimerous symmetry of the flowers. Against this view of Lindley's there is urged the total difference of habit between Nutmegs and Menisperma; the universal occurrence of ruminant albumen in the seeds of the former, whereas in many of the latter albumen is totally absent, and when present it is only occasionally ruminant; the seeds of *Menispermaceae*, moreover, have no arillus. By the majority of botanists the *Myristiceae* are regarded as belonging to the single genus *Myristica*. But, within the genus, there is no doubt considerable variety of form, and the species arrange themselves into various, more or less natural, groups or sections. The first author to recognize this was Loureiro, who in 1790 published his genus *Enema*. Blume is responsible for the section *Pyrrhosa* [*Rumphia* i. 190]; while he adopted Loureiro's genus *Knema* as a section, and grouped the remaining species in the section *Myristica proper*. Messrs. Hooker and Thomson, in their masterly account of the Indian species in their *Flora Indica*, added to the three sections recognized by Blume that of *Irya*; while M. DeDandolle, in treating of the species of the whole world, increased the total number of sections in the genus to thirteen. Only seven of these sections, however, contain Asiatic species; the members of five being, as has already been mentioned, entirely American, and the solitary member of the other being African (from Madagascar). In the *Genera Plantarum* of the late Mr. Bentham and Sir Joseph Hooker only seven sections are admitted for the species of the whole world, and of these two include purely American species.

Wherever it occurs the genus is a tropical one; but I feel convinced that many species remain still to be discovered, and I consider it would be premature to attempt to trace the geographical distribution of the known species more minutely than has already been incidentally done.

I have not found *Myristica* an easy genus. The difficulties that beset the student of it are of two sorts—natural and adventitious. Chief amongst the former sort are the direcious arrangement of the flowers ; thB scantiness of the female flowers ; the succulence of the fruit, which makes its preservation in good condition for examination an uncommon occurrence ; and finally the similarity in the form and texture of the leaves of species not very closely allied in Dther respects. The adventitious difficulties lie in the brief and insufficient accounts of their species given by all the earlier writers, and in the loose, though often lengthy, descriptions (often founded on the most imperfect materials) of the numerous species of which the late Professor Miquel is the author. I have little doubt I have blundered sadly in the account of the British Indian species which I now venture to publish. I would have blundered much more had it not been for the help of Sir Joseph Hooker, whose kindness I have acknowledged above. To my friend and colleague Dr. D. Prain I am also beholden for many sagacious suggestions, and to his pencil I owe the drawings of the analyses of the flowers of most of the species. Dr. Boerlage, Conservator of the Royal Herbarium, Leiden, has, in the most friendly way, compared for me most of my new species with the type specimens of Blume and Miquel which are deposited, respectively, in the collections at Leiden and Utrecht, and to him my warmest thanks are also due. My best acknowledgments arB also duB to Dr. H. Trimen, F.R.S., Director of the Botanic Garden, Peradeniya, Ceylon, who gave me much information about the Ceylon species, lent me his Herbarium specimens and drawings, and permitted me to copy several of the latter. To Mr. H. M. Ridley, F.L.S., Director of the Botanic Garden, Singapore, I am indebted for much invaluable material, and for the loan of the suite of specimens belonging to the Singapore Herbarium. Dr. H. Lawson, Director of the Botanical Department, Madras, also was kind enough to lend me the only specimens which I have ever seen of *Myristica magnifica*, Beddome.

I ought perhaps to explain that, in the measurements given in the following pages, thB length of the leaf means the length of its blade only, the measurement of the petiole being given separately; that the breadth of a leaf is taken at its broadest part; and that by " andruecium" I mean to include the staminal column as well as the anthers.

MYRISTICA, LINN.

DIEDIOUS trees or shrubs; with evergreen, simple, alternate, ex-stipulate, pinnatifid, sometimes pellucid-punctate leaves. *Flowers* small, regular; the males in axillary or supra-axillary, often bracteate, cymes, fascicles, umbels, or panicles, rarely in racemes; the individual flowers sometimes bracteolate. *Perianth* gamophyllous, single, inferior, coriaceous, deciduous, usually 3-lobed, sometimes 2 or 4-lobed; the aestivation valvate. *Male* flower; anthers 3 to 18 (or even 30 or 45), 2-celled, ovate or linear, usually sessile; attached by their backs to a central, vertical, cylindric or angled, sessile or stalked column; free from each other or connate; Dr (sect. *Knema*) attached by their bases, either with or without short filaments, to the edges of a peltate stipitate disc; always extrorse; rudimentary pistil none. *Female* flower without staminodes (except in No. IB). *Ovary* sessile in the fundus of the perianth, free, 1-celled. *Stigma* usually sessile (rarely with a short style), capitate or depressed, sometimes lobed. *Ovule* solitary, basal, erect, anatropous. *Fruit* more or less fleshy, often splitting into 2, sometimes into 4, valves. *Seed* erect; arillus fleshy or membranous, entire, bbed, or lacinate and often induplicate at the apex; usually coloured and often aromatic; testa usually thick; albumen copious, hard, ruminant. *Embryo* very small, next the hilum; cotyledons divaricate, flat or crumpled; radicle short, inferior.

Sect L—EUMYRISTICA [*Eumyristica*, Hook. fil. *k* Thorns.; *Eumyristka* and *Uahnvura*, A. DC.] Male flowers in cymes, umbels or few-flowered panicles; perianth 3-toothed (4-toothed in *M. Veyhnka*) with a persistent, usually oblique, bracteole at its base; androecium more or less cylindric or fusiform; staminal column elongate, usually stalked; anthers linear, elongate, usually entirely connate to the column and to each other; occasionally their apices, and more rarely their edges free. *Fruit* large, ovoid, or oblong; the pericarp succulent, rarely leathery.

Male flowers in panicles 4 or 5 in. long; flowers and bracteoles large;

leaves 10 to 16 in. long; fruit large. 1. *J. bracteata*.

Male flowers in lax little-branched panicles, 3 in. long or several times longer than the leaf-petioles; flowers small; leaves 8 to

10 in. long. 2. *M. Malaccensis*.

THE SPECIES OF MYEISTICA

Mais floWBrS in lax, branching cymBS (at hast twice as long as thB leaf-petioles) ; leaves small; fruit large.

- Fruit glabrous, broadly pyriform. 3. *M. fragrant*.
 Fruit rufous-toniBntose, elongate-oblong; cymes pubBrulous . . . 4. *\$/t. Malabarica*.
 Fruit broailly ovoid; cymes rusty-pubescent. 5. *M. gigantta*.

Mais floWDrS in condensed many-flow Bred umbels Dr cymes shorter
 Dr very little longer than thB lBaf-petioles.

- Pericarp of fruit lBathBry, not succulent ; mala perianth
 4-toothed. 6. *Jf Ccylanica*.

Pericarp succulent.

Male fIDWBrS ovoid or globose.

Fruit minutely rufous-tomentosB or pubsscsnt, not ruguloso.

- Leaves elliptic to oblong-elliptic, rounded Dr
 truncate or slightly cuneate at the base; fruit
 ovoid, abruptly and shortly apiculatB 7. *M. laurifylia*.

- Leaves elliptic-lancBolate, oblong or elliptic, rounded
 Dr suddenly cuneate at the basB; fruit sub-
 globular, 2-25 in. in diam. 8. *M. Beddomei*.

- LeaVBS oblong or elliptic-oblong, rounded at the
 base, 12 to 24 in. long, stellate-tomentose
 beneath; fruit ovoid, 3 to 4 in. long . . . 9. *M. magnifioa*.

- Leaves oblong-lanceolate with rounded bases, 4 to
 7 in. long, cinnamoneous-tomentosB beneath;
 fruit 3 to 3-5 in. long. 10. *Jf. cinnamonea*.

- Leaves oblong or elliptic-oblong, much cuneate
 at the base, 7 to 12 in. long, glabrous beneath;
 fruit 1'5 to 3 in. long. 11. *Jf. rrassa*.

- Fruit rugulose, densely woolly rufous-tomBntoSB . . . 12. *HI. Lowiana*.

Fruit glabrous.

- LeaVBS linear-oblong. 13. *M. Maingayi*.

- Leaves ovate-elliptic or elliptic. 14. *M. Andamanka*.

- MalB flowers elongate, narrowly tubular; fruit gibbous,
 glabrous. 15. *Jf. elliptica*.

- Mob flowers on short, woody, few-flowered axillary racemss . . . 16. *IB. if. mavis*.

- Sub-sBct. HorsfiBldia \A. DC7.) Male floWBrS minute, mixed with sub-
 persist Bnt braoteolBS, in many-flowered glomBruli on largB, open,
 branching panicles; andrscium and fruit as in *Eumyriska* . . . 17. *M. Horsfieldiü*

Sect. II—PYRRHDSA \Pyrrhom, BlumB, Hook. fil. & Th., & A. DC.) Male flowers minute, in many-flowered, branching-, often large and spreading panicles; perianth Bbracteulate, usually 3 sometimes 4-toothed; andrcecium short, sub-globular or 3-gonous, rarely cylindric, usually sessile; anthers not elongate, completely attached to the column by their backs, thair apices sometimes free for a short way. *Fruit*

globose or ovoid-globose, the pericarp usually leathery and but little succulent, (succulent in *M. superb a*).

Andrcecium cylindric.

Anthers about 10, quite connate; leavBs 5 to B'5 in. long . . . 18. *M. fuha*.

Anthers about 9, with free apices; leaves 19 to 12 in. long . . . 19. *M. Murtoni*.

Anthers about 18, with free apices; leaves 9 to 12 in. long . . . 20. *M. ferruginea*.

AndrcBcium ovoid, obtuse; flowers largB; stamens 20. 21. *M. superba*.

Andrmcium dBpressBd-gbbosB, shortly stalked. 22. *M. Prainii*.

AndrDBcium depressed-globose, sessile.

Leaves glabrous.

Male flowers largg ('13 in. in diam.) ; fruit 1'5 to 1'5 in.

long; arillus entirB. 23. *31. Kingii*.

Male flowers under '1 in. in diam.; fruit 1'5 in. long;

arillus laciniate at the apex. 24. *HI. amygdalina*.

Mab flowers '1 in. in diam.; fruit 2'5 to 3 in. long;

arillus slightly laciniate at the apex. 25. *M. sucosa*.

Leaves rusty-tomentosB, especially beneath.

Leaves glabrescent when old; 5 to 10 in. long; male panicles

2'5 to 4 in. long. 25. *M. tomtosa**

Leaves persistently tomentDSB; more than ID in. long.

Male panicles B to 9 in. long, their branches long
and slender.

£ flowers very small (D5 in. long), globular,
glabrous, crowded; their pedicels short 27. *M. rubiyinosa*.

g flowers '1 in. long; their pedicels two or three
times as long. 28. *M. floccubsa*.

Male panicles 4 to 12 in. long; their branches short,
very stout.

[J flowers '1 in. long, on very short tomentosB
pedicels, or sub-sessile; perianth of ? flower

sub-acrescent and persistent at base of fruit. 29. *M. WalUohii*.

Monoecious: the ? panicles much longer than the male. 30. *M. canarioides*.

Sect. III.— GYMNA CRANTHERA \A. DV.) Panicles as in *Pyrrhosa*, but short; perianth ebracteolate, 3-toothed; andrcEcium shortly cylindric, or sub-quadrangular and truncate, sessile; anthers connate to the column by their connectives only, their margins and apices quite free; stigma sessile, 2-lobed; leaves and fruit small.

Flowers globular in bud. 31. *M. GHffithii*.

Flowers pvoid in bud.

Leaves 3 to 6 in. long, with 6 to 13 pairs of very indistinct

nerves; fruit ovoid. 32. *M. Farquhftriana*.

Leaves 6 to 10 in. long, with 13 to 17 pairs of nerves; fruit

narrowly obovoid nr ellipsoid. 33. *M. Forbesii*.

Leaves 5 to 12 in. long, with 11 to 13 pairs of distinct nerves;

fruit globose. 34. *Jf. Caunrich*.

Staminal disc and anthers almost as in *Irya*; bracteole close to the flower.....4:4. *M.* *oblong ifblia.*

Anthers with filaments.

Disc flat or sub-concave.

Leaves less than 10 in. long.

Fruit broadly ovoid, apiculate, $\frac{1}{5}$ to $\frac{1}{75}$ in. long; arillus lacinate at its apex; anthers 9 to 12. 45. *M. Kunstleri.*

Fruit ovoid, blunt, $\frac{1}{5}$ in. long; arillus lacinate at the apex; anthers 15. 46. *M. conferta.*

Fruit oblong, not pointed, 1 to $\frac{1}{75}$ in. long, always glabrescent; arillus entire. 47. *M. WrayL*

Fruit pointed at each end, 1 to $\frac{1}{5}$ in. long, furfura-DBDus-tDmentosB when young, glabrescent only when old; arillus entire. 48. *M. attenuate.*

Leaves more than 10 in. long. 49. *M. Scortechinii.*

Disc convex. 50. *M. intermedia.*

Anthers sub-sessile; staminal disc large, flat, or sub-concave . . 51. *M. furfuracea.*

Anthers sessile, sub-erect; staminal disc small, concave.

Fruit $\frac{1}{75}$ to $\frac{1}{2}$ in. long, densely and harshly rufous-tomentose . 52. *If. laurina.*

Fruit $\frac{1}{75}$ to $\frac{1}{25}$ in. long; glabrous when oli 53. *M. ylauca.*

Anthers sessile (sub-sessile in *M. Uantleyi*), horizontal.

Disc flat or concave.

Anthers 11, or fewer.

Fruit spherical 54. *M. Missivnis.*

Fruit oblong, gibbous. 55. *M. tlibbnsa.*

Fruit oblong, not gibbous.

Fruit $\frac{1}{75}$ to 1 in. long; stigma not persistent; arillus entire. 56. *M. geminata.*

Fruit $\frac{1}{5}$ in. long; stigma persistent; arillus fimbriatB at apex. 57. *M. glaucescens.*

Anthers 14 to 18.

Leaves under 10 in. long. 58. *M. erratica.*

Leaves 10 to 20 in. long.

Ripe fruit blunt, densely covered with coarse, short, rusty tomentum. 59. *21. longifolia**

Ripe fruit pointed at each end; glabrous. 60. *AI_m Clarkmna.*

Ripe fruit 2 to 3 in. long, thickly coated with silky wool. 31. *M. Hvnkuriana.*

Anthers 45. 62. *M. Cnrtisii.*

Disc convex (mammiatB).

Perianth of ? flower accrescent, and persistent at the base of the fruit; anthers with short filaments. . . . 63. *M. Cantleyi.*

Imperfectly known species of which the position is uncertain.

- Fruit in long, lax panicles, Ellipsoid; leaves oblong to oblong-lanceolate, 10 to 12 in. long. *Evidently a Pyrrosa or an Irya*. E54 *ST. exaltata*.
- Fruit in long panicles like the last, ovoid, slightly oblique; leaves elliptic to elliptic-oblong, 6 to 8 in. long. *Evidently closely allied to M. exaltata*. B5. *M. racemosa*.
- Female perianth sub-acrescent and persistent at base of fruit; fruit ovoid; leaves oblong-lanceolate, tapering to each end, glabrous. *Probably a Pyrrosa near M. Wallichii*. 65. *M. paludicola*.
- Leaves narrowly oblong, much elongate; petiole short, winged. *Probably a Pyrrosa*. 57. *M. pendulina*.
- Fruit gibbous at the base, apiculate; arillus very short and much fimbriate; leaves oblong-elliptic, blunt Dr retuse, felted and pale underneath. *A Knema, probably near M. oblongifolia*. B8. *M. return*.

Sect. L—EUMYRISTIDA [Eumyristicu, HDDII. fil. & Th.; Eumyristica and Cabneura, A. DC.] Male flowers in cymes, umbels Dr few-flowered panicles; *perianth* 3-toothed (4-toothed in *Jf. Ceylanica*), with a persistent, usually oblique, bracteole at its base. *Andræcium* more or less cylindric Dr fusiform; *staminal column* elongate, usually stalked; *anthers* linear, elongate, usually entirely connate to the column and to each other; occasionally their apices, and more rarely their edges, free- *Fruit* large, ovoid or oblong; the pericarp succulent, rarely leathery.

1. MYRISTIDA BRACTEATA, A. DC. *Prod.* xiv. 1, 192. A tree 80 to 100 feet high, glabrous, except the under surfaces of the midribs and nerves of the leaves and the panicles. *Leaves* large, coriaceous, oblong, sometimes slightly obovate, shortly and rather abruptly acuminate; the base rounded or sub-truncate, often emarginate, rarely cuneate; upper surface shining, the lower pale, glaucous, minutely adpressed-lepidote when young; the nerves 29 to 30 pairs, spreading or sub-horizontal, interarching within the edge, prominent beneath, scaly when young, but ultimately glabrous; the midrib very stout; length 10 to 15 in., breadth 4 to 6 in.; petiole 1 to 1.5 in. *Male panicles* axillary, Dr from the axils of fallen leaves, long-stalked, spreading, trichotomous, few-flowered, the branches opposite, 4 to 8 in. long; *flowers* globular, .25 in. in diam.; pedicels slender, scaly, .25 to .5 in. long; bracteole semi-annular to sub-orbicular, embracing half the base of the flower; *perianth* leathery, scaly-tomentose outside, glabrous within, urceolate, the mouth gaping, with 3 broadly triangular, sub-acute teeth; *andræcium* on a short thin stalk, expanded at the base, cylindric, sub-apiculate, nearly as long as the *perianth*; *anthers* 12 to 18, narrowly elongate. *Female flower* unknown. *Fruit* ellipsoid or oblong when ripe, blunt at the apex, slightly narrowed at the base, minutely rufous-pubescent; sub-furfuraceous, 3 to 3.5 in. long by 1.5 to 2 in. in diam.; pericarp thickly coriaceous; arillus thin, fleshy, extending to the apex of the seed, lacinate and areolate; *seed* shining. *Wall Cat.* BDD, A. *if B.*

Perak: at low elevations on the hills. *Ring's Collector* NDS. 5513 & B9BD; *Scvrtechini* No. 1872.

Specimens of this plant were distributed by Wallich as No. BSD 1) Df his catalogue. These were derived partly from trees grown in the Botanic Garden, Calcutta [where they were reputed to have been received from the Mauritius], and from the

Mauritius, where the tree was reported to be indigenous. But it is now found that no *Myristica* is indigenous to the Mauritius, and no species is described in Baker's Flora of that island and of the Seychelles. There is, however, wild in the lower hill forests of Perak a species, specimens of which agree with Wallich's No. 6800. It appears therefore probable that the Wallichian specimens were derived from the Straits and not from Mauritius. M. DeDandolle refers to this species specimens collected by Dunning in the Philippines, but I have not seen these.

PLATE 1DB. *Myristica bracteata*, A. DC. 1, Branch with panicle of male flowers—*of natural size*; 2, male flower; 3, male flower—*dissected*; 4, androecium—*enlarged*.

PLATE 1D7. *Myristica bracteata*, A. DC. 1, Branch with ripe fruit; 2, section of ripe fruit showing seed and its arillus—*of natural size*.

2. MYEISTIDA MALACDENSIS, *Hook. fil. FL Br. Ind.* v. 1D4. A glabrous tree; young branches rather slender. *Leaves* oblong or oblong-elliptic, acute or acuminate, usually rounded but sometimes acute at the base; main nerves 15 to 20 pairs; length 3 to 10 in.; petiole 3/5 to 5/8 in. *Male panicles* solitary, from the axils of leaves or of fallen leaves, 3 to 4 in. long, slender; *flowers* 1 in. long, on filiform pedicels twice as long as themselves, in sub-cymose clusters; bracteoles large, reniform, membranous, glabrous with ciliate edges; *perianth* sub-globose, sub-inflated, very coriaceous, glabrous, its apex with 3 broad, blunt, shallow teeth; *androecium* much shorter than the perianth, broad, sub-truncate, almost sessile; anthers about 7; their tips free, sub-acute. *Fruit* unknown.

Malacca: Maingay (*Kew Distrib.* 13D5).

Known only by Dr. Maingay's scanty specimens.

PLATE 107 bis. *Myristica Malaccensis*, *Hook. fil.* 1, Branch with male panicles; 2 & 3, leaves and male panicles from other specimens—*of natural size*; 4, male flower; 5, androecium; 6, bracteole—*enlarged*. [*Drawn, through the courtesy of Mr. W. Thiselton Dyer, F.R.S., from Maingay's original specimen in the Kew Herbarium.*]

3. MYRISTIDA FRAGRANS, *Houtt. Hist. Nat.* ii. 3, 233. A considerable tree; all parts, except the ovary and young fruit, glabrous; young branches slender, brownish. *Leaves* thinly coriaceous, elliptic-oblong, lanceolate or elliptic; the apex shortly acuminate, the base cuneate; upper surface shining; the lower dull, pale, sub-glaucous; main nerves 8 to 10 pairs impressed above, prominent beneath, spreading; length 2 1/2 to 5 in., breadth 1 1/2 to 2 1/2 in.; petiole 1/4 to 1/2 in., slender. *Male flowers* in slender, long, pedunculate, slightly supra-axillary umbellate cymes, 75 to 125 in. long. *Perianth* 2 in. long, ellipsoid, sub-urceolate, glabrous; teeth short, triangular; bracteole ovate, quickly deciduous and leaving an oblique, wavy, incomplete annulus; pedicels slender, 1/25 to 1/5 in. *Androecium* cylindric-ellipsoid, hardly apiculate, its stalk a third of its length, ridged, glabrous; stamens about 12, narrow. *Female flowers* larger than the males and in fewer-flowered umbels; *perianth* 3/5 in. long, glabrescent, urceolate; the teeth short, reflexed; *ovary* sessile, cylindric-ellipsoid, tapering slightly upwards; tawny-villous; stigmas 2, flat, broad, fleshy. *Fruit* broadly pyriform, sometimes apiculate, 2 1/2 to 3 in. long and nearly as broad, glabrous; pericarp succulent; seed broadly ovoid, areolate, striate, embraced to the apex by the red, fleshy, much lacinate arillus. *Hook. fil. FL Br. Ind.* v. 102; A. DC. *Prod.* xiv. 1, 189; Mig. *FL Ind. Bat.* i. pt. 2, 53; Blume *Bumphia* i. 180, t. 55. Bentley *fy Trim. Med. PL* iii. t. 218. *M. officinalis*, Linn. *fil. Suppl.* 2B5; Gcertn. *Fruct.* i. 194, t. 41 *exrt. syn. Eumph.*) *Hook. Exot. Bot.* t. 155, 15B, *^ Bot. Mag.*, t. 275B, 2757. *M. moschata*, *TMinlg. in Act Holm.* 17S2, p. 45;

Dissert., 1784, p. 83; *Dissert. de Myristica*, 1788, p. 3; *Willd. Sp. iv.* 2, p. 859; *Blume Bijdr.*, 575; *flosS. FL Lid.* iii. 843. *M. aromatica*, *Lamk. Act. Paris*, 1788, p. 155, f. 5 to 7, & t. f. fwi., rf. 832; *Roxb. Corom. PL* iii. 2B7.

The Nutmeg of cummer us is said to be indigenous only in the Eastern Moluccas; but, as it has been introduced and is cultivated in most of the provinces dealt with in this paper, I give a description and figure of it.

PLATE 1D8. *Myristica fragrans*, *Houtt.* 1, Branch with male flowers; 2, twig with female flowers; 3, ripe fruit; 4, section of the same showing seed and arillus; 5, arillus (empty); 6, seed—of natural size; 7, male flower in section; 8, androecium; 9, ovary—enlarged.

4. MYRISTICA MALABARICA, *Lamk. in Act Paris*, 1788, 152. A large tree; all parts, except the inflorescence, glabrous; young branches very thin, rather pale. *Leaves* thinly coriaceous, sometimes almost membranous, elliptic-lanceolate or narrowly oblong, sub-acute at either end; upper surface shining, the lower dull, not paler than the upper when dry; main nerves 8 to 14 pairs, thin and indistinct on both surfaces, the midrib stout; length 4 to 5 in., breadth 1/25 to 2/25 in.; petiole about 1/5 in., slender. *Male flowers* in slender, open, di- or tri-chotomous, axillary or supra-axillary umbellulate cymes, often nearly half as long as the leaves; buds 1/2 in. long, ovoid-globose; pedicels 1/25 to 1/4 in. long, slender, puberulous; the bracteole semi-orbicular, minute, closely applied to the base of the flower at one side; *perianth* minutely scurfy, puberulous outside, glabrous within; its teeth short, triangular. *Androecium* apiculate; anthers 10 to 14, linear; stalk about a fourth of the length of the column, sub-globular, rufous-tomentose. *Female flowers* more globose and larger than the males and in simple, few-flowered, rather stout, axillary umbels not much longer than the petioles, pointed, 1/25 in. in diam.; the bracteole forming a narrow, imperfect cup round the base of the flower; *ovary* sessile, ovoid-globose, pointed, densely rufous-tomentose; stigma large, sessile, 2-lobed. *Fruit* elongate-oblong, pointed, densely rufous-tomentose, 2 to 25 in. long and 1/25 in. in diam.; arillus (ex A. DC.) reddish-yellow, irregularly lobed and lacunose, extending to the apex of the seed; *seed* ovoid, obtuse, slightly flattened on one side; the testa shining. *Hook. fil. Thorns. FL Ind.* 163; *Hook. fil. FL Br. Int.* v. 1D3; *A. DC. in Prod.* xiv. 1, 194; *DaU. in Gibs. FL Bomb.* 4; *Beddome FL Sylva* t. 2B9. *M. tomentosa*, *Grah. Cat. Bomb. PL* 175 [not of IT. f. if T.] \ *L. dactyloides*, *Wall. Cat* 6785 [not of Gcertn.]; *M. notha*, *Wall. Cat* 67B7.

Western coast of Peninsular India, from the Concan to Malabar, in the wet forests at the base of the hills; common.

PLATE 109. *Myristica Malabarica*, *Lamk.* 1, Branch with male flowers; 2, twig with female flowers; 3, ripe fruit—of natural size; 4, male flower—dissected; 5, ovary from female flower of fig. 2—enlarged.

5. MYRISTICA GIGANTEA, *W. sp. King.* A tree 9D to 13D feet high; all parts, except the leaf-buds, apices of branches, inflorescence and fruit, glabrous; young branches thin, at first rusty-puberulous, afterwards glabrous and dark-coloured. *Leaves* small, coriaceous, glabrous, narrowly oblong-elliptic or linear-lanceolate, rather blunt (sometimes sub-acute) at either end, when dry the edges revolute; upper surface shining, pale when dry; lower dull, pale, sub-glaucous at first; nerves 12 to 18 pairs, sub-horizontal, faint, evanescent towards the margin; midrib bold beneath; length 3 to 4 1/2 in., breadth 1/9 to 1/4 in.; petiole 1/5 to 1/75 in. *Male panicles* axillary or from the axils of fallen leaves, cymose,

rusty-pubescent, twice as long as the petioles; *perianth* 15 in. long, ovoid, with short blunt or sub-acute teeth, rusty-tomentose outside, sub-glabrous inside; pedicel 15 to 2 in. long; bracteole narrowly semi-annular, embracing half the base of the perianth, tomentose. *Andræcium* half the length of the perianth, cylindric, blunt; anthers linear, about 10, sometimes deficient in the lower third of the column; stalk about one-third of the length of the column, tomentose. *Female flowers* unknown. *Fruit* (immature) 1 in. long, solitary, on a thick woody pedicel 5 to 1 in. long, broadly ovoid, slightly pointed, densely and minutely rufous tomentose; arillus extending to the apex of the seed, thin, narrowly fimbriate to nearly the base; *seed* ovoid, shining.

Perak: at elevations under 1,310 feet. *ScorUchini* No. 1949; *King's Collector* Nos. 5B65 and 6050.

A very distinct species, distinguished by its small, narrow, glabrous, coriaceous leaves and condensed, many-flowered, minutely rufous-tomentose panicles of male flowers. It forms a larger tree than any of the species here described—hence its specific name. A closely allied species, but with glabrous, sub-obovoid, sub-gibbous fruit, contracted towards the base, occurs in New Guinea (Forbes, No. 710, in fruit only). Sir Joseph Hooker informs me that there is in the Kew Herbarium a leaf-specimen closely resembling this (Motley, No. 145), but it has neither flower nor fruit.

PLATE 11D. *Myristica gigantea*, *King*. 1, Branch with male flowers; 2, branch with young fruit; 3, section of young fruit; 4, arillus; 5, young seed *^o/ natural size*; 6, male flower; 7, andræcium—*enlarged*,

6. MYRISTIDA DEYLANICIA, A. DU. in *Ann. Sc. Nat. Ser. 4*, vol. 4, p. 29, *Sf Prod.* xiv. pt. 1, 100. A tree; all parts glabrous, except the leaf-buds, male and female inflorescence and fruit; young branches rather slender, dark-coloured, shining. *Leaves* coriaceous, narrowly elliptic-oblong to oblong-lanceolate, the apex sub-acute, the base cuneate, often much narrowed, never rounded, sometimes slightly unequal; upper surface very shining, the lower dull, rather darker in colour; main nerves about 12 to 14 pairs, very faint and depressed (when dry) on the upper surface, bolder below; all sub-ascending and slightly curving, interarching faintly inside the margin; length of blade 55 to 8 in., breadth 2 to 3 in.; petiole 75 to 15 in. *Male flowers* in rusty, very short, stoutly pedunculate, woody, 6- to 12-flowered, axillary cymes; peduncles 25 in. long, lengthening slightly with age. *Flowers* on pedicels 1 to 2 in. long, the bracteole half-orbicular, covering part of the base of the perianth; *perianth* 25 in. long, inflated-tubular, its teeth 4, broadly triangular, extending about a fourth of its length, rufous-tomentose outside and glabrous inside, as is the bracteole; *andracium* shorter than the perianth, cylindric, apiculate, its stalk from a fourth to a third of the length of the column; anthers 9 or 10, linear. *Female flowers* in axillary cymes, like the males, but fewer-flowered; the *perianth* with 3 spreading teeth. *Fruit* solitary or in pairs, axillary, shortly pedunculate, ellipsoid, sub-compressed, slightly ridged along one side, and sub-gibbous at the base; the apex narrowed, apiculate; length 25 in., diam. about 15 in.; pericarp covered with minute sub-deciduous, scurfy, rufous tomentum, thickly coriaceous, but not fleshy; peduncle thick, woody, 5 in. long. *Seed* ellipsoid, depressedly striate, enveloped to the apex by the yellow, fleshy, lacinated arillus. *Thwaites Enum. Pl. Cey.* 11 p. 399. *M. laurifolia*, *H. l. Sc Th.* VAR, *Deylanica*, *Hook, fil FL Br. Ind.* v. 103.

Ceylon: at low elevations in moist forests, and often near the banks of rivers. *Thwaites* C. P. No. 2923.

This has been reduced by Sir Joseph Hooker [*F. B. L.* v. 183] to a variety of *M. laurifolia*, Hook, *fil. 6f Thorns*. But a careful examination of fresh specimens kindly collected for me by my friend Dr. H. Trimen, F.R.S., Director of the Botanical Garden at Peradeniya, makes me believe that it is really a distinct species. Its leaves are perfectly glabrous, and its fruit has a leathery pericarp; whereas in *M. laurifolia* the leaves are minutely lepidote-pubescent underneath, except when quite adult, and the pericarp is very succulent. Dr. Trimen informs me that this is rather a local species, occurring 'both' in the low country and in what I call the intermediate region, i.e., intermediate between our moist and dry districts; whereas *M. laurifolia*, H. f. & Th., which it most closely resembles, is a moist country tree."

PLATE 111. *Myristica Deylanica*, A.DU. 1, Twig with female flowers; 2, cluster of male flowers; 3, fruit dehiscing and showing the seed covered by its arillus—of natural size; 4, male flower; 5, androecium—enlarged.

7. MYRISTICA LAURIFOLIA, Hook. *fil. 6f Th. FL Ind.* 183. A tree; all parts glabrous, except very young leaf-buds and the inflorescence at all stages; young branches dark-coloured. *Leaves* coriaceous, elliptic to oblong-elliptic, obtuse or sub-acute, the base truncate, rounded or slightly cuneate; upper surface shining, lower dull, darker (when dry); main nerves, 12 to 14 pairs, depressed on the upper, rather prominent on the lower, surface, interarching freely, the secondary nerves almost as prominent but much shorter; length 7 to 9 in., breadth 2 to 4 in., petiole 7/8 to 1 in. *Male flowers* in shortly pedunculate axillary cymes, shorter than the petioles when young, but often as long when did; pedicels shorter than the perianth, thick; bracteole orbicular-ovoid, embracing the lower part of the perianth at one side only; *perianth* nearly 2 in. long, obovate-tubular, sub-inflated, cut for a fourth of its length or less into 3 acute teeth, rufous-pubescent outside like the bracteole, glabrescent within; *androecium* thick, cylindric, apiculate, shorter than the perianth, its stalk thick, from half as long to as long as the column; anthers about 14, linear. *Fruit* shortly pedunculate, solitary, ovoid, with a short abrupt apiculus, rufous pulverulent, 1 1/2 to 2 in. long and 1 1/4 to 1 1/2 in. in diam.; pericarp slightly succulent; *seed* narrowly ovoid, covered to the apex by the deeply lacinate, fleshy, yellow arillus. II. *laurifolia* & *M. diospyrifolia*, A. DC. *Prod.* xiv. 1, 191; 11. *laurifolia*, Hook. *fil. FL Br. Ind.* v. 183 [*in part*].

Ceylon: in moist forests from 1000 to 4000 feet. *Thwaites* C. P. No. 415, Trimen, Dr. Trimen informs me that this is the most abundant species of *Myristica* in Ceylon, but that it occurs only in the moister parts of the island; whereas *M. Ueylanka* is found in parts intermediate, as regards moisture, between these and the dry northern districts. Its vernacular name is, Dr. Trimen says, "Mulaboda," and its timber is largely used in making tea chests. HB is of opinion that M. DeDandolle's *M. diospyrifolia* is not separable from *M. laurifolia* and as a matter of fact it appears from DeD's description of the latter [*Prod.* I. o.) that he had seen no specimen of it, and that he merely quotes its description from H. f. & Th. [*FL Ind.* 153]. Dr. Trimen believes that probably the oldest name for the species is *M. davtyhidzs* of Gkartner, whose figure [*Fruct. vt Sem.* i. t. 41, fig. 2] agrees very well. But Gartner probably included other species under the name.

PLATE 112. *Myristica laurifolia*, Hook. *fil* *Sf Thorns*. 1, Branch with a dehiscing ripe fruit; 2, ripe fruit; 3, seed; 4, seed covered by its arillus; 5 & B, sections • of seed; 7, male" inflorescence—of natural size; 8, male perianth; 9, androecium—enlarged. [Nos. 1 to 3 are copied from a drawing made from fresh specimens kindly lent to me by Dr. Trimen, F.E.S.)

8. MYRISTIDA BEDDOMEI, King. A tall tree; all parts glabrous, except the under surfaces of the young leaves and the inflorescence at all stages; young branches rather slender, dark coloured. *Leaves* coriaceous, elliptic-lanceolate, oblong or elliptic, acute; the base rounded or suddenly cuneate; upper surface shining, lower dull, glaucous, the midrib very stout; the 13 to 17 pairs of main nerves spreading, rather bold at their bases, but faint towards their interarching apices; length 6 to 10 in., breadth 2.5 to 3.5 in., petiole 1.25 to 1.5 in. *Male flowers* on stoutly pedunculate, woody, 8- to 20-flowered, axillary cymes; peduncles 2.5 in., lengthening slightly with age; flowers on pedicels 1 in. long, or sessile; the bracteole sub-orbicular, tomentose, oblique, embracing a large part of the flower on one side; *perianth* 2 in., divided, with 3 broad triangular teeth, extending to about a third of its length, rufous-pubescent externally, glabrous within. *Androecium* shorter than the perianth, cylindrical and bluntly apiculate; its stalk thick, grooved, varying with age from 1/2 to 1 the length of the column; anthers 9 Dr ID, linear. *Female flowers* in axillary cymes as in the males, but few-flowered; flowers sessile; *perianth* globular-urceolate, expanded below the 3 spreading ovate teeth, pubescent outside. *Ovary* sessile, globose, narrowed to the apex, adpressed-pubescent; stigma sessile, large, slightly oblique, sub-globose. *Fruit* solitary or in pairs, pedunculate, sub-globose, apiculate, grooved on one side along the suture, 2.25 in. in diam.; pericarp minutely rufous-pubescent, thick, succulent; peduncle 2.5 in. long, very stout. *Seed* globose, smooth, 1.35 in. in diam.; the arillus extending to its apex, red, fleshy. *M. laurifolia*, Bedd. *FL Sylvat.*, t. 267, in part] Hook. *fil* *FL Br. Ind.* v. 103, in part [excl. syn. *M. laurifolia*, H. f. & Th., from both citations).

Peninsular India; Western Ghats from Canara to Travancore, from the base of the range to elevations of 5000 feet.

This species has been included under *M. laurifolia* by Sir Joseph Hooker and Colonel Beddome. It appears to me, however, to differ so much from the Ceylon species to which H. f. & Th. originally gave that name, that I have ventured to form it into a species. The fruit of this is distinguished from the fruit both of *M. laurifolia*^ H. f. & Th., and of *M. Ueylaniva*, A. DC, by its more globular form and much more succulent pericarp, as well as by its leaves being glaucous underneath. Colonel Beddome's figure of *M. laurifolia* [*FL Sylv*^ t 237) is a mixture of the fruit of this with the leaves and flowers of *M. Malabarica*, Lamk.

PLATE 118. *Myristica Beddomei*, King. 1, Branch with male flowers; 2, young fruit (in section); 3, ripe fruit; 4, seed covered by its arillus—of natural size; 5, male flower with bracteole; 6, androecium; 7, female flower; 8, ovary—enlarged [Nos. 3 & 4 are copied from Beddome's *FL Sylv.*, t 257).

9. MYRISTICA MAGNIFICA, Bedd. *FL Sylv.*, t. 288. A tree 90 to 100 feet high; young branches stout, glabrous, the youngest deciduously rusty-pubescent. *Leaves* coriaceous, oblong to elliptic-oblong, acute or acuminate, the base rounded; upper

surface glabrous, shining, *tlb* midrib bold; lower covered by a dense layer of minute, stellate, rusty, deciduous tomentum; ultimately glabrous, pale and sub-glaucous; main nerves 20 to 25 pairs, spreading and interarching by the curving tips, prominent on the lower, impressed on the upper surface; midrib very stout on both surfaces; length 12 to 24 in., breadth 3.5 to 5 in.; petiole 1 in., stout, channelled. *Male flowers* in dense 8- to 15-flowered dusters from very short, woody, axillary tubercles; buds ovoid, their bases on one side embraced by the semi-orbicular, sericeous bracts; *pedicels* 1 in. long, or absent; *perianth* 2 in. long, ovoid-globes, with 3 or 4 short sharp teeth, sericeous-tomentose externally, glabrous internally. *Androecium* much shorter than the perianth, with a short hairy stalk, ovate-cylindric, bluntly apiculate; anthers about 15, narrow, slightly unequal in length. *Fertile flower* unknown. *Fruit* solitary or in pairs, axillary, pedicelled, rufous-pubescent, ovate, 3 to 4 in. long and about 2 in. in diam.; pedicel very stout, 5 to 8 in. long; pericarp thick, fleshy; arillus narrowly lacinate from nearly the base, its segments much conduplicate at the apex of the cylindric-elliptic vertically grooved seed; seed 2 in. long and 1 in. in diam., striate. *Hook. fil. FL Br. Ind.* v. 104.

South Travancore : in moist forests at the base of the hills. *Colonel R. H. Beddome*.

This species much resembles *J. laurifolia*. *Hook. fil. & Thorns.*, in many respects. But it has larger leaves, densely stellate-tomentose beneath; when young its fruit is larger and more oblong, and its staminal column has a shorter and sericeous stalk. It has, up to the present time, been seen alive by no botanist except Colonel R. H. Beddome, who describes it as one of the finest trees in Southern India, having magnificently buttressed stems with many aerial roots. Colonel Beddome has found it only in South Travancore, where it is most abundant at Mimoothee, near Culatoorpalay.

PLATE 119. *Myristica magnifica*, *Bedd.* 1, Leaf-twig; 2, branch with part of leaf and clusters of male flowers; 3, fruit dissected to show seed with its arillus; 4, arillus; 5, seed—of natural size; 6, male perianth with bractlet; 7, section of male flower; 8, androecium—enlarged (Nos. 3 & 8 are copied from Colonel Beddome's *FL Sylva*. 258).

10. MYRISTIDA CINNAMOMEA, *n. sp.* *King*. A tree 50 to 60 feet high; young branches thin, rather dark, sparingly rufous-pubescent at first, finally glabrous. *Leaves* thinly coriaceous, oblong-lanceolate, tapering about equally to either end; upper surface shining, pale brownish-green when dry; lower uniformly covered with a close layer of cinnamomeous, minute, stellate, adpressed hairs; main nerves 14 to 20 pairs, faint on both surfaces, sub-ascending; *tlb* midrib stout; length 4.5 to 7.5 in., breadth 1.5 to 2.25 in.; petiole 1.5 to 1.75 in., scurfy-pubescent. *Male flowers* 2.5 in. long, in umbellate 8- to 14-flowered axillary cymes about as long as the petioles; pedicels 1.5 to 2 in. long; bracteoles ovate-acute, rufous-tomentose, obliquely embracing one side of the base of the flower, *perianth* elongate-ovoid, tubular, minutely scurfy-tomentose outside, glabrous within, the teeth rather deep, sub-acute; *androecium* cylindric, nearly as long as the perianth, slightly apiculate; anthers about 10, linear, sinuate; stalk nearly as long as the column, scurfy rufous-tomentose. *Female flower* unknown. *Fruit* ellipsoid, tapering slightly to the base, the apex sub-obtuse, 3 to 3.5 in. long and 1.5 in. in diam., slightly ridged along one side, minutely rufous-tomentose; pericarp 3.5 to 5 in. thick, fleshy; peduncle stout, 2.5 to 5 in. long; arillus extending to the apex of the seed, thin, deeply lacinate at the sides; seed cylindric-ellipsoid, 2 in. long, the testa shining and thin.

Perak: at elevations under 1500 feet; common. *King's Collector, Wray.*

The leaves of this species greatly resemble those of *M. iners*, Bl.; but the fruit of this is larger and less pointed: moreover, it is rufous-tomentose, while the fruit of *M. iners* is pale yellowish-green and almost glabrous.

PLATE 11B. *Myristica cinnamomea*, King. 1, Branch with male flowers; 2, ripe fruit; 3, the same in section; 4, arillus and seed; 5, seed without arillus—all of natural size; 6, male flower—dissected; 7, andræcium—enlarged.

11. MYRISTICA DRASSA, *n. sp.* King. A tree 40 to 60 feet high; young branches rather stout, very dark-coloured, glabrous. Leaves coriaceous, oblong, elliptic-oblong or oblanceolate-oblong, sub-acute, the base cuneate; both surfaces glabrous, the lower pale, sub-glaucous; main nerves, 15 to 22 pairs, slightly prominent, spreading; length 7 to 12 in., breadth 2½ to 4 in.; petiole 1 to 1½ in., stout. Male flowers in many-flowered, sessile umbels from short, woody, axillary peduncles; pedicels ½ in. long, tomentose like the flowers; bracteole orbicular-ovate, rugose, closely embracing half the flower on one side. Perianth minutely rusty-tomentose, ovoid when young, urceolate and slightly constricted below the middle when adult, the apex pointed, 3-cleft to about a third of its length, the teeth ovate-acute; andræcium narrowly ovoid, apiculate; anthers 14 to 18, linear, closely attached to the column; stalk of column often nearly as long as itself, lepidote. Female flowers unknown. Fruit solitary or in clusters of 2 or 3, pedunculate, ovoid-globose, slightly pointed, the base rounded or sub-truncate, minutely rufous-puberulous, 1½ to 3 in. long and half as much in diameter; pericarp thick, succulent; arillus fleshy, lacinate, yellow, extending to the apex of the ovoid seed.

Perak: at low elevations; *King's Collector*; Waterfall Hill, *Wray* No. B45; common. Malacca; *Cantley*.

The fruit is eaten by the Chinese settlers. I have named this from the great thickness and soft texture of the pericarp. The arillus and seed possess considerable fragrance.

PLATE 117. *Myristica crassa*, King. 1, Branch with male flowers; 2, mature fruit; 3, section of fruit showing arillus and seed—of natural size; 4, male flower; 5, andræcium—enlarged.

12. MYRISTICA LOWIANA, *n. sp.* King. A tree 60 to 80 feet high; glabrous, except the inflorescence and fruit; young branches rather stout, rough, dark-coloured. Leaves coriaceous, oblong to elliptic-oblong, sometimes slightly obovate; apex acute, the base cuneate or sub-cuneate, often slightly unequal; upper surface shining, the lower dull, sub-glaucous; nerves 15 to 20 pairs, prominent on both surfaces (impressed on the upper), evanescent towards the margin; length 8 to 10 in., breadth 1½ to 3 in.; petiole ¾ to 1 in., stout. Male flowers in dense, many-flowered glomeruli, shorter than the petioles, from small solitary tubercles in the axils of leaves or of fallen leaves; pedicels ½ to ¾ in.; bracteole large, ovate or obovate-rotund, embracing more than half the perianth on one side, rusty-pubescent outside, glabrous inside. Perianth 1 in. long, fleshy, cut about a third of its length into 3 blunt, broadly triangular teeth, pubescent outside, glabrous and striate inside; andræcium ellipsoid; stalk stout, much shorter than column, ovoid, puberulous; anthers about 10 to 14, narrowly ovate. Female flowers unknown. Fruit ovoid, pointed at each end, 2½ to 3 in.

long and T35 to 15 in. in diam., covered with rufous, woolly tomentum, rugulose underneath with tomentum, the ridges protruding and glabrous; arillus thin, extending to the apex of the seed, its sides cut into wide areolae; seed ellipsoid, blunt at both ends, about 2 in. long.

Perak : *Scortechini* No. 1551; *King's Collector* Nos. 5537, 7258.

Named in honour of Sir Hugh Low, K.C.M.G., late British Resident at Perak, to whose ever-ready help Malayan Botanists were, for forty years, much beholden.

PLATE 120. *Myristica Lowiana*, *King*. 1, Branch with male flowers; 2, ripe fruit—of small size; 3, seed with arillus; 4, the same with arillus removed; 5, male flower—of natural size; 6, male flower; 7, androecium and bracteole—enlarged.

13. MYRISTICA MAINBAYI, *Hook. fil. Fl. Br. Ind.* v. 104. A tall tree; young branches rather stout, at first rusty-tomentose, afterwards glabrous, with thin, usually dark bark, often ridged. *Leaves* glabrous, coriaceous, linear-oblong, acute or sub-acuminate; upper surface shining, lower dull, rather darker than the upper; nerves 15 to 18 pairs, slightly prominent beneath, impressed above, evanescent towards the margin; length .55 to 8 in., breadth 1.25 to 1.75 in.; petiole 1 to 1.9 in. *Male flowers* rusty-tomentose, .25 in. long; in drooping, solitary, axillary, 10- to 18-flowered, shortly 2- to 3-branched, umbellate cymes; pedicels 1.5 in. long; bracteole half-orbicular, embracing the lower half of the flower on one side. *Perianth* ovate, rusty-tomentose outside, granular within; teeth ovate, acute; *androecium* fusiform, shortly apiculate; anthers 7 or 8, linear; stalk of column very short, rufous-villous. *Female flower* unknown. *Fruit* oblong, 3 to 3.5 in. long and 1.5 in. in diam., blunt, glabrous; peduncle .75 to 1.25 in. long, stout, woody; pericarp thick, fleshy. Arillus fleshy, reaching to the apex of the seed, deeply fimbriate in its upper half. *Seed* ellipsoid, smooth, 2 in. long.

Malacca: *Maingay* No. 1239 [*Kew Dist.*] Perak; *Scortechini* Penang; *Curtis* No. 2455.

PLATE 114. *Myristica Maingayi*, *Hook. fil.* 1, Branch with male flowers; 2, ripe fruit; 3, section of ripe fruit; 4, arillus and seed; 5, lateral view of seed—of natural size; 6, male flower; 7, male flower laid open; 8, androecium—enlarged.

14. MYRISTICA ANDAMANICA, *Hook. fil. Fl. Br. Ind.* v. 103. A glabrous tree, 25 to 40 feet high; young branches slender, smooth. *Leaves* membranous at first, coriaceous when old, ovate-elliptic or elliptic-oblong, or some times ob ovate-oblong, apex acute, base rounded or cuneate; upper surface shining, pale green when dry; lower dull, pale but not glaucous, the midrib strong; lateral nerves 12 to 15 pairs, spreading, rather straight, thin in young leaves, but stout in old ones; length 9 to 14 in., breadth 4 to 6 in.; petiole 1 to 1.25 in., stout. *Male cymes* supra-axillary, on short woody peduncles, 8- to 12-flowered; buds sub-globose, 1.5 in. in diam.; pedicels about .2 in. long; the bracteole large, sub-orbicular, puberulous outside, embracing the lower half of the flower on one side; *perianth* globular, with short triangular acute teeth, puberulous outside, glabrous within; *androecium* short, thick; anthers about 15, linear, extending almost to the apex of the column, but not to its base. *Female flowers* unknown. *Fruit* broadly ovoid, 2 to 2.5 in. long, glabrous; pericarp thickly coriaceous, sub-succulent; arillus enveloping the whole of the seed but much lacinate at the sides; seed irregularly grooved, shining, ovoid or ovoid-cylindric. *M. elliptica*, *Kurz Fl. B. Burm.* ii. 282 [not of Wall]

Andaman Islands: at Mount Harriet, elevation 1,200 feet; *Kurs, King's Collector*.

PLATE 115. *Myristica Andamanica*, Hook. *fil* 1, Branch with male flowers; 2 & 3, ripe fruit; 4, section of ripe fruit; 5, seeds covered by arillus—of natural size; 7, male flower and androecium—enlarged.

15. MYRISTICA ELLIPTICA, Wall Cat. B795il. A tree 60 to 80 feet high; young branches rather slender, pale, at first rusty-puberulous, afterwards glabrous like all the other parts. *Leaves* thickly coriaceous, pale when dry, elliptic, oblong-elliptic to linear-oblong, shortly and rather bluntly acuminate, acute or sub-acute; the base cuneate, slightly unequal; upper surface shining, the lower dull, pale, glaucous; nerves 8 to 12 pairs, slender, sub-ascending, midrib stout; length 5 to 8 in., breadth 1.75 to 3 in.; petiole .5 to .75 in. *Male flowers* in shortly pedunculate, slightly supra-axillary umbels rather longer than the petioles; pedicels .1 to .2 in.; bracteole sub-orbicular. *Perianth* .35 in. long, elongate and narrowly tubular, sub-urceolate, divided for 1/2 to 1/3 its length into 3 narrowly ovate-acute teeth, with many black glandular dots on both surfaces; puberulous or glabrous outside, glabrous within. *Androecium* cylindric, nearly as long as the tube; the stalk short and as thick as the column; anthers about 1D, linear. *Female flowers* umbellate like the males; *perianth* distinctly urceolate; the lobes ovate, blunt; *ovary* sessile, adpressed-pubescent, elongate-ovoid, tapering above into the oblique lateral stigma; style D. *Fruit* oblong, ridged along the suture, slightly gibbous, 2.5 to 3 in. long, glabrous; pedicel proper .25 in. long, stout; pericarp rather thick, succulent; arillus enveloping the whole of the cylindric tapering seed but much lacinate at the sides, rather succulent, red. Hook. *fil* 6f Thorns. *FL Ind.* 152; Hook. *fil* *FL Br. Ind.* v. 1D2; A. DC. in *Prod. aiv.* 1, 19D; *Miq. FL Ind. Bat.* i. pt. 2, 58. *M. cabcarpa*, *Miq. FL Ind. Bat.* i. pt. 2, 71; *Suppl* 383; *Ann. Mus. Lugd. Bat.* ii. 48. *M. sycocarpa*, *Miq. FL Ind. Bat.* i. pt. 2, 58; *Ann. Mus. Lugd. Bat.* ii. 48.

Miquel's type specimens of *M. calocarpa* from Sumatra and Borneo agree with this perfectly, and he himself reduced *M. sycocarpa* here [*Ann. Mus. Lugd. Bat.* ii. 48). This comes very near *M. succedanea*, Rvinw. [*Rumphia* i. IBB; *Miq. FL Ind. Bat.* i. pt. 2, 56; *Ann. Mus. Lugd. Bat.* ii. 5B), which has, however, rufous-tomentose fruit.

Penang and Singapore, Wallich, Ridley. Malacca, Maingay [*Kew Distrib.* 129B). Perak, King's Collector, Wray & Scortechini.

PLATE 113. *Myristica elliptica*, Wall. 1, Branch with male flowers; 2, ripe fruit—of natural size; 3, male flower and androecium; 4, female—enlarged.

IB. MYRISTIDA SUAVIS, n. sp. King. A tree; all parts glabrous, except the minutely pubescent leaf-buds and flowers; young branches rather stout, cinerous, striate, the tip dark-coloured and smooth. *Leaves* coriaceous, elliptic-lanceolate, acute at either end, the base slightly unequal-sided; upper surface glabrous, dull, the lower paler; main nerves, 20 to 25 pairs, rather straight, spreading, their apices evanescent, impressed on the upper, but bold and prominent on the lower surface; length 6 to 9 in., breadth 2 to 2.5 in.; petiole 1 in., stout, channelled in front. *Male flowers* 2 to 4, on short woody racemes from the axils of the leaves, or close together on the branches below the leaves; pedicels about .1 in. long; bracteole broad, half-orbicular, embracing the base of the flower on one side. *Perianth* narrowly campanulate, cut half-way down into 3

triangular, acute, recurved teeth, scurfy-tomentose outside, glabrous inside; *androeceium* shortly stalked, cylindric, not apiculate; anthers about S, linear, connate. *Female flower* like the male, but with longer, stouter pedicels and shorter teeth; *ovary* narrowly ovoid, minutely tomentose; stigma sessile, divided by a central groove into two oblong lobes; arillus of young seed extending to its apex, deeply and narrowly lacinate. *Fruit* unknown.

Selandor: Singapore Botanic Garden Collectors.

I have seen only a single specimen of this, kindly lent to me by Mr. H. H. Ridley, F.L.S., Director of the Botanic Garden, Singapore. It is very distinct from any other species of this section by its campanulate male flowers, which are borne on short, wart-like racemes. The female flowers on the solitary specimen which I have seen have 4 rudimentary anthers, as shown in figure B of the accompanying plate. The young fruit is very fragrant, having a powerful odour of pimento and nutmeg combined.

PLATE 121. *Myristica suavis*, King. 1 & 2, branches with male flowers; 3, branch with recently fertilised ovaries—of natural size; 4, male flower with its bracteole; 5, androeceium; 6, ovary and stigma with rudimentary stamens; 7, recently fertilised ovary; 8, arillus from recently fertilised ovule—enlarged.

SUB-SECT. HORSFIELDIA. *Mah* flowers minute, in many-flowered glomeruli, mixed with sub-persistent bracteoles on large, open, branching panicles. *Androeceium* and fruit as in *Eumyristica*.

17. MYRISTICA HORSFELDII, *Blume Bijdr.* 577 § *Rumphia* i. 192, t. 33 (not of Wall) A tree 40 or 50 feet high; young branches rather slender; at first densely and minutely tawny-tomentose, ultimately glabrous, shining, dark-coloured. *Leaves* very coriaceous, elliptic-oblong or oblong, acute; the edges when dry slightly recurved, the base rounded or sub-emarginate; upper surface glabrous, shining; lower at first rusty-tomentose, finally glabrous and pale; main nerves 18 to 24 pairs, prominent beneath, spreading and interarching submarginally; length 7 to 10 in., breadth 2½ to 4½ in.; petiole ¾ to 1 in., stout. *Male panicles* axillary, spreading, 3 to 5 in. long and 3 in. broad, softly rusty-tomentose. *Flowers* numerous, very small, closely packed in small capitules ½ to ⅝ in. in diam., which are distantly scattered upon the stout rufous-tomentose branches and rachis. *Perianth* obovate, ⅝ in. in diam., sessile, glabrous; the bracteoles between the flower sub-persistent, orbicular, woolly outside; *androeceium* sessile, clavate, depressed at the top; anthers about B, linear, confluent. *Female panicles* short, few-flowered; *perianth* as in the male; *ovary* ovoid-globose, rusty-tomentose; stigma sessile. *Fruit* shortly peduncled, sub-globular, obtuse, slightly grooved, glabrous, about 2 in. in diam.; pericarp succulent; arillus pale, fleshy, entire, completely enveloping the smooth ovoid seed. *Hook. fil. Thorns. Fl. Ind.* 183; *Hook. fil. Fl. Br. Ind.* v. 185; A. 2 [J. in prod. xiv. 1. 208; *Miq. Fl. Ind. Bat.* i. pt. 2, p. 83 *ezrt. syn.* M. ferruginea, Wall., from all the foregoing). M. glomerata, *Miq. PL Jungh.* i. 171. M. Iryaghedi, *Gccrln. Fruct.* i. 196, t. 41, *Jig.* 4 *excl. syn.*) *Pyrrhosa* Horsfieldii, *Wight Ic.* 1857 *t. ven. j ^ j*, *Horsfieldia odorata*, *Willd. Sp. PL* iv. 872.

Ceylon, common; Singapore and Java (cultivated).

Dr. Trimen informs me that this is a common tree in the low country in Ceylon. It is truly wild there, and he never saw it cultivated. Blume's original spelling was *31. Ilvrsfieldia*, but he afterwards corrected it to *M. Ilorsjieldii*.

PLATE 122. *Myristica Horsfieldii*, *Bhime*. j 1, Branch with male panicles; 2, vertical section of a glomerulus of male flowers—*of natural size*; 3 & 4, male flowers 3 and 4-cleft; 5, vertical section of flower showing antheridium—*enlarged*.

PLATE 123. *Myristica Horsfieldii*, *Illume*. ? 1, Branch with ripe fruit; 2, vertical section of ripe fruit and seed—*of natural size*; 3, panicle of female flowers; 4, ovary after the fall of the perianth—*enlarged*. [All copied from a drawing kindly lent to me by Dr. Trimzn, F.E.S., of the Peradmiya Botanical Gardm.]

Szd. IL—PYRRHDSA [*Pyrrhosa*, Blume). *Mah* flowers minute, in many-flowered, branching, often large and spreading, panicles; *perianth* ebracteolate, usually 3-toothed, sometimes 4-toothed; *androscium* short, sub-globular or 3-gonous, rarely cylindric, usually sessile; *anthers* not elongate, completely attached to the column by their backs, the apices sometimes free for a short way. *Fruit* globose or ovoid-globose; the pericarp usually leathery and only slightly succulent.

18. MYRISTIDA FULVA *King*. A tree; young branches rather stout, pale brown, slightly rough, scurfy, rufous-puberulous when very young-. *Leaves* very coriaceous, elliptic-oblong, slightly obovate, sub-acute, the base cuneate; both surfaces dull, pale brownish [when dry], the lower the paler; main nerves 12 to 14 pairs, stout, rather straight, spreading, the petiole and the midrib on both surfaces scurfy rufous-pubescent, otherwise glabrous; length 5 to 6½ in., breadth 1¾ to 2¾ in.; petiole ¼ to ¼ in., stout. *Male flowers* from the young branches below the leaves, in crowded, spreading, many-flowered, scurfy, stellate-pubescent, rufous panicles, 2 to 3 in. long. *Flowers* elongate-ovoid or slightly obovoid, ½ in. long; *perianth* leathery, glabrous on both surfaces, divided for ¼ or ½ of its length into 3 broadly triangular teeth. *Andrium* sessile, cylindric, slightly apiculate; anthers about 10, linear-elongate, connate from base to apex. *Female flowers* unknown. *Fruit* from the branches below the leaves, solitary, on woody, warted, often curving peduncles ½ in. or more long, ovoid, compressed, slightly pointed, glabrous, 1 in. long and ¾ in. in diam.; pericarp thick, sub-succulent, dehiscing into 2 divaricating valves; arillus thin but tough, entire, completely enveloping the broadly ovoid seed; testa shining, thin, the rugulose albumen appearing through it.

Malacca: *Maingay* [*Kew Distrih*] No. 1304. Perak, *Scortechini* No. 1B4A.

Maingay's MSS. note on the fruit of his No. 13D4 is as follows:—"Fruit sub-globose, 1½ by 1 in., glabrous, pale yellowish; pericarp thick, fleshy, ½ to ¾ in. thick; aril complete, slightly lobed at the top, clear reddish-orange; testa slightly crustaceous, pale brown."

PLATE 124. *Myristica fulva*, *King*. 1, Branch with panicles of male flowers (from Scortechini's specimen No. 1B4A); 2, fruit (from Maingay's No. 13D4)—*of natural size*; 3, male flower; 4, androecium—*enlarged*.

19. MYRISTICA MURTONI, *Rook, fil FL Br. Ind.* v. 1D5. A tree 70 feet high; young branches stout, rustily-tomentose, as are the young leaves beneath and the panicles. *Leaves* thinly coriaceous, oblong or elliptic-oblong, acute, the base rounded

or cordate, upper surface glabrous, shining; the lower, when adult, glaucous and quite glabrous; main nerves 17 to 20 pairs, spreading, impressed above, prominent beneath; length 10 to 13 in., breadth 3/25 to 5 in. *Male panicles* stout, shortly pedunculate, densely-flowered, 1 to 2 in. long; *perianth* 2 in. long, ovoid in bud, campanulate when open, deeply divided into 3 ovate, sub-acute teeth, rufous-tomentose both outside and inside; *androecium* sessile, cylindric, truncate; anthers about 9, linear, slightly free at their edges, the apices free and apiculate. *Female flower and fruit* unknown.

Singapore and Malacca : J. H. Murton.

The above description is copied mainly from Sir Joseph Hooker (in *F. B. I.*) The only specimen which I have seen is that from which the drawing was made. It was collected at Malacca. Its single fascicle of male flowers is detached. On the ticket which accompanies it there is written this note: — "A tree 70 feet high, bearing very large fruit, some 3 inches in diameter; leaves only, the tree not having fruited this year." The leaf part of this specimen resembles *M. bracteata*, A. DC., but the flowers are unlike those of any other that I have seen.

PLATE 124 *ter.* *Myristica Murtoni*, Hook. *fil.* 1, Leaf-twig; 2, fragment of a panicle of male flowers—of natural size; 3, male flower; 4, androecium—enlarged.

20. MYRISTICA FERRUGINEA, Wall. *Cat.* 883. A tree; young branches stout, densely covered with very short, rufous tomentum, beneath which they are minutely lenticellate and striate; leaf-buds densely rufous-tomentose. *Leaves* coriaceous, elliptic-ovate, very shortly and suddenly acuminate, the base broadly rounded and often emarginate; upper surface glabrous, shining; lower covered with loose deciduous rusty tomentum, finally glabrous and sub-glaucous; main nerves 20 to 22 pairs, sub-horizontal, rather prominent beneath, curving upwards and interarching at the much more slender tips; length 9 to 12 in., breadth 4 to 4 1/2 in., petiole 1/6 in. *Male panicles* axillary, with few short, condensed, many-flowered, spreading branches, the branches as well as the flowers densely silky rufous-tomentose, 2 to 2 1/2 in. long and 1 1/2 in. broad; buds ovoid, 1/5 in. long; the pedicels much shorter; *perianth* leathery, with 2 or sometimes 3 teeth, tomentose outside, glabrescent inside; *androecium* sessile, broadly ovoid, its apex obtuse; anthers about 18, narrow, elongate, firmly united to the column and to each other, their apices alone free. *Female flower and fruit* unknown.

Singapore : Wallich, Ridley.

This species, for many years known only by Wallich's fragmentary flowerless specimens, has been recently collected by Mr. F. M. Ridley, Director of the Botanical Garden, Singapore. Mr. Ridley's, which agree exactly with Wallich's specimens as far as the latter go, are males; females being still unknown. The *androecium* closely approaches that of *Eumyristica*, inasmuch as the anthers are much elongate and connate with each other and with the column. The panicles, however, are quite those of *Pyrrhus*. This species and *M. fulva* thus form, as regards the androecium, a connecting link between these two sections.

PLATE 125. *Myristica ferruginea*, Wall. 1, Branch with male panicle (the lower surface of the leaf exposed); 2, leaf, upper surface—of natural size; 3 & 4, male flowers; 5, perianth segment seen from inside; 5, androecium—enlarged.

21. MYRISTICA SUPERBA, Hook. *fil.* *Thorns. Fl. Ind.* 162. A tree 40 to 50 feet high; young branches stout, covered (as are the under surfaces of the leaves and the panicles)

with loose, scurfy, bright, rufous, minute, stellate tomentum; the branches ultimately glabrous, striate, lenticellate, cinereous. *Leaves* large, coriaceous, elliptic to elliptic-lanceolate or oblanceolate, acute or shortly acuminate; the base cuneate, slightly unequal; upper surface, when young, covered with dense, minute, rusty tomentum, which is permanent only along the midrib, the rest of the upper surface ultimately glabrous; main nerves 15 to 30 pairs, impressed on the upper, very prominent (almost winged in old leaves) on the lower surface, (when dry), spreading, sub-ascending, rather straight, but curving and interarching within the edge; length 1½ to 2½ in., breadth 4 to 8 in., petiole ½ to 1 in., tomentose. *Male panicles* robust, from the axils of fallen leaves, 4 to 8 in. long; *perianth* 2½ in. long, leathery, ellipsoid or slightly obovoid, obtuse, with 3 or 4 triangular teeth; pedicel about as long or shorter, glabrous; *androecium* shorter than the perianth, not apiculate, ovoid, obtuse; anthers nearly 2D, quite connate to the column and to each other. *Female flowers* on stout woody racemes, 1 in. or more long; the rachis woody, pale, rufous-tomentose; *perianth* coriaceous, glabrous, widely tubular with 2 Dr 3 acute, shallow teeth; *ovary* ovoid, slightly oblique, glabrous, grooved at one or sometimes on both sides; stigma flat. *Fruit* ovoid-globose, rough, warted, glabrescent, 2½ to 3 in. long and nearly 2 in. in diam.; peduncle stout, woody, ½ in. long; pericarp succulent, ½ to ¾ in. thick. A. DO. in *Prod.* xiv. 1, 194; *Miq. FL Ind. Bat.* i. pt. m. 2, 62; *Hook. fil. FL Br. Ind.* v. 105.

Penang; *Phillips*. Perak; near Gunung Batu Puteh, at an elevation of from 1,500 to 2,000 feet, *King's Collector* No. BD24, *Sovrtechini*

This resembles *M. rubiginosa* and *M. flycculosa* in its leaves, but is at once distinguishable from both by the much larger size of its male flowers and by its ovoid, obtuse audraecium.

PLATE 125 *bis.* *Myristira superba*, *Hook. fil. § Thorns.* 1, Leaf; 2, male panicle; 3, ripe fruit; 4, section of ripe fruit showing pericarp and seed—of natural size; 5 & 6, male flowers; 7, androecium—enlarged.

PLATE 124 *bis.* *Myristica superba*, *Hook. fil.* 1, Branch with panicles of male flowers; 2, raceme of female flowers—of natural size; 3, perianth of female flower; 4 & 5, ovaries—slightly enlarged.

22- MYRISTIDA PRAINII, *n. sp.* *King*. A tree 40 to 60 feet high; all parts glabrous except the inflorescence; young branches rather stout, smooth, dark brown. *Leaves* thinly coriaceous, elliptic-oblong to broadly-elliptic, acute (usually rather abruptly SD); the base rounded, sub-truncate or emarginate; both surfaces rather dull when dry, the lower paler; main nerves 15 to 18 pairs, thin but prominent, horizontal at the base, spreading towards the apex; length 8 to 10 in., breadth 2½ to 4½ in.; petiole ½ to ¾ in., stout. *Male panicles* from the branches below the young leaves, lax, much branched, wider than long, sub-glabrous below, rusty-pubescent above; 4 to 5 in. long and 1½ to 2 in. wide. *Flowers* ½ in. in diam., in umbellules of about 6, pedicellate; pedicels longer than the perianth; *perianth* ovoid, 2-valved, sometimes 3-toothed; *androecium* much shorter than the perianth, compressed-globose, minutely apiculate, shortly stalked; anthers 8, short, ovate, extrorse, confluent. *Female flowers* unknown. *Fruit* ovoid, slightly gibbous at the base at one side, 1½ in. long; peduncle ½ in., very stout; pericarp rather thick, coriaceous; arillus thin, fleshy, deeply lacinate, extending to the apex of the ellipsoid, shining seed.

Andaman Islands: *Cakutta Bot Garden Collectors* Nos. 417, 431; *Carter*.

PLATE 12B. *Myristica Prainii*, King. 1, Branch with male panicles ; 2, ripe fruit 3, section of ripe fruit; 4, arillus covering seed—*of natural size*; 5, male flower; 6, androecium—*enlarged*.

23. MYRISTICA KINGII, Hook, fil. *FL Br. Ind.* v. 1DB. A tree 3D feet high; young branches very stout, rough, scurfy-puberulous at the very tips. *Leaves* thinly coriaceous, obovate or oblanceolate, slightly oblique, shortly and sometimes bluntly acuminate, much narrowed to base ; upper surface dull, dark brown when dry, the lower pale brown both glabrous, except the scurfy-pubescent midrib when young; nerves 14 to 1B pairs, slender, spreading; length B to 1D in., breadth 25 to 4·5 in.; petiole '75 to 1'25 in. *Male panicles* from the axils of fallen leaves, about 3 in. long, their branches short, spreading, scurfy-tomentose. *Flowers* on very short pedicels, not crowded, '13 in. in diam., globose, scurfy-tomentose ; *perianth* thick, the teeth triangular, acute, glabrous inside; *androecium* sessile, depressed-globose, the apex concave, obscurely 3-cleft; anthers about 3D, completely united, convex. *Female panicles* only 1 to 1·35 in. long, stout, rigid, the flowers obovoid, '15 to '2 in. long; *perianth* very thick, often only bifid, not 3-toothed ; *wary* sessile, obovate; the stigma small. *Fruit* ovoid, tapering to each end, 1'D to 1'75 in. long and 1 in. in diam. ; pericarp thin, leathery, minutely rugose, glabrous ; peduncle stout, '35 in. long ; arillus thin, fleshy, entire, completely enveloping the narrowly ovoid, pointed, smooth seed.

Sikkim Himalaya: alt. 1DDD to 2DDD feet, King, Gammie. Assam; Mikir Hills, Simons; Sibsagar, Jenkins; Satsua, Masters; Da char, G. Mann.

PLATE 127. *Myristica Kingii*, Hook. fil. 1, Branch with male panicles ; 2, female panicle ; 3, ripe fruit ; 4, vertical section of same through the albumen ; 5, arillus enveloping seed—*of natural size*; 6, male flower ; 7, the same seen from above ; 8, androecium; 9, female flower; 1D, ovary—*enlarged*.

24. MYRISTICA AMYGDALINA, Wall. *FL As. Rar.* i. 79, t 90. A tall glabrous tree; young branches rather stout, the bark cinereous, rough; the tips dark, smooth. *Leaves* membranous, oblanceolate to elliptic-oblanceolate, acute, the base much narrowed; when dry both surfaces rather dull, the lower pale brown; nerves 8 to 1D pairs, faint, spreading; length 4 to 7 in., breadth 1'25 to 2 in., petiole '4 to '75 in. *Male panicles* 3 to 4 in. long and 2 to 3 in. broad, spreading, many-flowered, axillary, puberulous or glabrous. *Flowers* under '1 in. in diam., globular, glabrous; *perianth* thin, usually with 3 broadly triangular teeth, but sometimes only bifid; pedicels as long as the perianth. *Androecium* sessile, depressed-globose; anthers about 15, linear, convex, confluent. *Female flowers* in short, few-flowered racemes on the older branches, globular, glabrous, '15 in. in diam. bifid or trifid, the pedicel about as long as the perianth; *ovary* sessile, broadly ovoid, apiculate, hooked, glabrous. *Fruit* 15 in. long, narrowly ovoid, pointed, glabrous, grooved on one side, the pericarp fleshy; arillus thin, fleshy, lacinate from the apex, the lobes narrow, often imbricate. *Seed* oblong-cylindric, '8 in. long; reticulate, smooth. Wall. *Vat.* 5797; Hook, fil. & Thorns. *FL Ind.* 1BD excl syn. *M. exaltata*, Wall.) A. DC. in *Prod.* xiv. 1, 2D3 [excl var. *Hookeri*]; Miq. *FL Ind. Bat.* i. pt. 2, p. 67. *M. floribunda*, Wall. *Cat.* B8D5.

Silhet, Wallkh. Cachar, G. Mann. Assam, Masters. Khasia, Hooker. Burniah, Wallkh, Heifer, No. 4358, Brandt's, Falconer.

This species cannot be very much different from *M. glairy* 131.

PLATE 128. *Myristica amygdalina*, Wall 1, Branch with ripe fruit [copied from Wallich *PL As. Rar.* £. 9D); 2, male panicle (from a specimen collected in Assam by Masters); 3, ripe fruit; 4 & 5, sections of ripe fruit; 5 to 9, seeds and arillus—*of natural size*; 10, male flower; 11, the same seen from above; 12, andraecium; 13, female flower; 14, *waxy—enlarged*.

25. MYRISTIDA SUCOSA, *n. sp.* King. A tree 60 to 100 feet high; young branches rather stout with rather rough bark, the tips of which, as well as the leaf-buds and surfaces of the youngest leaves, are covered with deciduous, scurfy, minute tomentum. *Leaves* coriaceous, oblanceolate or obovate-lanceolate, acute or acuminate, much narrowed from the middle or above it to the petiole; both surfaces glabrous, the lower paler; main nerves 9 to 14 pairs, prominent and minutely winged on the lower surface, inconspicuous on the upper; length 5 to 10 in., breadth 2 to 3 in.; petiole 5 to 7 in. *Male panicles* from the branches below the leaves, 3 to 4 in. long including the peduncle, from 2 to 3 in. wide, branching above, their branchlets scurfy; pedicels slender, 15 to 20 in. long. *Flowers* numerous, sub-globular, 1 in. in diam.; *perianth* puberulous externally, glabrous within, with several bold vertical lines, inflated, bivalved or with 3 triangular teeth; *andraecium* sessile, sub-globular, truncate; stamens 10, sub-equal, sub-erect, connate by their sides, the apices free. *Female panicles* axillary, stout, rigid, spreading, rusty-puberulous, 1/5 in. long and about 1 1/2 in. broad. *Flowers* ovoid-globose, glabrous; *perianth* fleshy, with 3 short triangular teeth; *ovary* sessile, ovoid-globose, glabrous; stigma sessile, grooved, prolonged on one side. *Fruit* solitary or 2 or 3 in a raceme; when ripe ovoid or pyriform, very succulent, glabrous, 2 1/2 to 3 in. long and 1 1/2 to 2 in. in diam.; peduncle woody, 1 1/2 in. long; pericarp 1/5 in. thick. *Seed* ovoid, about 1/25 in. long; arillus fleshy, yellow, enveloping the whole of the seed, slightly lacinate and conduplicate at the apex, otherwise entire.

Perak: *Kim's Collector* Nos. 4078, 4B47 & 10475; Wray No. 467. Malacca, Maingay [*Kew Distrib.* No. 13DD).

By the kindness of Sir Joseph Hooker (who was so good as to copy it for me), I am able here to quote Maingay's MSS. note made on his specimen No. 13DD [*Kew Distrib.*) while it was fresh. It is as follows:—"Fruit ovoid, very succulent, broad and obtuse at the base, fleshy, 2 1/2 X 2 in., pale yellowish-buff or pinkish above, perfectly shining and glabrous. Epicarp distinct. Arillus rather fleshy, 2/3 of an inch thick, pale yellow, slightly lobed at the apex. Putamen dark brown, crustaceous, covered by a thin pale green membranous investment which, for want of a better name, I call endocarp. A small tree which, when in full bearing, presents a very elegant appearance from the abundance of pomiform, shining, buff or yellow, large fruit."—Malacca, 28th May 1857.

PLATE 172, *Myristica sucosa*, King. 1, Branch with young fruit; 2, male panicle; 3, female panicle; 4, section of ripe fruit—*of natural size*; 5 & 6, male flowers*; 7, androecium; 8, female flower; 9, ovary—*enlarged*.

26, MYRISTIDA TMENTOSA, Hook, *fil* \$ *Thorns. FL Ind.* 131 (*not of Blume's Bijdr.* 577, *nor of Thunb.*) A tree 15 to 50 feet high; young branches slender, rusty stellate-tomentose, as are the lower surfaces of the younger leaves and the branches of the inflorescence. *Leaves* sub-coriaceous, elliptic, elliptic-oblong, sometimes oblanceolate or lanceolate; apex suddenly acute or sub-acute, base cuneate; upper surface glabrous, dull brown when dry;

lower reddish-brown, sub-glabrescent when old, stellate rusty-tomentose when young", nerves 12 to 15 pairs, sub-erect, rather straight, slightly prominent on both surfaces; length B to ID in., breadth 25 to 325 in.; petiole about 'B in., slender. *Male panicles* 2.5 to 4 in. long, many-branched and many-flowered, the branches spreading, laxly rufous-tomentose; buds globose, on pedicels '05 in. long, ebracteolate; *perianth* glabrous, thin, divided half-way into 3 or 4 broad triangular acute teeth. *Androecium* sessile, depressed-globose, obtusely 3 or 4-angled; anthers 12 to 15, narrowly ovoid, much incurved at either end, confluent. *Female flowers* unknown; the young fruits in short, solitary, 8 to ID-flowered racemes. *Ripe fruit* in lax racemes of 3 to 5, .75 to 1 in. long, ovoid, slightly flattened, ridged along the suture, sub-glabrous; pericarp fleshy, pedicel about '25 in. long; arillus fleshy, entire, not lacinate Dr areolate, enveloping¹ the whole of the shining seed. *Hook. fil. FL Br. Ind.* v. 1D5; *A. DC. in Prod.* xiv. 1, 2D4; *Miq. FL Ind. BaL* 1. pi 2, p. &8. Myristicaceae, *Wall Vat* 9D25.

Penang, *Curtis* No. 1748; Malacca, *Mainrjay* (Kew Distrib.) No. 1284, *Canthy*; Perak, *King's Collector*; common.

PLATE 129. *Myristica tomentosa*, *Hook, fil. Shr Thorns.* 1, Branch with male flowers; 2, twig with young fruit; 3 & 4, ripe fruit; 5 & 5, arillus and seed—of natural size; 7, male flower; 8, androecium; 9, androecium from above—enlarged.

27. MYRISTIDA RUBIGINOSA, *n. sp. King.* A tree 2D to 3D feet high; young branches stout, at first densely rufous-tomentose, ultimately deeply striate, tomentose on the ridges and glaucous in the furrows. *Leaves* large, thinly coriaceous, elliptic-oblong, very shortly and suddenly acuminate, or blunt, the edges slightly recurved when dry, base rounded or very slightly cuneate; upper surface deeply reticulate, rugulose, scabrid from numerous short, stiff, branching, rusty hairs; the midrib and nerves rusty-tomentose; glabrescent when old; lower surface densely and uniformly covered with bright, reddish-brown, stellate tomentum, the reticulation prominent; main nerves IB to 19 pairs, spreading and arching within the margin, prominent on the lower, depressed on the upper surface; length ID to 12 in., breadth 4 to 55 in.; petiole '1 to '25 in., tomentose. *Male panicles* from the axils of leaves or of fallen leaves, 7 to 9 in. long and 25 to 3 in. broad, branching from the base, many-flowered, the rachis and branches rufous-lanate. *Flower** glabrous, globular, 'D5 in. in diam., in small crowded racemes at the apices of the branchlets; pedicels as long¹ as the flowers, glabrous. *Perianth* thin, with black dots, the teeth 3 or 4, triangular; *androechun* sessile, turbinate; anthers about 15, confluent, convex. *Female flowers* and *fruit* unknown.

Singapore; *King's Collector* No. 1233.

PLATE 13D. *Myristica rubiginosa*, *King.* 1, Branch with male panicles—of natural size; 2, male flower; 3, male flower dissected; 4, androecium—enlarged.

2B. MYRISTICA FLOCCULOSA, *n. sp. King.* A tree 40 to 6D feet high; branchlets stout; when young densely clothed with thick, felted, bright rufous tomentum; when old sub-glabrous, striate, rough and cinereous. *Leaves* large, coriaceous, oblong-lanceolate or oblanceolate, sub-acute or acute, the edges revolute when dry; the base rounded or slightly cuneate; upper surface hirsute-puberulous; the midrib and nerves flocculent-tomentose when young, but ultimately glabrous; lower densely covered with pale rufous, stellate, flocculent tomentum, the edges recurved when dry; main nerves 15 to 2D pairs,

impressed on the upper, boldly prominent on the under surface, rather straight, but interarching close to the margin; length 12 to 18 in., breadth 4 to 7 in.; petiole '5 to 1 in., very stout, tomentose. *Male panicles* robust, spreading, many-flowered, from the axils of fallen leaves, 6 to 8 in. long and 3 to 4 in. broad; rachises and peduncles flocculent rufous-tomentose. *Flowers* '1 in. long, ovoid-globose, slightly obovoid, inflated, pedicelled, ebracteolate, glabrescent; the *perianth* thin, its teeth 3 or 4, rather shallow, acute; pedicels 2 to '25 in. long, slender, glabrous. *Androecium* sub-sessile, obovate, its apex truncate, non-apiculate; anthers about 10, elongate, confluent. *Female flowers* unknown.

Perdt: alt. about 600 feet. *King's Collector* No. 8518.

PLATE 131. *Myristica flocculosa*, King. 1, Branch with panicle of male flowers—*of natural size*; 2, male flower; 3, androecium—*enlarged*.

29. MYRISTIDA WALLICHII, Hook. *fil. tiff Thorns. FL Ind.* 161. A tree 100 feet or more in height; young branches stout, rather rough, of a dark-grey colour, the youngest minutely rusty-tomentose. *Leaves* coriaceous, oblong and acute, or rarely elliptic and blunt, the base sub-truncate, emarginate, or sub-cuneate; upper surface shining, greenish-brown, glabrous; lower surface rufous-brown, loosely and deciduously stellate-tomentose; main nerves 10 to 22 pairs in the oblong, but only 10 to 12 in the elliptic forms, stout, rather straight, sub-ascending, forming bold sub-marginal areolae; length of the elliptic forms 6 to 8 in., breadth about 4 in.; length of the oblong forms 10 to 14 in., breadth 3 to 4"25 in.; petiole '5 to '75 in., stout, channelled. *Male panicles* 4 to 12 in. long, stout, spreading, rufous-tomentose, axillary or from the axils of fallen leaves, many-flowered; *flowers* glabrous, globose, '1 in. long, ebracteolate, on very short tomentose pedicels, in compact globose clusters of 8 to 10; *perianth* fleshy, glabrous, sometimes granular, teeth 3 or 4, triangular, acute; *androecium* sessile, obovate-globose, the apex depressed, deeply 3-cleft; anthers about 15, incurved, confluent. *Female panicles* stouter and much shorter than the male and fewer-flowered, the flowers larger; *perianth* * coriaceous, tomentose externally at the base, otherwise glabrescent, teeth 3, spreading; *ovary* globose, sessile, glabrous; stigma sessile, small, linear. *Fruit* (quite young) ovoid, smooth, on a short stout pedicel, the slightly enlarged perianth persistent at its base. Hook. *fil. FL Br. Ind.* v. 105; A. DO. *Prod.* xiv. 1, 203; Mig. *FL Ind.* Bat i. pt 2, p. 57. *M. crassifolia*, Hook. *fil. Sf Thorns. FL Ind.* 161; Miguel *l.c.* 68. *M. Horsfieldia*, Wall. [*not cf Blume*] *Cut* No. B8D6.

Singapore; Wallich, *Lolb. Maingay* No. 1283 [*Kew Dist.*], *Ridlnj.* Malacca, *3faingay* No. 1284 (*Kew Vist*) Perak; *Scortechini* No. 245, *King's Collector* No. 4827.

A species very imperfectly represented in collections. It was first issued by Wallich as No. 6805 of his catalogue, doubtfully under the name of *M. Horsfieldia*, Blume (which it is not), and with the remark "*forsan duas species mixtae*" There were really three specimens under his No. 58D5; this being one, and the others, according to Sir Joseph Hooker, being *M. crassifolia*, H. f. & Th., and *M. polyspherula*, H. f.

PLATE 132. *Myristica Wallichii*, Hook. *fil. Sf Thorns.* 1, Branch with male flowers—*of natural size*; 2, male flower; 3, male flower dissected; 4, androecium—*enlarged*.

PLATE 133. *Myristica Wallichii*, Hook. *fil. Sf Thorns.* 1, Branch with female flowers; 2, panicle of young fruit; 3 & 4, young fruit—*of natural size*; 5, female flower; 6, female flower seen from above; 7, ovary—*enlarged*.

30. MYRISTIDA DANARIDIDES, *n. sp.* King. A tree 30 to 55 feet high; all parts quite glabrous, except the panicles; youngest branches dark-coloured, slender; the older cinereous, striate. *Leaves* coriaceous, elliptic-oblong to elliptic, sub-acute, the edge slightly revolute, the base rounded, slightly oblique; both surfaces brown when dry, the lower slightly paler than the upper; nerves 12 to 15 pairs; sub-obsolete above, slightly prominent beneath, sub-horizontal; length 5 to 8 in., breadth 2 to 3 in.; petiole 3 to 5 in., stout. *Male panicles* axillary and from the axils of fallen leaves, slender, much-branched, many-flowered, spreading, 2 to 3 in. long by nearly as much wide, the rachises puberulous. *Flowers* globular, .5 in. in diam.; pedicels as long as the flower, both glabrous; *perianth* 2 to 3-toothed, glabrous; *androecium* sessile, turbinate, almost annular; *anthers* about 10, ovate, convex, conjoined from base to apex. *Female panicles* spreading, lax, slender, 8 to 9 in. long. *Flowers* unknown. *Fruit* oblong-ovoid, blunt at the apex, slightly narrowed at the base, 2.5 to 3 in. long, 1.25 in. in diam., glabrous; the pericarp leathery, .25 in. thick; arillus thin, fleshy, extending to the apex of the seed, slightly lacinate, occasionally with wide areolae at the sides; *seeds* 2 in. long, cylindric-elliptic, the apex sub-apiculate, the base rounded, smooth, with bold longitudinal coloured markings.

Malacca; *Mainjay* No. 1298 (*Kew Distrib.*) Perak, in Ulu Bubong, at elevations of 400 to 800 feet—*King's* Collector Nos. 10054, 10194, 1081B & 10B45.

This is the plant alluded to by Sir J. D. Hooker in *Fl. Br. Ind.* v. 113, as probably a new species; but which he was unable to describe owing to the incompleteness of the only specimens before him [*Mainjay's* No. 1208]. The much fuller material lately sent from Perak by the Calcutta garden collector removes now all doubt as to the novelty of the species. This plant has the double peculiarity of being monoecious and of having its male panicles much smaller than the female. It is true that Blume figures his species *M. javanica* [*Rumphia* i. t. B2] as inoecious; but in his text (p. 191) he describes it as dioecious; while in the explanation of his figure he makes no mention of the fact that his artist has shown both kinds of panicles on the same branch. It is probable therefore that *M. javanica*, Bl., is not monoecious. I have named this *M. canarioides* from the likeness of the long racemes of fruit to those of a *Uranium*. The leaves are also not unlike the leaflets of a species of that genus. Closely resembling this in the extraordinary length of the racemes of fruit are two species—one from Ttivoy, Wall, Cat, No. 58D4A, and the other culleutei in Penang by Mr. Curtis [*Herb. Curt.* No. 934].

PLATE 134. *Myristica canarioides*, King. 1, Branch with male panicles; 2, panicles of young fruit [from another tree]; 3, ripe fruit; 4, the same cut open to show seed; 5, arillus covering seed; S, seed—of natural size; 7, male flower; 8, androecium—enlarged.

Sevt. Ill—GYMNADRANTHERA (A, DC.) *Panicles* as in *Pyrrhosa*, but short; *perianth* ebracteolate, 3-toothed; *androecium* shortly cylindric or sub-quadrangular and truncate; *staminal column* sessile, short; the *anthers* connate to the column by their connectives only, their margins and apices quite free; stigma sessile, 2-lobed; *fruit* and leaves small.

31. MYRISTICA GRIFFITHI, Hook, fil *FL Br. Lid.* v. 109. A tree 25 to 30 feet high; all parts glabrous except the minutely pubescent panicles and flowers; young branches slender, brown, the tips dark-coloured. *Leaves* coriaceous, oblong lanceolate, acute or

shortly acuminate; the edges slightly recurved when dry, the base cuneate; upper surface glabrous and shining, the nerves indistinct; lower of a pale purplish-brown, when dry glaucous, the nerves thin but distinct; main nerves 7 to 10 pairs, ascending, inter-arching at some distance from the margin; length 4.5 to 6 in., breadth 1.1 to 1.6 in., petiole .5 to .5 in. *Male panicles* from the branches below the leaves, lax, narrow and rather few-flowered, the lateral branches short, the rachis and branches pubescent at first but ultimately glabrescent, length 2.5 in. *Male flowers* globular, .5 in. long; pedicels rufous-pubescent, about as long as the flowers; *perianth* coriaceous, rufous-puberulous externally, glabrous internally, 2 or 3-toothed; *androecium* ovoid-globular (or almost globular) not narrowed upwards; anthers about 12, attached by their backs only and easily separable, their margins and apices free. *Female flowers* in short axillary racemes or imperfect panicles shorter than the leaf-petioles, few-flowered, softly rufous-tomentous externally, as are the pedicels and rachis; *perianth* small, about .3 in. in diam., globose, shortly 3-toothed; *ovary* globose, pubescent; stigma sessile, small, bifid. *Fruit* (ex Griffith MSS. quoted in *F. 22. Ind. v. 189*) "racemed, the size of a cherry, pedicel .5 in.; pericarp thick, with a deep longitudinal furrow; aril white, as long as the seed."

Malacca; Griffith [*Kern Distrib.*] No. 435B. Penang, Curtis NDS. 24DB, 2458.

An imperfectly known species near *M. Farquhariana*, Wall, and *M. Forbesii*, King; but distinguished at once from both by its much smaller, globular, male flowers.

PLATE 135. *Myristica Griffithii*, Hook. fil. 1, Branch with panicles of male flowers—of natural size; 2, male perianth; 3, androecium—enlarged,

32. MYRISTICA FARQUHARIANA, Wall Cat. 5795. A tree 60 to 80 feet high; young branches slender; at first rusty-puberulous, afterwards paler, often slightly lenticellate. *Leaves* coriaceous, glabrous, lanceolate or oblong-lanceolate, rarely slightly oblanceolate, acuminate; the edge recurved when dry, the base cuneate; upper surface shining, brown when dry; the lower pale, purplish-brown, glaucous; main nerves 6 to 10 pairs, usually very indistinct, not interarching or only very slightly; length 3 to 8 in., breadth .8 to 1.75 in.; petiole .25 to .5 in. *Male panicles* axillary, but mostly from the axils of fallen leaves, spreading, 1 to 15 in. long and 1 in. broad, rusty-puberulous. *Flowers* ovoid, inflated, .1 in. long, in clusters of 5 to 15 and on pedicels slightly longer than themselves; *perianth* thinly coriaceous, 3 to 4-toothed, the teeth triangular-acute; outside puberulous; inside with numerous vertical lines of minute hairs; *androecium* cylindric, sessile, not apiculate, rather truncate, hardly more than half as long as the perianth; anthers 7 to 9, narrow, elongate, not twisted, only partially conjoined by their connectives, their apices and edges quite free, the cells sub-divergent. *Female panicles* shorter than the male, few-flowered, flowers reflexed, the *perianth* like the male but with sharper teeth; *ovary* sessile, ovoid-globose, tomentose; stigma sessile, transversely 2-lobed. *Fruit* in woody racemes of 2 to 5, ovoid, .8 to 1.75 in. long, slightly pointed at each end, faintly grooved on one side and ridged on the other, rufous-pubescent, becoming glabrous with age; peduncle .35 to .5 in., stout, pericarp coriaceous; arillus thin, extending to the apex of the seed, narrowly lacinate from base to apex; *seed* ellipsoid, mottled, smooth. Hook, fil. *Thorns. FL Ind.* 1B1 • Hook, fil. *FL Br. Ind.* v. 1DB; A. DC. *Prod.* xiv. 1, 2(D); Miq. *FL Ind. Bat. i pL* 2, p. 63 [all in part).

Singapore : Wallich, *Cctntley* No. 41, *Ridley*. Malacca : Harvey, *Maingay* [*Kew Distrib.* Nos. 129D, 1293, 13D2, 13D3, 13DB), *Ridley*. Penang: *Curtis* Nus. 487 & 8W-Perak: common at elevations under 500 feet.

VAR. *major*, *King*. Young branches rather darker coloured than in the typical form ; leaves 5 to 7 in. long, larger than the typical form and more glaucous beneath, the nerves more distinct on the lower surface ; male panicles rather longer (2½ to 3 in.) ; the flowers larger (1½ in. long) ; fruit larger (¾ to 1 in. long), and scarcely ridged on the side opposite the groove.

Malacca: *Griffith* [*Kew Distrib.* No. 4355). Perak : *King's Collector* Nos. 6548, B522, G735 & 7928; *Wray* Nos. 2399 & 2B95.

The variety may possibly be a distinct species, but the male flowers are so like those of true *M. Farquhariana*, Wall., that it seems desirable to consider it as a variety. The female flowers, when found, may possibly afford some specific character. As regards leaves, the variety forms a connecting link with the little-known species *M. Griffithii*, Hook. fil.

PLATE 13B. *Myristica Farquhariana*, Wall 1, Branch with panicles of male flowers; 2, female panicle ; 3, twig with ripe fruit ; 4, section of fruit showing arillus and seed in fruit of variety *major*—of natural size; 5, male flowers; 6, androeciuni ; 7, female flowers ; 8, ovary—enlarged.

33. MYRISTICA FDRBESII, n. sp. *King*. A tree 40 to 70 feet high; glabrous in all parts, except the rufous-tomentose leaf-buds and puberulous panicles and flowers ; young branches rather slender, pale brown. *Leaves* thinly coriaceous, oblong-lanceolate, oblong to elliptic, acuminate, the base cuneate, both surfaces tinged when dry with purplish-brown ; the upper shining, the lower pale, glaucous; main nerves 13 to 17 pairs, thin but distinct beneath, sub-horizontal to ascending, interarching within the margin; length 8 to 10 in., breadth 2 to 4 in.; petiole about ½ in. *Male panicles* axillary or in the axils of fallen leaves, spreading, 2 to 2½ in. long and about the same breadth. *Flowers* pedicellate, in sub-globular dusters, ovoid, 1½ in. long; pedicels about as long; *perianth* with 3 ovate sub-acute teeth ; *androecium* sessile, ovate, blunt or sub-quadrangular and truncate; anthers from 8 to 10, quite free at the apex and sides; the cells narrow, distinct, twisted. *Female panicles* condensed, fewer-flowered than the male and not more than 1 in. long, scurfy-pubescent inside; teeth of *perianth* acute; *ovary* sessile, ovoid, scurfy-pubescent, the stigma oblique. *Fruit* in racemes of 3 to 12, when young sub-globular, when ripe narrowly obovoid, grooved, slightly scurfy, ¾ in. to 1 in. long; peduncle rather stout, thickened upwards, ½ in. long ; pericarp coriaceous ; arillus extending to the apex of the seed, thin, pale, fleshy, divided to the base into many narrow segments ; *seed* smooth, ellipsoid or slightly obovoid.

Malacca : *Maingay* No. 12U5 [*Kew Distrib.*] Penang : *Maingay* [*Kew Distrib.*] No. 1293. Perak: common at elevations up to 500 feet. Singapore, *Ridley*. *Distrib.*—Sumatra: *Foebes* No. 2976 [?].

This is closely allied to *M. Griffithii*, Hook, fil., and to *M. Farquhariana*, Wall. ; but it has larger leaves, of thinner texture, which dry of a more purplish-brown colour,

and have more numerous, more prominent, spreading nerves, which leave the midrib at a less acute angle. An unnamed species from New Guinea [*Fortes* NDS. 329 & 375] also approaches this very closely.

PLATE 137. *Myristica Forbesii*, King, 1, Branch with male panicles; 2, panicle of female flowers; 3, raceme of young fruit; 4, raceme of ripe fruit; 5, section of fruit; 6, arillus covering seed—of natural size; 7 & 8, male flowers dissected and showing the androecium; 9, female flower; 10, ovary—enlarged.

34. MYRISTIDA CANARICA, *Bedd. MSS.* A tree; young branches cinereous, rather rough and sparingly lenticellate, the youngest minutely rufous-pubescent. *Leaves* thinly coriaceous, almost membranous, elliptic to oblong, acute or shortly acuminate, base rounded, sometimes slightly cordate or cuneate; both surfaces glabrous, the upper shining, the lower glaucous; main nerves 11 to 13 pairs, spreading, inconspicuous on the upper; thin but rather prominent on the lower surface, inter arching within the margin; length 6 to 12 in., breadth 1.5 to 4.25; petiole 3 to 5 in. *Male panicles* axillary, spreading, 3.5 to 4 in. long and about as many broad; minutely and scurfily rufous-pubescent; *perianth* clavate or narrowly obovoid, 1.5 in. long, minutely pubescent on both surfaces, cut for about a fourth of its length into 3 or 4, short, sub-acute, triangular teeth; pedicels about as long as the flowers. *Androecium* sessile, ellipsoid, blunt, much shorter than the perianth; anthers from 8 to 10, slightly unequal, narrow. *Female flowers* in racemes or imperfect panicles, about 5 in. long; the rachis woody, stout; *perianth* sessile or sub-sessile, narrowly obovoid in bud, puberulous outside, tomentose inside, cut half-way down into three blunt recurved teeth; *ovary* sessile, ovoid-globose, pubescent; stigma sessile, divided by a mesial groove into two semi-lunar narrow, wavy lobes. *Fruit* (fide *Beddome*) globose, 1 to 2.5 in. in diam., glabrous in age. *Beddome Fl. Sylvatica*, L 27D (excl. syn. *Wall. Vat.* B79B). *M. Farquhariana*, A. DC. *Prod.* xiv. 1, 2DD (in part) *Hook. fil. & Thorns. Fl. Br. Ind.* 1B1; *Hook. fil. Fl. Br. Ind.* v. 105 (both in part).

Forests of Canara, Doorg, and the Wynad—*Beddome*.

PLATE 138. *Myristica Canarica*, *Bedd.* 1, Branch with male panicle; 2, twig with female racemes; 3, ripe fruit—of natural size; 4, male flower; 5, androecium; 6, female flower; 7, ovary; 8, stigma—enlarged. [No. 3 is copied from *Beddome's Fl. Sylvat.*, t. 27D.]

Smt. IV.—IRYA [*Hook. fil. & Thorns*] *Panihus* as in *Pyrrhosa*; *perianth* bifid or 3-toothed, sometimes 4-toothed; *androecium* globose or depressed-globose, sessile, sometimes elongated transversely; the *anthers* for the most part attached to the Column by their bases only (quite connate to it in No. 35), their sides and apices quite free, the apices sometimes much incurved. *Fruit* as in *Pyrrhosa*.

35. MYRISTIDA BIVALVIS, *Hook. fil. Fl. Br. Ind.* v. 107. A glabrous tree, 3d to 50 fast high; young branches cinereous, rather rough, lenticellate. *Leaves* thinly coriaceous, oblong or narrowly elliptic-oblong, acute or shortly acuminate, the base cuneate, dark greenish-brown above when dry, pale brown beneath; main nerves 11 to 13 pairs, spreading, rather straight with curving evanescent tips, thin, not prominent; length 7 to 10 in.; breadth 2 to 2.5 in.; petiole 5 in. *Male panicles* axillary, spreading,

3 to 5 in. long and 3 to 3.5 in. broad, much-branched, many-flowered, quite glabrous. *Flowers* pedicellate, 1.5 in. broad, inflated, transversely ovate, broader than long, compressed, boldly 2-valved; pedicel as long as the perianth. *Androecium* a laterally-compressed, sessile, flattened, 2-lobed cup, bearing about 36 elongate linear anthers, connate from base to apex, each lobe completely inflexed about the middle. *Female flowers* and *ripe fruit* unknown.

Singapore; Murton, Ridley; Malacca, Ridley.

A species readily distinguished from any described in this paper by its broad, compressed, 2-lipped perianth, with the anthers connate into two inflexed masses. An allied species from Banda (Bintang?) is cultivated in the Botanic Garden, Buitenzorg; but the anthers in it are more numerous and they are inflexed only when young. A specimen collected by Dr. Vriese in Amboina (kindly contributed to the Calcutta Herbarium by the authorities of the Leiden Herbarium) agrees with this in leaves and male flowers, except that the latter are rather smaller. That specimen bears the name *M. globularia*, BL; but I venture to think that it is wrongly so named (*M. globularia* being figured by Blume in *Rumphia* 1, t. 6, fig. 2, with globular flowers), and that it is really referable to *M. bivalvis*.

PLATE 139. *Myristica bivalvis*, Hook. fil. 1, Branch with male panicles — of natural size; 2 & 3, male flowers unopened; 4, valves of perianth opened up, the androecium taken out; 5, androecium, side view; 6, half of the androecium seen from inside; 7, vertical section of androecium to show the incurving of the edges of its two halves—enlarged.

35. MYRISTIDA DRASEFDLIA, Hook. fil. *fy Thorns*. *FL Ind.* 150. A tree; young branches thick, dark-coloured and rather rough. *Leaves* coriaceous, glabrous, elliptic-oblong, rather widest in the lower half, obtuse, the base slightly and suddenly cuneate; upper surface dull, greenish when dry; lower brown, dull, sub-glaucous; main nerves 11 to 13 pairs, rather prominent beneath, half-ascending, little curved, interarching near the margin; length 5 to 8.5 in., breadth 3 to 3.5 in.; petiole .75 in., stout. *Male panicles* axillary or from axils of fallen leaves, branching from the base, rufous-tomentose, 2.5 to 5 in. long and 2 to 2.5 in. in diam. *Flowers* numerous, .03 in. in diam., sub-globular, slightly compressed, glabrous, in rather dense clusters on the panicles; pedicels as long as the flowers; *perianth* thin, 2-valved; *androecium* sessile, flattened, elongated transversely; anthers 10, only partially attached to the column and to each other, ovate, compressed, opening by vertical elongated sutures. *Female flowers* and *fruit* unknown. Hook, fil. *FL Br. Ind.* v. 108; A. DO. in *Prod.* xiv. 1, 2D4. M. Irya, VAR. *crassifolia*, Miq. in *Herb.* M. Horsfieldii, Blume, ? Wall. Cat. BDB (in part).

Malacca; Griffith [Kew Distrib. No. 455D], Cantley, Singapore; Wallich, Anderson, Ridley. Distrib.—Borneo, Bangka, Amboina, De Vriese*

PLATE 14D. *Myristica crassifolia*, Hook. fil. *fy Thorns*, 1, Branch with male panicles—of natural size; 2, male flower; 3 & 4, androecium—enlarged.

37. MYRISTIDA IRYA, Gcertn. *Fruct.* i. 195, t. 41. A tree 30 to 40 feet high; youngest branches rather stout, dark-coloured; the older glabrous, rather pale, often lenticellate, striate, two of the striae on opposite sides of the branches much elevated. *Leaves* membranous, glabrous, oblong-lanceolate, acuminate; the base cuneate; upper surface dull greenish-brown when dry; the lower of a paler brown, not greenish; nerves 9 to 13 pairs,

slender, spreading; length 5'5 to 8 in., breadth 1'7 to 2'5 in.; petiole about .35 in. *Male panicles* axillary, 2-5 to 4 in. long, glabrous or often minutely rufous-pubescent towards the apex, much-branched, many-flowered, the flowers glomerulate. *Flowers* .15 in. in diam., sub-globose, or sub-obovate, slightly or much compressed, usually glabrous; pedicels as long as the flowers; *perianth* thin, 2-valved; *androecium* broadly obovate, flat-topped, slightly elongate transversely; anthers about 1D, free except at the base, elongate-ovate, 2-celled, their apices slightly incurved when young. *Female panicles* much smaller than the male (Tō to 2 in. long and about 1'5 in. broad); the flowers fewer and larger; *perianth* slightly obovoid, blunt, glabrous, thick, 2-valved; *ovary* sessile, globular, ovoid, glabrous; stigma small, subterminal. *Fruit* solitary or in scanty racemes, globular, about .9 in. in diam., glabrous; pericarp thick, coriaceous; arillus thin, fleshy, red, completely enveloping the perfectly spherical seed, entire or slightly toothed at the very apex, the teeth overlapping. *Hook, fil. Thorns. FL Ind.* 159; *Hook. fil. FL Br. Ind.* v. 109; *A. DC. in Prod.* xiv. 1, 202 *excl. syn.* *M. exaltata*, Wall., from the forest (eg. rûng); *Thwaites Enum. PL Vey.* 11; *Miq. FL Ind. Bat. i. pt. 2, p.* 64; *Bedd. For. Man.* 173; *Miq. FL Lid. Bat. i. pt. 2, B4*; *Kurz FL Burm.* ii. 2B2. *M. Javanica*, *Bl. Bijdr.* 576, & *Rumphia* i. 19D, t. 62.

Ceylon; *Thwaites C. P.* 2B2D, *Trimen.* Penang, *Curtis* No. 93B. Malacca; *Griffith* No. 4357, *Maingay* No. 1292. Singapore and Pahang, *Ridley.* Perak, *Scortechini.* Distrib.—Malayan Archipelago.

There is no doubt that the nutmeg to which Gasrtner gave the name *M. Irya* was a Ceylon plant. The specific name is as near as may be to the vernacular name still current for it in that island; and the only locality he quotes for the species is Ceylon. The Ceylon plant is therefore, presumably, exactly Gasrtner's *M. Irya*. The only specimens which I have seen from any other source which in every particular agree with Ceylon specimens are from Penang [*Curtis* No. 935]. The species, or a plant or plants which it has hitherto been impossible to separate from it, is however found in Burmah, the Malayan Peninsula, and in the Andaman Islands; apparently also it extends to the Malayan Archipelago. This is an unusually wide distribution for a member of this genus, and, as might be expected, there is some amount of variety of form. Two of the forms I describe as varieties thus:—

VAB. *longifolia*, *Kiny.* Leaves oblong-lanceolate, 8 to 11 in. long; nerves 18 to 21 pairs. *M. Vrieseana*, *Miq. Ann. Mus. Luyd. Bat.* ii. 49.

Malacca; *Maingay* [No. 1291, *Kew Distrib.*] Perak, *Scortechini* No. 1738; *King's Collector* No. 7447. Great Coco Island; *D. Prain.* S. Andaman, *Kurz.* Distrib. — Borneo.

VAE. *Wallichii*, *King.* Leaves acuminate, much narrowed at the base; fruit slightly apiculate; arillus shortly toothed at the apex. *Myristica sphaerocarpa*, *Wall. Pl. As. Rar.* i. t. 89; *Wall. Cat.* 6796.

Burmah, *Wallich, Kurz.*

There is at Calcutta, thanks to the kindness of the authorities of the Liden Herbarium, one of the specimens of *De Vriese* on which Miquel founded his species *31. Vrieseana*, and there is no doubt whatever that it is *31. Irya*, Gasrtner, VAB. *longifolia*.

PLATE 141. *Myristica Irya*, *Gcertn.* 1, Branch with male panicles; 2, branch with ripe fruit; 3, ripe fruit dehiscing and showing the seed and arillus; 4, seed with the arillus removed—*of natural size*; 5 & 5, male flowers; 7, male flower opened up and seen from above; 8, section of male flower showing the androecium; 9, anthers; 10, female flowers; 11, section through female flower showing ovary; 12, apex of ovary, showing stigma; 13, Vertical section through ovary—*enlarged*,

PLATE 141 *his.* *Myristica Irya*, *Gcertn.*, VAR. *longifolia*. 1, Branch with male panicles; 2, female panicles, VAR. *Wallichii*; 3, leaf; 4, cluster of ripe fruit; 5, seed and toothed arillus—all *of natural size*.

From original drawings made from Ceylon specimens and kindly lent to me by Dr. Trimen, F.R.S., Director of the Royal Botanic Garden, Peradeniya.

38. MYRISTICA GLABRA, *Blume Bijdr.* 575. A tree 40 to 50 feet high; all parts quite glabrous; young branches rather stout; the bark cinereous, rough, the tips dark-coloured, slightly scurfy. *Leaves* thinly coriaceous, elliptic-oblong, usually slightly ubovate, acute or sub-acute, often much narrowed in the lower third to the acute base; nerves 9 to 11 pairs, rather faint; length 5 to 7 in., breadth 2 to 3 in.; petiole '5 to 1 in. *Male panicles* from the axils of fallen leaves, 3 to 3'5 in. long and nearly 2 in. broad, many-flowered. *Flowers* globular, glabrous, less than '1 in. in diam.; pedicels as long as or longer than the flowers; *perianth* thin, bifid or with 3 broadly triangular teeth. *Androecium* ovate or sub-globular, sessile; anthers about 10, linear, free at the sides and apices, convex. *Female flowers* unknown. *Fruit* ovoid or ellipsoid, glabrous, grooved on one side, 1'25 to 1'5 in. long; pericarp rather thick; arillus orange, thin, fleshy, entire, completely enveloping the ovoid smooth seed. *Blume Rumphia* 1, 191, t 54, fig. 1 A. & B.; *H. f. Sf. T. FL Ind.* 161; *A. DO. in Prod.* xiv. 1, 202 [excl. syn. *M. integra*, Wall. *Vat* B799]; *Miq. FL Ind. Bat*, i, pt. 2, p. 65; *Hook. fil. FL Br. Ind.* v. 107. *M. amygdalina*, Kurz [not of Wall.] *For. FL Burm.* ii. 283. *M. Kurzii*, King MSS.

Burmah, Kurz. S. Andaman, King, *Collectors of Calcutta Garden**

PLATE 142. *Myristica glabra*, *Blume*, 1, Branch with male flowers; 2 & 3, branches with ripe fruit—*of natural size*; 4, 5 & 6, male flowers; 7 androecium—*enlarged*.

39. MYRISTICA MAJUSCULA, *n. sp.* King. A tree 40 to 70 feet high; young branches as thick as a goose quill, minutely warted, puberulous at the tips, ultimately glabrous. *Leaves* glabrous, coriaceous, elliptic, acute or sub-acute, usually narrowed in the lower fourth to the cuneate base; upper surface pale, greenish-brown when dry, dull; the lower pale, bright brown; nerves 10 to 12 pairs, spreading, interarching '1 in. from the slightly recurved margin, rather prominent beneath, minutely and sparsely scurfy-puberulous at first, but ultimately quite glabrous; length 7 to 10 in.; breadth 2'5 to 3'5 in.; petiole '5 to '75 in. *Male panicles* from the axils of fallen leaves, wide at the base and narrowing upwards, much branched, lax, the main rachis rather stout, 3'5 in. long and 2'5 in. wide at the base; *flowers* rather few, buds globose, rather under '1 in. in diam., shorter than the pedicel, rather scurfy; *perianth* leathery, glabrous, with 3, sometimes 4, triangular teeth. *Androecium* almost sessile, sub-depressed, sharply trigonous; anthers 13, narrow, elongate, their sides conjoined, their apices free. *Female flowers* unknown. *Fruit* on the branches below the leaves, in pairs or solitary, broadly ovoid, blunt, slightly pointed when young, glabrous, 1'75 in. long by about 1'35 in. in diam.;

pericarp thickly leathery; arillus fleshy, entire, covering the whole seed, overlapping at the apex. *Seed* ovoid, faintly reticulate, smooth.

Perak: at elevations of from 300 to 2000 feet, *King's Collector* Nos. 5D59, 6DD4, 7955 & 1D413; *Wray* Nos. 2218, 2705, Singapore, ? *Hulleit*.

PLATE 143. *Myristica majuscula*, *King*. 1, Leaf-twig; 2, male panicle; 3, young fruit; 4, ripe fruit; 5, section of ripe fruit; 5, arillus covering seed—of natural size; 7, male flower; 8, androecium—enlarged.

40. MYRISTIDA BKACHIATA, *n. sp.* *King*. A spreading tree, 80 to 100 feet high; young branches rather stout, prominently 2-ridged, lenticellate, glabrous. *Leaves* thinly coriaceous, glabrous, oblong-lanceolate, shortly acuminate, the base acute; both surfaces rather dull, the upper olivaceous, the lower brown (when dry); main nerve[^] 15 to 20 pairs, thin but prominent beneath, spreading; length 7 to 11 in., breadth 2.5 to 4 in.; petiole 1.25 in. *Male panicles* from the axils of leaves or of fallen leaves, slender, much-branched, spreading, 4 to 6 in. long and about as many broad, glabrescent. *Male flowers* about 1.5 in. in diam., obovate-globular, glabrous; *perianth* leathery, its teeth 3, triangular. *Androecium* sessile, sharply trigonous; anthers about 9, slightly conjoined by their sides, the apices quite free, their cells very distinct. *Female panicles* shorter and stouter and much fewer-flowered than the males, 3.5 to 5 in. long; their branches puberulous towards their tips, glabrous below. *Flowers* larger than the males, nearly 1 in. long, ovoid, glabrous; *perianth* rather thick, 2 or 3-toothed; *ovary* sessile, broadly ovoid, sub-compressed, ridged in one side; stigma very short, oblique, slightly 2 lobed. *Fruits* 6 to 8 in woody spreading cymes from below the leaves, ovoid, glabrous, 1.25 in. long and .9 in. in diam.; pedicels 1.25 in. long; pericarp rather thinly coriaceous; arillus covering the whole of the seed, slightly lacinate and overlapping at the apex; *seed* ovoid, smooth.

Singapore; *Wallich*. Perak, *King's Collector* NDS. 4704 & 6771; *SCOTI'echini* No. 1B49. Malacca, *Griffith* [*Kew Dist.*] No. 4351. Perak, *King's Collector* NDS. 4704, 6771 & 7447; *Scortechini* No. 1649.

This species is readily distinguished by its 2-ridged young branches and large cymes of ovoid fruit. This is one of the plants mixed up by Wallich in his No. BSO5, and issued under the name of "*M. Horsfieldia*, *Bl.* (?)," which it does not much resemble. The other species thus mixed are [*fide F. Brm Ltd.* v. 108) *M. Wallichii*[^] Hook. fil. & Thorns., and *M. polyspherula*, Hook. fil.

PLATE 144. *Myristica brachiata*, *King*. 1, Branch with panicle of male flowers; 2, panicle of female flowers; 3, panicle of ripe fruit; 4, ripe fruit; 5, arillus covering seed—of natural size; 6, male flower; 7, androecium; 8, female flower; 9, ovary—enlarged.

41. MYRISTICA RIDLEYANA, *n. sp.* *King*. A tree 40 to 50 feet high; glabrous, except the panicle and leaf-buds; young branches slender, dark-coloured. *Leaves* thinly coriaceous, lanceolate, acuminate; the base cuneate; when dry the upper surface greenish, the lower bright brown; main nerves 7 to 10 pairs inconspicuous, spreading; length 3 to 6 in., breadth 1 to 1.5 in.; petiole .4 to .5 in. *Male panicles* from the axils of leaves or of fallen leaves, about 1.25 in. long, spreading, scurfy or almost glabrous. *Flowers* depressed-globose, 1.5 in. in diam., glabrous, slightly scaly; pedicels longer than the flowers; *perianth* with 3 or 4 broadly triangular, acute teeth; *androecium* sessile, with 7 or 8 broadly-ovate sub-erect anthers attached by their bases (almost as in *Knema*) their apices and margins free.

Female racemes less than 75 in. long; *flowers* globose, coriaceous, glabrous; the teeth short, blunt, gaping; *ovary* sessile, globose, glabrous, grooved; stigma slightly oblique, small, grooved. *Fruit* solitary or in short racemes of 2 to 4, ellipsoid; length [when young] 5 in., pedicel 2 in., stout; pericarp leathery, glabrous, thick; arillus thin, quite entire, and completely enveloping the smooth oval seed.

Perak: at elevations from 500 to 800 feet, *King's Collector* No. 1DD17; *Scorfechini* ND. 862. S. Ujong, *Vanthy* No. 1708.

Allied to *3L polyspherula*, Hook, fil., but with smaller, quite glabrous leaves, with fewer, fainter nerves, a different ovary, and ellipsoid fruit.

PLATE 145, *Myristica Ridleyana*, King. 1, Branch with male flowers; 2, branch with female flowers; 3 & 4, young fruit; 5, arillus covering seed—of natural size; 6, androecium; 7, ovary—enlarged.

42. MYRISTICA POLYSPHERULA, Hook, fil. Fl. Br. Ind. v. IDS. A tree 40 to 50 feet high; young shoots rather slender, at first covered with rusty scurf, ultimately glabrous and striate. *Leaves* narrowly oblong, or oblong-lanceolate, acute or acuminate, the edge slightly revolute when dry; the base cuneate, rarely rounded; upper surface pale greenish-brown when dry, glabrous, shining; the lower dark brown, dull, glabrous, except the midrib which in young leaves is scurfy-puberulous; main nerves 11 to 13 pairs, thin but sharp and bold on both surfaces, spreading, the ends interarching 1 in. from the edge; length 3.5 to 6 in., breadth .5 to .25 in.; petiole .35 to .5 in. *Mah panicles* from the axils of leaves and of fallen leaves, much-branched, spreading, densely rusty-tomentose, 2 to 4 in. long and 1.5 to 3 in. broad; *flowers* clustered towards the ends of the branchlets, .5 in. in diam., depressed-globose, glabrous; *perianth* black when dry, leathery, with 3 or 4 triangular acute teeth, sometimes only 2-valved; pedicels about as long as the flower; *androecium* sessile, transversely elongate or slightly 3 or 4-cornered, according to the number of perianth segments; anthers 9 to 12, ovate, the cells divergent, and the sides and apices free. *Female panicles* only about 1.5 in. long, stout, few-flowered; *perianth* ovoid, blunt, very thick, glabrous, with 3 sub-acute, concave teeth; *ovary* sessile, compressed, ovoid, glabrous; stigma grooved, sub-bilobed. *Fruit* in short racemes of 2 or 3, pedunculate, ovoid, narrowly ridged on one side, glabrous, about .75 in. long and .5 in. in diam.; peduncles .25 to .5 in. long; pericarp leathery, splitting into 2 valves when ripe; arillus rather fleshy, entire, completely covering the broadly ovoid, smooth, shining seed. *M. globularia*, Hook. fil. ff Thorns, (not of Blume) FL Ind. 1B0; A. DV. in Prod. xiv. 1, 202 [in part]. *M. Horsfieldia*, Bl ? Wall Cat. in part (not of Blume).

Malacca; Griffith (Kew Distrib.) No. 4351, Uantley. Singapore, Ridley. Perak; King Collector, Scorfechini, Way, at low elevations; common.

The leaves of this when dry are brittle, and have an olivaceous tint on the upper surface, the lower being of a bronze-like brown. It much resembles the only authentic specimen which I have seen (only) of *M. subglobosa*, Miq.

PLATE 14B. *Myristica polyspherula*, Hook. fil. 1, branch with male flowers; 2, ripe fruit; 3, section of ripe fruit; 4, arillus covering the seed—of natural size; 5, male flower; 6, androecium; 7, female flower; 8, ovary—enlarged.

43. MYRISTICA JIDLETTIANA, n. sp. King. A tree 30 to 70 feet high; young branches brown, faintly henticellate, striate, glabrous when old, scurfy rusty-pubescent when young.

Leaves elliptic-oblong, acute Dr acuminate, narrowed in the lower third to the acute base, the edges slightly recurved; upper surface pale, dull, olivaceous brown when dry, glabrous; the lower reddish-brown, glabrous, except the deciduously pubescent midrib; main nerves 13 to 17 pairs, prominent on both surfaces, but especially on the lower, spreading and forming double intermarginal arches; length 6 to 8 in., breadth 2 to 3 in.; petiole 3/5 to 1/5 in., stout. *Male panicles* axillary, lax, spreading, 2 1/5 to 3 1/5 in. long and about 1 1/5 in. broad; the axis and branches slightly scurfy-pubescent (never tomentose), the pedicels and flowers quite glabrous; buds depressed-globose or sometimes obovoid, less than 1/5 in. in diam., the pedicels longer; *perianth* leathery, pale, quite glabrous on both surfaces, with 3 acute triangular teeth; *androecium* transversely ovoid, compressed or 3-angled, the disc small, concave; anthers about 10, erect, rather short, narrow, attached by their bases only, their sides and apices quite free, the connectives sometimes produced into a short appendage at the apex. *Female panicles* about 1 in. long, sub-glabrous, slightly scurfy when very young; pedicels rather thick, recurved; flowers sub-globular, 1/5 in. in diam.; the *perianth* fleshy, glabrous; shortly 3-toothed; *ovary* depressed-globular, glabrous; stigma small, oblique. *Fruit* solitary or in racemes of 2 or 3, broadly ovoid, glabrous; 1-25 to 1-5 in. long and 1 to 1/25 in. broad; pericarp leathery, 1/25 in. thick, splitting when ripe into 3 or 4 valves; arillus rather thick, entire, covering the whole of the smooth globose seed. *M. glabra*, *Bhime*, VAK. Sumatranā, *Miq. Ann. Mus. Lugd. Bat.* ii. 49.

Malacca; *Maingay* (*Kew Distrib.*) No. 1286, *G'antley*. Perak; *King's Collectvr* Nos. 3B2D, 3B90, BB72, 6737.

This is closely allied to *M. polyspherula*. Hook, fil., from which, however, it differs in its nearly glabrous panicles and very much larger fruit. I have dedicated this species to that distinguished soldier and botanist Brigadier-General H. Dollett, D.B., who has recently done so much to increase our knowledge of the Flora of Upper Burmah.

PLATE 147. *Myristica Collettiana*, King. 1, Branch with panicles of male flowers; 2 & 3, fruits; 4, seed covered by arillus—of natural size; 5, male flower; 6, androecium—enlarged*

Sect F.—KNEMA {*Blume, Hook fil, & A. DC.*} *Male flowers* pedicelled, in clusters of from 3 to 15, from axillary tubercles, each pedicel with a persistent bracteole about the middle (close to the perianth in *M. Uantleyi* and *M. vbbngifoliw*). *Staminal column* usually stalked, peltate, discoid, concave, flat Dr convex; the *anthers* ovate, usually sessile, attached by their bases to its edge, otherwise free, rarely with filaments, radiating, more or less horizontal and dehiscing downwards, Dr sub-erect and extrorse,

44. MYRISTICA DBLONGIFOLIA, n. sp. King. A shrub, or small tree 30 to 40 feet high; young branches slender, at first minutely sturfily rufous-tomentose; afterwards sub-glabrous, the bark pale brown. *Leaves* thickly membranous, oblong-lanceolate or oblanceolate or oblong, rarely elliptic, apex acute or shortly acuminate, very gradually narrowed to the cordate or emarginate base; upper surface glabrous, shining; lower pale, dull; when young with much loose stellate rufous hair, when adult sub-glabrous, the midrib prominent below, as are the 21 to 28 pairs of spreading nerves, which

curve upwards and interarch inside the margin; length 5 to 15 in., breadth 1½ to 4 in.; petiole ½ to ¾ in., stout, rufous-tomentose when young. *Male flowers* in 6 to 8-flowered umbels from short axillary tubercles, elongated in VAR. *monticola*; buds ½ to 1 in. in diam., oblong-obovoid; pedicels ½ to ¾ in. long, almost sessile in VAR. *monticola*; the bracteole minute, sub-orbicular, close to the base of the flower; *perianth* lobes obovate, blunt or sub-acute, thick, concave, outside minutely rufous, stellate-hairy like the pedicel, inside glabrous, ridged; *staminal disc* very small, slightly concave, orbicular, sub-3-angled, lobed, glabrous; anthers 8 to 10, sessile, sub-erect; stalk cylindric, as long as the *perianth* tube. *Female flowers* sessile, in shortly but stoutly pedunculate 4 to 6-flowered axillary umbels; buds ovoid, lobes of *perianth* ovate, blunt, externally rufous stellate-tomentose; internally glabrous; *ovary* sessile, ovoid-conic, rusty-tomentose, style shorter than the ovary, cylindric, glabrous; stigma of 2, rounded, compressed, erect lobes. *Fruit* in pairs or solitary, axillary, shortly peduncled, sub-obovoid or ovoid, slightly pointed, slightly ridged, 1 to 1½ in. long, ¾ to 1 in. in diam.; pericarp thin, dry, densely covered with harsh, short, rusty tomentum, often sub-glabrescent when old; peduncle ½ in., stout; arillus thin, deeply-lobed, covering only the lower half of the mottled ovoid seed.

Perak, Penang: at elevations of 500 to 800 feet. Malacca, *Cantley*. Sungei Ujong, *Cantley*.

VAR. *monticola*, *Kinj.* Leaves smaller (8 to 10 in. long), their bases sub-acute or rounded, nerves rather fewer (18 to 22), petioles longer (5 to ¾ in.) and rather slender; male flowers almost sessile, on slightly elongated warted peduncles; stalk of *staminal disc* rather longer than in the typical form.

Perak: at elevations of 2,509 to 3,810 feet, *King's Collector, Scortevhini, Wray*.

A variety found only in the hills. The anthers are arranged on a *staminal column* resembling that of *Irya*, but having a stalk as in *Eumyristica*.

PLATE 14B. *Myristica oblongifolia*, *King*. 1, Branch with male flowers; 2, twig with ripe fruits; 3, section of fruit showing seed covered by arillus; 4, arillus; 5, seed—of natural size; 6, male flower; 7, androecium; 8, male flower of VAR. *monticola*; 9, androecium of *monticola*; 10, female flower; 11, ovary and stigma—enlarged.

45, MYRISTICA KUNSTLERI, *n. sp.* *King*. A tree 30 to 50 feet high; young branches slender, slightly and minutely rusty-tomentose at first, quickly becoming rather dark and glabrous. *Leaves* glabrous, thinly coriaceous, much reticulate when dry, elliptic or elliptic-oblong, sometimes ovate, shortly and rather bluntly acuminate or acute, occasionally obtuse, the base cuneate or rounded, slightly unequal; upper surface shining, pale greenish when dry, lower sub-glaucous, of a dull brownish white with numerous small brown dots, sub-lacunose, the lateral nerves and midrib prominent and brown, minutely scurfy; nerves 7 to 10 pairs, spreading, arching within the margin; length 3 to 7 in., breadth 1½ to 3 in.; petiole ½ to ¾ in. *Male flowers* in 4 to 12-flowered umbels from short, woody, axillary tubercles; pedicels ½ to ¾ in., slender, the minute bracteole about the middle; buds ½ to 1½ in. in diam., depressed-globose; segments of *perianth* fleshy, broadly-triangular, concave, glabrous within, minutely tomentose externally, as are the pedicels; *staminal disc* small, sub-rotund, obscurely 3-angled, flat.

glabrous; anthers 9 to 12 with filaments attached to edge of disc, short, ovate, horizontal, dehiscent downwards; stalk very short, cylindric. *Female flower* unknown; *ovary* (after fertilization) sessile, ovoid, narrowed above, rugulose; style very short, glabrous, stigma with 3 short conical spreading lobes. *Fruit* usually solitary, sometimes in clusters of 2 or 3, axillary, pedunculate, 75 to 1 in. long by 5 to 75 in. in diam., broadly ovoid, slightly apiculate; the stigma persistent, slightly narrowed at the base, minutely rugulose and rufous-pubescent; pericarp thickly coriaceous; arillus thin, enveloping the fruit, slightly 5 or 6 lobed at the very apex.

Perak: at elevations of from 500 to 2000 feet; common.

PLATE 149. *Myristica Kunstleri*, King. 1, Branch with ripe fruit; 2, twig with male flowers; 3, arillus and seed—of natural size; 4, male flower; 5, staminal disc and anthers—enlarged.

45. *MYRISTICA CONFERTA*, n. sp. King. A tree 60 to 80 feet high; young branches rather stout, pale brown, striate, glabrous; the youngest densely covered with short, stellate, rusty tomentum. *Leaves* oblong or narrowly elliptic, acute; the base rounded or slightly cordate; both surfaces minutely reticulate; the upper glabrous, shining; the lower, when young, and especially the nerves, with minute loose scurfy tomentum, ultimately glabrescent and sub-glaucous; main nerves conspicuous below, about 15 to 20 pairs, spreading; length 5 to 75 in., breadth 175 to 225 in. *Male flowers* in densely crowded axillary clusters of 20 to 30; pedicels 3 to 4 in. long, tawny-pubescent, the bracteole about the middle. *Perianth* sub-globose, depressed, bluntly 3-angled; the teeth broadly triangular, acute, fleshy, concave, stellate-tomentose externally, glabrous within; *staminal disc* very concave at first; the anthers 15, with short filaments, at first erect and slightly recurved at the apex, afterwards radiating and sub-horizontal, and the disc flat; stalk cylindrical below, rapidly widening upwards into the disc, striate, minutely hairy, especially at the base. *Female flowers* larger than the males, but in smaller clusters, slightly obovoid; *perianth* with 3 short sub-acute teeth; *ovary* depressed-globose, rufous-tomentose; stigma sessile with 3 spreading acute lobes. *Fruit* axillary, solitary, ovoid, blunt, 15 in. long and about 11 in. in diam., shortly rufous-pubescent when young, glabrescent when ripe; pericarp rather dry, about 2 in. thick, splitting vertically when ripe; *seed* ellipsoid, pointed; arillus covering the whole seed, minutely lacinate at the apex.

Perak: at low elevations; King's Collector Nos. B211, 1D295; Wray No. 2377. Malacca; Griffith No. 4345; Maingay Nos. 1294 & 1297. Singapore, Ridley No. 442.

Allied to *M. laurina*, Blume; but distinguished from that species by its more numerous stamens, 3-cleft sessile stigma, and larger glabrescent fruit.

PLATE 150. *Myristica conferta*, King. 1, Branch with male flowers; 2, twig with female flowers; 3, twig with ripe fruit; 4, seed covered by its arillus; 5, apex of arillus—of natural size; 6, male flower; 7, androecium; 8, female flower; 9, ovary and stigma—enlarged.

47. *MYRISTICA WRAYI*, n. sp. King. A tree 20 to 60 feet high; young branches slender, rather pale; all parts glabrous except the inflorescence. *Leaves* thinly coriaceous, narrowly elliptic or elliptic-oblong, acute or sub-acute, rarely sub-acuminate; the base rounded, sometimes emarginate or sub-cuneate, never cordate; upper surface shining; the lower dull, whitish grey; the midrib and 13 to 17 pairs of spreading

nerves prominent; length B to 9 in., breadth 2'25 to 3 in.; petiole '5 to '65 in. *Male flowers* in compound many-flowered umbels from short, woody, axillary tubercles; buds sub-globose, '15 in. in diam., minutely pubescent or sub-glabrous externally, as are the pedicels; pedicels '35 in. long, the bracteole above the middle; lobes of *perianth* broadly ovate, sub-acute, glabrous and ridged inside; *staminal disc* sub-triangular, sub-convex; anthers 13 to 17, on short filaments, horizontal; stalk very short, stout. *Female flowers* unknown. *Fruit* oblong-ovoid or ovoid, 1 to 1'75 in. long when ripe, in pairs, axillary, pedicellate, cinereous, glabrescent; pedicel '25 in. long; arillus entire, thin, tough, completely enveloping the oblong-ovoid or ovoid seed.

Perak: at elevations up to 500 feet—Wray, *King's Collector*.

This has leaves rather like *M. Spanogheana*, Miq., but narrower, with fewer nerves and paler on the under surface.

PLATE 151. *Myristica Wrayi*, King. 1, Branch with male flowers; 2, ripe fruit; 3, section of ripe fruit; 4, seed covered by its arillus—of natural size; 5, male flower; B, staminal column and disc with anthers—enlarged.

48. MYRISTICA ATTENUATA, Wall Vat. B791. A tall tree; youngest branches and inflorescence covered with golden or tawny, furfuraceous, deciduous turn on turn; ultimately glabrous and striate; slender. *Leaves* thinly coriaceous, flocculent-pubescent only when young, elliptic-oblong or elliptic-lanceolate, rarely elliptic, acute or acuminate; the base cuneate, sometimes rounded, often unequal; upper surface shining, glabrous; the lower pale, glaucous; lateral nerves 12 to 13 pairs, prominent, spreading; length 5 to 8 in., breadth 1'75 to 2'75 in.; petiole '5 in. or under. *Male flowers* '3 in. in diam., obovate-globose, in 3 to 6-flowered, shortly peduncled, axillary umbels; pedicels '2 to '4 in. long, slender, bracteolate above the middle; *perianth* deeply divided into 3 triangular, fleshy, concave segments, rufous-lanose externally, glabrous and striate within; *staminal disc* sub-concave, glabrous; anthers about 13, on short filaments, ovate, opening downwards; stalk of the disc cylindric, about as long as the perianth tube. *Female flowers* in umbels like the males, but fewer-flowered, sub-sessile or sessile, the bract close to the base of the perianth; *perianth* cylindric or narrowly ovoid, slightly gibbous at the base, 3-toothed, otherwise as in the male; *ovary* sessile, ovoid, densely tomentose; the style short, fleshy, glabrous, expanding above into the bi-lobed fleshy stigma, the lobes somewhat corrugated internally. *Fruit* 1 to 1'5 in. long, ellipsoid or sub-obovoid, abruptly and shortly pointed, densely rusty furfuraceous-tomentose, but ultimately sub-glabrous; arillus thin, uniform, entire, completely enveloping the narrowly ovoid seed. *Hook. fil. if Thorns. Flora Ind.*, 157; *A. DO. in Prod.* xiv. 1, 205; *Hook. fil. FU Br. Ind.* v. 110; *Dah. & Gibs. FL Bombay*, 4. *M. corticosa*, *Bedd. Fl. Sylv.*, t. 271 [not of Lour., nor of H. f. 6f Th.] *M. ainygjalina*, *Grah. Cat. Bomb. Plants*, 175 [not of Wall]

Moist forests of the Western Ghâts; from South Canara to South Travancore, at elevations of from 1000 to 3,000 feet.

PLATE 152. *Myristica attenuata*, Wall. 1 & 2, twigs with female flower and young fruits; 3 to 5, female flowers; 6, ovary, style, and stigma; 7, young fruit; 8, ripe fruit; 9, piece of twig with male flowers; 10, male flower; 11, staminal disc. Nos. 4, 5, B, 10, 11 are enlarged; the others are of natural size. Nos. 3, 4, 5, 7, 10 if 11 are copied from *Bedd. FL Sylv.*, t. 271.)

49. MYRISTIDA SCORTEDHINII, *n. sp. King*. A tree 4D to 8D feet high; young branches rather stout, covered at first with minute scurfy turn en turn, afterwards rather pale brown and glabrous. *Leaves* coriaceous, narrowly oblong-lanceolate, alternate towards the acute apex, the base rounded and emarginate or minutely cordate, or sub-cuneate; upper surface shining, glabrous; lower, when young, densely covered with very minute, stellate or tawny deciduous tomentum; when adult sub-glabrous and rather pale; main nerves from 18 to 28 pairs, spreading, prominent below; length 7 to 12 in., breadth 1^B75 to 2*5 in.; petiole "3 to "5 in., rusty-tomentose when young. *Male flowers* in 4 to 10-flowered umbels from usually short, woody, axillary tubercles; pedicels slender, "35 to "B in. long; the minute bracteole about the middle, pedicel thinner above the bracteole; buds "2 in. in diani., depressed-globular, obtusely 3-angled; *perianth* cleft nearly to its base, the teeth broad, triangular, minutely stellate-tomentose outside as are the pedicels, glabrous and striate within, very concave; *staminal disc* small, flat, 3-angled, glabrous; anthers 1B to 18, radiating horizontally, the filaments distinct, short; stalk of the disc cylindric, glabrous, ridged, thickened in its upper part. *Female flowers* unknown. *Fruit* 1 in. or more long when ripe, ovoid-globular, blunt, slightly ridged at the suture and slightly gibbous at the base on one side, pedicelled; when young densely and minutely rufous-tomentose, afterwards sub-glabrescent; pericarp thin; arillus thin, red, closely embracing the seed, irregularly lobed at the apex; *seed* ovoid-globose. *M. laurina*, Bl[^] VAR. *Borneensis*, *Miq. Ann. Mus. Lugd. Bat* ii. 51,

A species not unlike *M. intermedia*, Bl.; but at once distinguished by its flat (not mammillate) disc. It also resembles *M. furfuracea*, but its ripe fruit is more glabrescent, more globular and smaller, and the reticulations of its leaves are much more minute.

Perak: common at elevations from 500 to 1,505 feet, *Scvrthini*, *Wray*, *King's Collector*. Malacca, *Derry*. Di[^]trib.—Borneo.

PLATE 153. *Myristica Scortechinii*, *King*. 1, Branch with male flowers; 2, ripe fruit; 3, apex of seed showing the lubed arillus; 4, base of cordate leaves—of natural size; 5 & 6, male flowers; 6, staminal disc and anthers; 7, ovary—enlarged.

5D. MYRISTICA INTERMEDIA, *Bhime Rumph. i. 187*. A tree 4D to 70 feet high; branches slender, the youngest thinly covered with minute, scurfy, rufous tomentum, ultimately dark-colored and glabrous. *Leaves* coriaceous, glabrous, narrowly oblong-lanceolate, tapering but little towards the acute or shortly acuminate apex, or towards the cuneate (rarely rounded or sub-cordate) base; upper surface shining; lower dull, pale; lateral nerves 12 to 22 pairs, spreading, rather prominent on both surfaces; length 5 to 12 in., breadth "8 to 3 in.; petiole "5 in., deciduously tomentose, like the young branches. *Male flowers* from short, rounded, woody tubercles in the axils of leaves or of fallen leaves, in umbels of 5 or 8; pedicels and outer surface of perianth minutely rufous-tomentose, sub-flocculent; bracteole small, above the middle of the "4 in. long pedicel; the buds sub-globose, slightly pointed; *perianth* when expanded "25 to 3 in. in diam.; its segments triangular-ovate, sub-acute, glabrous and striate inside. *Staminal disc* very convex (mammillate); anthers 12 to 15, sessile, radiating, their dehiscent3 downwards; stalk of disc very short, thickened towards the apex. *Female flowers* in axillary umbels like the males, but sessile and the bracteole close to the base of the flower; buds ovoid; lobes of *perianth* ovate, acute; *ovary* sessile, ovoid, minutely rufous-tomentose; stigma sessile,

broad, with B to 8 short, sub-erect, narrow lobes. *Fruit* usually solitary, rarely in clusters of 2 or 3, 1.25 to 1.75 in., ellipsoid, blunt, grooved on one side, covered with a thin layer of minute scurfy rufous tomentum; arillus thin, entire, or slightly lacinate towards the apex, completely enveloping the elongate sub-rugose seed. *Hook. fil. Thorns. FL Ind.* 158; *Book. fil. FL Br. Ind.* v. 112; *A. DC. in Prod.* xiv. 1, 2DB; *Miq. FL Ind. Bat.* i. pt. 2, 7D. ? *M. corticosa*, *H. l. Sf T.* VAR. *decipiens*, *Miq. Ann. Mus. Lugd. Bat.* ii. 51.

Malacca; Griffith [*Kew Distrib.*] 4359 (with diseased male flowers); Maingay 1281; Cantley, Penang, Curtis, Singapore; Wacey, Lobb, Ridley. Perak; Scortechini, King's Collector, Wray* Penang, Curtis,

The fruits of this are always, and the leaves are usually, larger than those of *M. jauca*, Bl. It is, however, at once distinguished from that and from every other *Knema* in those provinces, except *M. Cantleyi*, by the curious mammillate staminal disc.

PLATE 154. *Myristica intermedia*, Blume. 1, Branch with female flowers and ripe fruit; 2, twig with male flower; 3, section of fruit showing arillus covering seed (slightly lacinate towards apex)—of natural size; 4, male flower; 5, staminal column and disc with anthers; 6, female flower; 7, ovary—enlarged.

51. MYRISTICA FURFURACEA, Hook. *fil. Thorns. FL Ind.* 159. A tree 40 to 60 feet high; branchlets stout, the bark smooth, black and much cracked when old; when very young densely covered by a thick layer of scurfy, tawny or rusty tomentum. *Leaves* coriaceous, glabrous, narrowly oblong-lanceolate, acute or acuminate, slightly narrowed to the cordate slightly unequal base; upper surface shining; lower dull, pale, purplish when dry; lateral nerves 20 to 25 pairs, prominent beneath, spreading; length 10 to 21 in., breadth 1.75 to 4.5 in.; petiole stout, rusty-tomentose when young, ultimately glabrous, 4 in. long. *Male flowers* in 5 to 8-flowered umbels, rising from short woody tubercles in the axils of leaves or of fallen leaves; pedicels 3 to 4 in. long, flocculent rusty-tomentose, as is the outer surface of the flower, the bracteole about the middle of the pedicel which is thinner above than below its insertion; buds obtusely 6-cornered, flat-topped, 1.5 in. in diam.; perianth deeply divided into 3 blunt, triangular teeth, glabrous and striate inside. *Staminal disc* rotund, obscurely 3-angled, concave, glabrous; anthers about 12, radiating, curving upwards, sub-sessile; stalk of disc glabrous, cylindric, thickened upwards, prominently ridged. *Female flowers* 3 in. long, in umbels like those of the male, but fewer-flowered, sessile, and the bracteole at the base of the perianth; bud ovoid-globose; segments of perianth ovate, sub-acute; ovary sessile, globose, densely rufous-tomentose; stigma sessile, discoid, with many linear lobes, glabrous. *Fruit* sub-globose at first and densely tomentose; when ripe ovoid or ellipsoid, blunt, 1 to 1.25 in. long, the perianth sub-accrecent and persistent at its base, rufous-tomentose; pericarp thick; arillus thin, completely enveloping the whole of the seed, except the extreme apex, where it is divided into 5 or 8 narrow lobes. *Hook. fil. FL Br. Ind.* v. 112; *A. DC. in Prod.* xiv. 1, 2D3; *Miq. FL Ind. Bat.* i. pt. 2, 7D. *Knema glaucescens*, *TFull. Oat.* 3810 (not of Jack).

Penang?, Curtis No. 1459. Perak, King's Collector. Malacca; Griffith ND. 434B [*Kew Distrib.*] Maingay [*Kew Distrib.*] Nos. 1287 & 1288).

Resembling *M. intermedia* in many points, but with larger, cordate leaves, and a concave, not mammillate, glabrous staminal disc.

VAR. *major*, *King*. Fruit narrowly ovoid, pointed; the perianth not sub-acrescent or persistent, rufous-tomentosB at first, partially glabrous when ripe, 1'5 to 2*5 in. long.

Perak; *King's Collector* Nos. 56DD, 5720, 6059, 7551, 1D349. Penang; *Curtis* NDS. 1459, 245 5.

The leaves of this variety are usually rather larger than those of the typical form, and the fruit is always much larger. It might be better to treat this variety as a distinct species, for the perianth of the female is neither sub-acrescent nor persistent at the base of the fruit.

PLATE 155. *Myristica furfuracea*, *Book, fil fy Thorns*. 1, Branch with male flowers; 2, twig with female flowers; 3, cluster of ripe fruit; 4, seed covered by arillus; 5, seed with arillus removed; 5, ripe fruit of VAR. *major*—of natural size; 7, male flower; 8, androecium; 9, female flower; 10, ovary—enlarged.

52. MYRISTICA LAURINA, *Blume Rumph.* i. 189, t 61. A tree 40 to 60 feet high; young branches rather stout, pale brown, faintly striate; the youngest harshly rufous-tomentose. *Leaves* oblong to oblong-lanceolate or oblanceolate, shortly acuminate or acute, slightly narrowed to the rounded or minutely cordate slightly unequal base; upper surface shining, glabrous; lower covered, especially on the nerves, with minute, stellate, loose, rusty hairs; main nerves 12 to 18 pairs, spreading; length 4 to 9 in., breadth 1.5 to 2.5 in.; petiole 1.25 to 1.5 in., rufous-tomentosB. *Male flowers* in dense, axillary, many-flowered umbels; pedicels 1/2 in. long, the bracteole above the middle or sub-sessile; buds 1 in. in diam., ovoid or slightly obovoid, densely shaggy, rufous-tomentose; teeth of *perianth* ovate, concave, glabrous and striate inside; *staminal disc* small, glabrous, concave, bearing 7 to 9 erect, sessile, extrorse anthers; stalk glabrous, cylindric, thickened towards the apex, striate. *Female flowers* like the male, but always sessile, and the rachis woody and elongating; *ovary* sessile, depressed-globose, densely rufous-tomentose; style 0 or very short; stigma as long as the ovary with 2 deep, obovate, laterally compressed, sub-lobulate lobes. *Fruit* 1/5 to 1 in., rarely 1.25 in. long when ripe; ovoid or ellipsoid, often obovoid, blunt, sub-sessile or shortly pedicellate, densely covered with coarse rufous tomentum; arillus thin, red, entire, completely enveloping the ellipsoid seed. *A. DC. in Prod.* xiv. 1, 208; *Miqm FL Ind. Bat* i. pt 2, 75; *Ann. Mus. Lugd. Bat.* ii. 51; *Hook, fil Flm Br. Ind.* v. 112 (in part). *M. tomentosa* Blume (not of Thunbg.) *Bijdr.* 577.

Malacca; *Griffith, Ridley*. Singapore; *Ridley, King*. Perak; *Scortechini, King's Collector*, Distrib.—Java [*Zoll Vat* 99 6], Sumatra.

The best marks of this species are the small staminal disc with only 6 to 8 stamens which are erect or sub-erect, not horizontal; the loose, stellate hairs of its young parts and of the under surfaces of the leaves. Blume's otherwise excellent figure shows the fruit in only a young state, and the leaves have attenuate bases, much the more common form of leaf-base being rounded and cordate.

PLATE 15B. *Myristica laurina*, *Blume*. 1, Branch with male flowers; 2, part of branch which has borne female flowers; 3, branch with nearly ripe fruit; 4, a ripe fruit; 5, vertical section through young fruit to show seed; 6, seed covered by its arillus—of natural size; 7, male flower open and seen from above; 8, the same unopened with its bracteole; 9, androecium; 10, female flower; 11, ovary, style, and stigma—enlarged.

53. MYRISTICA GLAUCA, *Blume Bijdr.* 57 B ; *Rumphia*, i. 182, t. BQ. A tree from 25 to 70 feet high; branches when quite young rusty-puberulous; afterwards glabrous, dark-coloured. *Leaves* thinly coriaceous, glabrous when adult, oblong-lanceolate, slightly narrowed to the acute or shortly acuminate apex and to the cuneate or rounded base; upper surface glabrous, shining; lower whitish or pale brown, but not glaucous, the nerves darker; main nerves 14 to 20 pairs, spreading; length 5 to 10 in., breadth 1.6 to 2.5 in.; petiole 4 to 5 in. *Male flowers* in umbels of 3 to 6, from short axillary tubercles; the pedicels .25 to .5 in. long, with a minute semi-rotund bracteole close to the flower; buds ovoid-globose, .2 in. in diam.; *perianth* lobes ovate, rather blunt, ferruginous-tomentose outside like the pedicels; glabrous and striate within. *Staminal disc* glabrous, concave; the anthers 8 to 12, sessile, sub-erect; pedicel of disc long, a little thickened upwards, ridged, glabrous. *Female flowers* umbellate like the males, but the pedicels shorter and the buds oblong, .2 in. wide when expanded; the teeth sub-acute, triangular, concave, tomentose externally like the males; inside the teeth glabrous; the tube tightly embracing the pistil. *Ovary* globular, densely rufous-tomentose; style short, fleshy; stigma broad, fleshy, 2-lobed, the lobes bifid. *Fruit* shortly stalked, solitary or 2 to 5 together, ellipsoid to ovoid globose, rather pointed, densely rufous-tomentose at first, ultimately glabrous; .75 to 1.25 in. long, slightly ridged at the suture; arillus fleshy, quite entire, and enveloping the whole of the broadly ovoid seed. *M. Sumatrana*, *BL Rumph.* i. 187; *M. corticosa*, *Hook, f. Thorns. FL Ind.* 15B [in part] *A. DO. Prod.* xiv. 1, 205 (in part) *Miq. FL Ind. Bat.* i, pt. 2, 69, and in *Ann. Mus. Lugd. Bat.* i. 207; ii. 51 [both in part] *Kurz FL Burm.* ii. 284 [in part]. *M. glaucescens*, *H. f. FL Br. Ind.* v. 111, *vide H. f. Thorns. FL Ind.* [in part]. *Knema corticosa*, *Lour. FL Uoch.-Chine, ed. Willd.*, 742.

Tenasserim ; *Gallatly*. Martaban and Pegu, *Kurz*. Diamond Island and Narcondam, *D. Prain*. Andamans; *Kurz*, *King*, Nicobars ; *Kurz*, *King's Collector*. Penang; *Curtis*. Singapore; *Ridley*, *Cantley*. Malacca; *Maingay* [*Kew. Disl*] 1280-2, *Jlervy*. Distrib.—Sumatra, Java.

The Burmese and Andamans' specimens, upon which the foregoing description is founded, agree well with Blume's description and figure of *M. glauca*, and are exactly like authentic specimens of *M. glauca* at Peradeniya, Calcutta and Leiden, and also *vide Hook. f. Thorns. FL Ind.* 158) with authentic specimens of Loureiro's *Knema corticosa*. Drs. Hooker and Thomson, being at the time they wrote the *Flora Indica* of the opinion that the genus *Knema* would ultimately have to be kept up, gave this species the name *Myristica corticosa*. In the subsequently published *Flora of British India*, however, Sir Joseph Hooker writes that "the copious specimens received since the date of the *Flora Indica* show that the Tenasserim and Malayan plants included under *M. corticosa* in that work are not different from *M. glaucescens*." The very numerous specimens brought still more recently by the Calcutta Garden Collectors from Perak, the Andaman Islands and elsewhere, seem to me to prove that Sir Joseph Hooker's earlier view is the correct one, and that *Knema corticosa* and *Myristica yunnanensis* are separable by the characters given above. I have therefore followed the earlier view.

In his *Rumphia* [i. 187] Blume proposes the name *M. Sumatrana* for a plant collected by Korthals in Sumatra and referred by that botanist to *M. glauca*, *Bl.* This plant appears to be merely a large-leaved form of *M. glauca*, and is the plant named by Miquel [*FL Ind. Bat. Stippl.* 334] *M. corticosa*, *H. f. & T.*, VAR. *Sumatrana*. *M. glauca*, *Bl.*, VAR. *Sumatrana*, *Miq.*, is also apparently (as specimens from the Leiden

Herbarium show) his own *M. corticosa*, B1-, VAR. *lanceolata*. In Blume's figure of *M. glauca* (*Rumphia* i. t, 5D) the arillus is represented as red; whereas in specimens from Narcondam, of which the fruit was not quite ripe when collected by Dr. Prain, the arillus was pearly white. Possibly the red colour develops as the fruit ripens? Should *Knema* be re-established as a genus, the name of this plant would therefore be *Knema corticosa*, Lour. (1793). But as a *Myristica*, the name *M. glauca*, Blume (1825), takes precedence.

PLATE 157. *Myristica glauca*, Blumv. 1, Branch with ripe fruit (original specimen from Buitenzorg Herbm.); 2, portion of branch with male flowers; 3, portion of branch with female flowers; 4, cluster of young fruit; 5, arillus covering seed—all of natural size; 6, male flower; 7 & 8, staminal column and disc with anthers; 9, female flower; 10, ovary—enlarged.

54. MYKISTIDA MISSIDNIS, Wall Cat. 5788. A tree 20 to 50 feet high; young branches slender, dark-brown, minutely tawny-pubescent when young, ultimately glabrous and striate. Leaves linear-lanceolate to oblong-lanceolate, rarely oblanceolate, acute or shortly acuminate, the base acute; both surfaces glabrous, the upper shining, the lower rather pale, sub-glaucous, the midrib prominent; main nerves 12 to 14 pairs, sub-erect, slightly prominent beneath, puberulous when young; length 35 to 45 in., breadth 1 to 15 in. [rarely 1.75 in.]; petiole 4 to 5 in. Male flowers in numerous, 6 to 9-flowered fascicles on short axillary, warted tubercles; buds depressed-globose, bluntly 3-angled, 1 in. in diam.; perianth thick, with 3 triangular teeth, stellate-tomentose outside, striate and glabrous inside; pedicel 2 to 3 in. long, tomentose like the perianth; the bracteole above the middle, small. Staminal disc concave, its stalk short, striate; anthers about 11, sessile, radiating. Female flowers larger than the males, but in fewer-flowered racemes; buds clavate; perianth with 3 broad, obtuse, spreading teeth; ovary globose, rufous-silky; style short, glabrous; stigma with 2 spreading, lobulate lobes. Fruit spherical, apiculate, 5 to 5 in. in diam., silky-tomentose at first, but glabrescent with age, the slightly enlarged perianth persistent at its base; seed globose, smooth; arillus thin, fimbriate at the apex. *M. corticosa*, Hook. fil. & Thorns. Fl. Ind. 158 [in part] A. DV. in Prod. xiv. 1, 255; Miq. FL Ind. Bat i. pt. 2, p. 69 [in part]; Kurz For. FL Burm., ii. 284. *M. glaucescens*, Hook. fil. Fl. Br. Ind. v. 111 [in part]. *M. sphaerula*, Hook. fil. Fl. Br. Ind. v. 859. *M. lanceolata*, Wall Cat 6794. ? *M. angustifolia*, Roxb. Fl. Ind. iii. B47.

Burmah: at Mergui, Griffith; at Yaitho, Brandis; at Rangoon, Falconer; Heifer, [Kew Distrib. No. 4344]. Penang, Curtis Nos. 7DB & 935. Malacca, Griffith, Harvey, Cantky. Sclangor, Curtis. Pahang, Ridley No. 541.

The descriptions of their species given by the earlier writers on *Myristica* are so incomplete, that it is very doubtful whether several of the synonyms reduced above ought really to fall here.

PLATE 158. *Myristica Missionis*, Wall. 1, Branch with male flowers; 2, branch with female flowers; 3, twig with ripe fruit—of natural size; 4, male perianth; 5, andrrecium; 6 & 7, female flowers; 8, Ovary, style, and stigma—enlarged; 9 style and stigma—still further enlarged.

55. MYRISTIDA GIBBOSA, Hook. fil. & Thorns. Fl. Ind. 158. A tree; the youngest branches slender, at first rufous scurfy-puberulous, their bark afterwards dark-coloured,







7:



Drawn by A. D. Miller

MYRISTICA FRAGRANS. Hook.

Colored by E. D. Chisholm

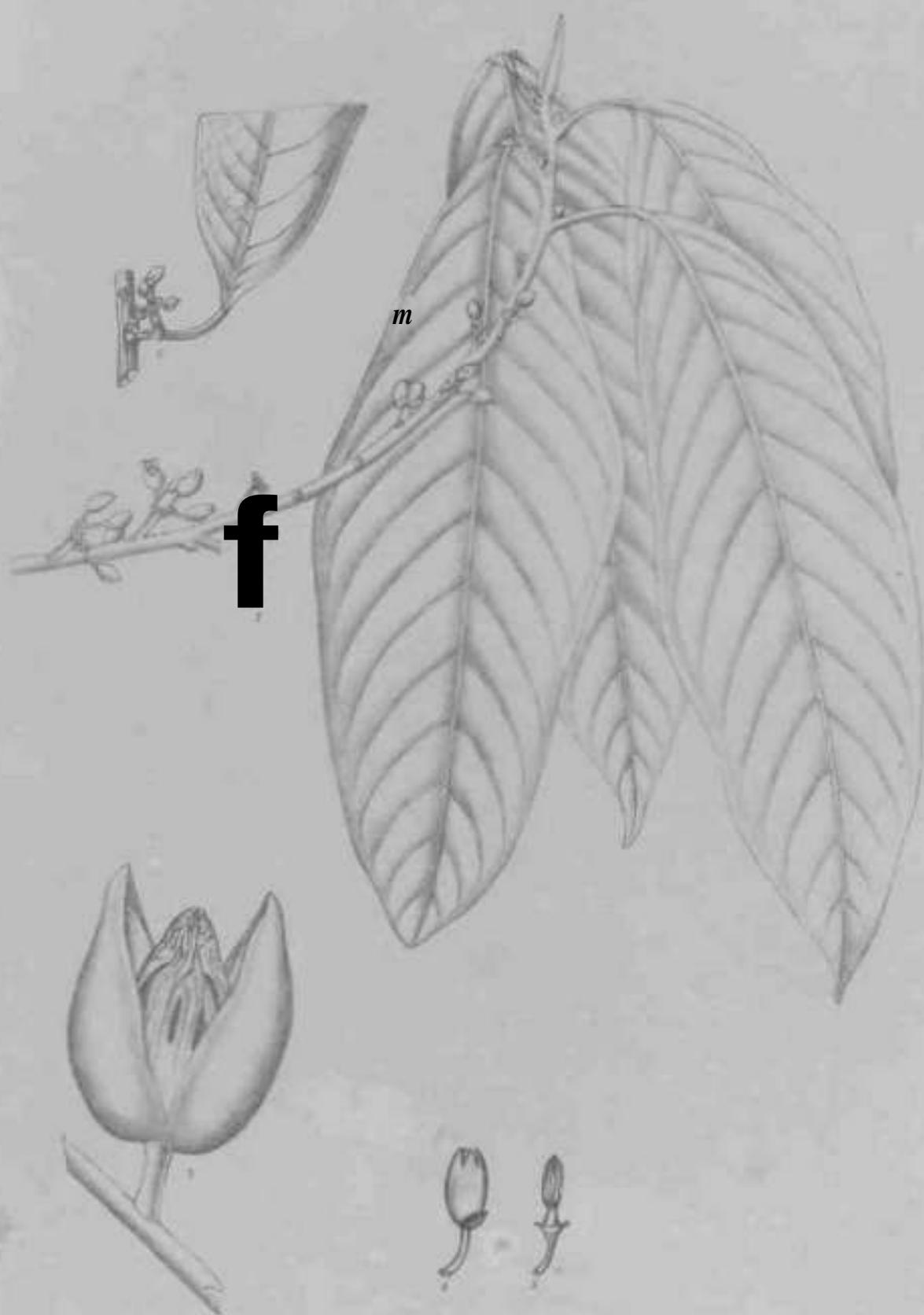


Drawn by A. C. Smith

MYRISTICA MALABARICA, Linn.

Engraved by J. D. Smith







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Ceylon

Bot. Mag. Brit. Mus. Nat. Hist., 1857, p. 107, t. 1, f. 107.

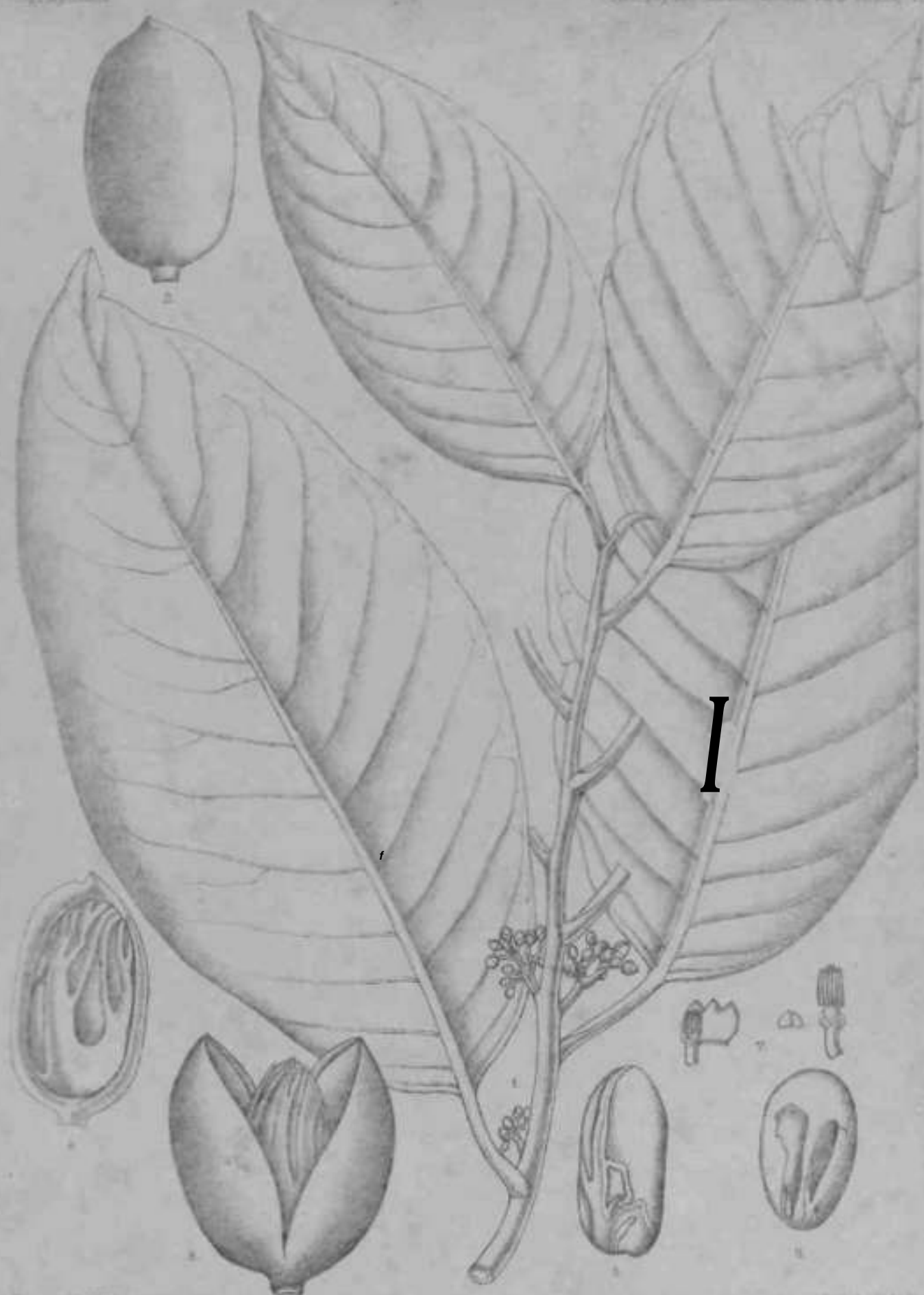


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Drawn by G. C. Davis

MYRISTICA MANGAYA, Hook. & B.

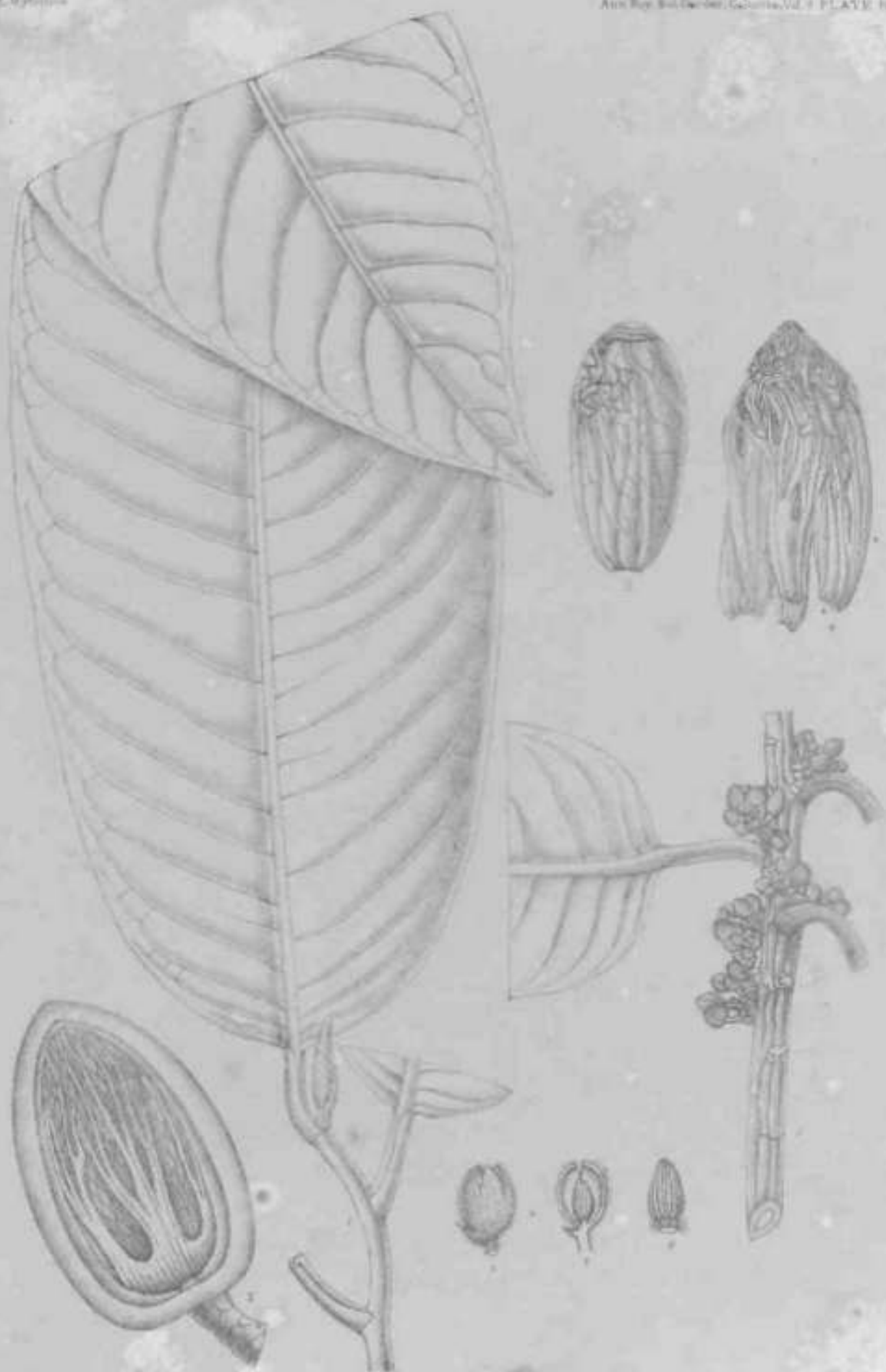
Label by A. C. M. Morgan















Described by C. H. S. Gentry

MYRTILLEA HUAYANA

1931



MYRSINE HIRSUPELLA Engelm.

Lab. by J. C. Clendenen

Young Myrica



Drawn by K. F. Dyer

MYRTICA HORSFIELDII: Clavon

Engr. by A. C. Goring





• rutili*

Ant" Acad Bot Garden, Calcutta, Vol 3, PLATE 134



Drawn by A. D. Mc

MYRISTICA MURTOMII Hook. &

Lith by A. C. Smith

V

V

Indist. ferruginea

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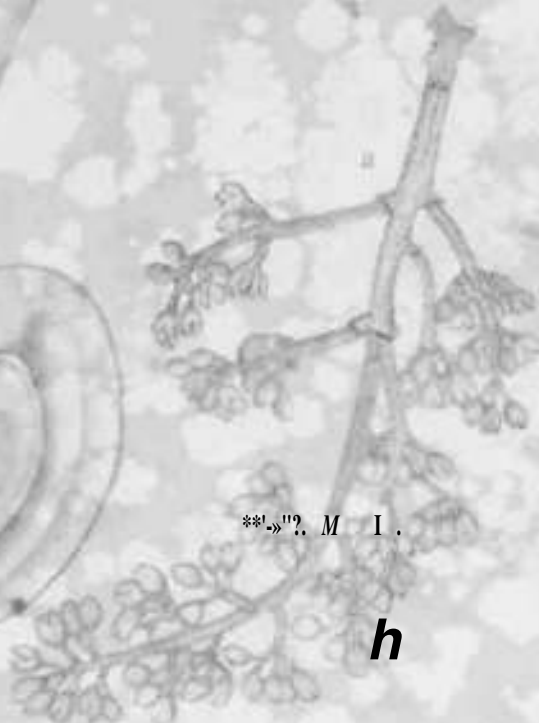


Drawn by F. N. C. 1877

INDISTICA FERRUGINEA, W.

Litho by A. C. Mather

F



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Drawn by E. M. M. M.

MYRISTICA KINNABALA (L.) DC.

Colored by E. M. M. M.



Drawn by W. E. Dean

Let. by A. C. Sargent

MYRISTICA AMYGDARINA, Walp.





MYRISTICA RUBIGINOSA, King

Life by A. T. Milne





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MYRTICA, WALLICH, Hook. II et Thoms

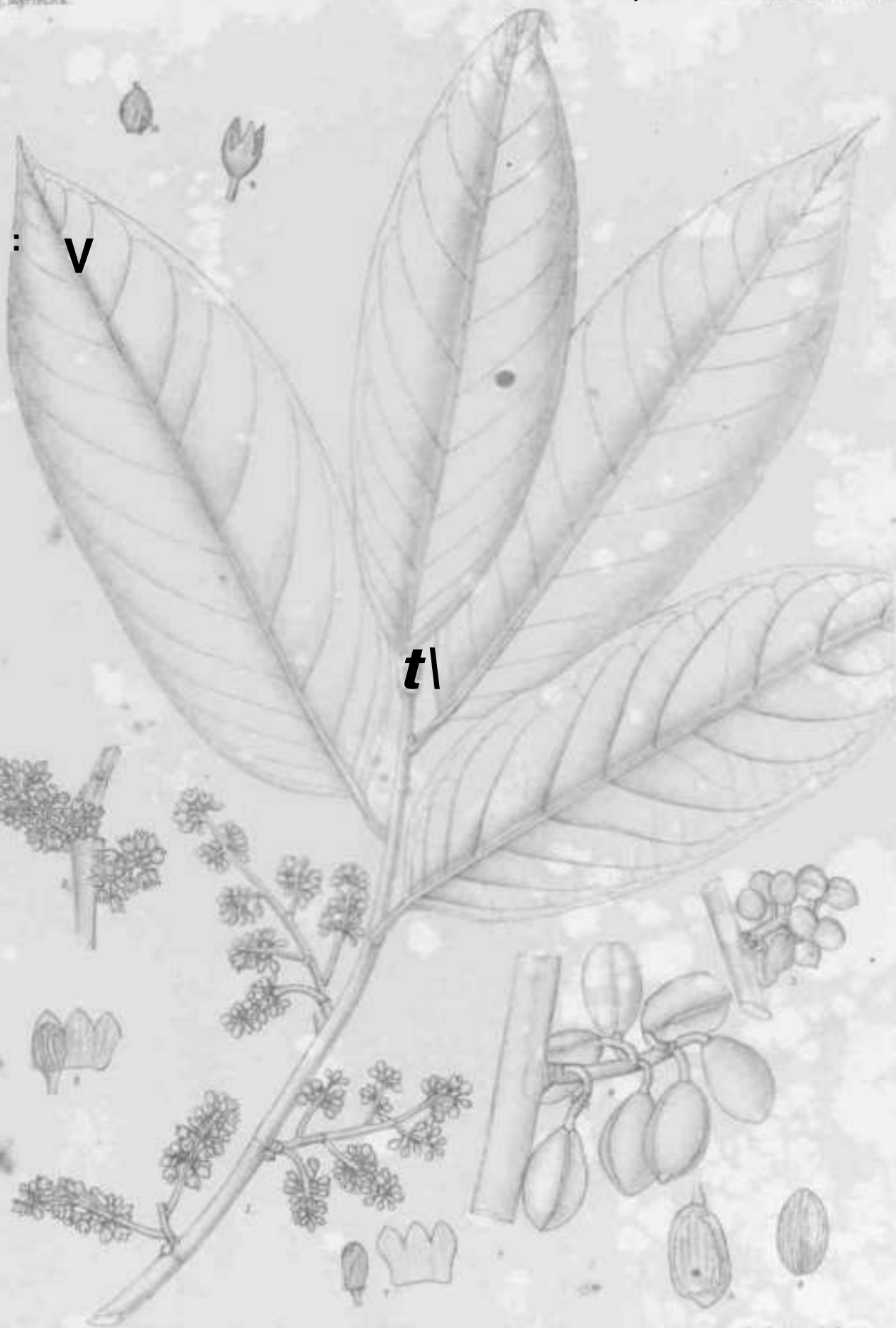
Ed. by A. C. Murray







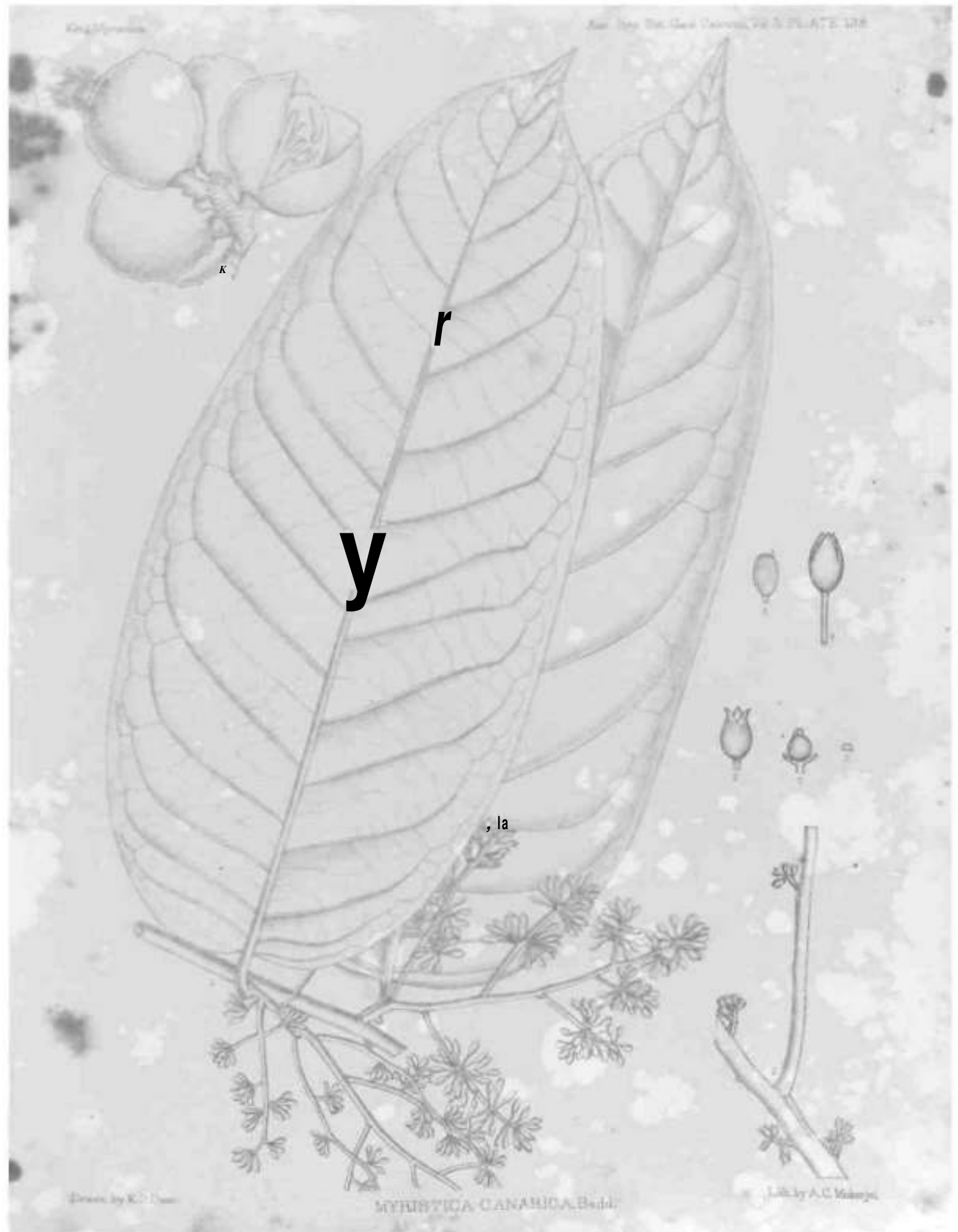




Drawn by A. N. S. King

MYRISTICA FORESHII King

Col. by A. C. H. orj*

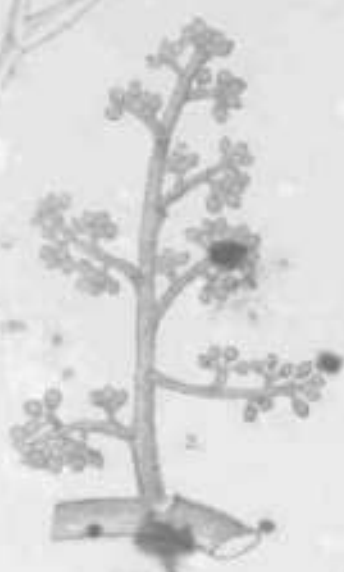
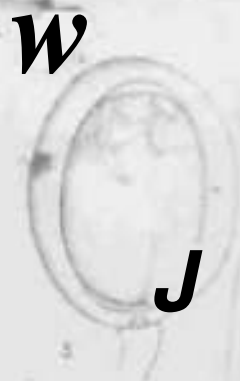












Drawn by E. F. Dax

Engraved by E. H. Dax

MYRTICA MAJUSCULA King

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London CH. Dorr

LYTHISTICA RIDLEYANA, King.

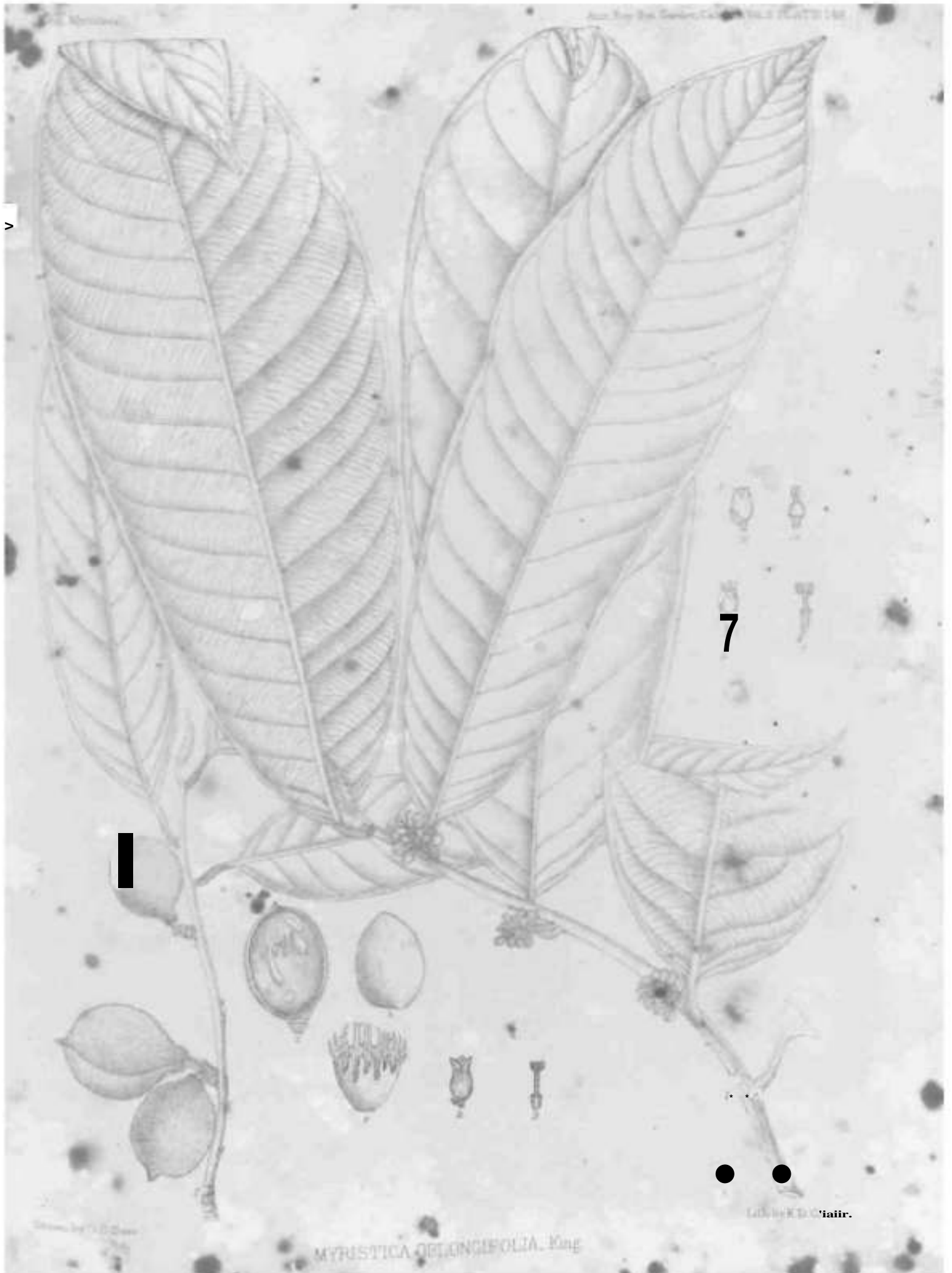


Drawn by G. C. Davis

Lutzky K. H. 2000.

MYRISTICA POLYSPHERULA, Hook. fil.





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MYRISTICA OBLONGIFOLIA. King

LIBRARY Fair.

Jft .



C



MYRICA CONFERTA (L.) R. & S.

K *



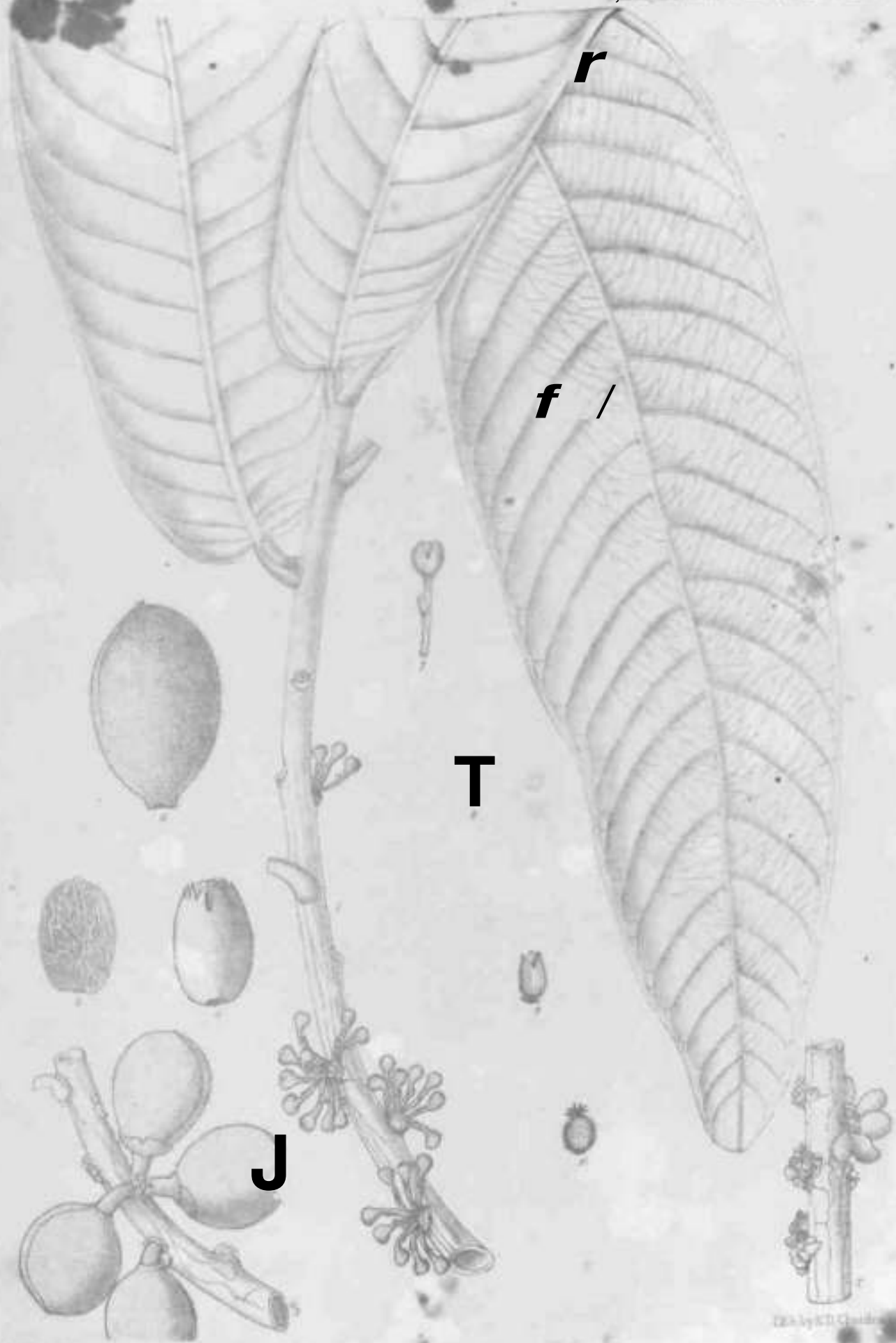


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MYRISTICA CINNAMOMEA, Blume

Drawn by J. C. Moore



MYRISTICA RACEMOSA, Hook. f. and Th.



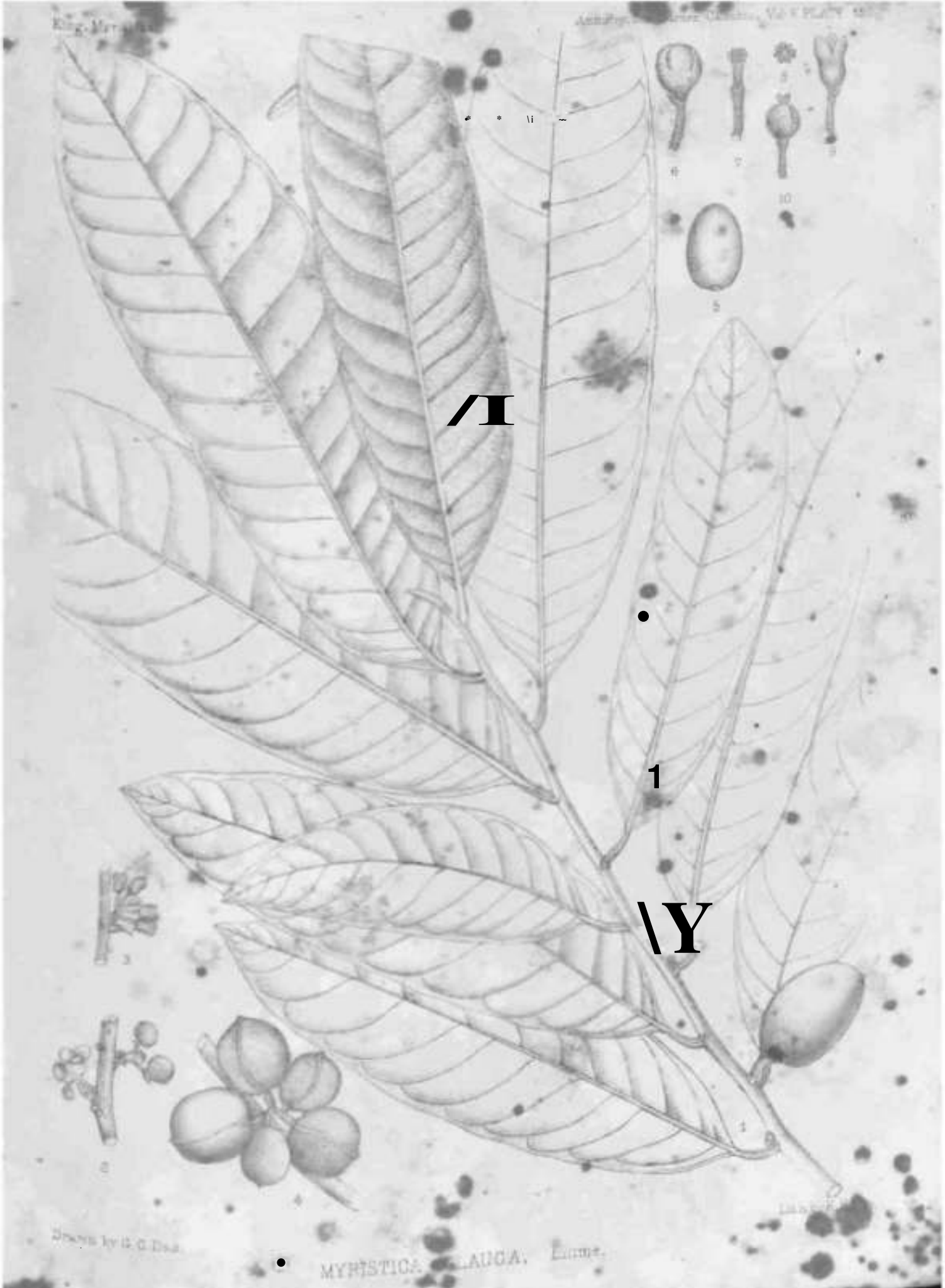
MYRISTICA AURINA. SHEL.

Each by A.C.T.

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King-Met...

Amboyna, Sumatra, Java, V. & F. 1857



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Drawn by H. G. Don

MYRISTICA LAUCA, Lamour.



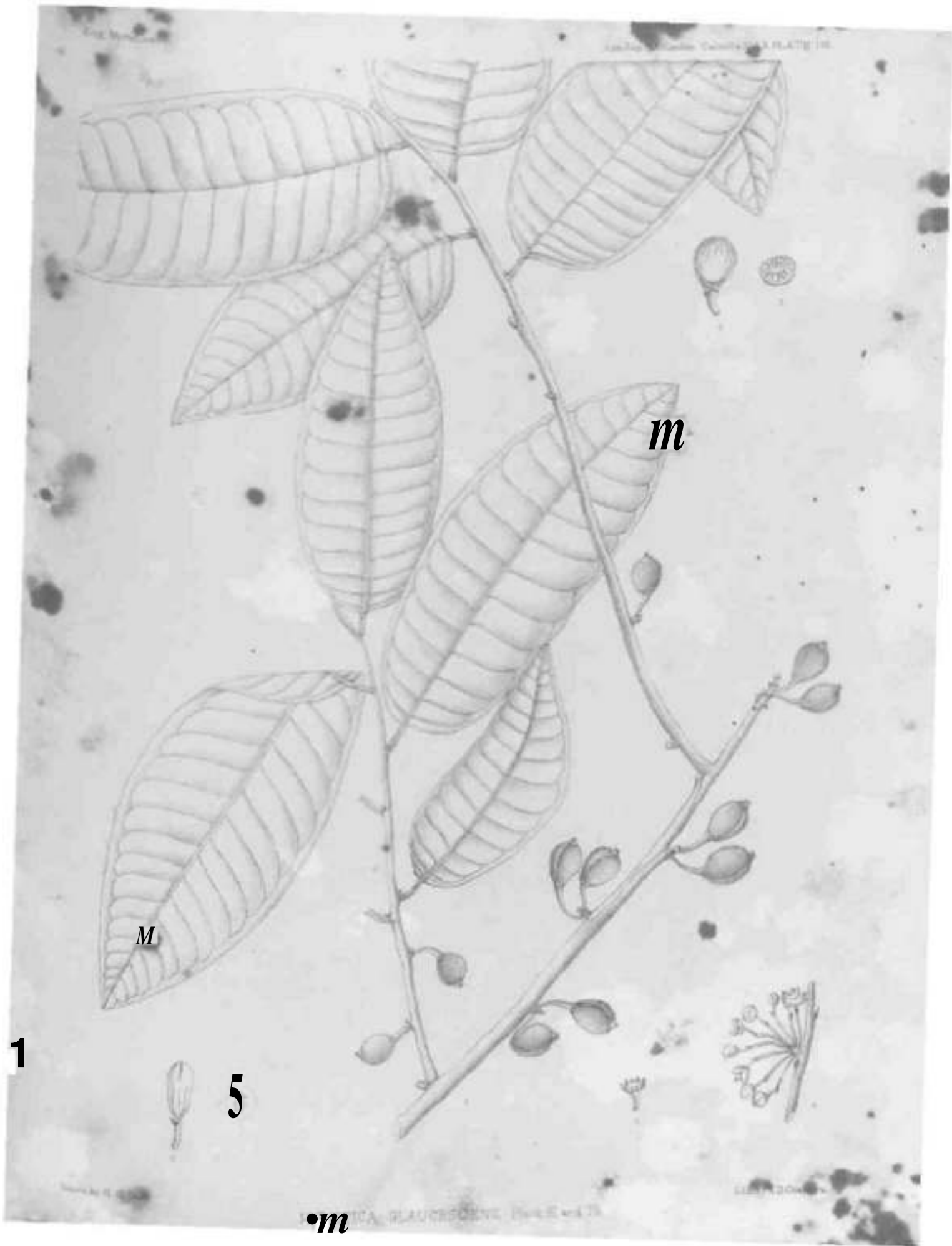
MYRTICA, GORDONIA, WALL.



by A. D. Molle.

MYRISTICA GIBBOSA, Hook. fil. and Thoms.

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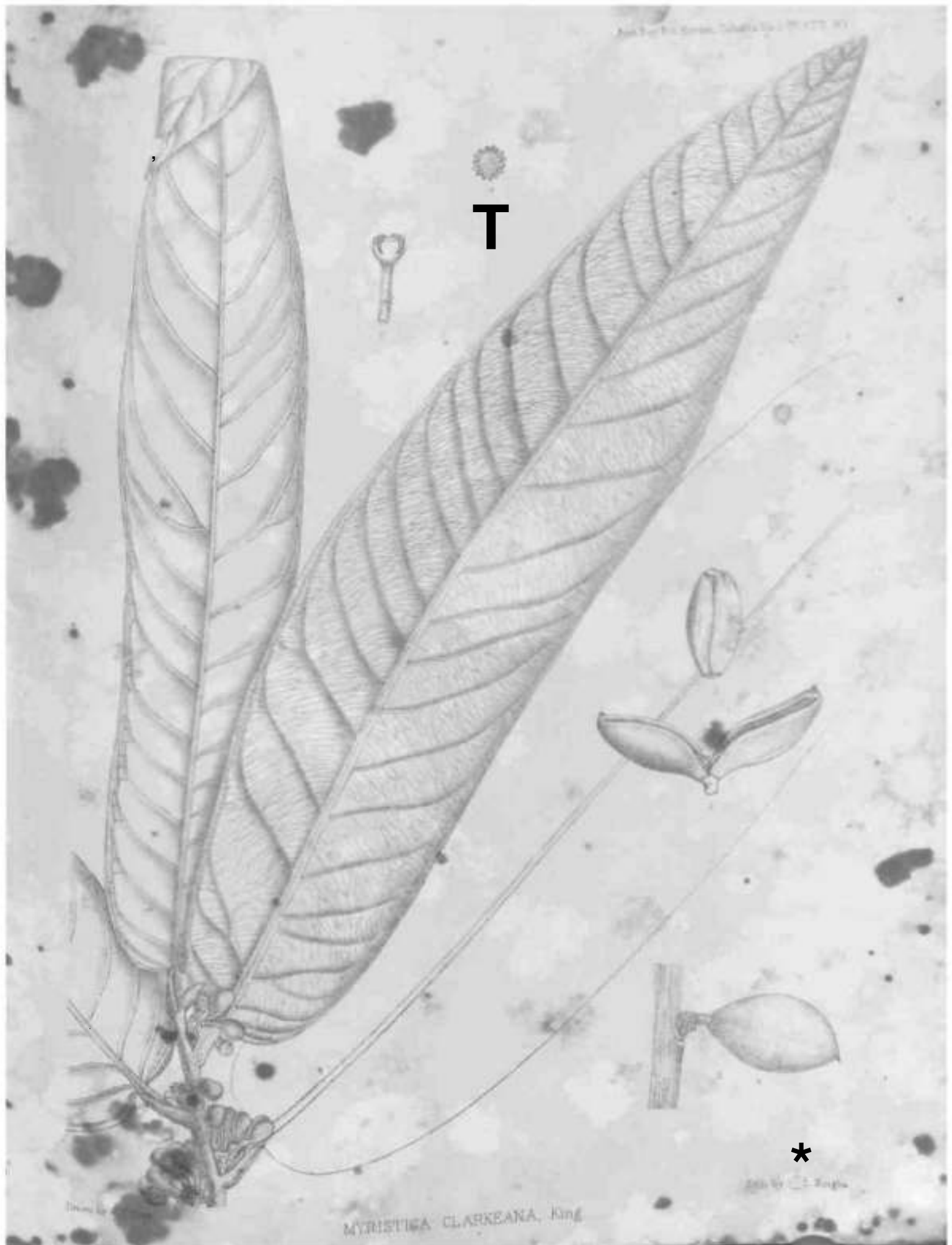
MYRISTICA ERRATICA, Hook. fil. and Thoms.



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HYBRIDICA NOOTE • RIAN VAIL



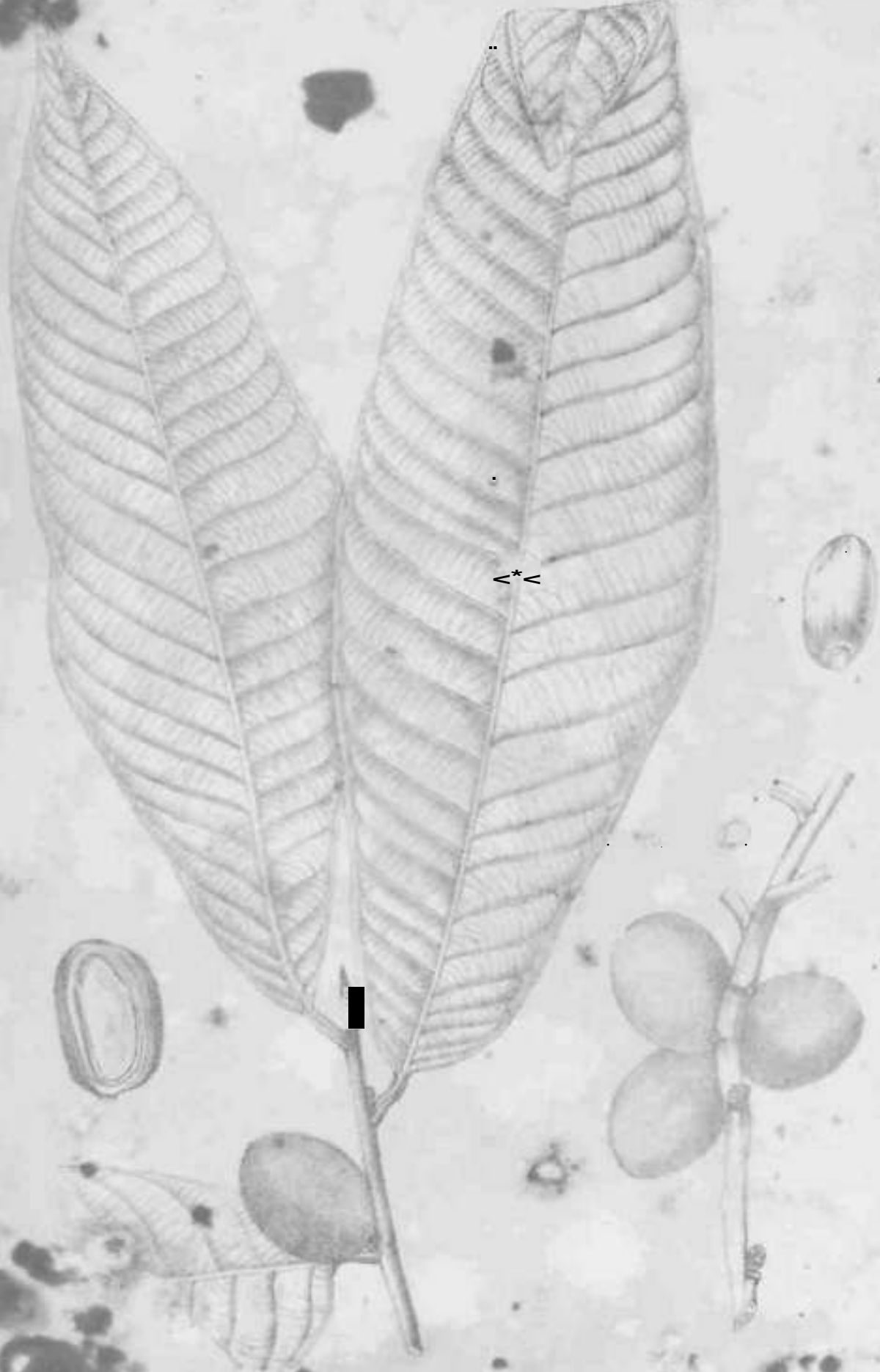
MORICOLA LINDLEYA, 1845



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MYRISTICA CLARKEANA, King



MYRSINUS LONGIFOLIA, WILD.

V



Lithog. K. H. D. & Co.

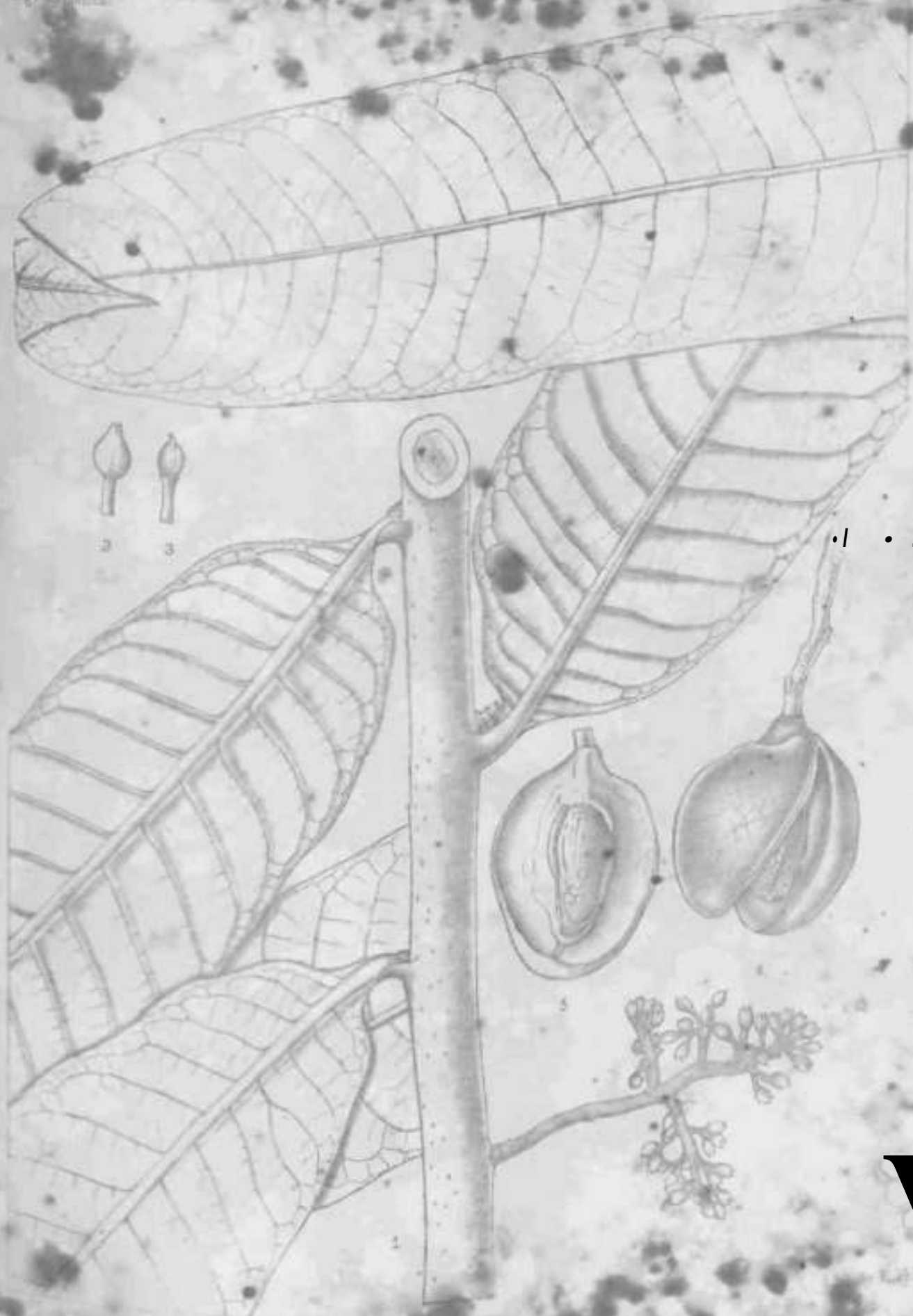
LEUCISTICA CURTIS King.



MYRISTICA CANTLEYI Hook. f.

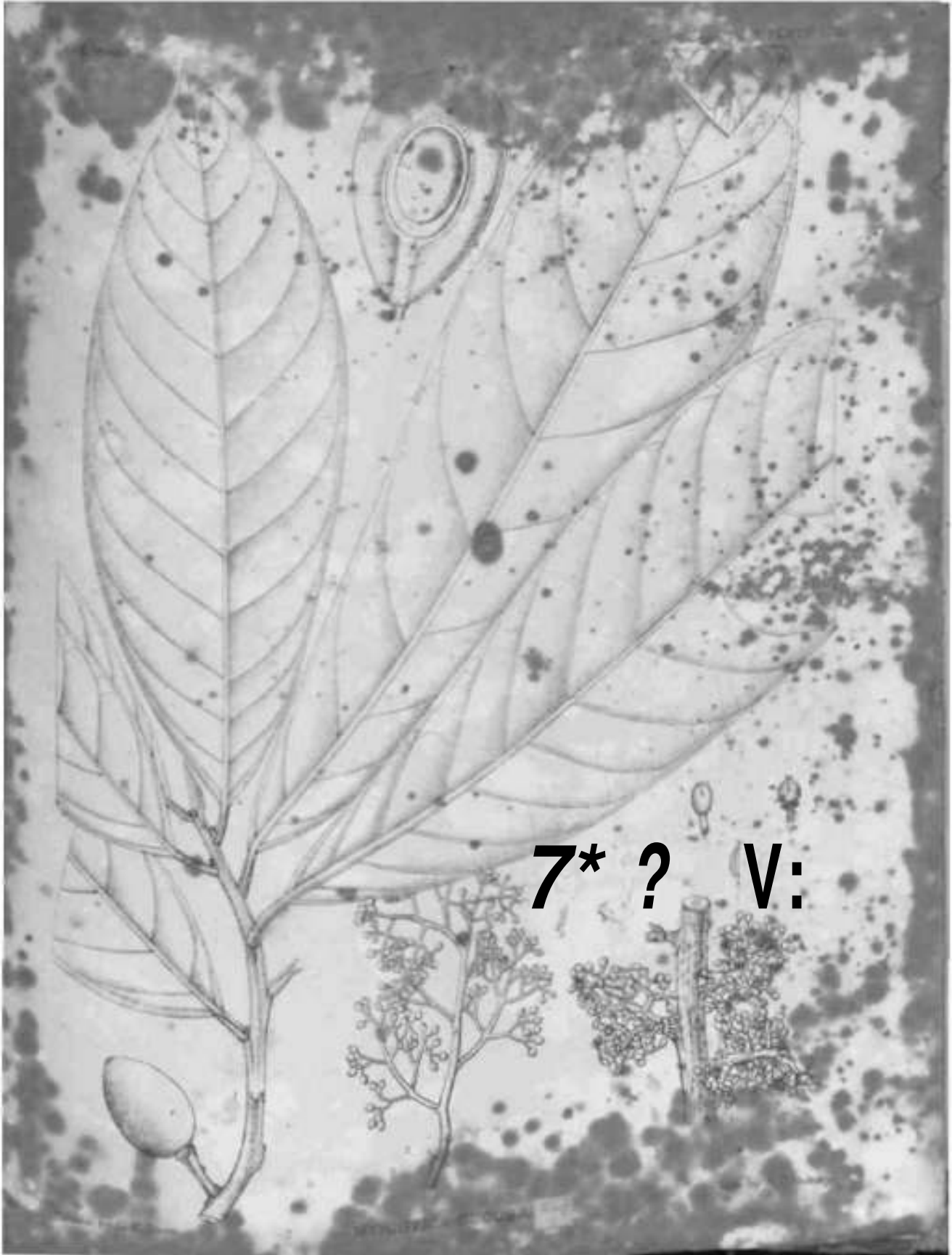
King, *Spicata*

King, *Spicata*



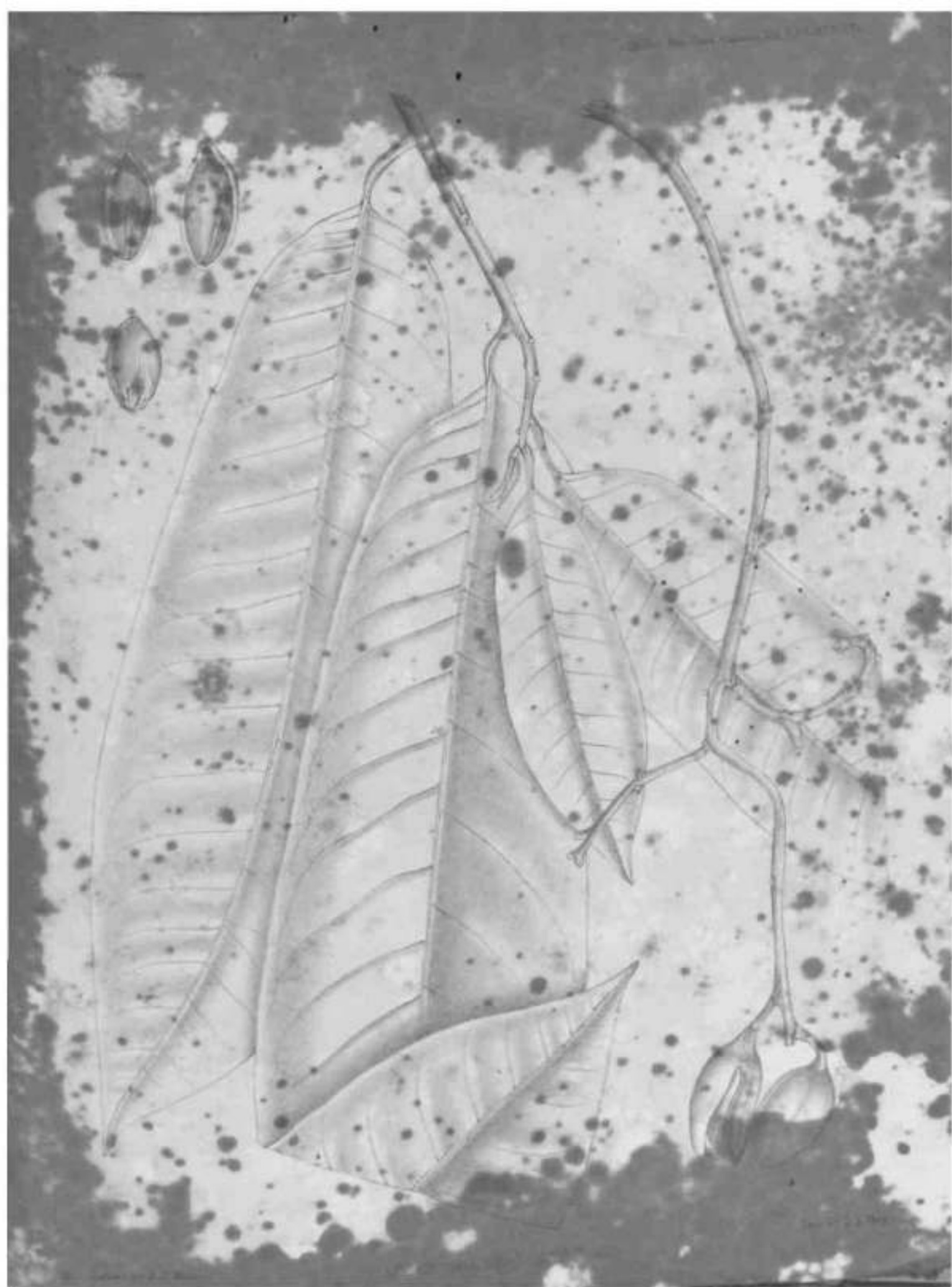
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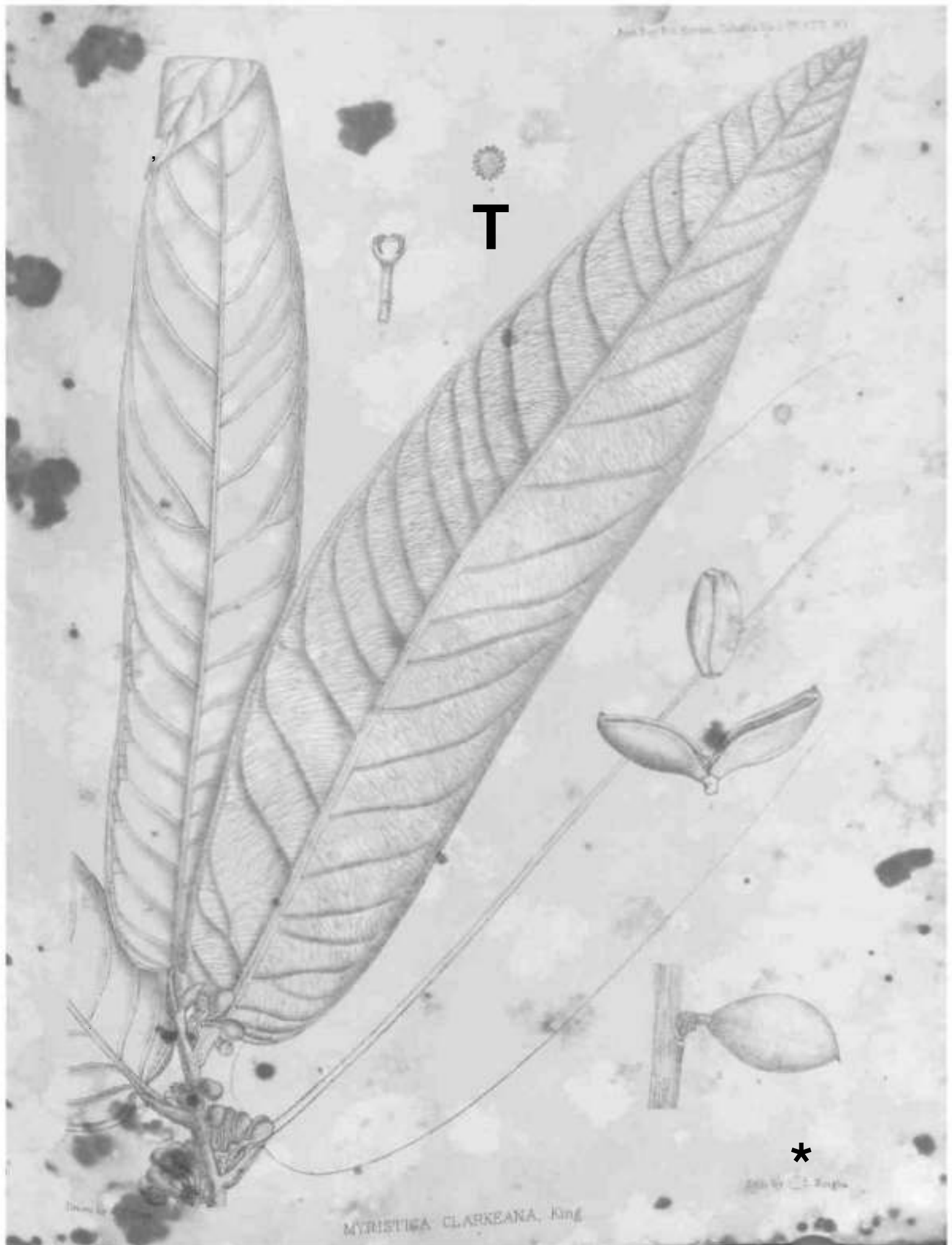
MYRISTICA ERRATICA, Hook. fil. and Thoms.



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HYBRIDICA NOOTE • RIAN VAIL



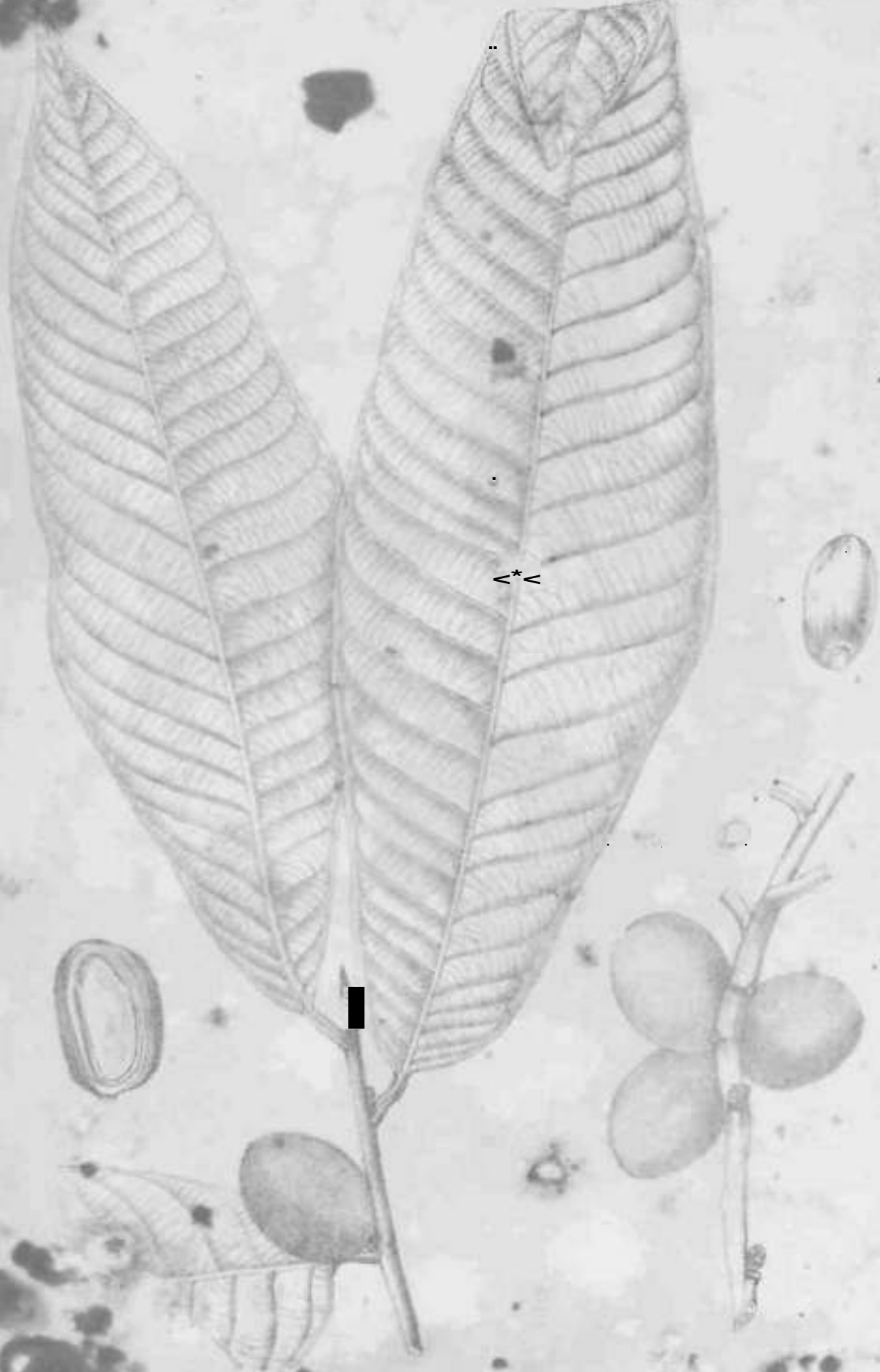
MORITICA LINDLEYA, 1845



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MYRTICA CLARKEANA, King



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LEUCISTICA CURTIS King.

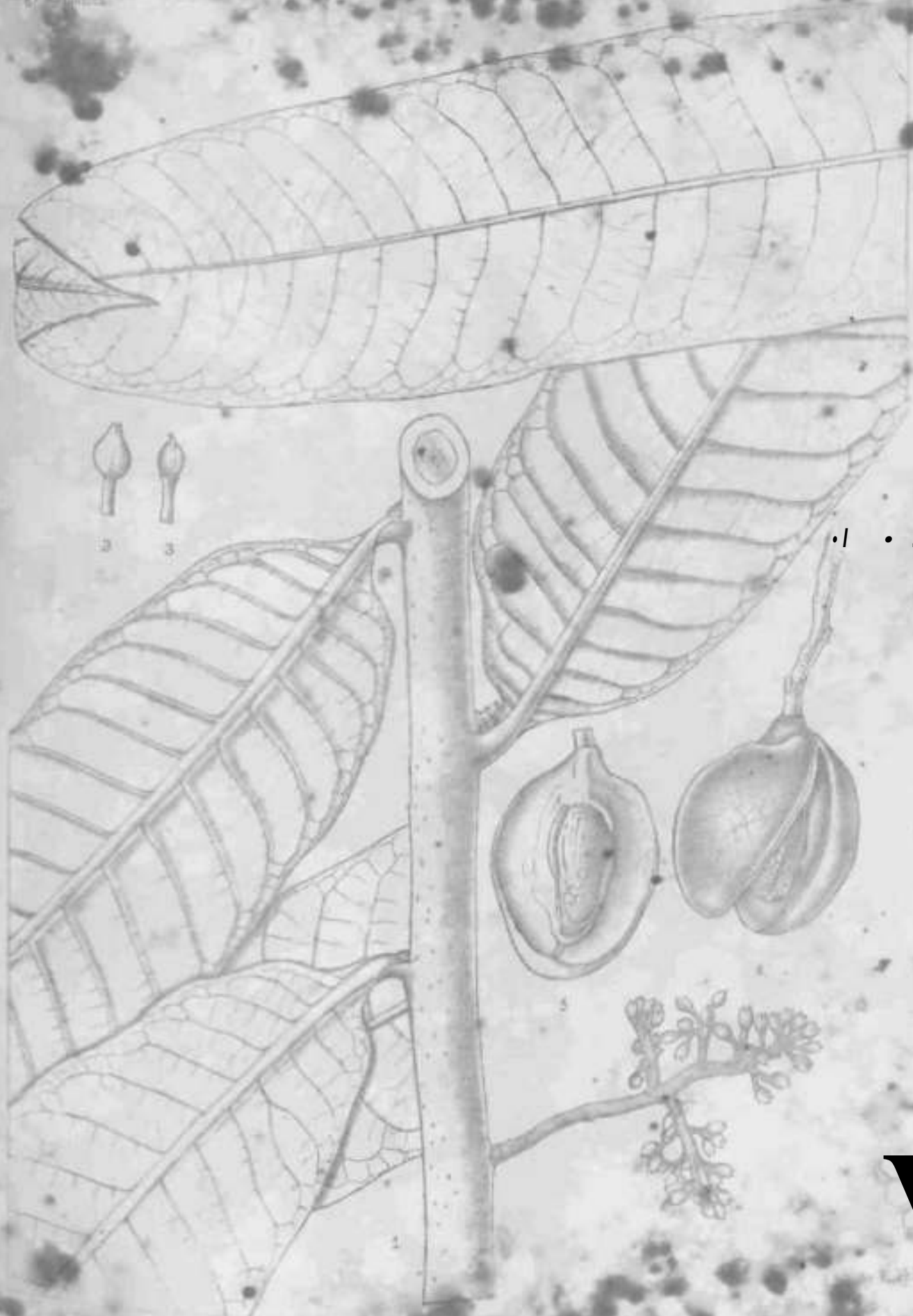
Edw. A. M. D. 1847



MYRISTICA CANTLEYI Hook. f.

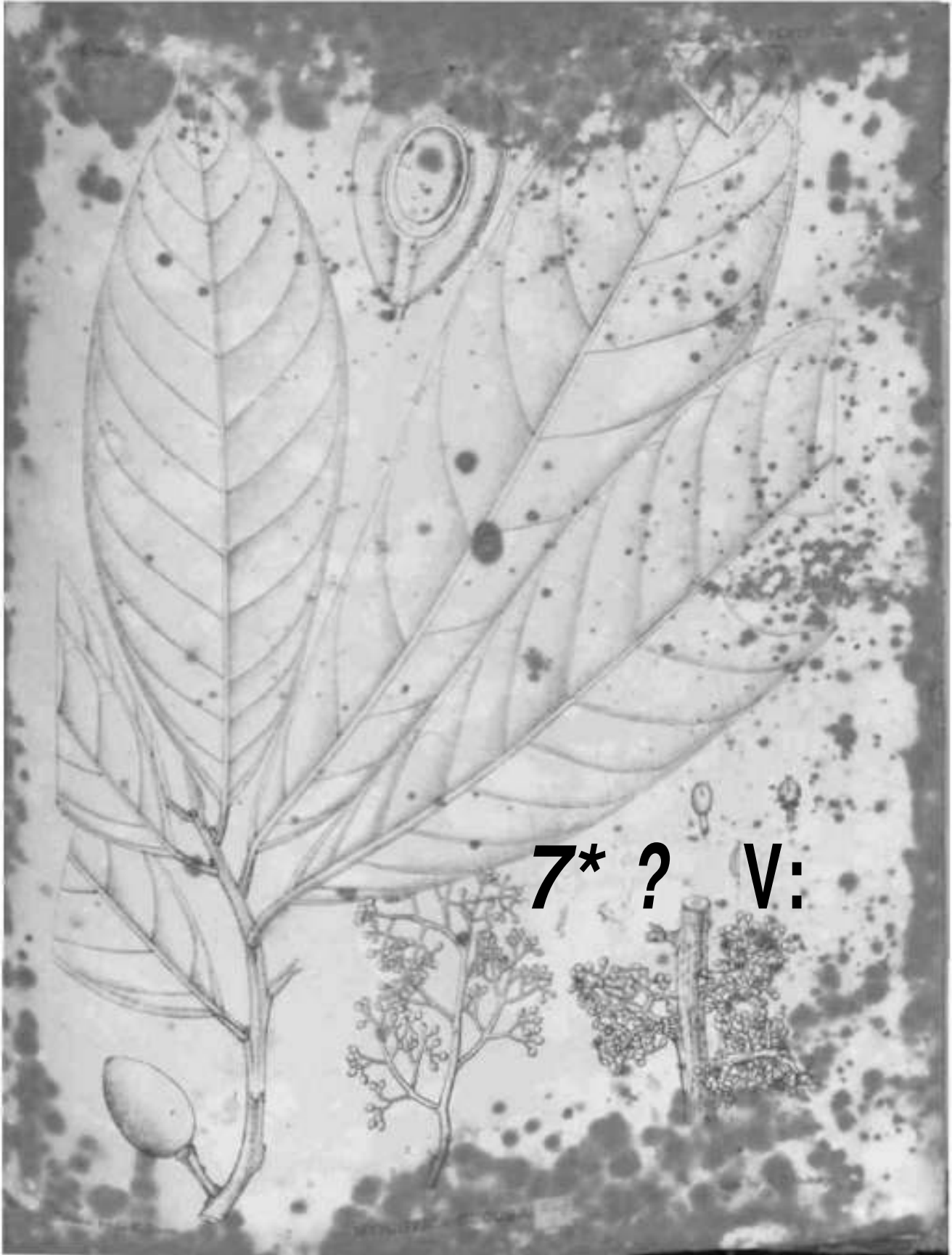
King, *Spicata*

King, *Spicata*



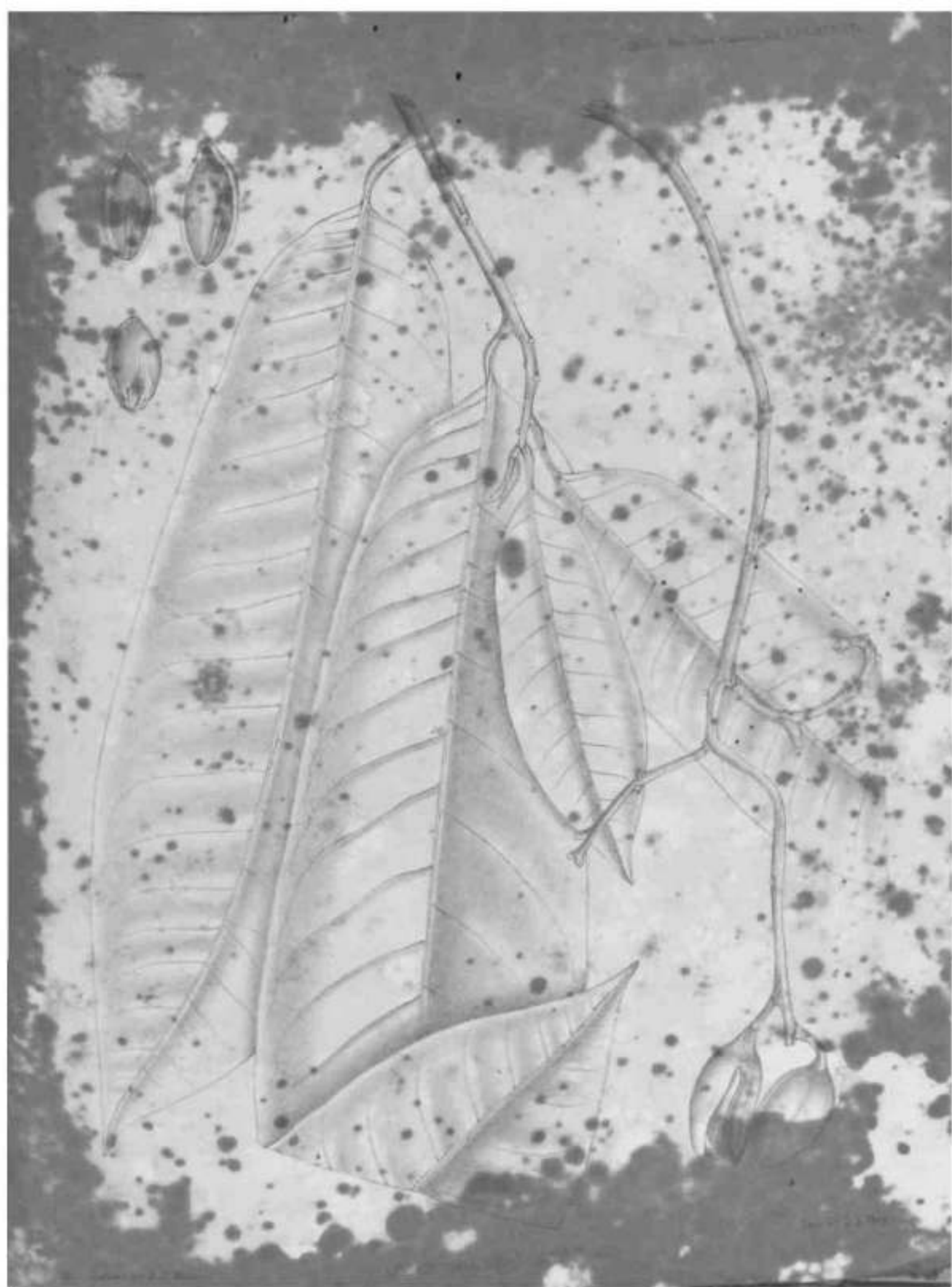
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