

**THE
ORCHIDS OF BOMBAY**

**H. SANTAPAU
&
Z. KAPADIA**

1966

The Orchids of Bombay

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BY

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&

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FOREWORD

The present book is a reprint of a series of articles published in the Journal of Bombay Natural History Society in 1959-1963, under the title of 'Critical Notes on the Orchidaceae of Bombay State'. It is a revision of the family Orchidaceae intended to bring up-to-date the treatment of the family by Th. Cooke in his *Flora of the Presidency of Bombay* and by E. Blatter and C. McCann in their series 'Revision of the Flora of the Bombay Presidency', published in 1931-1932 in the Journal of Bombay Natural History Society (Vols. 35 & 36).

This revision was undertaken by the junior author under the guidance of the senior one, for the degree of Ph. D. in Botany of the University of Bombay. Both the authors made extensive collections of Orchids all over Bombay State for many years; in addition the senior author studied the collections preserved in the Royal Botanic Gardens, Kew, England, and his critical notes and photographs of type specimens have been made use of in this revision. We have consulted other herbaria in India, in particular the Central National Herbarium, Calcutta, and the Regional Herbarium of the Botanical Survey of India, Poona; through the kindness of Prof. A. Abraham we have been able to examine some specimens of the herbarium of the University of Kerala.

The authors desire to express their gratitude to the Bombay Natural History Society for the publication of the series in its Journal and for permission to republish it in book form. Most of the plants discussed in these pages were for a time kept alive in the garden of St. Xavier's College, Bombay, so that descriptions and illustrations were based on living specimens. We wish to express our gratitude to the authorities of St. Xavier's College, Bombay, for the facilities extended to us for our work. Our gratitude goes also to the Government of India for the publication of this book under the auspices of the Botanical Survey of India.

The area covered by this book is Bombay State, as the latter stood in 1955, and, therefore, includes districts that are now under Mysore State, but does not include Marathwada. With but few exceptions, the specimens mentioned for the various parts of Bombay are preserved in Blatter Herbarium, St. Xavier's College, Bombay.

Calcutta, March 1st, 1964.

H. SANTAPAU
Z. KAPADIA

ARTIFICIAL KEY TO THE GENERA OF ORCHIDACEAE

1. Epiphytic or lithophytic plants :
 2. Plants with distinct pseudobulbs :
 3. Pseudobulbs flattened, discoid, rounded :
 4. Pseudobulbs with distinct reticulate, lace like sheaths ; flowers orange or deep brown-red ; sepals united to form a tube at least at base *Porpax*
 4. Pseudobulbs without lace-like sheaths ; flowers greenish-yellow or white ; sepals completely free *Eria*
 3. Pseudobulbs elongated, ovoid or conical :
 4. Pseudobulbs 2- or more-noded (rarely 1-noded in *Dendrobium* sect. *Stachyobium*) :
 5. Leaves thick, coriaceous, 20-25 cm long ; inflorescence lateral ; lip with calli or keels at base *Cymbidium*
 5. Leaves thin, membranous, not exceeding 15 cm in length ; inflorescence terminal or lateral ; lip without calli or keels :
 6. Flowers spurred ; spur projecting beyond lateral sepals ; sepals and petals about 4 cm long ; pollinia 8 *Thunia*
 6. Flowers with a short mentum which is enclosed by lateral sepals ; sepals and petals up to 2.5 cm long ; pollinia 4 or 8 :
 7. Inflorescence terminal ; lip superior ; pollinia globular with a short broad caudicle *Polystachya*
 7. Inflorescence terminal or lateral ; lip inferior ; pollinia linear or pyriform without caudicles :
 8. Pedicel and ovary sparsely pubescent ; pollinia 8, pyriform *Eria mysorensis*
 8. Pedicel and ovary glabrous ; pollinia 4, linear or linear-oblong *Dendrobium*
 4. Pseudobulbs only of a single node :
 5. Pseudobulbs with 2 or more thin, membranous leaves ; leaves deciduous at time of flowering ; scape bearing a fan-shaped, radiating umbel at apex ; lateral sepals $2\frac{1}{2}$ - $3\frac{1}{2}$ times as long as the dorsal *Cirrhopetalum*
 5. Pseudobulbs with a single thick coriaceous leaf on top ; leaves persistent ; scape 1-flowered or bearing an elongated raceme ; sepals sub-equal :
 6. Pseudobulbs 1×1.3 - 1.7 cm shortly conical-ovoid ; leaf 1.5-4.5 cm long ; scape 1-flowered ; anther with a long horn *Trilas*
 6. Pseudobulbs 2-8 cm long, oblong or conical-ovoid ; leaf 4-30 cm long ; scape many-flowered ; anther without a horn :
 7. Pseudobulbs conical-ovoid, dark-green or brownish-purple with broad grooves along its length ; leaf-apex acute ; scape 20-45 cm long *Pholidota*

7. Pseudobulbs oblong, yellowish-green, 3-5 angled; leaf-apex obtuse or emarginate; scape up to 12 cm long *Bulbophyllum*
2. Plants without pseudobulbs :
3. Plants completely leafless, or rarely with scale leaves; scape small, glandular-pubescent, arising directly from cluster of greenish roots *Chiloschista*
3. Plants with normal green leaves :
4. Plants with fleshy rhizomes; scape pubescent; sepals united for about half their length; pollinia lamellate *Cheirostylis flabellata*
4. Plants without rhizomes; scape glabrous; sepals free; pollinia waxy :
5. Leaves membranous, plicate; lip superior *Malaxis versicolor*
5. Leaves fleshy or coriaceous, not plicate; lip inferior :
6. Plants without a distinct stem; leaves radical :
7. Leaves sessile, fleshy, laterally compressed; flowers in terminal, dense, cylindric, simple spikes or racemes; pollinia 4 without a gland or caudicle *Oberonia*
7. Leaves petiolate, coriaceous, normal; flowers in lateral, laxly branching racemes; pollinia 4 with a broad gland *Sirhookeru*
6. Plants with a distinct stem; leaves cauline :
7. Leaves terete; scape up to 2 cm long, stout, woody *Luisia*
7. Leaves flat, scape longer, herbaceous :
8. Scape branched, 2-5 times as long as leaves; flowers not spurred; lip resembling a bee *Cottonia*
8. Scape simple or rarely branched, not more than twice as long as leaves; flowers spurred; lip not resembling a bee :
9. Spurs 2 *Diplocentrum*
9. Spur 1 :
10. Leaf-apex acute or sharply pointed; flowers about 7 mm across *Sarcanthus*
10. Leaf-apex irregularly toothed with 1-3 sharp teeth; flowers larger :
11. Flowers whitish or pale pink; lip scarcely lobed; spur laterally compressed, truncate at apex *Rhynchostylis*
11. Flowers variously coloured, not whitish or pale pink; lip distinctly 3-lobed; spur short oblong or conical, obtuse at apex *Vanda*

10. Leaf-apex bilobed, lobes unequal or subequal, rounded or subacute; flowers larger :
11. Stem very short; mid-lobe of lip semi-circular forming a brim on large ventricose, saccate spur; pollinia shorter than narrow linear caudicle, with a small linear gland *Gastrochilus*
11. Stem long; midlobe of lip various; spur narrow, linear or rarely a small conical sac; pollinia about equaling oblong caudicle with a small more or less oblong or square gland :
12. Sepals and petals coriaceous, yellow with unequal, horizontal, crimson bars; lip 3.5-7.5 mm long, column without a foot *Acanthe*
12. Sepals and petals pale pink or pinkish-mauve; lip 10-28 mm long, column with a stout foot *Aërides*
1. Terrestrial or saprophytic, rarely epiphytic plants (see *Cheirostylis*, *Malaxis*) :
2. Lip spurred; spur projecting beyond lateral sepals :
3. Plants with green leaves; leaves not plicate; anther immovably affixed to column by a broad base :
4. Flowers about 7.5 cm across, greenish-white; stigmatic surfaces flat, almost confluent *Platanthera*
4. Flowers not exceeding 3 cm across, green, white or yellow; stigmatic surfaces not flat, separate :
5. Ovary and capsules ± erect and parallel to peduncle, not spreading at an angle to it; stigmatic surfaces in form of small swellings on edge of lip *Peristylus*
5. Ovary and capsules widely spreading at an angle to peduncle; stigmatic lobes standing out as stalked appendages *Habenaria*
3. Plants with green leaves or rarely saprophytes; leaves plicate, rarely absent; anther separable from the column or often attached at base by a slender filament :
4. Plants with a cluster of stout fibrous roots; lip superior *Tropidia*
4. Plants with a fleshy rhizome or subterranean tuberous pseudobulbs; lip inferior :

5. Flowers appearing with the leaves :
6. Leaves puberulous ; spur long, slender ; pollinia 8 *Calanthe*
6. Leaves glabrous ; spur short, rounded, conical or saccate ; pollinia 2 :
7. Inflorescence erect ; lip with a short, rounded or conical spur *Eulophia*
7. Inflorescence decurved ; lip with a wide conical sac *Geodorum*
5. Leaves absent or flowers appearing after leaves :
6. Leafless saprophytes with fleshy, rounded or ellipsoid rhizomes lying horizontally on ground ; pollinia 2, powdery, each with its own long, slender caudicle *Epipogium*
6. Leaves present appearing much before flowers ; plants with fleshy, tuberous, irregularly shaped pseudobulbs ; pollinia 2, waxy, attached to a short caudicle and a small gland *Eulophia*
2. Lip not spurred, often saccate at the base ; sac never projecting beyond the lateral sepals :
3. Sepals united for about half their length :
4. Leafless, brown saprophytes ; pedicels greatly elongating in fruit ; limb of lip undivided *Didymoplexis*
4. Plants with green leaves ; pedicels not elongating in fruit ; limb of lip 2-cleft, lobes digitately fimbriate *Cheirostylis*
3. Sepals free :
4. Leaves and flowers not appearing together :
5. Leaves petiolate, cordate or orbicular ; scape glabrous ; pollinia 2, powdery, without caudicles or glands *Nervilia*
5. Leaves sessile, narrowly oblong-lanceolate ; scape pubescent ; pollinia 8, waxy, adhering to a small viscid mass *Pachystoma*
4. Leaves and flowers appearing together :
5. Plants with subterranean pseudobulbs ; pollinia 4, waxy without caudicles, adhering in pairs to a small, viscid mass :
6. Lip inferior, without auricles ; column long, winged in upper part *Liparis*
6. Lip superior, with or without auricles ; column very short, wingless *Malaxis*
5. Plants with a rhizome or a cluster of fibrous roots ; pollinia 2, lamellate with a caudicle and a small, orbicular gland :
6. Plants with a cluster of stout, fibrous roots ; spikes spirally twisted ; lip subsaccate at base, the apex not widened into a blade *Spiranthes*
6. Plants with a short or long rhizome ; spikes not spirally twisted ; lip with a prominent convex sac at base, the apex widened into a bilobed blade *Zeuxine*

1. *HABENARIA* WILLD.

The Orchidaceae of Bombay were revised by Blatter and McCann in the *Journal* in the years 1931-1932 ; in our intensive work on the family we have found a number of details in which some further revision work is necessary. Except for a few isolated cases, we have not been able to study the types of the new species described by Blatter and McCann ; in some cases their types were not actual specimens but careful drawings with notes taken from fresh plants at the time of collection ; we have based our study on the illustrations and descriptions given by Blatter and McCann for the revision of their new species.

A number of our specimens have been checked with the types in Kew Herbarium or, where the types were not available, then with specimens critically examined by a number of authors, among them O. Kuntze, J. S. Gamble, etc. For our study we have had at our disposal photographs of many of the Kew types taken by the senior author, also photographs of most of the Bombay orchids represented in the Kew Herbarium. We have relied much on the synonymy given by Hooker f. in *FLORA OF BRITISH INDIA*, for it is clear from Huxley's *LIFE AND LETTERS OF SIR J. D. HOOKER* that Hooker spent more time and energy in the study of the Orchidaceae of India than in any other family with the possible exception of the Gramineae. Hooker's synonymy is not disputed ; his choice of names is sometimes rejected in these pages.

Both of us, but particularly the younger author, have spent many days in the field all over Bombay State in an attempt to collect, as far as possible, all the orchids of Bombay in perfect condition. With but few exceptions we have succeeded in this ; the exceptions are mostly species that do not seem to have been collected by subsequent botanists after the original collection and publication of the species. Our collections, then, become important especially in cases where no type sheet was designated when the new taxon was described by Bombay botanists.

KEY TO THE SPECIES OF *HABENARIA*

Identification of the genus is about the easiest among the ground orchids of Bombay ; identification of the species is somewhat difficult. There is little variation in the general habit of these species, except that some species have leaves flat on the ground, most species have leaves, which are either radical or cauline, but are not flat on the ground. Some of the species appear mostly on old walls ; others favour an open situation in grass fields, whilst others occur in the undergrowth of dense forest ; one plant of the genus is found to be epiphytic.

1. Petals 2-partite :

2. Sepals with filiform tips ; lateral lobes of lip
less than half as long as midlobe

stenopetala

2. Sepals without filiform tips ; lobes of lip subequal, or the lateral ones much longer :
3. Flrs. pure green, occasionally faintly whitish or yellowish, strongly foul-scented after sunset ; lower segment of petals filiform, less than (or rarely up to) half as long as the upper ones ; spur scarcely clavate *digitata*
3. Flrs. pure white, greenish- or rarely dirty brownish-white, odourless or foul-scented in day time ; segments of petals subequal or the lower slightly shorter, not filiform ; spur distinctly clavate at apex *gibsonii*
3. Flrs. white or green, faintly or not at all scented ; lower segment of petals 2-3 times longer than upper one ; spur clavate or globular at apex :
4. Ls. several, clustered about middle of stem ; flrs. brownish-green, scentless ; segments of petals and of lip filiform, variously contorted *multicaudata*
4. Ls. few, radical ; flrs. white, faintly scented ; upper segment of petals somewhat triangular ovate ; lower segment much longer, filiform ; lateral lobes of lip filiform, as long as or longer than the broader linear midlobe :
5. Ls. 2-5, oblong or oblong-lanceolate, thin, not flat on ground ; anthers rounded on top *rariflora*
5. Ls. 1-2, ovate to almost orbicular, flat on ground, fleshy, coriaceous ; anthers distinctly tricuspidate at top *grandifloriformis*
1. Petals entire :
6. Ls. 2, rarely more, flat on ground, opposite or subopposite, coriaceous, broadly ovate to suborbicular :
7. Lip shorter than lateral sepals, 3-lobed ; lateral lobes oblong, rounded, half as long as whole lip ; spur twice as long as ovary or more *platyphylla*

7. Lip longer than lateral sepals, 3-partite ; lobes subequal or lateral ones longer ; spur about equalling the ovary ;
8. Flrs. greenish-white ; petals narrow, linear oblong ; segments of lip filiform, the lateral ones much longer than the midlobe *diphylla*
8. Flrs. white ; petals ovate or ovate-oblong ; segments of lip subequal, linear-oblong *crassifolia*
6. Ls. radical or cauline, not flat on ground :
9. Ovary long-beaked ; petals broad, oblong ; lip 3-partite, segments filiform, lateral ones longer ; tube of anther cells long *commelinifolia*
9. Ovary scarcely beaked ; segment of lip not filiform ; tube of anther cells short :
10. Petals narrow-linear ; lateral lobes of lip with long filiform tails, mid-lobe 2-lobulate with minute mucro between the filiform-tailed lobules *crinifera*
10. Petals linear-oblong, spathulate or broadly ovate or ovate-oblong ; lobes of lip not tailed :
11. Flrs. white ; lateral lobes of lip broader than midlobe, obliquely truncate-denticulate at apex :
12. Spur shorter than or equalling ovary :
13. Lip not at all or scarcely longer than lateral sepals ; spur about as long as ovary *suaveolens*
13. Lip $1\frac{1}{2}$ -2 times as long as lateral sepals ; spur much shorter than ovary *panchganiensis*
12. Spur $1\frac{1}{2}$ -3 times longer than ovary :
14. Ls. radical, \pm spreading on ground ; ovary sessile or subsessile ; lip 7-12 mm long ;

- stigmatic processes somewhat oblong, white *plantaginea*
14. Ls. \pm grouped at base of stem ; ovary on long pedicel ; lip 14-29 mm long ; stigmatic processes clavate, green *longicorniculata*
11. Flrs. white, yellow or green ; lateral lobes of lip not broader than midlobe, linear oblong to linear filiform :
15. Stem leafy upwards ; flrs. white, then yellow, drying black, secund or subsecund *heyneana*
15. Ls. radical, clustered at base of stem (except in *H. marginata* var. *fusifera*) ; flrs. yellow, not secund :
16. Ls. broad, oblong with narrow yellowish margins ; floral bracts equal to or longer than ovary *marginata*
16. Ls. narrow, lanceolate or linear-oblong, without yellow margins ; floral bracts up to half as long as ovary *viridiflora*
15. Ls. clustered about middle of stem ; flrs. green, not secund :
17. Floral bracts longer or shorter than ovary ; midlobe of lip ovate-oblong, obtuse, inflexed, meeting dorsal sepal and petals at apex, thus enclosing column, shorter or about as long as the linear or linear-oblong spreading lateral lobes ; spur longer than ovary, straight *ovalifolia*
17. Floral bracts longer than ovary ; midlobe of lip

straight, broader and shorter than the filiform spreading lateral lobes; spur longer than ovary, incurved

furcifera

17. Floral bracts much shorter than ovary; lobes of lip similar, straight, narrow linear or linear-oblong, spreading; spur shorter than ovary, incurved

hollandiana

ENUMERATION OF THE SPECIES OF *HABENARIA*

1. *Habenaria stenopetala* Lindl. Gen. Sp. Orch. 319, 1835; Hook. f. Fl. Brit. India 6 : 134, 1890; Cooke, Fl. Pres. Bombay 2 : 715, 1907 (excl. syn. *H. modesta* Dalz.); Blatt. & McC. in J. Bombay nat. Hist. Soc. 36 : 14, t.l., 1932.

Terrestrial herbs. Tubers 1-2, ovoid, about 3×2 cm. Leaves clustered about the middle of the stem, passing into the bracts of the inflorescence above and into the bracteate sheaths below; 4-14×1-4 cm obovate, oblong to lanceolate, acute or shortly acuminate. Inflorescence about 14 cm long, somewhat densely many-flowered. Flowers pale brownish-green, pedicellate, bracteate. Bracts 3×0.8 cm, longer than the flowers, ovate-lanceolate, acuminate. Sepals subequal, ovate, entire, 3-nerved, with a 2-4 mm long, curved or straight acumen; dorsal sepal 10×5 mm; lateral 9×4 mm. Petals 2-partite; upper segment 9×1.5 mm, erect, linear, acute, entire; lower one minute, 3×1 mm, at right angles to the upper segment, lanceolate, acute. Lip 3-lobed almost to the base; lateral lobes 5×1 mm, spreading, linear, acute; mid-lobe 11×2 mm, linear-lanceolate, curved downwards, acuminate. Spur 2 cm long, longer than the ovary, with a broad infundibuliform mouth lying just behind the separation of the lobes of lip. Column 5×2.5 mm, sub-clavate. Anther cells meeting above; pollinia 3×2 mm, with 2-2.5 mm long, curved caudicle and a small orbicular gland; staminodes oblong, somewhat quadrate, on the sides of the anther cells. Stigmatic processes 1.5 mm long, elliptic, lying parallel over the entrance to the spur. Ovary a little over 1 cm long with a short beak and 0.5 cm long stalk.

Flowering : October. *Fruiting* : December.

Occurrence : CONCAN : Stocks. W. GHATS : Parva Ghat, Dalzell; Lonavla, D. K. Patel. DECCAN : Heiwar, Vartak 6789. N. KANARA : Bell; Londa, Spooner.

Distribution : N. W. India, Sikkim from about 1,000 to 2,000 metres, Upper Assam, Bengal, Bihar, Concan, W. Ghats, Deccan, N. Kanara.

This is one of the few Bombay orchids that we have been unable

to collect in the field ; it seems to be a rather rare plant. Lately Vartak has collected it from Helwac in the Deccan.

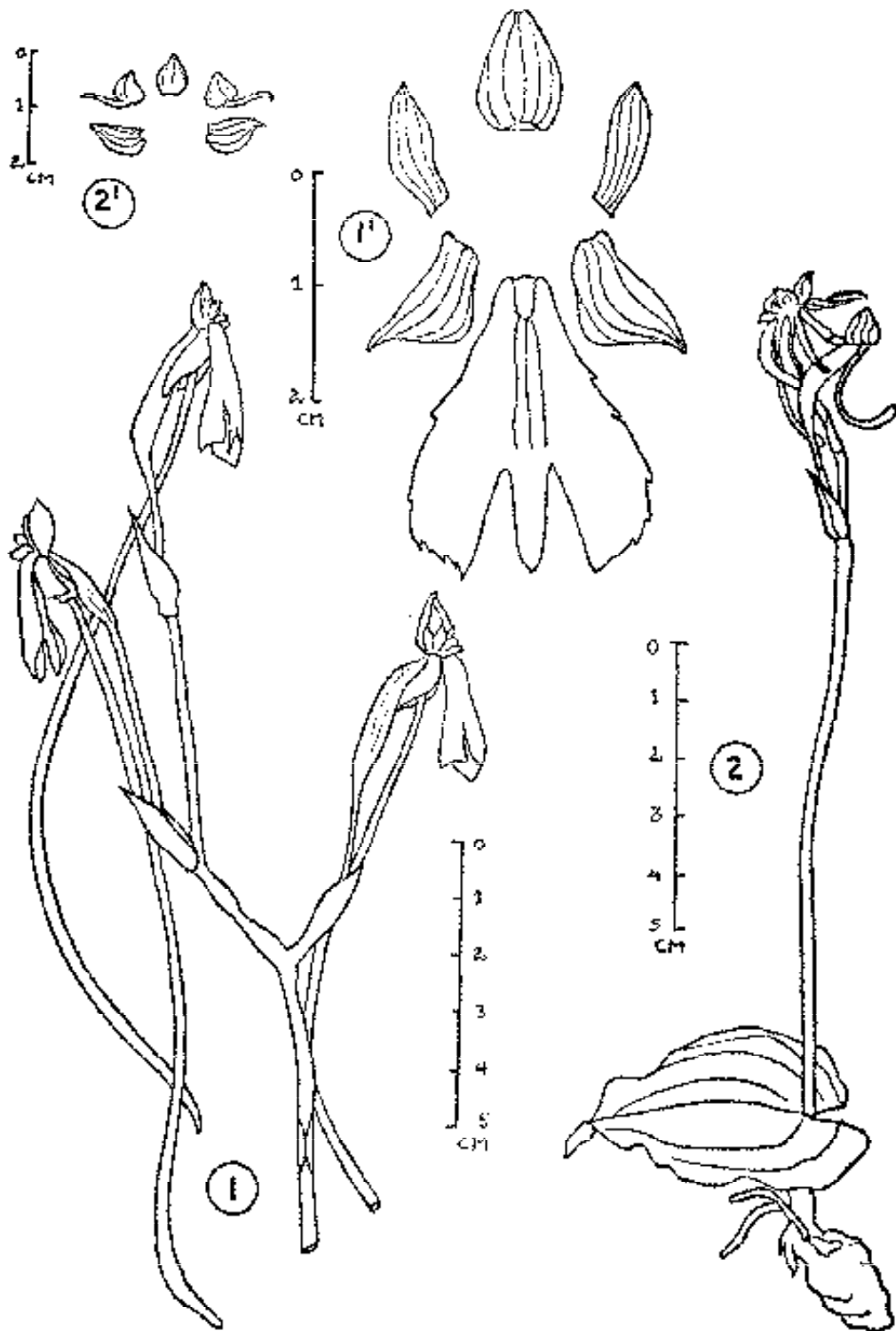
Cooke gives *H. modesta* Dalz. as a synonym of this plant, but with some reservations ; Blatt. & McC. consider *H. modesta* Dalz. identical with *Peristylus stenostachyus* Kränz. ; judging from Dalzell's general description, and particularly from the structure of the lip, the plant seems to be identical with *Habenaria ovalifolia* Wight.

2. *Habenaria digitata* Lindl. Gen. Sp. Orch. 307, 1835 ; Hook. f. 134, pro parte ; Cooke 715, pro parte ; Blatt. & McC. 14 ; Santapau in Rec. bot. Surv. India 16(1) : 306, 1953. *H. trinervis* Wight, Icon. t. 1701, 1851. (See Plate III, figs. 7-8).

Terrestrial herbs, 18-65 cm tall. *Tubers* 1-2, ovoid. *Leaves* alternate, pentastichous, 2-13 × 1.5-5 cm, ovate, elliptic to elliptic-lanceolate or ovate-oblong, acute, entire, somewhat strongly 3-nerved. *Inflorescence* 4-13 cm long, in few- to many-flowered, dense or lax spikes ; peduncle short, ebracteate or often with 1-3 sheathing bracts which are about 2.5-3.5 cm long, ovate-lanceolate, acute, faintly 3-nerved. *Flowers* 24-27 mm long, pure green or occasionally with a yellowish or whitish tinge, bracteate, shortly pedicellate, emitting a pungent foul smell after sunset. *Bracts* longer than the flowers, the uppermost ones slightly shorter, convolute round the ovary, similar to those of the peduncle. *Sepals* subequal, green, ovate-oblong, subacute, 3-nerved, somewhat erect or spreading not reflexed ; dorsal sepal 9 × 7 mm ; lateral ones 12 × 6 mm, somewhat oblique. *Petals* green, 2-partite ; posterior or the upper segment 8-10 × 1-2 mm, linear, acute, subfalcate, curved along with the dorsal sepal or projecting slightly beyond it ; anterior or lower segment 3-5 mm long, filiform, lying on the lip, external and parallel to the stigmatic processes. *Lip* green, 3-lobed not quite to the base but a little beyond the stigmatic processes ; lobes subequal, similar, somewhat fleshy, often slightly dilated about the middle, acute ; lateral-lobes spreading and reflexed at right angles to the straight or often inward reflexed midlobe. *Spur* 15-18 mm long, green, scarcely clavate, obtuse, the mouth liguled, narrow. *Column* 4-6 × 5 mm, oblong, green. *Anther cells* short ; pollinia obovoid, with a 2.5 mm long curved caudicle and a small, orbicular gland. *Stigmatic processes* green, 1.5-2 mm long, thin, lying on the lip on either side of the liguled entrance of the spur. *Ovary* 16-18 mm long, green, quite strongly ribbed, shortly pedicellate.

Flowering : End of July to October. *Fruiting* : August onwards.

Occurrence : CONCAN : Karanja island, Dalzell & Gibson ; Matherran, Paranjpye. W. GHATS : Khandala, Hallberg ; Santapau 770-772, 774, 803, 2460, 4768-4770, 4888, 6913-6914, 6952, 9226-9228, 11249-11250, Kapadia 636, 1234, 2262 ; Panchgani, Blatter ; McCann ; Mahableshwar. Sedgwick ; McCann ; Santapau 13098, 13132, 13206, Bole ; Kapadia 58 7



Habenaria longicorniculata Grah. : Fig. 1, Upper part of inflorescence ; Fig. 1'.
 Sepals and petals dissected. *H. grandifloriformis* Blatt. & McC. : Fig. 2. Whole plant ;
 Fig. 2'. Sepals and petals dissected.

1 BS1/64

595, 613, 2063. DECCAN : Purandhar, *Burns* ; *Santapau* 7081, 7178, 7296, 11384 ; *Kapadia* 644, 1331. N. KANARA : 70 miles W. of Dharwar, *Sedgwick* ; Nagargali, *Bell & Sedgwick* ; Yellapur, *Talbot* ; Guddehali, near Karwar, *Talbot*.

Distribution : India : Kashmir, Assam, Bengal, W. Ghats, Deccan, in hilly tracts from Godavari Dist., and Mysore to Tinnevelley. 600-1,800 metres. *World* : India, Burma.

This plant has been confused with some of its allies ; after examination of numerous fresh specimens, we consider the following to be the distinctive features of this species : i. Flowers pure green, fading to whitish- or yellowish-green, emitting a pungent foul scent after sunset. ii. Lateral sepals erect or spreading, not reflexed, more or less similar to the dorsal one. iii. Segments of petals unequal, the upper one about as long as the lower segment and lying along the dorsal sepal ; the lower segment up to half as long as the upper one, filiform. iv. Lobes of lip linear, more or less thick, the lateral ones reflexed at right angles to the midlobe, which is straight or rarely inflexed. v. Stigmatic processes thin, lying on the lip. vi. Mouth of spur liguled, narrow, not funnel-shaped ; spur green, slightly clavate.

This is a common orchid on the Western Ghats, where it has been collected from Matheran, Khandala, Purandhar, Panchgani, Mahablieshwar, etc. It is also fairly common in N. Kanara.

3. *Habenaria gibsonii* Hook. f. *Fl. Brit. India* 6 : 135, 1890 ; *Santapau*, *Fl. Purandh.* 126. *H. digitata* Cooke 715, pro parte (non Lindl. 1835). *H. digitata* var. *gibsonii* Fischer in Gamble, *Fl. Pres. Madras* 1469, 1928 ; *Santapau* 306.

Terrestrial herbs, 15-45 cm high. *Tuber* usually one, somewhat cylindrical, about 2.5 cm in diam. *Leaves* 3.5 - 15 × 1.5-3.5 cm, alternate, pentastichous, ovate to oblong-lanceolate, acute rarely subacuminate ; margins wavy, paler in colour. *Inflorescence* 5-15 cm long, lax, secund or subsecund. *Flowers* white, bracteate, not foul-smelling, very shortly-stalked. *Bracts* 30-33 × 7 mm, longer than the flowers, pale green, sheathing more than three fourths of the ovary, ovate-lanceolate, acute or subacuminate. *Sepals* unequal ; dorsal sepal 10-12 × 9 mm, concave, broadly ovate-elliptic, abruptly acute to subacuminate, the 3 nerves greenish at the base ; lateral sepals 18-20 × 7-9 mm, ovate-lanceolate, acute, 3-nerved, white. *Petals* white, bipartite nearly to the base ; upper segment sickle-shaped, 14 × 1.2 mm, acute ; lower segment 8-11 mm long, narrower, not filiform, more than half as long as the upper one, often both segments subequal. *Lip* white, 3-partite nearly to the base ; lateral segments 11.5 × 1.5 mm, linear, acute to subacuminate, decurved downwards along the midsegment, the apices rarely diverging ; mid-segment 15-16 × 1.1-1.5 mm, linear, acuminate, often a little abruptly

curved at the apex. *Spur* 1.7 cm long, white, slightly longer than or equalling the ovary, ending in a clavate, green, obtuse, apex; mouth of the spur unliguled, broadly infundibuliform. *Anther cells* diverging, 2-3 mm long, white; pollinia ovoid, subfalcate, 1.8×1 mm, yellow, bilobed, with a 2 mm long caudicle and a small kidney-shaped gland; staminodes 2, elliptical with wavy margins, pale green. *Stigmatic processes* 2, about 2 mm long, somewhat ligulate, slightly curved at the apex, white, rostellum green, 3-lobed. *Ovary* green, 1.3 cm long, slightly curved, ribbed.

The measurements of individual floral parts are a little above average, but this may be due to the fact that they were taken from a specimen cultivated on the St. Xavier's College terrace garden.

Flowering : July to August. *Fruiting* : End of July to September.

Occurrence : CONCAN : Hills W. of Mullund, McCann. W. GHATS : Khandala, Gibson; Blatter 35234; McCann; Hallberg; Santapau 233-12, 233-18, 618, 646, 745, 2259, 4590-4591, 4725, 6782, 6813, 6878, 6880, 6920, 10137, 12891; Kapadia 506, 519, 528, 578-579; 636; Lonavla, Kapadia 553-554, 557.

Distribution : Concan, W. Ghats, Mysore.

Three varieties of this species have been recorded from Bombay State; they can be separated from one another by the following key :

1. Flowers scentless during the day time :
 2. Dorsal sepal broadly ovate-elliptic, up to 10-12×9 mm; lateral sepals up to 18-20×7-8 mm; upper segment of petals longer than the lower one v. *gibsonii*
 2. Dorsal sepal ovate oblong, 6.7×3.5 mm; lateral sepals 8-9×3 mm; segments of petals about equal, or the lower slightly longer v. *foliosa*
1. Flowers foul-scented during the day time; dorsal sepal broader than long, 7×8 mm; lateral sepals 9×5-6 mm; upper segment of petals slightly longer than lower one, 7-8×1-1.5 mm, the lower segment 5-7×0.5 mm. v. *foetida*

3A. *Habenaria gibsonii* var. *gibsonii* Hook. f. (See Plate II, figs. 3-4)

This is the typical variety of the species; it has been recorded from Khandala and Lonavla as common; McCann collected it from the hills east of Vehar Lake in Salsette Isl.

3B. *Habenaria gibsonii* var. *foetida* Blatt. & McC. in J. Bombay nat. Hist. Soc. 36 : 16, 1932. (See Plate II, fig. 5)

This variety seems to be more common than the typical one ; it is found in dense undergrowth in forest areas, often on sloping ground. We have recorded it from Waghai in the Dangs, from Borivli and Ghodbunder in Salsette Isl., from Khandala, Lonavla, Purandhar and Bhimashankar on the Western Ghats, and from Dapoli in the Deccan. The carrion-stench of the flowers during the day time is very penetrating and unpleasant.

3C. *Habenaria gibsonii* var. *foliosa* (A. Rich.) Sant. & Kapad. in J. Bombay nat. Hist. Soc. 56 : 194, 1959. *H. foliosa* A. Rich. in Ann. Sci. nat. (ser. 2) 15 : 71, t. 3A, 1841 ; Wight, Icon. t. 1700 ; Blatt. & McC. 15. *H. digitata* var. *foliosa* Hook. f. Fl. Brit. India 6 : 135, 1890 ; Cooke 716 ; Fischer 1469. *H. spencei* Blatt. & McC. loc. cit. 17, t. 3, 1932. (See Plate II, fig. 6)

The flowers of this variety are much smaller and more delicate than in the typical variety ; they are scentless, or at any rate, without the pronounced carrion-stench of the var. *foetida* ; the dorsal sepal is ovate-oblong, the segments of the petals straight, the upper segment included within the dorsal sepal ; the spur is distinctly inflated in the lower portion.

This variety until recently has been considered either as a distinct species or as a variety of *H. digitata* Lindl. We consider it to be more appropriately placed under *H. gibsonii* Hook. f. and base our selection on the following characters : i. The petals are bipartite to the base, the segments being subequal, directed upwards. ii. The lip is tripartite to the base, the segments being more or less similar, uniformly linear-subulate.

Two of our specimens (*Kapadia* 614, 622) from Mahabaleshwar match the illustration and description of *H. spencei* Blatt. & McC. We have examined the specimens carefully and think that they belong to our new variety, and that therefore *H. spencei* Blatt. & McC. is conspecific with the new variety.

This variety is not too common ; we have recorded it from the Western Ghats and from the high hills near Poona in the Deccan ; also from Karwar in N. Kanara.

4. *Habenaria multicaudata* Sedgw. in Rec. bot. Surv. India 6 : 352, 1919 ; Fischer 1469 ; Blatt. & McC. 16. (See Plate VI, fig. 21)

Terrestrial herbs, 35-65 cm tall. Stem with several obtuse or acute, closely appressed sheaths on the lower part. Leaves pentastichously clustered about the middle of the stem, tapering at the base into a distinct, 5-10 mm long pseudo-petiole, 4-15 × 1.5-4 cm, elliptic-oblong, acute or sub-acuminate. Racemes 10-15 cm long, lax, shortly pedunculate, bracteate. Bracts lanceolate, acute. Flowers pedicellate, bracteate, pale brownish-green, resembling an ichneumon fly (according to Fischer).

Pedicel with ovary 17-20 mm long ; ovary broadly ribbed, beak 2-3 mm long. *Bracts* 15-17 × 3-5 mm, shorter than the ovary, lanceolate, acute. *Sepals* unequal, subacute, 3-nerved ; dorsal sepal 6 × 3 mm, strongly concave, erect, hooded, ovate or ovate-oblong ; lateral sepals 8 × 4-5 mm, obliquely ovate-oblong, subfalcate, reflexed. *Petals* bipartite ; posterior or upper segment 5-6 mm long, narrowly linear filiform, subfalcate, erect along the sides of the dorsal sepal ; anterior or lower segment 14-17 mm long, irregularly contorted, more filiform than the upper. *Lip* 3-partite almost to the base ; midsegment 10-11 mm long, nearly 1 mm broad, narrowly linear-filiform, curved downwards, somewhat inwards at the acute apex ; lateral segments up to 25 mm long, more filiform than the mid-segment, irregularly contorted. *Spur* 10-12 mm long, brownish-green, slender, curved, the mouth broad, apex clavate and subacute or rounded. *Column* 3 × 1.5 mm, oblong, greenish. *Anther cells* very large and conspicuous for the size of the flowers ; the tubes up to 2 mm long, projecting at right angles to the column ; pollinia 2 × 1 mm, sub-falcately pyriform with a 3 mm long, slender, curved caudicle and a minute orbicular gland ; staminodes small, ovoid, just above the anther tubes. *Stigmatic processes* 1.5-2 mm long, elongate, appressed on both sides of the basal margins of the lip ; rostellum obscure.

Flowering : August to September.

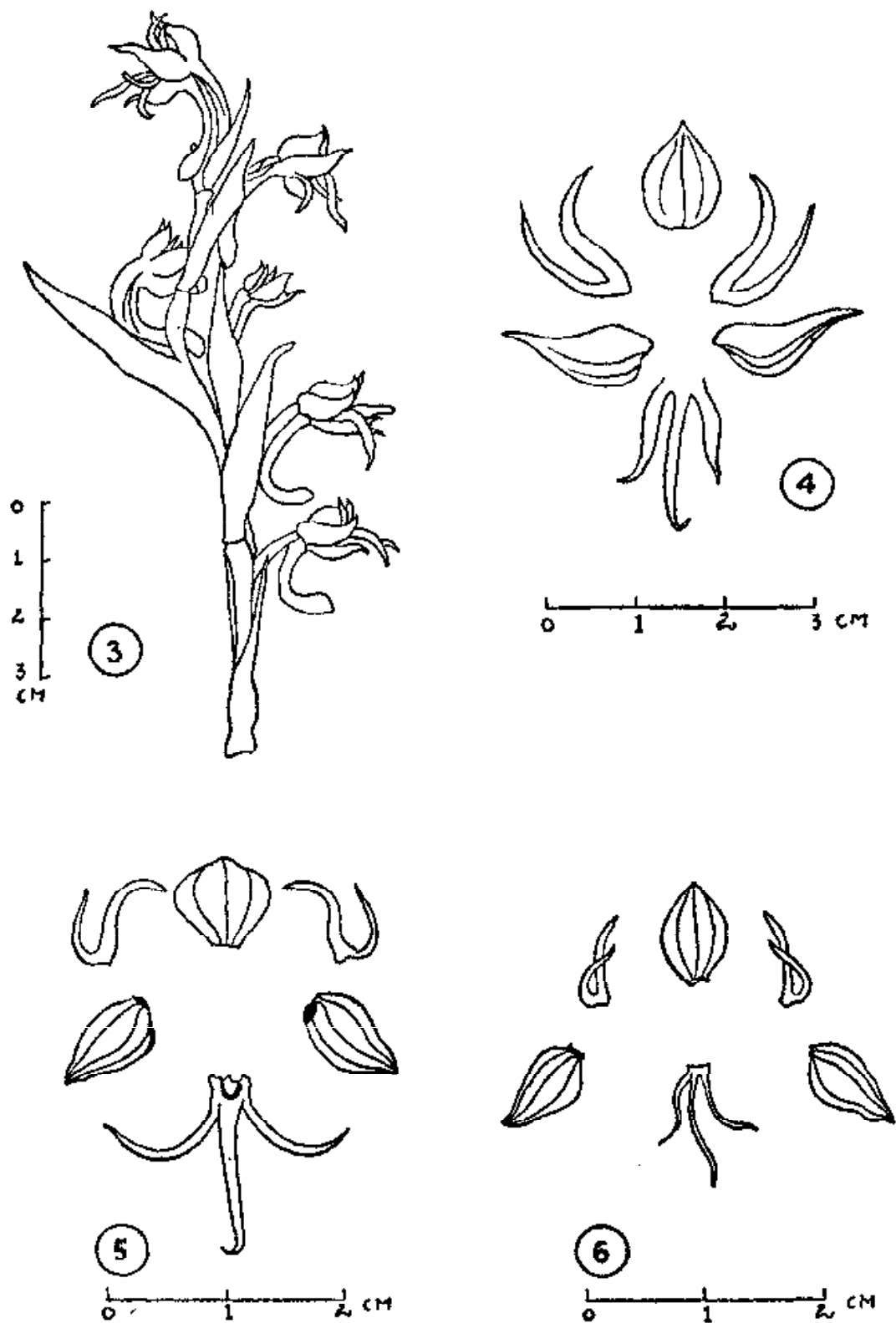
Occurrence : N. KANARA : Yellapur, Kapadia 2230 ; Katgal, Talbot ; Karwar, Bell 7871 ; Blatt. Herb. 233.16 (coll. Bell) ; Guddehalli, near Karwar, Bell.

Distribution : N. Kanara, Nilgiri hills, Anamalai Hills in Karianshola at 2,200 metres.

The type was described from Guddehalli in N. Kanara near Karwar ; it has also been collected from other places in N. Kanara ; Fischer has recorded it from the Nilgiri and Anaimalai hills. It has not been found in the re-organized Bombay State.

5. *Habenaria rariflora* A. Rich. in Ann. Sci. nat. (ser. 2) 15 : 70, t. 2D, 1841 ; Wight, Icon. t. 924 ; Hook. f. 136 ; Cooke 716 ; Blatt. & McC. 17, t. 2 ; Santapau 306 & Fl. Purandh. 127. *H. rariflora* var. *latifolia* Blatt. & McC. loc. cit. 17, 1932. (See Plate III, figs. 9-10)

Lithophytic, rarely terrestrial or epiphytic *herbs*. *Tubers* 1-2, small, ovoid or oblong, occasionally laterally compressed. *Leaves* 3-12 × 0.5-4 cm, radical, clustered at base, thin or somewhat coriaceous, very variable in shape, narrowly linear-lanceolate to oblong-lanceolate, or broadly oblong, or ovate-elliptic, or even ovate. *Inflorescence* of 1-4 flowers, rarely of 6-13, terminate on a peduncle which is terete, faintly or deeply ribbed, green and ebracteate. *Flowers* white, pedicellate, bracteate. *Bracts* unequal, the lower ones larger, up to 2.5 × 1.3 cm, ovate or ovate-lanceolate, acute. *Sepals* unequal, white, subacute, 3-5 nerved ; dorsal



Habenaria gibsonii var. *gibsonii* Hook. f.: Fig. 3. Upper part of inflorescence ;
 Fig. 4. Sepals and petals dissected. *Habenaria gibsonii* var. *foetida* Blatt. & McC. :
 Fig. 5. Sepals and petals dissected. *Habenaria gibsonii* var. *foliosu* Sant. & Kapad. :
 Fig. 6. Sepals and petals dissected.

sepal 6-10 × 5-8 mm, strongly 5-nerved (the extreme pair of nerves fainter), broadly ovate; lateral sepals 9-14 × 6-9 mm, obliquely ovate, spreading, the apical portions slightly decurved. *Petals* white, 2-partite; upper or posterior segment 8-10 × 4-6 mm, obliquely triangular-ovate, subacute, 3-nerved; anterior or lower segment 10-13 mm long, filiform, acute. *Lip* white, 12-20 mm long, tripartite from a little below the middle; lateral segments scarcely 5 mm long, longer than the midsegment, filiform or narrowly linear-subulate, up to 1 mm broad, acute, entire or often with a toothed lobe on the outer margin; midsegment 7-11 × 2-4 mm, linear-ligulate to lanceolate, often slightly dilated about the middle, subobtuse. *Spur* 2.5-4 cm long, curved, white, somewhat greenish towards the slightly enlarged, subglobular apex. *Column* 5 × 3.5 mm, oblong, rounded, greenish-white. *Anther cells* short; pollinia 2.5 × 1.5 mm, ovoid-oblong, with curved, 1.5 mm long, slender caudicle and a comparatively large, triangular-ovate gland; staminodes erect by the sides of the column, linear-oblong. *Stigmatic processes* clavate, white, somewhat large. *Ovary* 1.8-2.2 cm, green, ribbed, stalk 2.5-3 cm long. *Capsule* 2-3 cm long, strongly ribbed, beak 2-4 mm long, stalk 2.5-3.5 cm long.

Flowering: July to September. *Fruiting*: Up to November.

Occurrence: CONCAN: *Stocks*, W. GHATS: Khandala, *Hallberg*; *Blatter* 35236; *Acland* 1167; *Santapau* 421, 617, 2254, 4607-4608, 4718, 4787-4788, 9240, 14514; *Irani* 955, *Kapadia* 513, 517, 532; *Panchgani*, *Cooke*; *Blatter*; *Frenchman*; *Sedgwick*; *Kapadia* 2047; *Pasarnighat*, *McCann*. DECCAN: Karkula, near Poona, *Woodrow*; *Purandhar Barnes*; *Bhide*; *Santapau* 7077, 7161, 7275, 11385, 11459; *Rukminibai* 390, 392; *Kapadia* 1320-1330.

Distribution: Concan, W. Ghats, Deccan, Horaleykonda at 1,300 metres, Kollaimalai hills.

During the first half of the monsoon this orchid is very common on the Western Ghats, usually growing on vertical rocks and old walls; very rarely it is found growing in the ground.

We have examined many specimens from the W. Ghats, and found that the leaves are very variable in shape, size, and consistency; the var. *latifolia* seems to be but one of the variants of this very variable plant.

The name *rariflora* was given by Richard to this plant because of the small number of flowers in each scape, usually 1-2; in some of the more robust specimens collected on Purandhar hill we have noted up to 13 flowers; in these large specimens the flower and all its parts are slightly larger than in the normal few-flowered plants; the floral structure is, however, identical.

6. *Habenaria grandifloriformis* Blatt. & McCann in J. Bombay nat. Hist. Soc. 36: 17, 1932, charact. emend. Sant. & Kapad. *H.*

grandiflora Lindl. in Wall. Cat. n. 7032, 1828, nom. nud. ; Dalz. & Gibs. Bombay Fl. 267, 1861, cum descriptione ; Hook. f. 136 ; Cooke 716 ; Fischer 1469 ; Blatt. & McC. 18 ; Santapau 307 (non Torr. ex Beck, 1823). *H. rotundifolia* Lindl. Gen. Sp. Orch. 306, 1835 (non Rich., 1823). *H. grandifloriformis* var. *aequiloba* Blatt. & McC. loc. cit. 18, 1932. (See Plate I, figs. 2-2')

Terrestrial herbs. Tubers 1-2, 1.8-3 × 0.8-2 cm, globose or ellipsoid. Leaves 1-2, opposite, lying flat on the ground, coriaceous 2.9 × 1.5 × 8 cm, broadly ovate to suborbicular, rarely oblong-lanceolate, acute or obtuse, entire, deep grass-green above, pale green below, 8-12-nerved ; often the upper leaf is replaced by a small ovate-oblong or oblong-lanceolate sheathing leaflike bract ; the latter may occasionally be up to 2-3 cm above the lower leaf on the peduncle. Scape 5-20 cm long, erect, rigid, terete, longitudinally ribbed. Flowers at the top of the scape, white, faintly perfumed, pedicellate, bracteate, in one-to several-flowered racemes. Pedicels 2-3 cm long, elongating in fruit up to 5 cm, somewhat curved, greenish-white ; the ribs of the ovary continued into the pedicels. Bracts 1-2.7 × 0.6-1.5 cm, ovate or oblong-lanceolate, acute, amplexicaul, 5-7-nerved. Sepals unequal, white, acute or mucronulate ; dorsal sepal 6.9 × 3.5 mm, broadly ovate, concave, 3-nerved ; lateral sepals 7.15 × 3.5 mm, obliquely ovate, rarely tapering the apex, faintly 7-nerved. Petals white, 2-partite ; upper segment more or less equal to the dorsal sepal, 4.7 × 4.6 mm, obliquely ovate-triangular, acute, entire, 3-nerved ; the lower segment filiform or narrowly linear-subulate acute, 9-15 mm long. Lip white, 3-partite, 10-18-(22) mm long ; lateral segments narrowly linear or filiform, spreading, more or less equalling the midsegment or 2-4 mm longer ; midsegment linear, acute or sub-obtuse, often slightly dilated about the middle. Spur 20-27 (up to 40) mm long, curved, white tinged with green towards the dilated, subglobular apex. Column greenish-white, short. Anther cells diverging with a 1-2 mm long curved apiculus at the top or obscurely or distinctly tricuspidate, the cusps sub-equal, the middle one longer ; tubes short ; pollinia 2 × 1 mm, ovoid, with a 1-2 mm long caudicle and a comparatively large, orbicular gland ; staminodes white, glandular, elliptic, on the sides of the anther cells. Stigmatic processes 2 mm long, parallel, white, clavate, rounded ; rostellum greenish, in between the anther cells. Ovary 2-2.5 cm long, curved, strongly ribbed, green. Capsule 2-2.8 × 5 cm, strongly ribbed.

Flowering and Fruiting : June to November.

Occurrence : CONCAN : Stocks ; Law ; Badlapur, Kapadia 1287 ; Karjat, Kapadia 1093. W. GHATS : Khandala, Sedgwick ; Razi 5221 ; Santapau 233.5, 233.14, 619, 764, 840, 2255, 4589, 4606, 6788, 6867, 6888, 6921, 11054, 12892, 15689, 18844-18845 ; Kapadia 490, 518, 523, 535 ; Lonavla, D. K. Patel ; Kapadia 537 ; Panchgani,

Blatter ; *Sedgwick* ; *Rukminibai* 305, 307-311 ; Mahableswar, *Cooke* ; *Kapadia* 496, 1205-1206. DECCAN : Maval, Poona Dist., *Stocks* ; Shivapur, *Cooke* ; Sinhagad, *Woodrow* ; *Bhide* ; Purandhar, *Woodrow* ; *Santapau* 7261 ; Satara, *Hallberg* ; *J. Kulp* 843 ; Dapoli, *Acland* 117. N. KANARA : Dharwar, *Sedgwick* 7601 ; Belgaum, *Stocks* ; *Talbot* 2436.

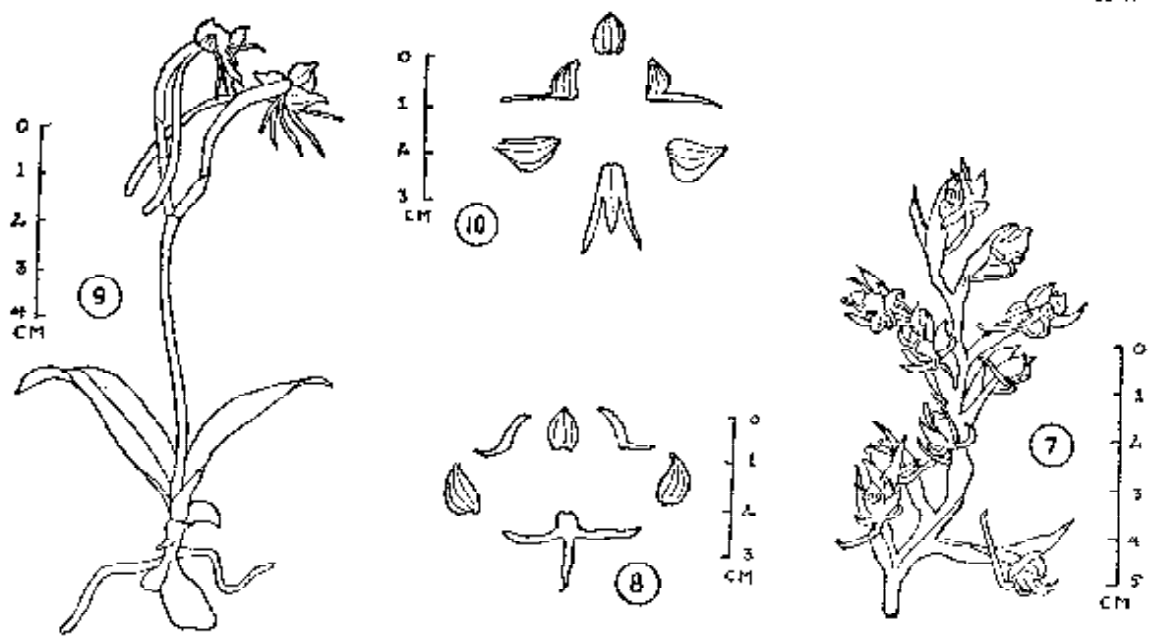
Distribution : Concan, W. Ghats, Deccan, N. Kanara, Bababuddan hills, Shevaroy hills.

The identity of *grandiflora* and *grandifloriformis* is clear to us ; the latter plant is said to have flowers slightly larger than the former, but the basic floral structure is the same in both plants. Further in *grandifloriformis*, as delimited by *Blatter* and *McCann*, there is a continuous range of variation in the size of the floral parts ; it appears somewhat incongruous to make size the basis for the new species. Similar variations have been noted for *grandiflora* by *Cooke* and others. The measurements given for *grandifloriformis* by *Blatt.* and *McC.* are the following : lateral sepals 15 × 6 mm ; lower segment of petals 17 mm long ; lip up to 22 mm long. We have measured a number of specimens in the field, and our data are the following : lateral sepals 10, 12, 14, or 15 mm long, 5-6 mm broad ; lower segment of petals 9, 12, 14, 15 mm long ; lip 9, 12, 15, 16, 17.5, 18 mm long. *Blatter* and *McCann* in their key to the species of *Habenaria* give the length of the lip as the distinctive character between *grandiflora* and *grandifloriformis*, the former being 12, the latter 22 mm long ; if this be correct, then what is the systematic position of specimens with lips 14, 17.5, 18 mm long ?

Given, then, that there is great variation in the size of the floral parts of this plant, we feel justified in fusing the two species into one. The question then remains about the correct nomenclature for the complex group ; *H. grandiflora* Lindl. 1828 is *nomen nudum*, the validity of which dates only from the publication by *Dalzell* and *Gibson* in 1861 of the description of the plant ; but by then the specific epithet *grandiflora* was not available for the genus, it being legitimately used for another plant by *Torrey ex Beck* in 1833. Of the names mentioned above in the synonymy only *grandifloriformis* is available, which we adopt for the plant in an extended sense, so as to include both *Lindley's* and *Blatter and McCann's* types.

We have recorded this plant from several places in the Konkan plains, from the Western Ghats and from N. Kanara. It is common on rocky plateaux among short grasses ; it is one of the first species of the genus to come into flower at the beginning of the monsoon.

7. *Habenaria platyphylla* (Willd.) Spreng. Syst. Veg. 690, 1826 ; *Graham*, Cat. 201, 1839 ; *Wight*, Icon. t. 1709 ; *Hook.* f. 140 ; *Cooke* 717 ; *Fischer* 1470 ; *Blatt. & McC.* 18. *Orchis platyphyllos* Willd. Sp. Pl. 4 : 10, 1805. *Orchis plantaginea* Roxb. Pl. Cor. 1 : 33, t. 37, 1795



Habentaria alpigena Lindl. : Fig. 7. Inflorescence ; Fig. 8. Sepals and petals dissected. *H. rariflora* A. Rich. : Fig. 9. Whole plant ; Fig. 10. Sepals and petals dissected.

& Fl. Ind. 3 : 450, 1832.

We have not seen this species from Bombay ; Blatter and McCann did not see it either. However, we have been able to study the plant in detail from specimens collected in the parts of India covered by Roxburgh's PLANTS OF THE COAST OF COROMANDEL, where it seems to be fairly common.

Terrestrial herbs. Tubers 1-2, 2-4 × 1.5-2.5 cm, ovoid or oblong-ovoid. Leaves 2-3, lying flat on the ground, somewhat fleshy, coriaceous, 2.5-9 × 1.5-7 cm, oblong-elliptic to oblong-orbicular, acute, obtuse or rounded. Peduncle 12.5-33 cm, bracteate. Bracts 1.5-2.5 cm long, oblong-lanceolate, acute or acuminate. Flowers white, bracteate, shortly pedicellate in 3-9 cm long dense or lax racemes ; the floral parts (ovary, sepals, petals, lip) minutely papillate at the edges. Bracts 1.5 × 0.3 cm, lanceolate, acute or subacuminate. Sepals white, unequal, acute or subobtuse, entire, somewhat strongly 3-nerved ; lateral sepals 8-10 × 5-6 mm, spreading, obliquely ovate or oblong ; dorsal sepal 7-8 × 6 mm, oblong-ovate, concave. Petals 4-6 × 1.5 mm, white, narrowly linear-spathulate, acute. Lip 6-7 mm long, white, 3-lobed ; lateral lobes 3 × 1 mm, narrowly oblong, entire, rounded, 1-2-nerved, up to the junction of the midlobe ; midlobe 4 mm long, linear, tapering to an acute incurved apex, 3-nerved, midnerve straight, going the whole length of the lobe, lateral nerves sinuate a little beyond the junction of the lateral lobes. Spur about 28 mm long, white, geniculate, broadly funnel-shaped at the mouth, slightly clavate at the obtuse apex. Anther cells spreading, tubes somewhat long ; staminodes small, oblong-suborbicular, glandular-papillate. Stigmatic processes clavate, somewhat concave, adnate to the base of the lip, on either side of the broad mouth of the spur. Ovary about 18 mm long, shortly pedicellate, strongly ribbed, the ridges minutely papillate ; beak 7-8 mm long.

Flowering : August to September.

Occurrence : CONCAN : Dalzell ; Stocks ; Law. N. KANARA : Belgaum, Ritchie ; Dharwar. Woodrow.

We have not been able to locate this species in Bombay State. The details of this species have been drawn up from S. K. Wagh 3484-3485, 6895, 7037-7038, 7061 from Andhra.

Distribution : Chota Nagpur, Madhya Pradesh, Concan, N. Kanara, Andhra and S. India.

8. *Habenaria diphylla* Dalz. in Hook. J. Bot. 2 : 262, 1850 ; Dalz. & Gibs. 268 ; Hook. f. 151 (excl. *Lip. diphyllus* Nimmo) ; Cooke 722 (excl. *Lip. diphyllus* Nimmo) ; Fischer 1471 ; Blatt. & McC. 25 (excl. *L. diphyllus* Nimmo). *H. jerdoniana* Wight, Icon. t. 1715, 1851. (See Plate VI, fig. 22)

This is a rare plant ; it has been mentioned for the Konkan by Stocks

and Dalzell ; it is more common in N. Kanara where we have collected it from several spots.

Terrestrial *herbs*. *Tuber* generally one, ellipsoid. *Leaves* 1-2, with or without a small leaf-like bract just above, very coriaceous, lying flat on the ground, 1.5-4 × 0.5-4 cm, ovate-oblong to suborbicular, acute or obtuse, the margins yellowish or pale-coloured ; the leaf-like bract 1-2 × 0.3-0.5 cm, lanceolate, sheathing, acute. *Scape* 7-15 cm, terete, rigid, with a few sheathing oblong or oblong-lanceolate, acute bracts. *Racemes* 2-to many-flowered, lax, up to 10 cm long. *Flowers* shortly stalked bracteate, greenish-white. *Bracts* 1 × 0.4-0.6 cm, ovate-lanceolate, subacuminate, shorter than the ovary. *Sepals* subequal, acute, often mucronulate, entire, 3-nerved ; dorsal sepal 6-7 × 5 mm, pale green, broadly ovate ; lateral sepals 7-9 × 3-4 mm, white, spreading, their apices somewhat deflexed, obliquely ovate or ovate-lanceolate. *Petals* 6-7 × 2 mm, greenish-white, subfalcate, linear-oblong, acute, entire, midnerve prominent with a pair of fainter lateral ones. *Lip* 3-lobed, white, the extremities of the lobes pale green ; lateral lobes 10-14 mm long, somewhat filiform, acute, spreading across the flower at right angles to the midlobe, which is acute or subobtuse, straight or slightly incurved, 6-8 × 1-1.5 mm. *Spur* about 18-20 mm long, curved, white tinged with green towards the acute or obtuse, clavate apex, slightly broad at the mouth. *Column* 5 × 4 mm, stout, broadly oblong, pale green. *Anther cells* short ; pollinia 2 × 1 mm, bipartite, caudicle 2.5 mm long and slender, gland small, orbicular. *Stigmatic processes* nearly 2 mm long, parallel, stout, clavate, rounded, deep green ; rostellum band-shaped, white. *Ovary* 17-19 mm long, shortly stalked, strongly ribbed. *Capsule* 18-20 × 0.3 mm fusiform, shortly pedicellate, beak 2-3 mm long.

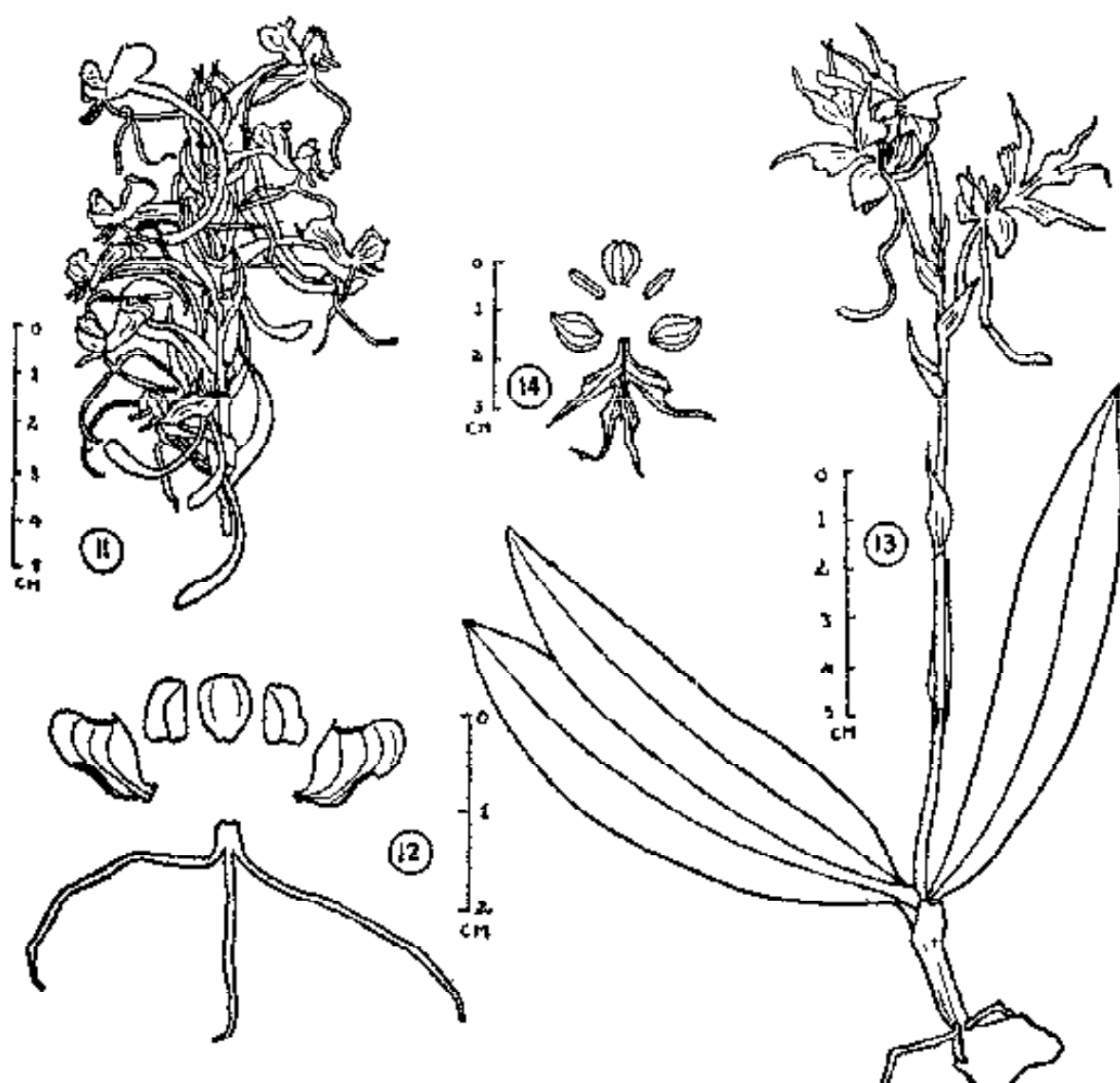
Flowering : July to September. *Fruiting* : Up to October.

Occurrence : CONCAN : *Stocks* ; Dalzell. N. KANARA : *Law* ; Belikeri, Blatt. Herb. 233.15 (coll. Bell.). Kapadia 2201-2209 ; Karwar, Hallberg & McCann 34264 ; Talbot ; Guddehalli, near Karwar, Talbot 1916 ; Bell ; Kapadia 2117.

Distribution : *India* : Outer ranges of W. Himalayas in Garhwal eastwards to Bengal and southwards to Chota Nagpur. Orissa, Concan, N. Kanara, W. Coast of Madras State. *World* : India, Phillipines.

9. *Habenaria crassifolia* A. Rich. in Ann. Sci. nat. (ser. 2) 15 : 72 t. 3C, 1841 ; Hook. f. 151, (excl. syn. *H. brachyphylla* Reichenb. f.) ; Cooke 722 ; Fischer 1471 ; Blatt. & McC. 25 ; Santapau, Fl. Purandh. 126. *Platanthera brachyphylla* Lindl. Gen. Sp. Orch. 293, 1835 ; Wight, Icon. t. 1694 ; Dalz. & Gibs. 269. *Habenaria brachyphylla* (Lindl.) Kränz. in Bot. Jahrb. 16 : 153, 1893 (non Reichenb. f. 1886). (See Plate VI, fig. 23)

Terrestrial *herbs*, 18-60 cm tall. *Tubers* 1-2, about 2.5-4 × 1.5.



Habenaria commelinifolia Wall. : Fig. 11. Inflorescence ; Fig. 12. Sepals and petals dissected. *H. cristifera* Lindl. : Fig. 13. Whole plant ; Fig. 14. Sepals and petals dissected.

2.5 cm, ovate-elliptic or broadly rounded. *Leaves* 2, rarely 3, fleshy lying flat on the ground, dark-green above, pale dull green below, very variable in shape and size; the lower 2 leaves usually similar, the uppermost different, often all 3 quite similar; lower leaves 2.5-13 × 2-10 cm, nearly as broad as long, broadly ovate, oblong-ovate, oblong-elliptic or even suborbicular, acute or obtuse, the uppermost leaf 4-8 × 1.2 cm, lanceolate, acute or acuminate, rarely oblong-elliptic or suborbicular. *Racemes* 15-55 cm tall, lax, many-flowered. *Peduncle* 13-35 cm, green cylindrical, densely or laxly covered by sheathing bracts, often slightly ribbed. *Bracts* unequal, 2-4.8 × 0.6-0.8 cm, linear-lanceolate to ovate-lanceolate, acute to subacuminate, 1-nerved. *Buds* ovate, acute, pale green. *Flowers* 7 × 9 mm, white, bracteate, shortly pedicellate; pedicel with ovary 1.8 cm long, green, ribbed. *Bracts* 2 × 0.6 cm, equalling or somewhat longer than the flowers, green, paler on the margins, ovate-lanceolate, acuminate. *Sepals* unequal, white, obtuse or slightly mucronulate; dorsal sepal 4 × 3.5 mm, ovate-orbicular, strongly 3-nerved; lateral sepals 6 × 4 mm, somewhat oblique, broadly ovate-oblong, mid-nerve prominent with 2 pairs of faint, lateral nerves; the lateral sepals arise at right angles to the dorsal one, extend outwards and become then reflexed downwards. *Petals* 3 × 2 mm, white, ovate or oblong-ovate, mucronulate, entire or notched at the base by a small apiculate projection, strongly 1-nerved in the middle, with a pair of fainter lateral ones. *Lip* 5 × 3 mm, white, oblong in outline, 3-lobed from a little above the middle, the lobes about 1 mm broad, subequal, curved downwards and inwards; lateral ones linear-lanceolate or linear-oblong, subacute, shorter or rarely slightly longer than the linear-ligulate, obtuse midlobe. *Spur* 1.8 cm long, curved, slightly inflated, somewhat clavate towards the subacute apex, pale green, slightly shorter than the ovary. *Column* short, green oblong. *Anther cells* short, diverging, with their bases, lying internal to the stigmatic processes; pollinia oblong, with a thin 1.5 mm long caudicle and small, rounded, kidney-shaped gland. *Stigmatic processes* short, broad, ovate-rounded, placed on the basal sides of the column. *Capsule* 1.5 × 0.4 cm, elliptic, ribbed, beak 4 mm long, curved thin.

Flowering : August to October.

Occurrence : CONCAN : *Stocks, Law. W. GHATS* : Panchgani, Blatter & McCann; Mahabaleshwar, Cooke; Hallberg; McCann 2902; Sedgwick; Santapau 13097, 13129, 13131, Bole 352, Kapadia 584, 588, 594, 607, 612, 620, 1208, 2081. DECCAN : Purandhar, Woodrow; Bhide; Santapau 5333, 7077, 7106, 7153, 7272, 11383; Rukminibai 377, 396; Irani 6043; Kapadia 647-648, 1317-1320; Sinhadad, Garade 57; Junnar, near Poona, Stocks.

Distribution : Concan, W. Ghats, Deccan, Nilgiris, Pulney Hills, 1,900-2,300 metres.

This is a common orchid on sloping grass fields on Purandhar Hill ; the leaves are suborbicular and rather stiff.

The name of the plant requires attention. *Habenaria brachyphylla* Reichenb. f. 1893 is a later homonym of *H. brachyphylla* Aitch. & Hemsl. 1882, which Hook. f. and Duthie list as synonymous with *H. aitchisonii* Reichenb. f. The name *brachyphylla* then is not available for this plant, although it is the oldest epithet for the plant.

10. *Habenaria commelinifolia* Wall. ex Lindl. Gen. Sp. Orch. 325, 1835 ; Hook f. 143 ; Cooke 719 ; Fischer 1470 ; Blatt. & McC. 20 ; Santapau 308. *Orchis commelinifolia* Roxb. Fl. Ind. 3 ; 451, 1832. (See Plate IV, figs. 11-12)

Terrestrial herbs. 42-78 cm tall. *Tubers* 1-2, 4-7 × 1-2 cm, ellipsoidal. *Leaves* cauline, alternately distichous, becoming smaller and gradually merging into the inflorescence bracts, 6-20 × 1.5-3.5 cm, subconduplicate, oblong or oblong-lanceolate, acute or rarely subspinescent, the margins white or yellowish, entire, minutely papillate. *Peduncle* 15-35 cm long, terete, rigid, pale green, bracteate. *Bracts* 3-4 cm long, unequal, the lower ones completely amplexicaul, the upper ones smaller, semiamplexicaul, lanceolate, acuminate, finely ciliolate. *Spike* 7-20 cm long, somewhat dense. *Flowers* greenish-white, sessile, bracteate. *Bracts* about 2.5 × 0.4 cm, lanceolate, acuminate, finely ciliolate, the upper ones smaller. *Sepals* white, 3-nerved ; dorsal sepal 6.5 × 5.5 mm, broadly obovate-oblong, strongly concave in the upper half, mucronulate ; lateral sepals 12.5 × 7 mm, parallel to each other and reflexed enclosing the apical portions of the ovary and spur, obliquely obovate-oblong, rounded at the apex. *Petals* 6 × 4 mm, white, more or less quadrately-oblong, subacute, entire, 1-nerved. *Lip* white, 3-partite almost to the base ; lateral lobes 2-3 cm long, somewhat filiform, spreading, acute ; midlobe 1.5-2 cm long, narrowly linear, strap-shaped, acute. *Spur* 5-6.5 cm long, 1.5-3 mm in diam, curved, clavate. *Column* 4-5 mm long, oblong, greenish-white. *Anther cells* parallel at the base, tubes long white ; pollinia small, caudicle nearly 1 cm long, gland minute, globular ; staminodes small, oblong, on the sides of the anther cells and curving round in front of the tubes. *Stigmatic processes* green, in between the anther cells and below the 3-lobed rostellum, each somewhat falcate. *Ovary* 3-3.5 cm long, curved, strongly ribbed, sessile, beak nearly 2 cm long.

Flowering : August to October. *Fructing* : Up to November.

Occurrence : CONCAN : Dalzell ; S. Concan, Graham ; Salsette, Hallberg ; Bassein, Ryan 1341 ; Andheri, Santapau 233, 22, 998, 4931, 7371-7372 ; S. of Tulsi Lake, McCann ; Kandivli, Kapadia 1505-1509 ; Borivli, R. Farnandez 2649-2651 ; Herbert 2105, 2106 ; Mumbra, Shenoy 4299. W. GHATS : Khandala, Woodrow ex Cooke. DECCAN : Puran-

dhar, *Bhide*. N. KANARA : Yellapur, *Sedgwick* 3101 ; *Bell* ; *Talbot* 902.

Distribution : *India* : Outer ranges of W. Himalaya from Punjab to Kumaon up to 1,600 metres, extending eastwards and southwards to Parasnath, Chota Nagpur, Bihar, Orissa, Central India, Concan, W. Ghats, Deccan, N. Kanara, Bababuddan hills. *World* : India, Upper Burma.

This is a very common ground orchid on the Konkan plains ; we have recorded it from Bassein, Andheri, Tulsi Lake, Kandivli, Mumbra, etc. ; we have also seen a few specimens from Purandhar and N. Kanara. The general structure of the inflorescence is typical.

11. *Habenaria crinifera* Lindl. Gen. Sp. Orch. 323, 1835 ; Wight, Icon. t. 926 ; Hook. f. 142 ; Cooke 718 ; Fischer 1471 ; Blatt. & McC. 20. *H. schizochilus* Nimmo ex Grah. Cat. Bombay Pl. 252, 1839. *Synmaria schizochilus* Nimmo in Grah. loc. cit. pag. ult. sine no. (See Plate IV, figs. 13-14)

Terrestrial, rarely epiphytic *herbs*. *Tubers* 1, oblong or ovoid, about 2×1 cm, lateral roots above the tuber developing into secondary tubers. *Leaves* 2-4, clustered at the base, 5-13×0.8-2 cm, oblong-elliptic or oblanceolate, somewhat tapering at the base, acute. *Scape* 7-12 cm, cylindrical, bracteate, green. *Racemes* 2-4-flowered. *Flowers* shortly pedicellate, bracteate, white. *Bracts* about 1.5×0.4 cm, oblong-lanceolate, subacuminate, shorter than the ovary. *Sepals* subequal, greenish-white, obtuse, often subretuse, 3-nerved ; dorsal sepal 8×8 mm, obovate-oblong ; lateral sepals 11×2 mm, obliquely oblong or elliptic. *Pelals* 8×1.5 mm, narrowly linear-oblong or linear, acute, 1-nerved. *Lip* 3-lobed with a claw 5 mm long and linear ; lateral lobes 7×6 mm, cuneate, praemorse, the lower part prolonged into a tail 7-11 mm long ; midlobe 10×7 mm cuneate in outline, 2-lobulate with or without a mucro in between, the lobules praemorse with the inner portions prolonged into an acumination 10 mm long. *Spur* about 3.5 cm long, clavate, greenish-white. *Anther cells* somewhat long with fairly long tubes. *Ovary* 2-2.5 cm long, shortly pedicellate, beak 5-7 mm long.

Flowering : August.

Occurrence : CONCAN : Vengurla, *Dalzell & Gibson*. W. GHATS : Ramghat, *Dalzell ex Stocks*. DECCAN : Koinanagar, Koina Valley, *Kapadia* 2893-2894.

Distribution : *India* : Concan, W. Ghats, Deccan, Kerala. *World* : Ceylon, India.

A rare orchid ; we have found it in the Koina Valley ; it has also been recorded from the Konkan and the W. Ghats. Our specimens were found epiphytic on tree trunks about 1 m from the ground ; *Dalzell* and *Gibson* also recorded the epiphytic habit of this plant ; this is the only species of the genus in Bombay which is truly epiphytic.

12. *Habenaria suaveolens* Dalz. in Kew Journ. Bot. 2 : 263, 1850 & in Dalz. & Gibs. Bombay Fl. 263 ; Hook. f. 140 ; Blatt. & McC. 19.

Terrestrial herbs. Tubers generally 2, 1.5-2 × 1 cm, ovoid or oblong-ovoid. Leaves 5, clustered at the base, sub-radical, somewhat spreading on the ground, 1.5-7 × 1-3.5 cm, oblong or elliptic, acute. Scape about 25 cm long, erect, bracteate. Bracts 1.2-2 × 0.4-0.7 cm, oblong or oblong-lanceolate, acute to subacuminate, the lower ones larger. Spike about 2 cm long, fairly dense. Flowers small, white, bracteate, hardly pedicellate, jasmine-scented (Dalzell). Bracts 6-8 mm long, shorter than or equalling the ovary, lanceolate, subacuminate. Ovary 9-11 mm, slender, green. Sepals unequal, white, acute ; lateral sepals obliquely ovate ; dorsal sepal ovate. Petals somewhat oblique, ovate-acute. Lip slightly longer than or equalling the lateral sepals, white, 3-lobed ; lateral lobes broader slightly shorter than the linear midlobe, obliquely truncate, denticulate at the apex. Spur pendulous, filiform, scarcely clavate, about equalling the ovary or slightly shorter, white. We have not given any floral measurements as the specimens at our disposal were in very young buds.

Flowering : September (buds).

Occurrence : We have been unable to locate this species in Bombay State. CONCAN : Dalzell ; Vengurla, Malwan, Dalzell & Gibson.

Distribution : Concan, Bababuddan Hills, E. Godavari Dist.

This seems to be one of the rarest of Bombay orchids ; after the original collection in the 'Konkan' by Dalzell, it has been recorded only from between Vengurla and Malwan by Dalzell & Gibson ; none of the subsequent Bombay botanists have found the plant again.

13. *Habenaria panchganiensis* Sant. & Kapad. in J. Bombay nat. Hist. Soc. 54 : 478, 1957. *H. variabilis* Blatt. & McC. in eodem op. 36 : 19-20, tt. 4-5, 1932 (non Ridley, 1886). (See Plate VI, fig. 24)

Terrestrial herbs, 10-22 cm tall. Tubers 1-2, 1-2.5 × 0.8-1.5 cm, oblong or ellipsoid, the smaller ones generally suborbicular. Leaves 3-5, radical or subradical, alternate, distichously clustered at the base, subconduplicate to conduplicate, 2-8 × 0.8-2.5 cm, oblong or oblong-lanceolate or elliptical, acute, entire, minutely papillate. Inflorescence 4-15 cm long, 2-to several-flowered, secund or subsecund in dense or lax racemes. Peduncle 6-10 cm long, about 1-2 mm in diam. rigid, terete, bracteate, longitudinally ribbed. Bracts 1-2, rarely several, 1.5-3 × 0.3-1 cm, amplexicaul, oblong, elliptic or oblong-lanceolate, acute. Flowers white, faintly fragrant, pedicellate, bracteate. Bracts 13 × 4 mm, 7 mm broad on spreading, much shorter than the convolute round the ovary, oblong-ovate in outline, the basal half oblong-orbicular, the upper one strongly acuminate. Sepals unequal, white, acute, 3-nerved ; lateral ones 10-14 × 5-6 mm, obliquely ovate-lanceolate, subfalcate, spreading.

slightly decurved downwards; dorsal sepal 10-12×4-6 mm, ovate, concave. *Petals* 10-12×4-6 mm, white, obliquely ovate, basal half more or less orbicular, the upper one gradually tapering to an acute apex, 3-nerved. *Lip* 15-22×14-24 mm, white, broadly ovate in outline, 3-lobed about or a little beyond the middle, glabrous; lateral lobes 6-9 mm broad, obliquely ovate or cuneate-oblong, truncate, entire, denticulate or crenulate, faintly 5-7-nerved; midlobe 8-10×3-5 mm, slightly longer than the lateral lobes or subequal, broadly or narrowly lanceolate, subacute to obtuse, entire, 5-nerved. *Spur* 8-11 mm long, about 1.5 mm in diam. reaching to about 3/4 the length of the ovary, straight or slightly curved, subclavate at the rounded apex, white, greenish below. *Column* 4-5×2 mm, yellowish-green, oblong, curved behind, straight in front, apiculate on top, with a central longitudinal groove running all along the back. *Anther cells* short; pollinia 2-2.5 mm long, oblong, suboblique, caudicle about as long or slightly shorter, and gland comparatively large, exposed, discoid-oblong. *Stigmatic processes* short, yellowish-green. *Ovary* 13-17 mm long, curved, strongly 6-ribbed, narrowly oblong. *Capsule* 2.5 cm long, about 5-7 mm in diam. spindle-shaped, beak a 3-5 mm long, and with 6 strong ribs.

Flowering: July to September.

Occurrence: W. GHATS: Panchgani, *Rukminibai* 306; *Kapadia* 1354-1355, 2050-2051; *Hallberg*; *Blatter*; *Sedgwick*; Mahableshwar, *Santapau* 13103, 13166; *Mozelle Isaacs & Blatter*; *McCann*; *Kapadia* 497-498, 591-592.

This species seems to be endemic on the Western Ghats of Bombay; it is one of the commonest and most abundant ground orchids of Mahableshwar and Panchgani during the monsoon.

H. variabilis Blatt. & McC., 1932, is an illegitimate name, it being a later homonym of *H. variabilis* Ridl., 1886; the later is an Abyssinian plant. The one point in which both the Indian and the Abyssinian species agree is the great variability in the shape and size of their floral structures.

14. *Habenaria plantaginea* Lindl. Gen. Sp. Orch. 323, 1835; Wight, Icon. t. 1710; Hook. f. 141; Cooke 718; Fischer 1420; Blatt. & McC. 20; Santapau 308. (See Plate VI, fig. 25)

Terrestrial herbs, 10-40 cm tall. *Tubers* 2 unequal, suborbicular to elliptic. *Leaves* 3-5, radical or subradical, pentastichously clustered at the base, more or less spreading on the ground, the uppermost usually small and bract-like 2-13×0.5-3.5 cm, oblong or oblong-lanceolate, acute, entire, minutely papillate. *Inflorescence* 8-30 cm, lax of few-many-flowered secund or subsecund racemes, terminating the long, terete, bracteate, longitudinally ribbed peduncle. *Flowers* white, shortly pedicellate, bracteate. *Bracts* 1.5×0.4 cm, much shorter than the ovary,

ovate-lanceolate, acute or subacuminate, 3-nerved. *Sepals* unequal, white, entire, very minutely denticulate, 3-nerved; dorsal sepals 5×2.5 mm, 4 mm broad on flattening, ovate, subacute; lateral sepals $6 \times 3-4$ mm, obliquely or falcately oblong, subacute. *Petals* $4-5 \times 1.5-2$ mm, white, linear or narrowly oblanceolate, subspathulate, acute, entire minutely and irregularly denticulate, 1-nerved. *Lip* $7-12 \times 7-9$ mm, white, ovate-oblong in outline, narrowly clawed at the base, 3-lobed about a little before the middle; lateral lobes $5-7 \times 3-4$ mm, obliquely ovate, entire, subcuneate, truncate-denticulate to the acute apex, longer than the midlobe, which is $4-6 \times 1.5-2$ mm, linear or linear-oblong, subacute. *Spur* 2-3 cm long, curved, slender, pendulous, white longer than the ovary, somewhat clavate, acute. *Column* small, green, oblong, 2.5×2 mm. *Anther cells* pale yellow, short; pollinia pyriform, about as long as or slightly shorter than the comparatively broad caudicle and with an oblong gland; staminodes small, oblong-orbicular. *Stigmatic processes* large, elliptic, about 1.5 mm long, clavate, greenish. *Ovary* $15 \times 3-4$ mm, curved, turgid, strongly ribbed, with a 3-4 mm long beak

Flowering : September to November.

Occurrence : CONCAN : Dalzell; Matheran, Birdwood. W. GHATS : Khandala, Santapau 363, 910, 2490, 4993; Kapadia 632-635; Lonavla, Kanitkar; Mahableshwar, Sedgwick 7591; Bole 1200. DECCAN : Ambenali, below Mahableshwar, McCann & Blatter. N. KANARA : Siddulgundi, Talbot; Katgal, Sedgwick; Hallberg & McCann 34517; Guddehalli, near Karwar, Bell.

Distribution : Outer Himalayan ranges of Garwhal and Kumaon, up to 2,200 metres, Sikkim, Bengal, Bihar, Central India, Concan, W. Ghats, Deccan, N. Kanara and all districts of S. India.

We have recorded this species from various places on the Western Ghats and N. Kanara. It usually occurs either solitary or in small groups in open, sloping ground in exposed situations; it is rarely found in the shade.

15. *Habenaria longicorniculata* Graham, Cat. Bombay Pl. 202, 1839. *H. longecalcarata* A. Rich. in Ann. Sc. nat. (ser. 2) 15 : 71, t. 3B, 1841; Wight, Icon. t. 925; Hook. f. 141; Cooke 718; Fischer 1470; Blatt. & McC. 20; Santapau 307. *H. longecalcarata* var. *viridis* Blatt. & McC. in J. Bombay nat. Hist. Soc. 36 : 20, 1932. (See Plate I, figs. 1-1')

Terrestrial herbs, 30-115 cm high. *Tubers* 1-2, unequal, $3-6 \times 1-3$ cm, ovate or ellipsoid. *Leaves* 3-10, pentastichously clustered near the base of the stem, $3-23 \times 1.5-4$ cm, oblong or oblong-lanceolate or oblong-elliptic, rarely linear-oblong, acute, the margins paler. *Peduncle* up to 85 cm in length, green, terete, covered by sheathing bracts of varying sizes, larger below becoming smaller upwards. *Bracts* $3-6 \times 0.7-1.15$ cm, semiamplexicaul, elliptic-lanceolate, acute to subacuminate, entire,

minutely papillate. *Flowers* 1-4, faintly scented, bracteate, pedicellate. *Bracts* 2.6×0.4 cm, convolute round the ovary, oblong-lanceolate, acute. *Pedicles* up to 4 cm long, pale green, ribbed. *Sepals* subequal, pure white or white suffused with green, more so at the base; nerves 5-7, pale green; lateral sepals 10-14×4-7 mm, going straight down parallel to the lip and the dorsal sepal, obliquely ovate, somewhat semi-lunar, broad at the base, tapered at the obtuse apex, entire; dorsal sepal 11×7 mm, concave, ovate, subcordate at the base. *Petals* 10-12×3.5-4 mm, white suffused with green or pure white, subfalcate, spathulate, sub-obtuse, 3-nerved. *Lip* 14-29 mm long, white, broadly ovate in outline, 3-lobed, with a claw which is 2-3 mm long and somewhat concave at the base; lateral lobes 10×7 mm, turning inwards, oblong, subcuneate, entire, obliquely and serrately cut into a fine point or rarely to an obtuse apex; midlobe 9×3 mm, linear-oblong, slightly shorter than or rarely equal to the lateral lobes, subobtuse, entire. *Spur* up to 14 cm long, pale green, somewhat thickened below the middle, subclavate at the acute or subobtuse apex; mouth funnel-shaped white, the orifice broadly cordate with a small triangular-mucronulate ligule arising from the anterior end and lying at right angles to the horizontal orifice. *Column* 4×6 mm, greenish-white, slightly tapered towards the truncate, subretuse apex. *Anther cells* diverging, yellowish-white, somewhat long; *pollinia* 3×1 mm, subfalcate, narrowly pyriform, acute with a narrow 5 mm long caudicle and a small knot-like round gland. *Stigmatic processes* 2, about 5 mm long, green, thick, elliptic, curved, blunt, projecting at right angles to the column, surrounding the orifice of the spur. *Ovary* 2.5 cm long, curved, with 6 strong ribs beak 7 mm long. *Capsule* 25-30 mm long, narrowly fusiform, stalk 3 cm long, beak 5 mm long.

Flowering : July to September. *Fruiting* : October.

Occurrence : CONCAN : Jacquemont, Stocks. W. GHATS : Khandala, Blatt. Herb. 28208, 28211, 28347; Chibber; Gammie; Acland 1181; Santapau 233.21, 909, 913-916, 1020, 1054, 1078, 2492, 2559, 2611-2612, 2829, 5032, 7430, 10245, 11269, 13425-13426, 15008, 21161-21162; Kapadia 629, 638-639, 643, 2314-2316. DECCAN : Katraj Ghat, Rukminibai 408; Irani 1067; Kapadia 1337-1341; Poona, Kapadia 1296-1298; Purandhar, Kanitkar ex Cooke; Rukminibai 394; Bhor Ghat, Cooke. N. KANARA : Belgaum, Dalzell & Gibson; Londa, Spooner; Yellapur, Tulbot; W. of Dharwar, Sedgwick; Sampkhand, Hallberg & McCann 36185; Sirsi-Siddhapur, Hallberg & McCann 34785.

Distribution : Concan, W. Ghats, Deccan, N. Kanara, throughout the W. Ghats of S. India, Bellary Dist., Bihar, Orissa.

The identity of this plant is quite clear; the name needs correction from what is usually given in our floras and from what the senior author has given elsewhere. There is no doubt that the oldest legitimate name is that of Graham, 1839; his description seems to be sufficient to bring out



Habenaria hymenaea Lindl. : Fig. 15. Whole plant; Fig. 16. Sepals and petals dissected. *H. marginata* Coleb. : Fig. 17. Sepals and petals dissected. *H. ovalifolia* Wight : Fig. 18. Sepals and petals dissected. *H. viridiflora* R. Br. : Fig. 19. Sepals and petals dissected. Fig. 20. Sepals and petals dissected.

the essential characters of the plant. On a previous occasion the senior author did not adopt Graham's name on account of 'the solid weight of authority in favour of *longecalcarata*.' Herewith we reinstate Graham's specific name on the basis of priority.

The var. *vicialis* Blatt. & McC. is but an immature specimen of the typical species, with which it is therefore merged. The typical species is usually green in its early stages, gradually changing to cream or pure white.

This orchid is common in sloping grass fields; the size of the plant seems to keep pace with the growth of grasses; in the early part of the monsoon, when grasses are low, this plant is but 30 cm tall; by the end of the season it may reach beyond 1 m in size. Very common on the Western Ghats, not so common in N. Kanara.

16. *Habenaria heyneana* Lindl. Gen. Sp. Orch. 320, 1835; Wight, Icon. t. 923; Hook. f. 148; Cooke 719; Fischer 1471 & in Kew Bull. 1928: 284; Blatt. & McC. 22; Santapau 308. *H. subpubens* A. Rich. in Ann. Sci. nat. (ser. 2) 15: 75, t. 4C, 1841; Hook. f. 148; Cooke 720. *H. glabra* A. Rich. loc. cit. 75, t. 5A, 1841. *H. candida* Dalz. in Hook. J. Bot. 2: 262, 1850. *H. cerea* Blatt. & McC. 21, t. 6, 1932. *H. cerea* var. *polyantha* Blatt. & McC. ibid. 22, 1932. (See Plate V, figs. 15-16)

Terrestrial herbs, 8-45 cm tall. Tubers 1 or 2, somewhat ovoid or oblong-ovoid. Leaves alternately imbricating or subdistichous to distichous, thin or coriaceous, 1.7×0.5-2 cm, narrowly oblong-lanceolate to lanceolate, rarely ovate, acute, often mucronulate. Inflorescence 2-14 cm long, lax (rarely dense), secund or subsecund. Flowers bracteate, shortly pedicellate, greenish-white when young, turning yellowish with age, and black on drying or preservation in formaline solution. Bracts 12.22×4.8 mm, longer or shorter than the flowers, oblong to oblong-lanceolate, acute. Sepals unequal, greenish-white when young, turning yellowish with age, acute, rarely mucronulate, 1-nerved, the nerve somewhat keeled below; dorsal sepal 7.9×2.5 mm, oblong or oblong-elliptic; lateral sepals 8-10×2.4 mm, subfalcate, somewhat oblique, oblong-lanceolate, or narrowly oblong. Petals 4.7×1.5-3 mm, similarly coloured as the sepals, somewhat falcate, linear or narrowly oblong, acute 1-nerved. Lip 5-10×4-6 mm, similarly coloured as the sepals, 3-lobed a little before the middle, the lobes deflexed; lateral lobes shorter than the middle one, falcate, narrowly-oblong, entire, acute; midlobe oblong or elliptic-oblong, slightly tapering to the acute or obtuse apex. Spur about 6 mm long, narrowly linear, slightly bent about the middle or straight, widening out uniformly from a little before the middle, obtuse. Column with the anthers very small; pollinia globular with a somewhat large globular gland. Stigmatic processes clavate, comparatively large for the column. Ovary 1-4 cm, stalk

about 3 mm long.

Flowering : August to November.

Occurrence : CONCAN : *Law* ; *Dalzell* ; Wari country, *Dalzell & Gibson*. W. GHATS : *Khandala, Blatt. Herb.* 27990 ; *Santapau* 541, 559, 722, 804, 948, 2458-2459, 2493, 2669, 4719-4720, 4883, 6950 ; *Lonavla, Hallberg* ; *Panchgani, Blatter & Hallberg* ; *Sedgwick* 7907 ; *Rukminibai* 318 ; *Kapadia* 1350-1352 ; *Mahableshwar, McCann* ; *Santapau* 13101 ; *Kapadia* 589, 593. DECCAN : *Stocks* ; *Karli, Jacquemont* ; *Purandhar, Bhide* ; *Santapau* 7083, 7197, 7271, 11382 ; *Bhimashankar, Kapadia* 1459-1460. N. KANARA : *Sedgwick & Bell* 5408 ; *Talbot* 2520 ; *Londa, Spooner* ; *Dharwar, Law* ; *Castle Rock, Sedgwick* ; *Tinai Ghat, Talbot* ; *Sirsi, Dalzell*.

Distribution : Concan, W. Ghats of Bombay State and S. India, Deccan, N. Kanara.

The senior author, in *Rec. bot. Surv. India* 16 (1) : 308, 1953, has discussed the identity of the plant, after examination of the types in Kew Herb. ; the plants listed above are all one and the same species, the oldest legitimate name being *H. heyneana* Lindl.

This orchid is rather variable ; it grows in abundance in rocky plateaux on the Western Ghats. Locally the plant is known as 'The Tooth-brush orchid' on account of the second arrangement of the flowers ; the pedicels, however, are arranged all round the stem, the twisting of the flowers being a later development. Flowers at first cream or white, with age they turn yellow, on drying they become almost black.

17. *Habenaria marginata* Coleb. in *Hook. Exot. Fl.* t. 136, 1825 ; *Graham* 201 ; *Hook. f.* 150 ; *Cooke* 721 ; *Fischer* 1471 (excl. syn. *H. fusifera* Hook. f.) ; *Blatt. & McC.* 23 (excl. syn. *H. fusifera* Hook. f.) ; *Santapau* 310 & *Fl. Purandh.* 127. (See Plate V, fig. 17)

Terrestrial herbs, 8-36 cm tall. *Tubers* 1-2, ovoid or ellipsoidal. *Leaves* 2-5, pentastichously clustered at the base, radical or subradical, often passing into the bracts of the peduncle above, somewhat fleshy, 3.9×1.5-3 cm, oblong, oblong-elliptic or ovate to ovate-lanceolate, acute, obtuse or mucronulate, the margins typically whitish-yellow. *Inflorescence* 4-26 cm, spicate, laxly or densely many-flowered ; *peduncle* 2-12 cm, green, terete, bracteate ; *bracts* 1.5-3×0.4-1 cm, laxly or densely arranged, semiamplexicaul, ovate-lanceolate, to lanceolate, acute, 1-nerved, the margins whitish-yellow. *Flowers* greenish-yellow, sessile, bracteate. *Bracts* 1-2×0.3-0.5 cm, the lower ones longer than the ovary, the upper ones somewhat shorter, similar to those of the peduncle. *Sepals* unequal, pale green, acute, faintly 5-nerved ; dorsal sepal 8×6 mm, concave, broadly ovate, almost suborbicular, subcordate at the base ; lateral sepals 7×3 mm drooping, obliquely oblong-lanceolate. *Petals* 7×4 mm, yellow with a green tinge on the portions overlapped by the

dorsal sepal, oblong-lanceolate, falcate from a broad base, acute or subobtusate, faintly 3-nerved. *Lip* 11 mm long, yellow, fleshy, trifurcate beyond the small 1-2×1-2 mm claw; lateral lobes 11×1.5 mm, more or less spreading, straight, with a small inward-hook-shaped curve at the acute or rounded apex, narrowly linear-lanceolate or often much dilated about the middle, becoming somewhat narrowly ellipsoidal; midlobe clavate towards the rounded apex. *Spur* about 10 mm long, more or less equalling the ovary, rarely slightly shorter or longer, yellowish-green, broad at the mouth tapering into a somewhat constricted middle, suddenly dilating, clavate, and laterally compressed towards the obtuse apex. *Column* short, broad, 3×3 mm faintly greenish-white. *Anther cells* short, yellowish-brown speckled; pollinia 1×1 mm, deep cadmium yellow, ovoid, rarely subfalcate with a small curved caudicle and a small oblong gland; staminodes 2 mm long, white, erect, placed at right angles to the anther cells and across them, not parallel as is usually the case. *Stigmatic processes* pale green, subclavate, parallel and adnate to the lip; rostellum 3-lobed, the midlobe band-shaped, the lateral ones subretuse forming the inner arms of the caudicle channels. *Ovary* 12×3 mm, curved, ribbed, beak short.

Flowering and Fruiting : July to November.

Occurrence : DANGS : Rankuwa, *Kapadia*, 1440-1441; Waghai, *Santapau* 19074; Subir, *Santapau* 19515-19518. CONCAN : *Law*; *Dalzell*; S. Concan, *Stocks*; *Karanja*, *Dalzell & Gibson*; *Uran*, *Dalzell*; *Mumbra*, *Shenoy* 3721, 4051, 4312; *Andheri*, *Santapau* 233.13, 999, 4921, 7367; *Mulund*, *McCann*; *Trombay*, *Hallberg* 33832; *Madh Island*, *Shah* 7639, 9005; *Boisar*, *Hallberg*; *Vehar Lake*, *McCann*. W. GHATS : *Khandala*, *Blatt. Herb.* 29672. DECCAN : *Junnar*, near *Poona*, *Stocks*; *Bhiva*; *Talegaon*, *Kapadia* 567-569, 571-572; *Purandhar*, *Woodrow*, *Santapau* 8380, 8432, 8436-8437; *Kolhapur*, *Acland* 1168-1169. N. KANARA : *Dharwar*, *Sedgwick* 2800, 6207; *Yellapur*, *Talbot*; *Supa*, *Talbot*; *Karwar*, *Sedgwick*; *Guddehalli*, near *Karwar*, *Sedgwick*.

Distribution : *India* : W. Himalayas from Kashmir to Kumaon, up to 2,000 metres, Bengal, Bihar, Mt. Abu, Dangs, Concan, Deccan, N. Kanara, W. Ghats of Bombay State and S. India. *World* : India, Burma.

The specific epithet of this plant refers to the clear margins along the edges of the leaves, the margins being whitish or yellowish. This is a common species, which we have recorded from the Dangs Forest, from various places in the Konkan especially in Salsette Isl., from the Deccan and the Western Ghats and from N. Kanara. It is found among low grasses in moist soil during the monsoon.

17A. *Habenaria marginata* var. *marginata* f. *flavescens* Blatt. & McC. in *J. Bombay nat. Hist. Soc.* 36 : 24, 1932. *H. flavescens* Hook.

f. Fl. Brit. India 6 : 150, 1890. *H. marginata* var. *flavescens* Cooke, Fl. Pres. Bombay 2 : 721, 1907.

This is but a slender form of *marginata* with fewer flowers and an ovary that is somewhat more beaked than the typical plant. It is a rare plant, which we have been unable to locate in the field.

17B. *Habenaria marginata* var. *fusifera* (Hook. f.) Sant. & Kapad. in J. Bombay nat. Hist. Soc. 56 : 199, 1959. *H. fusifera* Hook. f. Fl. Brit. India 6 : 147, 1890.

Flowering : September.

Occurrence : DANGS : Dungarda ; Santapau 19279.

Distribution : Dangs, Travancore (Hooker f.).

This plant differs from the typical variety in the position of the leaves, which here are arranged all along the stem for a distance of 12 cm from the base ; in the typical variety the leaves are clustered at the base of the plant. The inflorescence of our variety is lax, the spur shorter than the ovary, thin, slightly clavate at the apex but not inflated. The whole plant grows to 45 cm high. Leaves are margined with a yellowish strip, and are elliptic or elliptic-lanceolate, 8-15 × 1.6-3.5 cm. Flowers yellow, similar to those of the typical species.

Fischer, in Kew Bull. 1928 : 285, remarks that he has examined the type and only specimen of *H. fusifera* Hook. f. which was preserved in the Calcutta Herb. ; Fischer considers the plant identical with *H. marginata* Coleb. We have found a specimen in the Dangs Forest (Santapau 19279) which in the structure of the flowers is definitely *H. marginata* Coleb., but the leaves are not radical, as in the typical species but are arranged along the stem for some distance. Hook. f. placed his *fusifera* in the group with 'stem leafy upwards', whilst *marginata* is placed in the group with 'leaves clustered at the base or middle of the stem'. We consider this arrangement of the leaves to be of sufficient importance to justify our retaining *fusifera* as distinct from the typical *marginata*.

18. *Habenaria viridiflora* (Sw.) R. Br. Prodr. 312, 1810 ; Wight, Icon. t. 1705 ; Hook. f. 150 ; Fischer 1471. *Orchis viridiflora* Sw. in Act. Holm. 706, 1800. *Habenaria graminea* A. Rich. in Ann. Sci. nat. (ser. 2) 15 : 73, 1841 (non Spreng. 1826, nec 1835). *H. viridiflora* var. *dalzellii* Hook. f. Fl. Brit. India 6 : 150, 1890 ; Cooke 701 ; Blatt. & McC. 24. *Coeloglossum luteum* Dalz. in Hook. J. Bot. 2 : 263, 1850. (See Plate V, fig. 19)

Terrestrial herbs. Tubers 1-2, irregularly ellipsoid. Underground portion of the stem 3-4 cm long, bearing a few horizontal roots. Leaves radical, 3-5, clustered at the base, 4-7 × 0.6-1 cm narrowly linear-oblong, mucronate, the margin yellowish, paler than the general colour of the

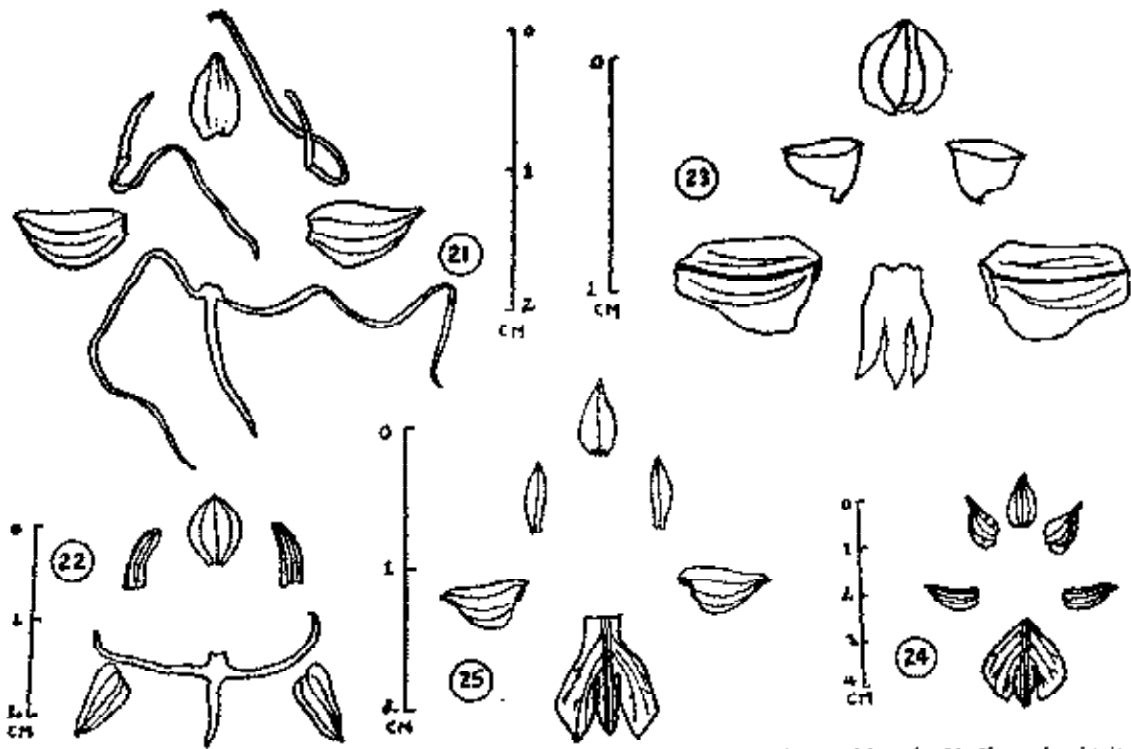


Fig. 21. *Halimnatis multicaulis* Sedgw.; Fig. 22. *H. diphylla* Datz.; Fig. 23. *H. crassifolia* A. Rich.; Fig. 24. *H. panchganiensis* Sacc. & Kupnd.; Fig. 25. *H. plantaginea* Lindl., showing sepals and petals dissected.

leaf. *Peduncle* 8-11 cm long, 1-2 mm in diam., terete, curved, bracteate. *Bracts* 7-20×4-6 mm, sheathing at the base, acute or subacuminate. *Racemes* 5.5-9 cm long, lax. *Flowers* bracteate, shortly pedicellate. *Bracts* 3-6×1-2 mm, narrowly lanceolate, acuminate, half the length of the ovary and pedicel or even shorter. *Sepals* unequal, subobtusate, entire, strongly 3-nerved; dorsal sepal 2×1.75 mm, ovate to suborbicular; lateral sepals 2.5×1.5 mm, obliquely ovate or ovate-oblong. *Petals* 2.5×1.5 mm, obliquely ovate, subobtusate, strongly 3-nerved. *Lip* 4-4.5 mm long, 3-partite practically to the base; segments variable in length, subequal, the relative differences in the lengths of the lateral and mid-segments very small, narrowly linear, acute. *Spur* 10-12.5 mm long slender, scarcely clavate at the apex, acute. *Ovary* with the short pedicel about 10 mm long, very shortly beaked.

Flowering : December.

This is another rare species; we have not seen it in the field; Stocks found it in the Konkan, Dalzell and Gibson in Malwan; no other Bombay botanist has collected it again. We have been able to study the plant from a specimen (*Fischer* 4225) from S. India.

From the descriptions, and we have nothing but the descriptions to go by, of these two plants, i.e. *viridiflora* and var. *dalzellii*, we consider that the two plants are one and the same species, perhaps at most the latter plant may be accepted as a form of the former.

19. *Habenaria ovalifolia* Wight, *Icon.* 5(1): 13, t. 1708, 1851; *Hook. f.* 149; *Kränz.* 139; *Fischer* 1471; *Blatt. & McC.* 23; *Santapau* 309. *H. modesta* Dalz. in *Kew J. Bot.* 2: 262, 1850; *Hook. f.* 166 (?) *H. hallbergii* Blatt. & McC. in *J. Bombay nat. Hist. Soc.* 36: 24, 1932; *Santapau* 310. (See Plate V, fig. 18)

Terrestrial herbs, 18-90 cm tall. *Tubers* 1-2, 2-4×1.2 cm irregularly ellipsoidal. *Leaves* 4-6, pentastichously clustered below the middle of the stem, 5-18×1.5-7 cm, oblong, oblong-lanceolate or obovate to oblanceolate, acute, glabrous, entire or slightly crimped. *Inflorescence* 12-40 cm long, of lax, many-flowered racemes; *peduncle* 6-20 cm, green, terete, bracteate. *Bracts* 2.4-4×0.7-1 cm, lower ones larger, all ovate-lanceolate, acute or subacuminate. *Flowers* appropriately described by Wight as dull pea-green, bracteate, very shortly pedicellate. *Bracts* 10-13×4 mm, subconcave at the base, similar to those of the peduncle, shorter than or equalling the ovary. *Sepals* subequal, pale green, obtuse, entire, sparsely gland-dotted; dorsal sepal 5×3 mm, concave, of a deeper colour than the lateral ones and the petals, ovate-elliptic; lateral sepals 5×2.5 mm, spreading, subconcave, obliquely ovate, subfalcate. *Petals* 5×3 mm, pale green, erect, connivent at their apices with the dorsal sepal and the inflexed midlobe of the lip, obliquely-ovate, obtuse, 1-nerved. *Lip* 7×12 mm, more or less triangular in outline, fleshy, green, 3-lobed

almost to the base ; lateral lobes 6×2 mm, straight, spreading, narrowly linear-lanceolate, tapering to the acute apex, entire or rarely slightly notched on the upper margin ; midlobe 5×2 mm, ovate-oblong, faintly 3-nerved, longitudinally grooved on the under-surface, inflexed upwards, the truncate, subretuse apex firmly attached to the spices of the petals and dorsal sepal thus enclosing the column. *Spur* 16 mm long, pale green, longer than the ovary, curved or straight, thin, broadening into a funnel-shaped mouth and a somewhat dilated, flattened acute apex. *Column* about 3×3 mm, pale green, enclosed completely by the dorsal sepal at the back, by the petals from the sides, and incompletely by the midlobe of the lip on the front side. *Anther cells* short, slightly diverging, whitish ; *pollinia* about 1 mm, long, obovoid, 2-partite with a thin 1 mm long caudicle and a small oblong-lanceolate gland. *Staminodes* 1 mm long, narrowly oblong, pale green. *Stigmatic processes* 2, elliptic, clavate, rounded, green ; *rostellum* prominent, green, 3-lobed. *Ovary* with pedicel 14 mm long, curved, strongly ribbed. *Capsule* $15 \times 3-4$ mm, broadly fusiform strongly ribbed, beak minute.

Flowering : August to October. *Fruiting* : Up to November.

Occurrence : CONCAN : Hillside of Kanheri Caves, *McCann* ; Borivli, *R. Fernandez* 1919, 2136 ; *Herbert* 2209, 2394, 2416, 2826 ; *Kapadia* 623, 1273 ; Bombay, cultivated, *Kapadia* 2922-2923 ; Hills of W. of Mulund, *McCann*. W. GHATS : Khandala, *Hallberg* ; Santapau 853, 2892, 6931. N. KANARA : Yellapur, *Kapadia* 2023-2025, 2225-2229, 2341-2343 ; Sirsi, *Sedgwick & Bell* 7004 ; Sirsi-Siddhapur, *Hallberg & McCann* 34782 ; Nayali, *Sedgwick* 2945.

Distribution : Concan, N. Kanara, W. Ghats of Bombay State and S. India.

We have collected this plant from various places in Salsette Isl., from Khandala on the W. Ghats, and from N. Kanara. It is generally found in forest in dense undergrowth, occasionally in forest clearings ; the flowers present a problem for pollination ; the pollinia and stigmatic surfaces are more or less completely covered by the sepals and petals ; it appears that only very minute insects can pass through the small opening between the petals and the midlobe of the lip.

The type of Dalzell's *H. modesta* has not been available in this study ; but from the description it seems to us that this plant must be fused with *H. ovalifolia* Wt. The structure of the lip, especially the midlobe, which is reflexed upwards and joins with the dorsal sepal and the tips of the petals, is very characteristic of this species. In accordance with the Rule of Priority this plant should be called by the oldest valid name, *H. modesta* Dalz. We defer to the authority of Hook. f. and others, especially since we have not been able to see the type, and leave the nomenclature unaltered ; there seems to be some doubt about the identity of *H. modesta* Dalz., the evidence of the doubt being that the plant

has been put under *H. stenopetala* Lindl. or *Peristylus stenostachyus* Kränzl.

On the other hand we have examined the type of *H. hallbergii* Blatt. & McC. in Blatter Herb. ; the basic floral structure is identical with that of *H. ovalifolia* Wight, and in consequence we place the former name as a synonym of the latter.

20. *Habenaria furcifera* Lindl. Gen. Sp. Orch. 319, 1835 ; Hook. f. 149 ; Kränzl. 161 ; King & Pantling in Ann. R. bot. Gard. Calcutta 8 : 313, t. 410 ; Prain, Bengal Pl. 1033 ; Duthie in Ann. R. bot. Gard. Calcutta 9 : 184, & Fl. Upp. Gang. Pl. 3 : 225, 1920 ; Haines, Bot. Bih. Or. 1157. (See Plate V, fig. 20)

As this is a new record for Bombay, we give herewith a full description of the plant.

Terrestrial herbs, 40-60 cm high. Tubers 1-2, ovate-ellipsoid, 3×1.5 cm. Leaves 13-17×3-6 cm, oblanceolate or obovate or elliptical, acute or subacuminate, clustered just below the middle of the stem gradually passing into the bracts of the scape. Inflorescence 25-40 cm long, stout, erect, lax, many-flowered ; scape bracteate, glabrous, at times longitudinally grooved ; bracts the lowermost 6-7×3-6 cm, the others 2×0.8 cm, lanceolate, acuminate. Flowers small, green, very shortly pedicelled, bracteate ; pedicels 1-1.5 mm long ; floral bracts 1.3×0.3 cm, ovate-lanceolate, acuminate, slightly concave at the base, about as long as the ovary, the margins minutely papillate. Sepals subequal, 3-nerved ; dorsal sepal 4-5×1 mm, spreading, somewhat falcate and concave at the base, subacute to acute, sparsely gland-dotted. Petals 4×2.5 mm, broadly oblong, obtuse or subretuse. Lip 6×6 mm, trifurcate right to the base ; lateral segments filiform, diverging, curved, much longer than the stout, blunt, entire midlobe. Spur slightly longer than the ovary, slender laterally compressed, involute at the base. Anther cells 2, touching, rather short ; pollinia ovoid with slightly curved slender caudicles, and small narrowly oblong glands ; staminodes 2, somewhat large, broadly oblong, white, glandular, placed at the sides of the column below the anther cells. Stigmatic processes 2, elliptic, blunt, one on either side of the entrance to the spur ; rostellum a thickened horny rim just above the orifice of the spur, from the centre of which a small ligulate projection is given out, which forms a flap over the entrance to the spur. Capsule 1.5×0.55 cm, fusiform, turgid, decurved, with strong ribs ; beak of capsule one-fourth the length of the body.

Flowering : August to September ; Fruiting : up to November.

Occurrence : The following specimens are preserved in Blatter Herbarium from the Dangs Forest : Waghai, R. Fernandez 2223 ; Santapau 19143-19144, 19204 ; Kapadia 681-683, 1411, 1438 ;

Ahwa, *Santapau* 19393.

This species is widespread in northern and north-eastern India ; Sikkim and Garhwal in the Himalayas, Orissa, East Bengal and Assam ; this is the first time it has been recorded from Bombay State.

21. *Habenaria holbandiana* Sant. Fl. Purandh. 126, 1958. *H. affinis* Wight, Icon. t. 1707, 1851 ; Hook. f. 149 ; Cooke 720 ; Fischer 1471 ; Blatt. & McC. 23 (non D. Don, 1825).

Terrestrial herbs. *Tubers* 2, about $3 \times 1-1.5$ cm, oblong-ovoid to ellipsoid. *Leaves* $2-12 \times 0.5-3.5$ cm, obovate, or broadly oblanceolate or oblanceolate-elliptic, acute, minutely papillate on the margin, clustered about the lower fourth of the stem, passing into sheathing bracts below. *Peduncle* about 23 cm long, terete, bracteate ; bracts $1.5-4 \times 0.2-4$ cm, oblong or lanceolate, the lower ones longer and completely sheathing the peduncle, the upper ones smaller, semiamplexicaul, minutely papillate on the margin. *Racemes* 8-22 cm long, somewhat dense. *Flowers* about 16 mm long, bracteate, very shortly pedicellate. *Bracts* $10-15 \times 2-3$ mm, equalling or shorter than the ovary, lanceolate, acuminate, minutely papillate on the margins. *Sepals* unequal ; dorsal sepal $3-3.5 \times 1.5-2$ mm, concave, ovate-oblong, obtuse ; lateral sepals 2.5×1.5 mm, spreading, obliquely ovate, rarely subfalcate, acute, 3-nerved. *Petals* 3-3.5 mm long, the major portion hidden by the dorsal sepal, oblong-lanceolate, entire, obtuse. *Lip* longer than the sepals and petals ; lateral lobes linear, acute, 6 mm long, slightly longer than the midlobe, which is linear, broader, 4 mm long, obtuse. *Spur* 6 mm long, shorter than the ovary, incurved, slightly clavate at the acute apex. *Anther cells* slightly curved upwards. *Capsule* $10-14 \times 3-4$ mm, fusiform, tapering above into a narrow, 2-4 mm long beak.

Flowering : November.

Distribution : Bengal, Bihar, Central India, Deccan, N. Kanara, Nilgiris hills, Anamalai hills, Rampa hills, 600 to 1,200 metres.

This is a plant of rare occurrence in Bombay ; only Woodrow and Ritchie seem to have found it in Purandhar and Belgaum respectively. Wight mentions that his sheets do not show any definite locality, but were probably received from Mr. Law of Belgaum. No subsequent botanist after Woodrow has been able to locate the plant in Bombay.

H. affinis Wight, 1851, is a later homonym of *H. affinis* D. Don, 1825, and therefore an illegitimate name. The new name commemorates the help received by the senior author in his exploration of Purandhar hill, during the time Mr. A. S. Holland was the Commandant of the Internment Camp and Parole Centre, Purandhar, during the second World War.

IMPERFECTLY KNOWN SPECIES

Habenaria caranjensis Dalz. in Hook. Journ. Bot. 2 : 262, 1850 ('*caraujensis*'); Dalz. & Gibs. 267 ; Hook. f. 166 ; Cooke 723.

There are no specimens of this species in Kew Herb. or in any of the herbaria we have consulted ; the plant does not seem to have been collected by any other botanist after Dalzell. The following are the data given by Dalzell in the original description : ' Lower leaves subrotund, the upper ones oblong-lanceolate, 3-nerved. Bracts acuminate, shorter than the ovary. Upper sepal rotundate ; petals semi-ovate, obtuse ; middle segment of the tripartite lip oblong, somewhat obtuse, the lateral segments shorter, cuneate, truncate at the apex ; spur clavate, shorter than the ovary. Flowers small, yellow.'

The original locality given by Dalzell is the island of ' Carauja near Bombay '. There is no place with such a name near Bombay ; there is, however, a place called Karanja or Caranja on the sea-coast across the harbour of Bombay, which seems to be the locality of Dalzell's collection.

2. *PLATANThERA* L. C. RICH. & *PERISTYLUS* BL.

These two genera are here treated together on account of their close relationships. The genera *Platanthera* L. C. Rich. and *Peristylus* Bl. are in fact so closely allied among themselves and with the genus *Habenaria* that many of the older botanists treated the three genera as one, *Habenaria*, the other plants being merely distinguished as sections of the same genus. This is the case, for instance, in Bentham and Hooker's *GENERA PLANTARUM* and in Hooker's *FLORA OF BRITISH INDIA*. Modern authors are somewhat divided on the subject ; Holttum (1953) retains the whole group under *Habenaria* ; on the other hand, J. J. Smith (1905) and Summerhayes (1951) split the group into distinct genera. Cooke in his *FLORA OF THE PRESIDENCY OF BOMBAY* and Blatter and McCann in their *REVISION OF THE FLORA OF THE BOMBAY PRESIDENCY* keep *Platanthera* and *Peristylus* independent from *Habenaria*. In the following pages we treat these two genera as closely allied to but independent from *Habenaria*.

Our Bombay genera may be distinguished by the following key :

1. Flowers about 7.5 cm across, greenish white ;
stigmatic surfaces flat, almost confluent *Platanthera*
1. Flowers under 3 cm across, white or yellow ;
stigmatic surfaces not flat, and separate :
 2. Ovary and capsule more or less erect, and
parallel to the peduncle, not spreading at
an angle to it ; stigmatic surfaces in the
form of small swellings on the edge of
the lip *Peristylus*

2. Ovary and capsule widely spreading at an angle to the peduncle ; stigmatic lobes standing out as stalked appendages

Habenaria

PLATANTHERA L. C. RICH.

PLATANTHERA L. C. Rich. in Mem. Mus. Paris 4 : 48, 1818 ; Pfitzer in Engler & Prantl, Natürl. Pflanzenfam. 2 (6) : 92, 1889 (excl. syn. *Peristylus* Bl.) ; J. J. Smith in Fl. Buitenz. 6: 26, 1905 ; Slechter, Orchid. 62, 1927. *Habenaria* Benth. & Hook. Gen. Pl. 3: 624, 1863 ; Hook. f. Fl. Brit. India 6 : 131, 1890 ; Duthie in Ann. R. bot. Gard. Calcutta 9 (2): 174, 1906 ; Holttum, Rev. Fl. Malaya 1 : 79, 1953 (omnes pro parte). *Lysias* Salisb. in Trans. Hort. Soc. 1 : 288, 1812, nom. nud. (See Plates VII & VIII)

The generic name, *Platanthera*, is made up of two Greek words, *Platys*=flat and *Anthera*=anthers. The genus is distributed in the Northern Temperate Zone of the World, particularly in North America ; a few species occur in Europe and in tropical Asia.

Pfitzer has divided the genus *Platanthera* into two sections, 1. *Filicornes*, with a thin and long spur, and 2. *Crassicornes*, with a stout and short spur. In accordance with Art. 22 of the Code, the first section (that includes the type species) should be called *Platanthera* sect. *Platanthera*. Our Bombay species belong to this first section.

Platanthera susannae (Linn.) Lindl. Gen. Sp. Orch. 295, 1835 ; Wight, Icon. t. 920 ; Dalz. & Gibs. Bombay Fl. 261, 1861 ; J. J. Smith 27, f. 9 ; Cooke 2 : 713, 1907 ; Fischer in Gamble, Fl. Madras 1475, 1923 ; Blatt. & McCann in J. Bombay nat. Hist. Soc. 36 : 736, 1932 ; Santapau in Rec. bot. Surv. India 16 (1) : 305, 1953. *Orchis susannae* Linn. Sp. Pl. 939, 1753 ; Lour. Fl. Coch. 522, 1790. *Orchis gigantea* Smith, Exot. Bot. 2 : 79, t. 100, 1805. *Habenaria gigantea* D. Don, Prodr. Fl. Nepal. 24, 1825 ; Graham, Cat. Bombay Pl. 201, 1839. *Habenaria susannae* (Linn.) R. Brown ex Sprengel, Syst. Veg. 3: 622, 1826 ; Hook. f. Fl. Brit. India 6 : 137, 1890 ; Prain, Bengal Pl. 1030, 1903 ; Duthie, loc. cit. 178, t. 128, & Fl. Upp. Gang. Pl. 3 : 222, 1920 ; Gammie in J. Bombay nat. Hist. Soc. 21 : t. 11, 1911 ; Haines, Bot. Bihar Or. 1155, 1924 ; Merrill in Trans. Amer. Phil. Soc. n.s. 24 : 121, 1935 ; Holttum 81, f. 13.

Stout terrestrial herbs, 60-120 cm high. Tubers 2, ellipsoid or ovoid. Leaves 5-18×2-7 cm, ovate-oblong or oblong-lanceolate, acute, often with a sharp black apex, entire, glabrous, deep green above, paler beneath ; sheaths veined, the veins decurrent from the lamina ; midnerve prominent beneath, with 8-10 fainter side-nerves ; margins faintly yellowish. Inflorescence terminal, in 2-6-flowered racemes, 16-20 cm long. Flowers 6×7.5 cm, white faintly tinged



Platanthera susannæ Lindl.

Whole inflorescence of plant collected from Khandala and grown in Bombay.

Photo : H. Santapau

with green, bracteate, shortly pedicellate, strongly perfumed especially when freshly opened. *Bracts* 6-10×1.5-2 cm, longer than and ensheathing the ovary, oblong-lanceolate, subacuminate, often sharply pointed, entire, several-nerved. *Sepals* unequal, white, faintly suffused with green, entire, 5-nerved; dorsal sepal 4.6×3.4 cm, revolute on the margins, subconcave, obovate-elliptic, obtuse; lateral sepals 4.4×1.8 cm, spreading lightly backwards, somewhat ascending, revolute on the margins, obliquely subquadrately oblong, acute. *Petals* 3.4×0.4 cm, white, narrowly linear-oblong, obliquely curving along the lower margins to an acute apex. *Lip* 4.7×9 cm, white, fan-shaped in outline, fimbriately dissected into 10-16 thin, narrow, often bipartite, 8-26×0.5-1 mm, narrowly linear-filiform segments; midlobe 3.8×0.9 cm, recurved at the margins, elliptic, slightly dilated beyond the middle, obtuse. *Spur* 8-11.5 cm long, about 3-5 mm in diam., pale green, obtuse; mouth broad. *Column* 7.1×1.2 mm, white, oblong, truncate-retuse above. *Anther* cells 0.4 cm long, curved, divergent; pollinia 2, each 6×2 mm, yellow, narrowly falcate with a 6 mm long, thin caudicle and a small, shiny, ovate-elliptic gland. *Stigmatic* surfaces 2, almost touching, 5×5 mm, just below the rostellum, white, squarely oblong with rounded ends, flat. *Ovary* 4.3×0.7 cm, strongly ribbed, green with 4 yellowish ridges. *Capsule* 4.5×1.5 cm, ellipsoid, strongly ribbed; beak 7 mm long.

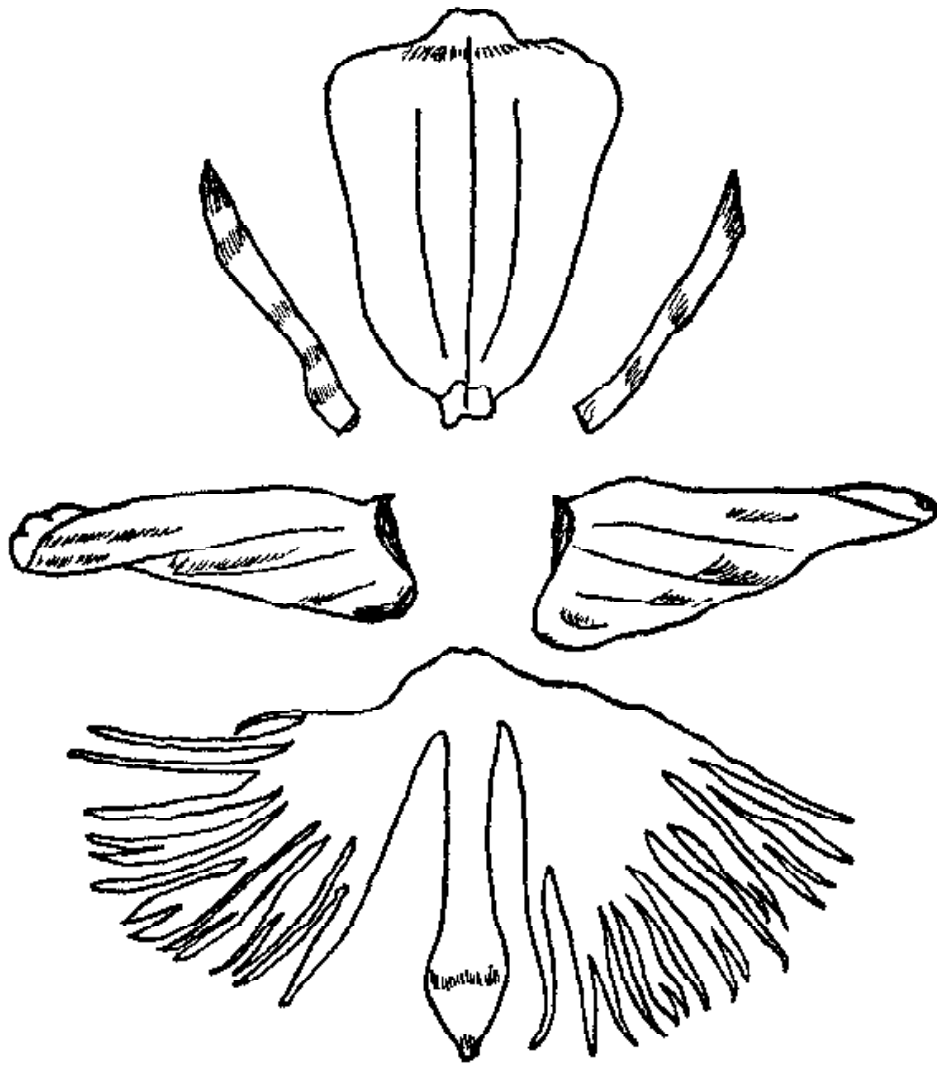
Flowering: September to October. *Fruiting*: October to December.

Occurrence: DANGS: Waghai, *Kapadia* s.n.; Susarda, *Kapadia* 711. KONKAN: Bombay, cultivated, *Santapau* 1578; *Kapadia* 726; Matheran, *Cooke*. W. GHATS: Igatpuri, *Kapadia* s.n.; Khandala, *Blatter* 25953; *Santapau* 775, 1101, 2672, 2818-2820, 5010, 11156; *Kapadia* 627-628; Lonavla, *D. K. Patel*. DECCAN: Lohagad, *Blatter* 27522; Dapoli, *Acland* 1173. N. KANARA: Belgaum, *Ritchie*; Yellapur, *Bell* 3121; Castle Rock, *Gammie*; *Sedgwick*.

Distribution in India: Most of the hilly parts of India from the lower Himalayan ranges to the south of the country. *World*: India, Burma, China, Java, and throughout Malaysia.

Critical Notes: In cultivated specimens the flowers have been noted to appear somewhat earlier and to be larger than in wild specimens. In the field this beautiful orchid grows usually on sloping ground at the edges of forest, usually in places rich in humus. The plant suffers much persecution from humans, who find the flowers very attractive, and from wild pigs, who uproot many plants for the sake of the apparently very tasty tubers.

In our floras the binomial *Habenaria susannae* is usually attributed to R. Brown; but according to Merrill this is not correct, for Brown did not make the actual combination as required by Art. 32, paragraph 2 of the Code; Merrill gives the combination as *H. susannae*



0 1 2 3 4 5 cm

Platanthera susannae Lindl. Dissection of the calyx and corolla.

R. Br. ex Sprengel, Syst. Veg. 3 : 622, 1826.

Cultivation : This beautiful orchid does deserve a place in our gardens, and it is one of the easiest plants to grow under artificial conditions. In St. Xavier's College garden a specimen has been kept growing and flowering regularly for over 15 years. In the first instance the plant was collected from Khandala, and planted in a flower-pot ; after flowering and fruiting, the plant was left in the flower-pot without watering until the following season's monsoon. Flowers are showy, the largest among our Bombay wild orchids, and about the most sweetly and strongly scented among our wild flowers. The photograph appearing at the beginning of this paper was taken from a plant grown in Bombay from a Khandala specimen.

PERISTYLUS BL.

PERISTYLUS Bl. Bijdr. 404, t. 30, 1825 ; Endl. Gen. Pl. 209, 1837 ; J. J. Smith, Fl. Buitenz. 6 : 30, 1906 ; Cooke 710 ; Santapau in Rec. bot. Surv. India 16(1) : 305, 1953. *Habenaria* sect. *Peristylus* Bth. & Hk. Gen. Pl. 3 : 624, 1883 ; Hook. f. Fl. Brit. India 6 : 131, 1890 ; King & Pant. in Ann. R. Bot. Gard. Calcutta 8 : 305, 1898 ; Duthie, *ibid.* 9 (2) : 174, 1906. *Platanthera* Pfitzer in Engl. & Prantl, Natürl. Pflanzenfam. 2 (6) : 92, 1888 pro parte.

The generic name, *Peristylus*, is derived from the Greek words *Peri*=around and *Stylus*=column, probably referring to the shape of the column, which is in the form of a protuberance from the apical portion of the ovary. In Bombay State the plants belonging to this genus are among the least showy of our wild orchids ; flowers are usually in compact racemes or spikes, and individually they are small and inconspicuous ; the plants, however, are typical in their appearance and in their habitat, i.e., the surroundings in which they grow.

Many modern orchidologists favour including *Peristylus* under *Habenaria* Willd. ; Pfitzer, loc. cit., separates it from *Habenaria* but places it under *Platanthera*. We keep it separate from both, following among others J. J. Smith, for the reason that *Peristylus* forms a natural and clearly distinct group in our native orchids. There are about 80 species of *Peristylus* distributed in the warmer regions of the Old World.

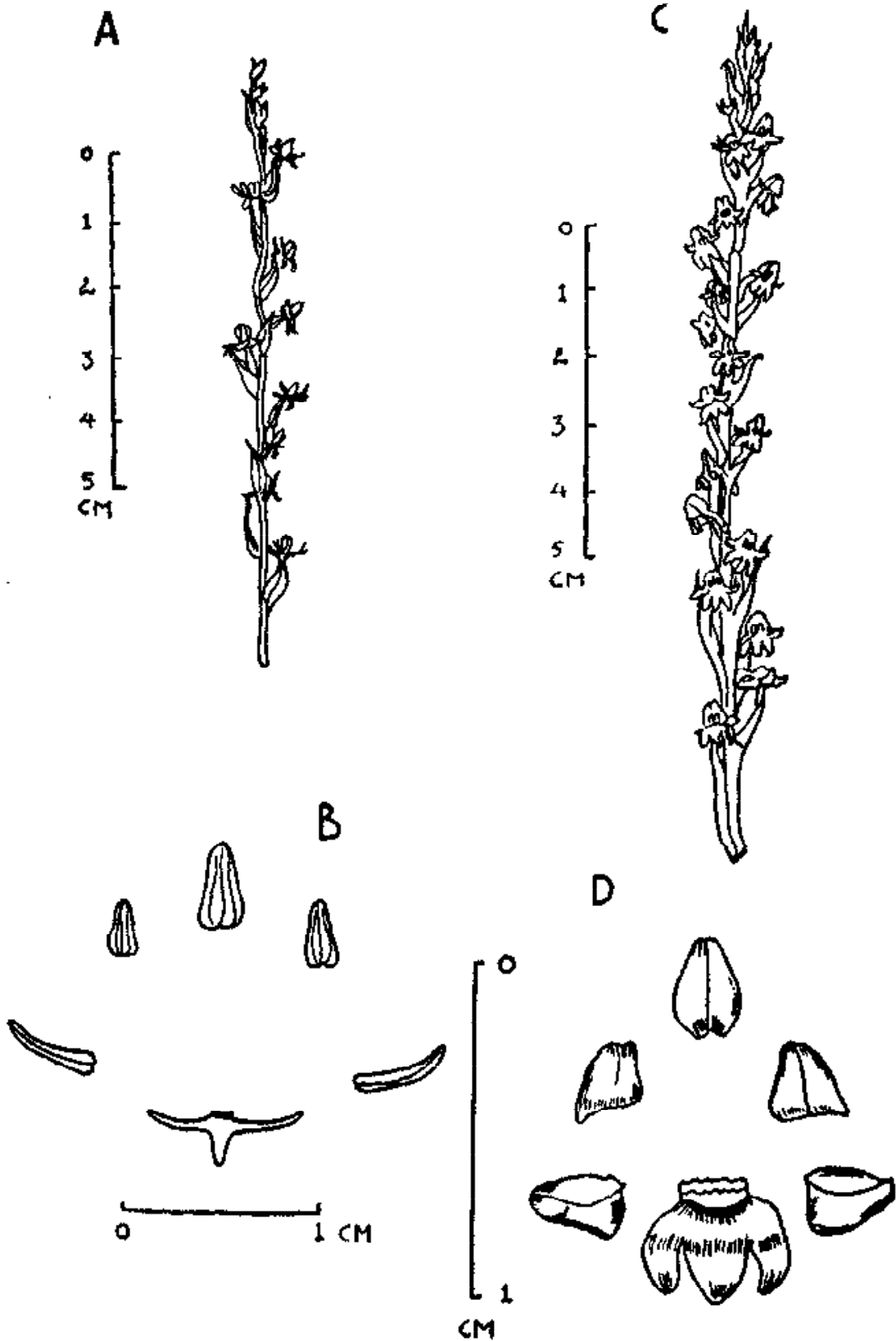
KEY TO THE SPECIES OF *PERISTYLUS*

1. Spur as long as or longer than sepals, linear, subclavate :
 2. Leaves sessile, narrowly lanceolate ; lateral sepals linear ; lateral lobes of lip subulate, or narrowly linear-oblong, spreading, about twice as long as the midlobe ; spur scarcely

- | | |
|--|---------------------|
| clavate at apex | <i>densus</i> |
| 2. Leaves tapered at base, broadly obovate-elliptic ; lateral sepals broad ; lobes of lip subequal, linear oblong, rounded ; spur inflated at apex | <i>stocksi</i> |
| 1. Spur much shorter than sepals, saccate, globose : | |
| 3. Leaves scattered or subimbricate on stem | <i>spiralis</i> |
| 3. Leaves clustered about middle of stem : | |
| 4. Petals white ; lip shorter than the broad sepals, entire or scarcely 3-lobed, lobes very small, entire, rounded | <i>plantagineus</i> |
| 4. Petals yellow or yellowish-green ; lip about as long as sepals, distinctly 3-lobed : | |
| 5. Spikes dense ; lateral sepals mucronate at the back a little below apex | <i>goodyeroides</i> |
| 5. Spikes lax ; lateral sepals not mucronate | <i>lawii</i> |

1. *Peristylus densus* (Lindl.) Santapau & Kapadia, comb. nov. *Coeloglossum densum* Lindl. Gen. Sp. Orch. 302, 1835. *Gymnadenia ? tenuis* Lindl. in Wall. Cat. n. 7057, 1832, nom. nud. *Habenaria peristylodes* Wight, Icon. t. 1702, 1851. *Platanthera stenostachya* Lindl. in Hook. J. Bot. 7 : 37, 1855. *Habenaria stenostachya* Benth. Fl. Hongk. 362, 1861 ; Hook. f. Fl. Brit. India 6 : 156. *Peristylus stenostachyus* (Lindl.) Kränz. Orchid. Gen. Spec. 1 : 502, 1898 ; Fischer in Gamble, Fl. Pres. Madras 1474, 1928 ; Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 734, 1932. *P. xanthochlorus* Blatt. & McC. loc. cit. 733, 1932. (See Plate IX, A-B)

Herbs 12-35 cm tall. *Tuber* 1, small, globular. *Leaves* grouped on the basal third of the stem, green or yellowish-green, sheathing, 2-7 × 0.5-2 cm, lanceolate, oblong-lanceolate or linear lanceolate, acute or obtuse, mucronulate, entire, minutely papillate ; midnerve prominent below with 3-5 lateral fainter nerves. *Inflorescence* in lax or dense spikes 7-21 cm long ; peduncle slender, up to 3 mm thick, short terete ; bracts distantly or closely arranged, subopposite to imbricate, lanceolate, entire, minutely papillate, subacuminate ; the margins paler. *Flowers* yellowish-white to greenish-yellow, subsecund, bracteate, sessile. *Bracts* unequal, the lower equalling or slightly longer than the flowers, the upper ones shorter, 7-15 × 3-5 mm, acute or acuminate. *Sepals* pale greenish-yellow, obtuse ; dorsal sepal 4-5 × 2-3 mm, ovate oblong, concave, midnerve prominent on the back with a pair of fainter lateral ones ; lateral sepals 4-5 × 1-1.5 mm, narrowly linear, often subfalcate, 1-nerved, margins incurved. *Petals* 3.5 × 1.5-2 mm, sub-oblique, ovate-oblong, obtuse, erect, greenish-yellow. *Lip* shortly clawed fleshy, rigid, 3-lobed ; claw very short, hollowed at the base ; lateral lobes 3.5 × 5 × 0.5-1 mm, linear, subulate, spreading straight or upwards



Peristylus densus Sant. & Kapad. Inflorescence (A) and dissection of calyx and corolla (B). *P. stocksii* Kränz. Inflorescence (C) and dissection of calyx and corolla (D).

and backwards, slightly narrower than the midlobe, acute or obtuse ; midlobe 2.3 × 1-1.5 mm, narrowly oblong, straight, slightly tapering to the obtuse apex. *Spur* 5-7 mm long, straight or slightly curved, very slightly thickened towards the acute apex, shorter than the ovary, greenish-white. *Ovary* 7 mm long, curved, faintly ribbed. *Capsule* 10 × 4 mm, sessile, narrowly conical, 6-ridged.

Flowering : August to October.

Occurrence : W. GHATS : Panchgani, *Blatter & Hallberg* ; *Sedgwick* 7596 ; *Saldanha* 1521 ; Mahableshwar, *Sedgwick* 7622. N. KANARA : Castle Rock, *Sedgwick* 2779 ; Mundgod, *Talbot* s.n. ; Tinai Ghat, *Talbot* 2508 ; Yellapur, *Talbot*.

Distribution in India : Sikkim Himalaya, Khasia Hills, W. Ghats, N. Kanara, Bababudden and Pulney Hills, High Wavy Mountains. *World* : India, Burma, China.

Critical Notes : We have examined *Sedgwick* 7596, collected from the type locality of *P. xanthochlorus* Blatt. & McC., and also *Sedgwick* 7622, both specimens identified by Blatter himself as *P. xanthochlorus*, and cited under this name in the REVISION. In the absence of the type, these specimens may serve to clarify the identity of the species. There does not seem to be any definite and constant character by which such specimens may be separated from *P. densus*. In our opinion this is another case of variations induced by the conditions of the habitat. Normally *P. densus* has laxer and longer spikes ; but in open rocky plateaux (as in Panchgani and Mahableshwar) plants are more stunted, somewhat stouter, and shorter ; the basic floral structure of *P. xanthochlorus* is identical with that of *P. densus*.

Hooker f. op. cit. p. 157 adds the remark : ' I have had difficulty in choosing a specific name, for Bentham, in adopting *stenostachya*, overlooked the older published one of *tenuis*. That of *peristylodes* may be objected to from the plant being sectionally a *Peristylus*, though Wight did not recognise it as such, and it is preoccupied by A. Richard for an Abyssinian species.' The earliest published name is, indeed, *tenuis*, but this is a *nomen nudum*. We have not been able to examine the types of *Coeloglossum densum* Lindl. and *Peristylus stenostachyus* Kränz., but from the descriptions and from Hooker's own admission they are identical ; this being the case, the oldest valid name is *Coeloglossum densum* Lindl. and in consequence the correct binomial in the genus *Peristylus* for the present plant is *P. densus* Sant. & Kapad.

2. *Peristylus stocksii* (Hook. f.) Kränz. *Orchid. Gen. Spec.* 1 : 513, 1898 ; *Cooke* 710 ; *Gammie* in *J. Bombay nat. Hist. Soc.* 21 : 172, 1911 ; *Fischer* 1475 ; *Blatt. & McC.* 735 : Santapau 305. *Habenaria stocksii* Hook. f. *Fl. Brit. India* 6 : 158, 1890 ; *Haines, Bot. Bih. & Or.* 1159, 1924. (See Plate IX, C-D)

Herbs 10-50 cm high. *Tubers* 1-2 each, 1.7-3×1.2-2 cm, oblong or ellipsoidal. *Stem* slender, sheathed. *Leaves* 5-14×2.4 cm, clustered about the middle or more or less scattered on the stem, narrowed and sheathing at the base, obovate-elliptic, elliptic-lanceolate, or lanceolate to oblong, acute or subacuminate; margins wavy, yellowish, minutely papillate. *Inflorescence* lax, of many-flowered subsecund twisted spikes, 9-24 cm long; peduncle 5-10 cm long, slender, with a few bracts which are scaly, ovate, acute, and 1-nerved. *Flowers* small, yellowish-green, sessile, bracteate. *Bracts* 1.2×0.3 cm, more or less equalling the ovary, ovate, acuminate, glabrous, 1-nerved. *Sepals* subequal, green, glabrous, 1-nerved, sub-fleshy; dorsal sepal 3×2 mm, concave, forming a hood over the column with the petals, elliptic-oblong; lateral sepals 2.5-3×1.5-2 mm, spreading, obliquely oblong, obtuse. *Petals* 2.5×2 mm, green, sub-fleshy, sub-obliquely ovate-oblong, obtuse or sub-retuse, entire, glabrous, 1-nerved. *Lip* 3×4 mm, green, longer than the lateral sepals, 3-lobed, clawed; claw 2 mm broad, concave; lateral lobes 1.5×1 mm, narrower than the midlobe, incurved, oblong, obtuse, entire; midlobe 1.6×1.5 mm, straight, oblong, obtuse, entire. *Spur* 6 mm long, green, shorter than the ovary, obtuse, inflated downwards. *Column* very small, green, obtuse. Anther cells small, whitish-green, slightly divergent at the base; pollinia yellowish, clavate, obovate-oblong with a short caudicle and an exerted linear-elliptic gland; staminodes greenish-white, small, glandular, auriculate-oblong. *Ovary* 8 mm long, green, slightly curved, ribbed.

Flowering : July to September. *Fruiting* : August to October.

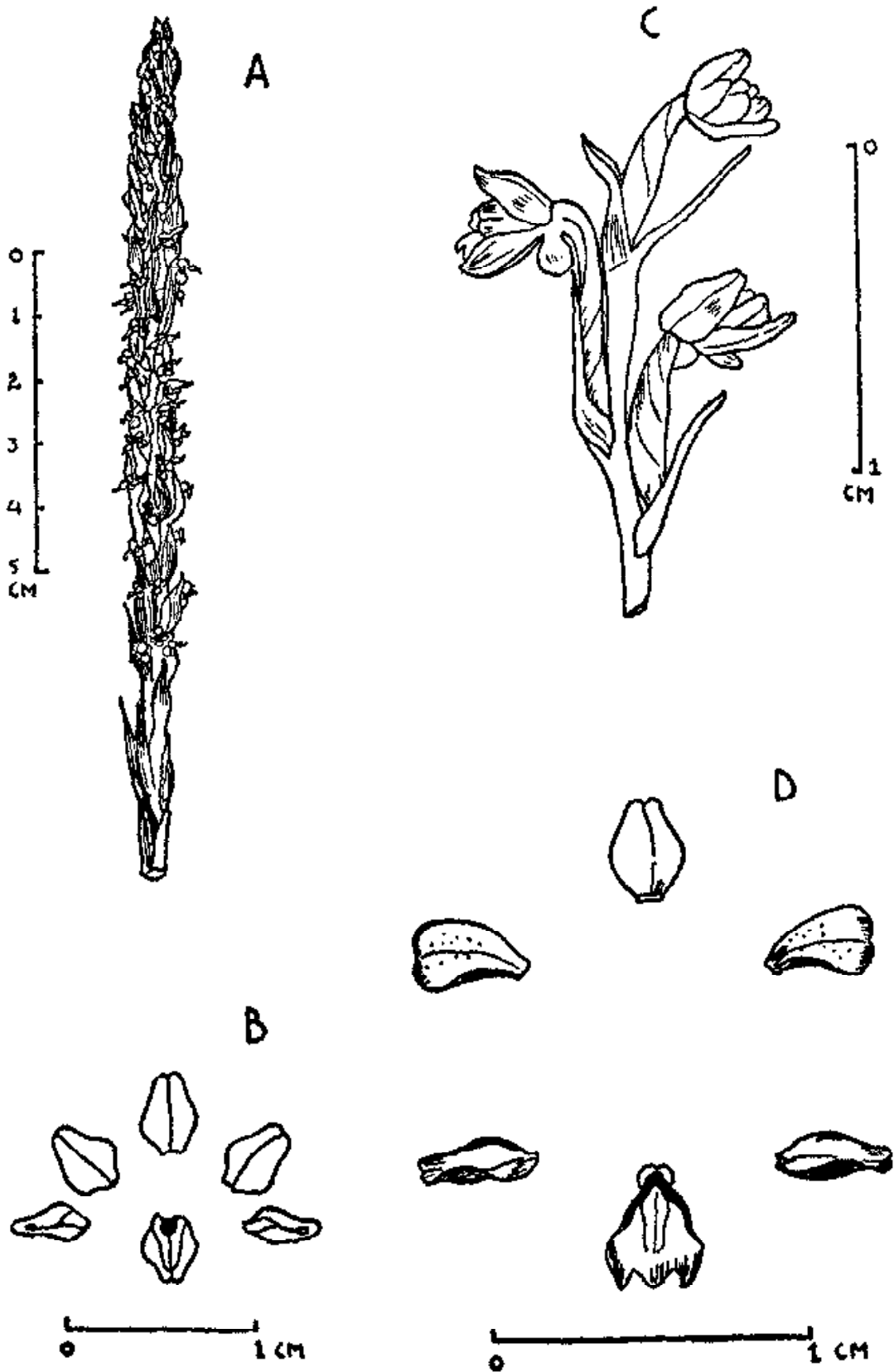
Occurrence : DANGS : Waghai, *Santapau* 19210. W. GHATS : Igatpuri, *Kapadia* 1383; Khandala, *Santapau* 773, 805, 2491, 2579, 4575-4576, 4672, 6883-6885, 9224-9225, 9248-9249; Irani 1167; *Kapadia* 557-559, 561; Lonavla, *Kapadia* 541, 545; Mahableshwar, *Santapau* 13208-13209; *Kapadia* 617-619, 2077-2080; Bhimashankar, *Kapadia* 1463. N. KANARA : Yellapur, *Kapadia* 2240.

Distribution in India : Parasnath Hill, Dangs, W. Ghats, N. Kanara southwards to Mysore. *World* : Apparently endemic in India.

Critical Notes : This is a common orchid in the undergrowth of forests; together with *P. lawii* this is one of the commonest orchids in such habitats. The structure of the spur at once distinguishes this species from *lawii*.

3. *Peristylus spiralis* A. Rich. in Ann. Sc. Nat. ser. 2, 15 : 69, t. 2 B, 1841; Wight, Icon. t. 1696, 1851; Cooke 711; Gammie 172; Fischer 1474; Blatt. & McC. 735. *Habenaria torta* Hook. f. Fl. Brit. India 6 : 159, 1890.

We have seen no specimen of this plant in the field; there is none



Peristylus plantagineus Lindl. Inflorescence (A) and dissection of calyx and corolla (B).
P. lawii Wt. Inflorescence apex (C) and dissection of calyx and corolla (D).

in Blatter Herbarium. We give, therefore, a translation of the original description of A. Richard's loc. cit. :

'Stem slender, leafless for a foot from the base, laxly sheathed ; leaves elliptic-lanceolate, acute, sheathing at the base, passing into bracts above, which are lanceolate, acute ; flowers small, spicate, bracteate ; spikes subspiral ; bracts lanceolate, acute, longer than the flowers ; sepals oval-oblong, obtuse ; lip fleshy, trifold, saccate at the base ; lobes subequal, linear, obtuse ... Stem bi-tuberculate, tubers entire, ovoid-oblong, leaves narrow ; flowers greenish-white ...'

Occurrence : KONKAN : Law ; Stocks. N. KANARA : Tinai Ghat, Talbot.

Distribution in India : Konkan, N. Kanara, Bababudden Hills, Nilgiris up to 2100 m, Travancore. *World* : India, Ceylon.

4. *Peristylus plantagineus* Lindl. Gen. Sp. Orch. 300, 1835 ; Wight, Icon. t. 921 ; Cooke 711 ; Gammie 173 ; Fischer 1475 ; Blatt. & McC. 735. *Habenaria wightii* Trimen, Cat. Ceyl. Pl. 91, 1885 ; Hook. f. Fl. Brit. India 6 : 162. (See Plate X, A-B)

Herbs 17-88 cm tall. *Tubers* 2, oblong or ellipsoidal. *Stem* robust, generally of a pinkish-brown hue, sheathed below the leaves ; sheaths broad widening at the mouth, somewhat funnel-shaped, acute, the margins entire and minutely papillose, often pale yellowish-white. *Leaves* 4-8, clustered about the middle of the stem, closely sheathing at the base, sessile, brownish-green above, pale pink-brown beneath ; oblong, oblong-lanceolate to broadly elliptic or elliptic-ovate, acute, 7-23 × 2-9 cm ; margins yellowish, entire, minutely papillose ; midnerve prominent beneath with 5-7 faint lateral nerves. *Inflorescence* in spikes 9-22 cm long, erect, strict, densely and compactly many-flowered, pale pinkish-brown ; peduncle 4-10 cm long, terete, pale brown, bracteate ; bracts 1.5-2 × 0.4 cm, ovate-lanceolate, acuminate, entire, minutely papillose, glabrous, dirty brownish-green with a yellowish margin. *Flowers* sessile, bracteate, pinkish-brown. *Bracts* unequal, the lower much longer than the ovary, the upper ones smaller, 9-14 × 2-3 mm, subulate, lanceolate-acuminate, pale brownish-green, somewhat strongly 1-nerved. *Sepals* subequal, dirty brown, very minutely denticulate, glabrous, strongly 1-nerved ; dorsal sepal 2-4.5 × 2.3 mm, concave, oblong-ovate ; lateral sepals 2.5-5 × 1.5-2.5 mm, spreading, oblong, the margins incurved often overlapping. *Petals* 2.5-4 × 2-3 mm, white, subobliquely oblong-elliptic or rarely sub-orbicular, obtuse, entire, glabrous, 1-nerved, somewhat gland-dotted. *Lip* 2-3.5 × 2-3.5 mm, smaller than the lateral sepals, white, faintly gland-dotted, broadly ovate-oblong in outline, shortly 3-lobed ; very small, entire, obtuse ; base of the lip subconcave ; the lip 3-nerved, mid-nerve running straight from the base to the apex, the 2 lateral ones

slightly sinuate, meeting a little below the apex to form a loop across the midnerve. *Column* very short, pale green. *Anther*-cells short, sessile on the column, divergent at the base; pollinia 2, bipartite, clavate, caudicles very small with a small, orbicular gland. *Stigmatic* lobes short, stout, convex. *Ovary* 10×2 mm stout, curved at the apex, pale brown, ribbed.

Flowering : July to August. *Fruiting* : up to December.

Occurrence : DANGS : Waghai, *Santapau* 19133, 19208-19211, 19999 ; *Kapadia* 691-693, 1429-1435 ; Subir, *Santapau* 19510. KONKAN : *Nimma* ; Borivli, R. Fernandez 2314-2315 ; *Herbert* 2521 ; Malwan, *Dalzell*. W. GHATS : Lonavla, *Kanitkar* ; *Kapadia* 544-545 ; Ram Ghat, *Ritche*. N. KANARA : Londa, *Spooner* ; Yellapur, *Talbot* ; *Kapadia* 2042, 2214-2223 ; Dandeli, *Kapadia* ; Guddehalli, *Talbot* ; *Bell* 7869 ; *Hallberg & McCann* 34896 ; *Kapadia* 2131 ; Karwar, *Hallberg & McCann* 34375, 35014.

Distribution in India : Madhya Pradesh, Dangs, Konkan, W. Ghats, N. Kanara, Rampa Hills in Andhra, Annamalais, Malabar, Travancore. *World*: India, Ceylon.

Critical Notes : This species is typical of dense forests, but is usually found only in clearings in the forest, along forest paths, etc. Hooker f. has given *P. elatus* Dalz. as a synonym of this species ; Alston has kept it as a distinct and valid species but in the genus *Habenaria* as *H. elata* (Dalz.) Alston in *Trim. Handb. Fl. Ceyl.* 6 : 280, 1931. Dalzell & Gibson in their BOMBAY FLORA mention that the lateral sepals of *P. elatus* Dalz. are mucronate on the back ; this is certainly not the case with *P. plantagineus* Lindl.

5. *Peristylus goodyeroides* Lindl. *Gen. Sp. Orch.* 299, 1835 ; Dalz. & Gibs. *Bombay Fl.* 300, 1861 ; J. J. Smith 32, t. 14 ; Fischer 1475 ; Blatt. & McC. 735. *Habenaria goodyeroides* D. Don, *Prodr. Fl. Nep.* 25, 1825 ; Graham, *Cat.* 201, 1839 ; Hook. f. 161 ; King & Pantling 326, t. 430 ; Duthie 192 ; Prain, *Bengal Pl.* 1039 ; Holttum 86. *H. affinis* D. Don, *op. cit.* 25, 1825. *Peristylus goodyeroides* var. *affinis* Lindl. *op. cit.* 300, 1835 ; Cooke 712 ; Gammie 173. *Habenaria goodyeroides* var. *affinis* King & Pantl. *op. cit.* 327, t. 430 (bis), 1893.

Herbs 37 cm tall. *Leaves* more or less clustered about the lower third of the stem sessile, hardly narrowed to the sheathing base, broadly ovate-elliptic or elliptic, about 7-nerved, acute, 7-11×4-4.5 cm ; margins entire, yellowish, minutely papillose. *Peduncle* 10 cm long, terete, grooved, with a single bract, which is 3×0.6 cm, oblong-lanceolate, acute, entire and minutely papillose. *Spike* erect, very lax, 14.5 cm long. *Flowers* about 10 mm long sessile, bracteate. *Bracts* lanceolate, acuminate, acicular, equal to or longer than the flowers, entire minutely papillose, 1-3-nerved, each 12-20×3-4 mm. *Sepals*

unequal ; dorsal ovate-oblong, obtuse, entire, $3.5 \times 1.5-1.75$ mm ; lateral ones 4×1.5 mm, obliquely obovate-oblong or oblong, concave, 1-nerved, mucronate a little below the apex, which is somewhat incurved and acute. *Petals* trapezoidal-obovate, rounded, entire 3×1.5 mm. *Lip* longer than the petals, 3-lobed to below the middle, 3-4 mm long ; lateral lobes narrowly linear-oblong, obtuse, entire ; midlobe very slightly shorter than the side-lobes, obovate-oblong, tapering to a blunt, subtruncate entire apex. *Spur* long, saccate, ovate-globular, 1.5 mm long. *Ovary* twisted, shallowly ribbed, sessile, 6-7 mm long.

Flowering : August.

Occurrence : KONKAN : Nimmo ; Dalzell. N. KANARA : Castle Rock, Sedgwick ex Blatt. & McC. Devimane Ghat, Sedgwick & Bell ex Blatt. & McC.

Distribution in India : Dehra Dun, Sikkim, Khasia and Naga Hills, Konkan, N. Kanara, W. Ghats of Bombay, and southwards. *World* : India, Nepal, Ceylon, China, southwards to Malaysia.

Critical Notes : We have studied a specimen from Travancore collected by Calder & Ramaswamy, very kindly loaned to us by the Curator, National Herbarium, Calcutta. Our plant differs somewhat from the typical forms described and illustrated by King & Pantling, Duthie, and others, in that the spikes are very lax, and the floral bracts are sharply acuminate and about twice as long as the entire flower.

Hooker f., op. cit., p. 166, considers *H. affinis* D. Don a small state of *H. goodyeroides* D. Don. King and Pantling reduce the former to a variety of the latter. Cooke points out that it is the var. *affinis* that has been recorded from Bombay ; on the other hand Blattner and McCann do not distinguish the variety from the typical plant. After carefully examining the descriptions and illustrations of these plants, we have come to the conclusion that the so-called variety does not deserve even varietal rank, and for this reason we have merged it with the typical species.

6. *Peristylus lawii* Wight, Icon. 5 : 12, t. 1695, 1851 ; Dalz. & Gibs. 270 ; Cooke 710 ; Gammie 174 ; Blatt. & McC. 735. *Habenaria lawii* Hook. f. Fl. Brit. India 6 : 162, 1890 ; Prain, Bengal Pl. 1032 ; Duthie 192, t. 143 & Fl. Upp. Gang. Pl. 3 : 227, 1920 ; Haines, Bot. Bih. & Or. 1160. (See Plate X, C-D)

Herbs 15-45 cm high. *Tubers* 1-2, oblong-obovate, somewhat flattened. *Stem* terete, brownish-white, stout, sheathed ; sheaths 2-3, each 1.5-3 cm in length, broad-mouthed, oblong. *Leaves* 3-5, clustered about the middle of the stem, not reduced to bracts above, sheathing at the base, lanceolate or oblong-lanceolate, acute, entire, minutely papillose, glabrous, grass-green above, pale dull green beneath,

3-13×2.4 cm. *Inflorescence* in somewhat lax spikes, 8-18 cm long ; peduncle bracteate, terete, green, 4-7 cm long. *Flowers* sessile, white tinged with greenish-yellow, bracteate. Bracts lanceolate, acuminate entire, shorter or longer than the flowers, 1-nerved, 5×2 mm. *Sepals* subequal, white ; dorsal sepal ovate-oblong, obtuse or subretuse, entire, 1-nerved, concave, 3×2 mm ; lateral sepals oblong, obtuse, subconcave conduplicate, entire, glabrous, 1-nerved, 3.5×1.5 mm. *Petals* obovate in outline, retuse. *Lip* 3-lobed about the middle, clawed, 3.5×2.5 mm ; claw slightly elongate, concave ; lobes subequal, lateral ones about 1 mm long, rounded, curved on the outer margins, subacute, slightly longer than the straight obtuse midlobe. *Spur* small, scrotiform, 1 mm in diameter with a circular depression all round. *Column* very short, greenish-white. *Ovary* pale green, ribbed, about 5 mm long. *Capsule* fusiform, turgid, ribbed, 1-1.5 cm long ; beak 3-5 mm long.

Flowering : July. *Fruiting* : September.

Occurrence : DANGS : Waghai, *Kapadia* 1420. KONKAN : NW. of Bhiwandi, *Santapau* 233/3 ; Hills SE. of Tansa Lake, *Santapau* 15876 ; Badlapur, *Kapadia* 1291 ; Nerul, *Bhiva*. N. KANARA : Belgaum, *Law* ; Dharwar, *Law ex Stocks*.

Distribution in India : Dehra Dun, Garhwal, Bengal, Bihar, Madhya Pradesh, Dangs, Konkan, W. Ghats, N. Kanara, Mysore. *World* : Apparently endemic in India.

Critical Notes : This species has been found by us in fairly dense undergrowth on sloping ground, on hilly parts of Bombay State. This and *P. stocksii* are the only species that can be said to be common in Bombay ; the spur of the present species is typical.

3. OBERONIA LINDL.

The generic name *Oberonia* seems to be derived from Oberon, the King of Fairies, in reference to the strange and variable forms of the plants of this genus. This is one of the more difficult among orchid genera, mostly on account of the minute structure of the flowers. Identification of the genus is simple enough, for the plants are very distinctive in their general appearance ; identification down to the species level is rather difficult on account both of the very small size of the flowers and of their annoying variability.

The genus *Oberonia* is common in most parts of the former Bombay State, as it stood after Independence ; *Oberonia* is particularly common from about Bombay latitude southwards to N. Kanara and beyond. They are usually perennial herbs, but flower at various times in the year. We do hope that these notes with the diagrams of some of the species will be of help to other Bombay botanists.

OBERONIA Lindl. Gen. & Sp. Orch. Pl. 15, 1830, nom. cons. ; Endl.

Gen. Pl. 188, 1837 ; Lindl. Fol. Orchid. Oberon. 1852 ; Benth. & Hook. f. Gen. Pl. 3 : 494, 1883 ; Pfitz. in Engl. & Prantl. Pflanzenfam. 2(6) : 131, 1888 ; Hook. f. Fl. Brit. India 5 : 675, 1898 ; King & Pantl. in Ann. R. bot. Gard. Calcutta 8 : 2, 1898 ; Duthie, *ibid.* 9 (2) : 85, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 233, 1905 ; Schlecht. Orchid. 156, 1927 ; Holttum Rev. Fl. Malay. 1 : 208, 1953. *Iridorkis* Thou. in Nouv. Bull. Soc. Philom. Paris 1 : 319, 1809. *Iridorchis* Thou. Hist. Pl. Orch. 1822 ; O. Kuntze, Rev. Gen. Pl. 2 : 668, 1891.

Erect or pendulous *epiphytes*. *Stems* usually dense and short, occasionally long and slender. *Leaves* much laterally compressed, with broad overlapping sheaths at the base, ensiform, fleshy, leathery. *In-florescence* in terminal, dense, sub-cylindric racemes or spikes, which continue to grow at the base after the middle part has matured; the uppermost flowers usually open first. *Flowers* up to 2 mm, often scarcely 1 mm long, sessile or on a short stalk and bracteate ; the colour of the flowers is usually inconspicuous, often greenish or greenish yellow. *Sepals* free, nearly equal among themselves, erect or reflexed. *Petals* usually narrower and shorter. *Lip* sessile, concave at the base, fimbriate, entire or more or less 3-lobed. *Column* very short, footless ; clinandrium fairly prominent. *Anther* terminal, opercular, incumbent ; pollinia 4, waxy, yellow, in pairs without caudicles, often attached by a viscid substance at the apices. *Capsules* small, globose or shortly oblong, ridged.

It may be interesting to put down here some general points on the structure of the flowers. Hooker f. mentions that each bract supports 2 flowers ; in Bombay we have noted that each flower is supported by its own individual bract. Some of the species are described as having setaceous sepals and petals; actually these setaceous structures are prominent hyaline glands which may appear as setae especially in moist flowers from dry herbarium specimens. The tips of the sepals are often curved inwards, and they then seem to be obtuse ; in fact they are sharply acute. In the normal position of the lip the lateral lobes are usually more or less folded over the column, and appear very small ; again careful observation will show that they are often fairly large ; but this can only be seen when the fresh lip is properly spread out. A careful examination of the structure of the lateral lobes is essential, since the separation of species is often based on such a structure.

Type species : *O. iridifolia* (Roxb.) Lindl.

KEY TO THE SPECIES OF *OBERONIA*

1. Sepals similar ; lateral lobes of lip not encircling the column ; midlobe of lip usually straight :
 2. Petals and lobes of lip deeply toothed ;

3. Small plants ; lvs. to 4 cm long ; rachis terete ; flrs. orange, stalked ; sepals & petals erect ; lip clearly 3-lobed, the midlobe with broad oblong lobules *brachyphylla*
3. Large plants ; lvs. to 15 cm long ; rachis flattened ; flrs. golden yellow, \pm sessile ; sepals & petals reflexed ; lip obscurely 3-lobed, midlobe 2-lobulate *iridifolia*
var. *denticulata*
2. Petals & lobes of lip \pm entire :
4. Petals broad :
5. Spikes shorter than leaves ; petals and lip pubescent . *ensiformis*
5. Spikes much longer than leaves ; petals and lip glabrous :
6. Lobes of lip large ; midlobe about equal to side lobes *recurva*
6. Lobes of lip very small or 0 ; midlobe 4-5 times larger than side ones :
7. Inflorescence rachis thickened in fruit, with a few minute scaly bracts ; flrs. \pm embedded in rachis ; lip as broad as long, not lobed, denticulate *proudlockii*
7. Rachis not thickened in fruit, with large serrulate bracts at base ; lip broader across side lobes than across midlobe, which is entire, 2-lobulate *falconeri*
7. Rachis not thickened in fruit, with a few or 0 minute bracts ; midlobe broader than lip across side lobes ; midlobe divided at apex into 2 truncate lobules *verticillata*
4. Petals, narrow, \pm linear :
8. Lvs. thin ; flrs. long-pedicelled ; lateral lobes of lip up to equal to midlobe, which is divided at apex into 2 diverging lobules *wightiana*
8. Lvs. fleshy ; flrs. sessile ; lateral lobes longer than midlobe :
9. Lip longer than broad ; lateral lobes

- broad, wing-like ; midlobe short \pm quadrate, \pm 3-lobed at margin *platycaulon*
9. Lip oblong-orbicular ; apex 2-lobulate, lobules orbicular *brunoniana*
9. Lip broadly 3-lobed ; midlobe much smaller than lateral lobes *santapau*
1. Sepals unequal ; lateral lobes of lip encircling the column ; midlobe of lip usually folded upwards :
10. Petals broad ovate ; lateral lobes of lip linear-lanceolate, ascending as erect horns around the column, slightly diverging at the tips or not *bicornis*
10. Petals narrow linear ; lateral lobes of lip elongated, filiform, \pm aristate meeting beyond the column *tenuis*

ENUMERATION OF THE SPECIES OF *OBERONIA*

1. *Oberonia brachyphylla* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 257, t. 2, 1931 (See Plate XI, A'-B')

Small pendulous *epiphytes*. Leaves 0.6-4 \times 0.3-1.4 cm fleshy or thin, ovate to oblong or lanceolate, straight or more commonly the uppermost falcate. *Scapes* adnate to the uppermost leaf, bracteate, about 2-5 mm long, terete. *Inflorescence* 0.8-7 cm long, somewhat decurved, dense or lax, many-flowered. *Flowers* about 2 mm long, orange or yellowish orange, more or less whorled, bracteate, with long pedicels. *Bracts* shorter than the pedicels, lanceolate or ovate-lanceolate, acute or acuminate, irregularly crose, gland-dotted. *Sepals* about 0.75 \times 0.5 mm, subequal, gland-dotted, acute-mucronulate, entire, erect ; the dorsal one ovate-oblong, the laterals obliquely ovate-subacuminate. *Petals* more or less equal to the sepals, oblong-obovate, narrowed to the base, or even oblong-orbicular, obtuse, slightly retuse, irregularly denticulate. *Lip* 1-1.25 mm, nearly twice the size of the sepals and petals, somewhat quadrangular in outline, 3-lobed, 3-nerved, distinctly gland-dotted ; lateral lobes broad, irregularly pectinate, the lip across the lateral lobes about equal to or slightly broader than across the midlobe ; midlobe 2-lobulate with a broad or narrow sinus in between the lobules, the latter slightly divergent, oblong, irregularly denticulate or pectinate at the apex or even all around. *Ovary* with pedicel about 1 mm long. *Capsules* up to 5 mm long, ovoid or obovoid, long-pedicelled.

Flowering and Fruiting : March.

Occurrence : Bell ; Kapadia 1857, 2853-2857.

Distribution : Apparently endemic in N. Kanara.

Notes : Blatter & McCann described their species from detailed illustrations prepared by T. R. Bell and Miss Bell ; these illustrations were drawn directly from live specimens. As no type was designated

for the species, and further as there is no type material at all, we hereby establish the specimen, *Kapadia* 2855, as the Neotype of *O. brachyphylla* Blatt. & McC.

2. *Oberonia iridifolia* Lindl. var. *denticulata* Hook. f. Fl. Brit. India 5 : 676, 1890 ; Fischer, Fl. Pres. Madr. 1406, 1928. *O. denticulata* Wight, Icon. 5(1) : 3, t. 1625, 1851 ; Lindl. 2. (See Plate XII)

Erect or occasionally pendulous *epiphytes*. *Leaves* 4-15 × 1.5-2.5 cm, fleshy, broadly ensiform, ovate-oblong to oblong-lanceolate, often subfalcate, acute to subacuminate. *Scape* 2-5 cm long, bracteate or ebracteate, flattened, 2-angled, somewhat twisted, often adnate to the uppermost leaf particularly in young plants. *Inflorescence* 7-20 cm long, decurved or rarely straight, dense. *Flowers* about 2 mm across, imbricating or in sub-verticils, golden yellow, bracteate, sessile. *Bracts* 2 × 1 mm, ovate to elliptic, acute, irregularly crenulate, convolute, sheathing the sessile ovary. *Sepals* 1 × 0.75 mm, equal, broadly ovate-rotund or suborbicular, acute-mucronulate, 1-nerved. *Petals* 1 × 0.6 mm, ovate-elliptic, obtuse to rarely subretuse, irregularly jagged, 1-nerved. *Sepals* and *petals* reflexed and resting on the ovary. *Lip* 1.5 × 2 mm, obscurely 3-lobed ; lateral lobes pectinately crose ; terminal lobe 2-lobulate with an unequal broad sinus, the lobules dentate or more often bidentate ; nerves of the lip 3, the lateral ones sinuous, the central one straight. *Column* stout, broad, sessile, over 1 mm in length. *Anther* transversely oblong-orbicular with a small rounded apex, greenish-white. *Capsule* sessile, broadly ovoid, 5 × 2 mm.

Flowering : August to September. *Fruiting* : October to December.

Occurrence : KONKAN : Tansa, *Santapau* 16030 ; *Kapadia* 731, 1638. N. KANARA : Gundh, *Bole* 1497 ; *Kapadia* 1711-1717.

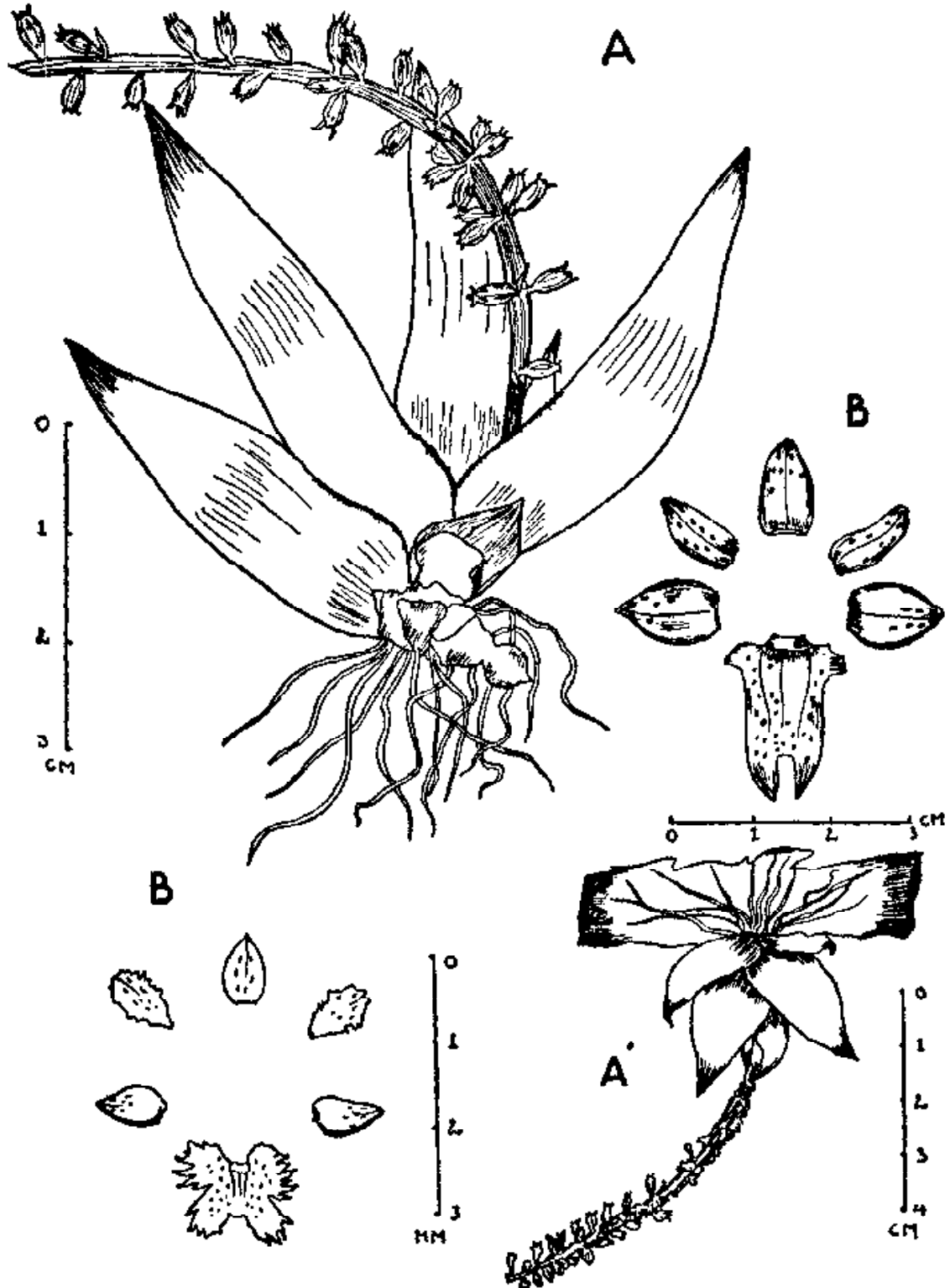
This species has been recorded from Bombay State for the first time.

Distribution : *O. iridifolia* Lindl. is a very variable species and is widely distributed all over India. The var. *denticulata* Hook. f. is restricted to South India ; we have noted it in Bombay for the first time.

Notes : We have examined the specimen *Fischer* 3509 labelled *O. brunoniana* Wt. in 1920 ; the name was changed by Fischer himself to *O. lindleyana* Wt. The plant, however, belongs to *O. iridifolia* var. *denticulata* Hook. f.

In Wight's description of *O. denticulata* there is no mention of the crose nature of the petals ; Wight's Icon 1625 shows the petals to be smoothly entire. We have observed the petals to be distinctly and irregularly jagged.

3. *Oberonia ensiformis* (Sm. ex Rees) Lindl. Fol. Orchid. Oberon. 4, 1852 ; Hook. f. 679 ; Grant, Orch. Burma 29, 1895 ; King & Pantl. 9, t. 9 ; Duthie 86 et Fl. Upp. Gang. Pl. 3 : 183, 1920 ; Brühl, Guide Orch.



A-B. *Oberonia falconeri* Hook. f. ; A'-B'. *O. brachyphylla* Platt. & McC.
 A-A'. Whole plant ; B-B'. Sepals, petals and lip.

Sikk. 37, 1926; Fischer 1405. *Malaxis ensiformis* Smith in Rees, Cycl. 22: n. 14, 1812; Reichb. f. in Walp. Ann. 6: 212, 1861. *Oberonia trilobata* Griff. Notul. 3: 273, 1851. *O. acaulis* Hook. Bot. Mag. t. 5056, 1858, (non. Griff. 1851). *Iridorchis ensiformis* O. Kuntze, Rev. Gen. Pl. 2: 669, 1891 (See Plate XIII)

Large pendulous epiphytes. Leaves 6-28 × 0.5-1.5 cm fleshy, ensiform, acuminate, falcate or straight, generally all curving in one direction. Inflorescence much shorter than the leaves, 6-14 cm long; peduncle fleshy, pale brown, terete, sparsely bracteate; bracts lanceolate, minute, pale yellow. Flowers about 2 mm long, subsessile, bracteate, in more or less clear verticils. Bracts longer, ovate-oblong, erose, glabrous, completely sheathing the ovary, their apices acute and recurved. Sepals and petals reflexed on the ovary, gland-dotted, entire, subacute. Sepals subequal, broadly ovate, glabrous. Petals ovate, pubescent with blackish stiff bristles. Lip about twice as long as the sepals or petals, 3-lobed, of a much darker colour, turning somewhat black on drying; lateral lobes fairly large, rounded, stiffly pubescent; the terminal lobe somewhat obreniform in outline, 2-lobulate, pubescent with bristle-like black hairs, the lobules somewhat rounded, separated by a wide subtruncate sinus; the terminal lobe is separated from the lateral ones by an oblong, completely glabrous mesochile, which has 2 blister-like projections on the sides. Ovary very shortly stalked, pale yellowish, ridged. Capsule 4-6 × 2-3 mm, ovoid, strongly ribbed, subsessile.

Fruiting: November onwards.

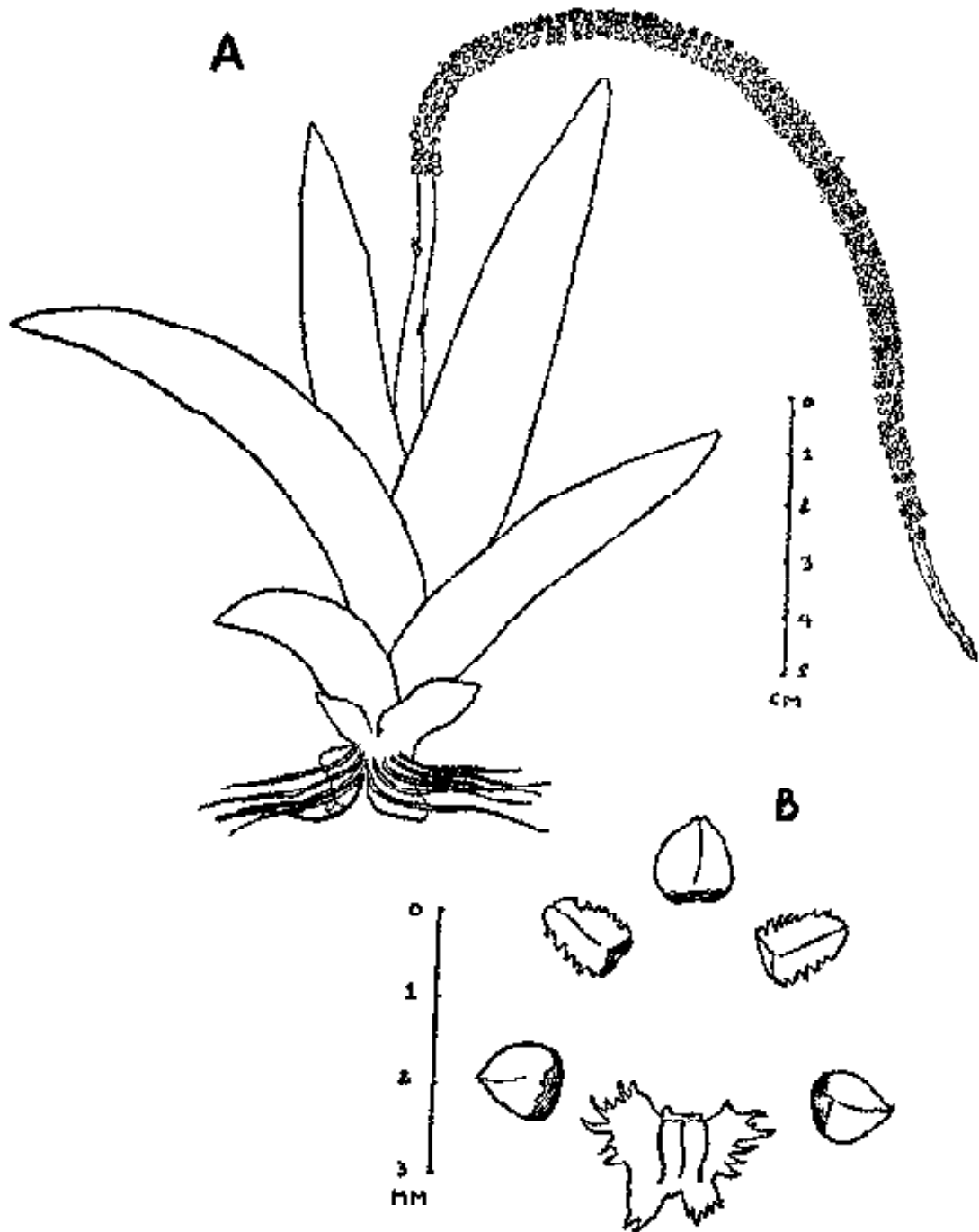
Occurrence: N. KANARA: Dandeli, Kapadia 1671-1672, 1682; Yellapur, V. Patel 1847; Kapadia 2350-2352; Kumbelli Mines, about 17 miles from Supa, Kapadia 2662-2663.

This species is of fairly widespread occurrence in N. Kanara; strangely enough it has not been recorded for Bombay State by any of the earlier workers. It constitutes a new record for this area.

Distribution: India: Dehra Dun and up to 1000 m on the adjacent Himalayas, extending eastwards to Sikkim and Khasia Hills, southwards to N. Kanara and the Nilgiris. World: India, Nepal.

Notes: This species is easily distinguished by its large ensiform leaves, all of which usually curve in the same direction, and by the stout inflorescence, which, however, is always much shorter than the leaves. It is closely allied to *O. ferruginea* Parish ex Hook. f.; the latter has completely glabrous flowers.

4. *Oberonia recurva* Lindl. in Bot. Reg. msc. 8, 1839, et Fol. Orchid. Oberon. 5, 1852; Dalz. & Gibs. Bomb. Fl. 260, 1861; Hook. f. Icon. Pl. t. 1784 A, 1888, et Fl. Brit. India 5: 680, 1890; Gammie in J. Bombay nat. Hist. Soc. 16: 564, 1905; Cooke, Fl. Pres. Bomb. 2: 676, 1907;



Oberonia iridifolia var. *denticulata* Hook. f.
 A. Whole plant : B. Sepals, petals and lip.

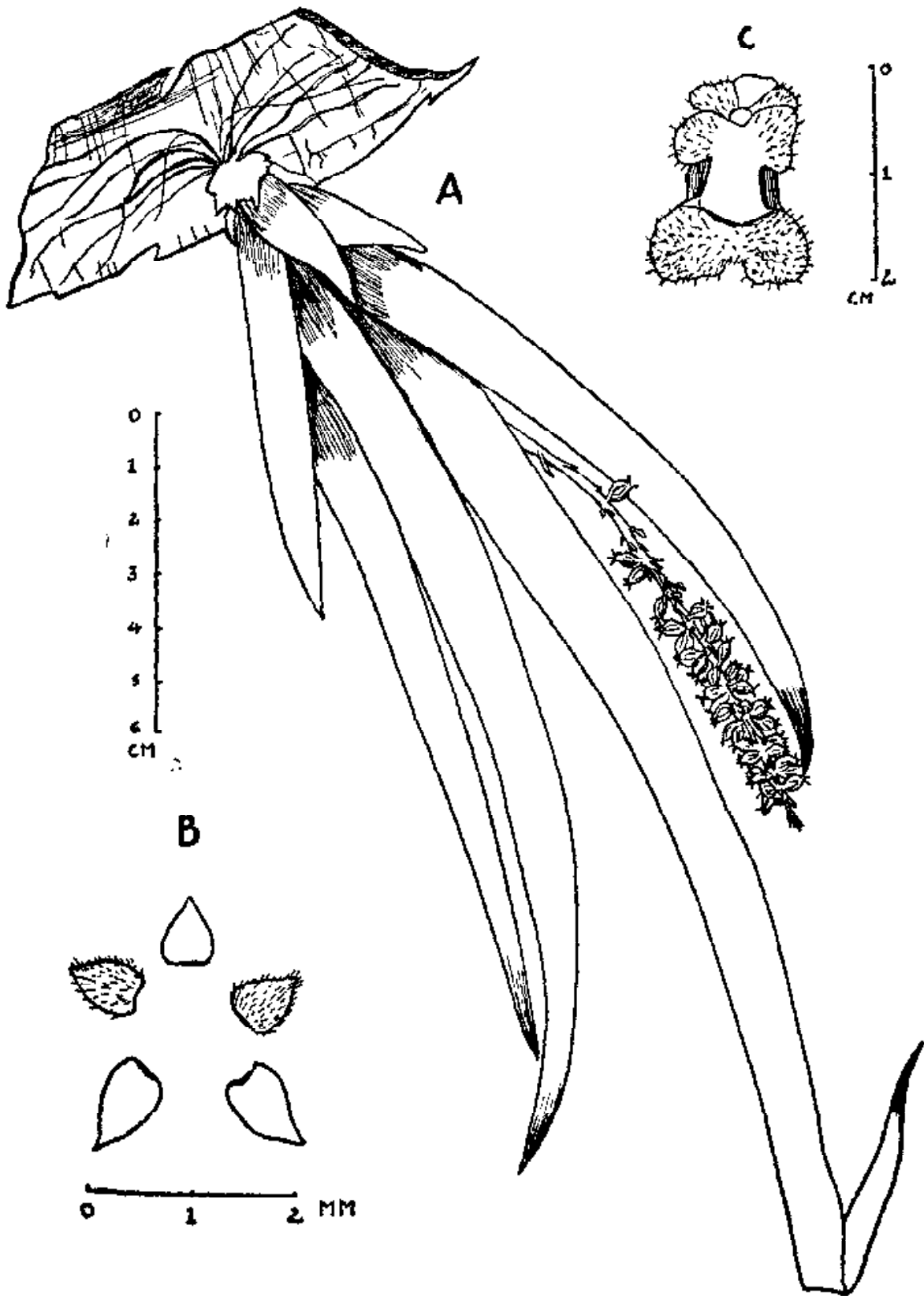
Fischer 1406 ; Blatt. & McC. 257 ; Santapau in Rec. bot. Surv. India 16 (1) : 288, 1953. *Oberonia setifera* Lindl. Fol. Orchid. Oberon. 3, 1852. *Malaxis recurva* et *setifera* (Lindl.) Reichb. f. in Walp. Ann. 6 : 210, 212, 1861. *Iridorchis recurva* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 669, 1891.

Pendulous epiphytes. Leaves 0.5-5 × 0.3-1.7 cm, ovate to lanceolate, at times subfalcate (particularly the uppermost one), acute to acuminate. Peduncles 0-1 cm long, adnate to the uppermost leaf, with minute hyaline subulate bracts. Racemes 1-11.5 cm long, straight or recurved, dense or rarely lax. Flowers 1.5-2 mm across, imbricating, bracteate, pedicellate, pale orange to deep brick-red. Bracts 1-2 × 0.5 mm, shorter or slightly longer than the flowers, gland-dotted, 1-nerved, ovate-acuminate to subulate ; subtire to erose, acuminate. Sepals 0.5-0.75 mm long, subequal, ovate, entire, more or less gland-dotted, 1-nerved ; lateral sepals concave, very often mucronulate ; the dorsal one subconvex, ovate-oblong, obtuse, at times subacute. Petals 0.5-0.75 mm obovate-oblong or obovate-spathulate, truncate or truncate-retuse or obtuse-retuse, subtire to erose, more or less gland-dotted along the single midnerve. Lip deep red, usually of a much darker colour than the petals and sepals, very variable in shape and size, 3-lobed, 0.75-1 mm long, equal to or nearly twice as long as the sepals or petals, densely or very sparsely gland-dotted, with a small concave disc just below the anther, 3-nerved. Lateral lobes of lip large, rounded, rarely subtruncate, subtire, erose ; width of the lip across lateral lobes \pm equal to that across the midlobe ; midlobe 2-lobulate, obcordate-oblong, subtire to erose ; apices of lobules acute to truncate or obtuse, subtire or erose ; sinus between the lobules broad or narrow, with or without a small apiculum in between. Column very small with a transversely oblong stigmatic surface. Anther opercular, yellowish green. Ovary with pedicel 0.75-1.5 mm long. Capsule 2.5 × 2 mm, subrotund to obovate-oblong ; pedicel 0.5 mm long.

Flowering : November to February. Fruiting : December to July.

Occurrence : KONKAN : Law ; Thana, cultivated, Kapadia 1105. W. GHATS : Kasara, Kapadia 902 ; Khandala D. K. Patel ; Santapau 233.4, 3622, 10788 ; C. Saldanha 1152 ; Kapadia 507, 529, 1062, 1834-1835 ; Lonavla, Gammie ; Hallberg ; Kapadia 538, 1047, 1054 ; Mahableshwar, Cooke ; Santapau 11819, 11913 ; Kapadia 500, 600-601, 983, 1928-1929 ; Mahableshwar-Pratapgad, Agharkar ; Pratapgad, Bole 1078, DECCAN : Koina Valley, Kapadia 2906-2907. N. KANARA : Londa, Santapau 10854 ; Kumbelli Mines, about 17 miles from Supa, Kapadia 2563-2567, 2675-2677, 2764-2766 ; Yellapur, Kapadia 2868 ; Castle Rock, Santapau 17655, 17831, 17909 ; Kapadia 2814 ; Anmod, Kapadia 1914 ; Dandeli, Kapadia.

Distribution : Konkan, W. Ghats, Deccan, N. Kanara, Travancore.



Oberonia ensiformis Lindl.
A. Whole plant ; B. Sepals and petals ; C. Lip.

Notes : We have noticed this species epiphytic on *Careya arborea* Roxb., *Ficus* sp., *Carissa congesta* Wt., *Euphorbia nerifolia* L., *Randia brandishi* Gamble and *Ixora brachiata* Roxb. This species is very variable in the shape and size of the various floral parts.

Blatter & McCann and Santapau cite King & Pantling in Ann. R. Bot. Gard. Calcutta 8 : t. 9, for *O. recurva* Lindl. This plate is *O. ensiformis* Lindl., a totally different species ; *O. recurva* Lindl. has not been recorded from Sikkim Himalayas.

5. *Oberonia recurva* Lindl. var. *lingmalensis* (Blatt. & McC.) Sant. & Kapadia in J. Bombay nat. Hist. Soc. 57 : 259, 1960. *O. lingmalensis* Blatt. & McC. *ibid.* 35 : 255, 1931.

After a very careful examination of a number of fresh plants collected from the type locality and a sheet in Sedgwick herbarium, *Sedgwick* 4626, identified by Blatter himself as *Oberonia lingmalensis* Blatt. & McC., we have come to the conclusion that the latter is but an intermediate form between *O. verticillata* Wt. and *O. recurva* Lindl. with greater affinities to the latter.

The only constant distinguishing characters between the present variety and *O. recurva* Lindl. are : (1) flowers in the variety have longer pedicels, and are placed in distinct verticils, not imbricating ; (2) the leaves in the variety are acute or acuminate. Often the lateral lobes of the lip are only slightly smaller than those normally met with in *O. recurva* Lindl., definitely not as minute as in *O. verticillata* Wt. ; with the latter species it can be compared only in the arrangement of the flowers.

We have, then, reduced the plants with narrower and more acuminate leaves, and with verticillate or subverticillate, long-pedicelled flowers, to a variety of *O. recurva* Lindl.

Flowering and Fruiting : September to February.

Occurrence : KONKAN : Thana, Bell. W. GHATS : Mahableshwar, *Sedgwick* 4626 ; Santapau 12519, 13169 ; Bole 409 ; Kapadia 956, 967, 1832, 2065. N. KANARA : Bell.

Distribution : Konkan, W. Ghats, N. Kanara.

6. *Oberonia proudlockii* King & Pantl. in Journ. As. Soc. Bengal II, 66 : 580, 1897 ; Fischer 1407. *O. sedgwickii* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 257, 1931.

Small pendulous epiphytes. Leaves 0.7-4 × 0.2-1.5 cm, very variable in shape and thickness, oblong to elliptic, or ovate to lanceolate, acute or rarely subacuminate, fleshy or rarely very thin. Scape 2-10 mm long, adnate to the uppermost leaf, with minute, hyaline ovate or ovate-oblong bracts. Inflorescence 1-6 cm long, straight or decurved ; rachis fleshy, considerably thickened in fruit. Flowers 1.25 × 1-1.25 mm, somewhat laxly imbricate, more or less sunk in the fleshy rachis and

scarcely appearing out of the general outline, subsessile, bracteate. *Bracts* 1×0.75 mm, pale yellowish green, slightly longer than the ovary and completely sheathing it, ovate-oblong, irregularly serrulate, acute, gland-dotted. *Sepals* 0.75×0.5 mm, subequal, 1-nerved, gland-dotted; the dorsal one ovate, acute or sub-obtuse; the lateral obliquely broadly ovate-acuminate, reflexed, lying at right angles to the dorsal sepal below the lip. *Petals* slightly shorter than sepals, reflexed, faintly 1-nerved, gland-dotted, entire or slightly erose, slightly dilated about the middle, somewhat spatulate, acute or subobtuse. *Lip* $0.6-0.75 \times 0.75-1$ mm, broader than the sepals, entire, gland-dotted, obovate-orbicular or quadrately-orbicular, erose or irregularly denticulate; apex usually somewhat 2-lobulate with a broad or narrow sinus in between; occasionally the lobules not distinct. Disc of the lip orbicular, distinct, 3-nerved. *Column* minute, yellow. *Anther* minute. *Ovary* together with the very short *pedicel* 0.75×0.5 mm, broadly obovate, ribbed. *Capsule* 3×1.5 mm, obovoid-oblong, ribbed.

Flowering and Fruiting : March.

Occurrence : N. KANARA : Anmod, *Kapadia* 1863, 1906, 1915 ; Castle Rock, *Sedgwick* ; *Kapadia* 2781, 2796-2797.

Distribution : N. Kanara, Nilgiris.

Notes : Our specimens have been collected from the type locality, Castle Rock, of *O. sedgwickii* Blatt. & McC. The latter species seems to be identical with *O. proudlockii* King & Pantling. It may be pointed out that certain characters, which are very distinctive of this species, have not been mentioned by Blatter & McCann such as (a) the considerably thickened rachis in fruits, (b) the peculiar way of the flowers being sunk in the fleshy rachis, (c) and the lip irregularly denticulate on the margin. Blatter & McCann describe the petals for their species as linear; King & Pantling state they are ovate-lanceolate. A careful examination of a number of flowers has shown that the petals in their reflexed position appear narrowly linear, but actually on dissection they are broad, oblong, slightly dilated about the middle.

We have found this species to be epiphytic on *Careya arborea* Roxb. and *Terminalia* sp. in open deciduous forest.

7. *Oberonia falconeri* Hook. f. *Icon. Pl.* t. 1780, 1888, et *Fl. Brit. India.* 5 : 678, 1890 ; Prain, *Beng. Pl.* 1003, 1903 ; Gammie 564 ; Duthie 2, t. 94, et *Fl. Upp. Gang.* Pl. 3 : 183, 1920 ; Cooke 676 ; Haines, *Bot. Bih. & Or.* 1164, 1924 ; Fischer 1406 ; Blatt. & McC. 256. *Iridorchis falconeri* (Hook. f.) O. Kuntze, *Rev. Gen. Pl.* 2 : 669, 1891. (See Plate XI, A-D)

Erect or pendulous *epiphytes*. *Leaves* $2-9 \times 0.5$ cm, coriaceous, oblong-lanceolate, subfalcate, acute or subacuminate. *Scapes* short covered by hyaline, subulate, irregularly serrulate bracts, more so at the base. *Inflorescence* 2-14 cm long, erect or curved, laxly many-flowered ;

rachis stout, strongly grooved, more so in fruit. *Flowers* spiral to subverticillate, about 1.5 mm across, greenish yellow, bracteate, shortly pedicellate. *Bracts* 2.5-3.5 × 0.7-1 mm, hyaline, shorter or longer than the flowers, sheathing round the ovary, oblong-lanceolate, subulate, irregularly denticulate, glabrous, 1-nerved. *Sepals* 1.25 × 0.75 mm, yellow, obtuse, entire, faintly 1-nerved, sparsely speckled with glands towards the apex; the dorsal one oblong-ovate, slightly narrower than the lateral ones; the lateral sepals broadly ovate. *Petals* 1.2 × 0.5 mm, yellow, oblong-ovate, subfalcate, obtuse, entire, glabrous, 1-nerved, sparsely gland-dotted. *Lip* 2 × 1.5 mm, greenish-yellow, obovate-oblong or oblong in outline, 3-lobed; the lateral lobes small, tooth-like, rounded, truncate, rarely subretuse; midlobe broad, about 4-5 times as long as the lateral ones, oblong, faintly wavy on the margins, 2-lobulate about a third from the apex; lobules parallel or incurved towards each other, subacute or obtuse, with a broad subtruncate sinus; nerves of the lip 3, the lateral ones sinuate, middle one straight, practically up to the sinus. *Column* small subquadrate, transversely oblong, yellow. *Anther* white, broadly ovate, truncate at the apex, rarely subretuse. *Capsule* 4 × 2 mm, obovoid, strongly ribbed, shortly stalked; pedicels about 1 mm long.

Flowering : September. *Fruiting* : October to December.

Occurrence : DANGS : Waghai, Santapau 20103; Kapadia 1161, 1439; Susarda, Kapadia 713. KONKAN : Law; Woodrow; Thana, Ryan; Kalyan, Millard; Tansa, Kapadia 748. N. KANARA : Alawal-Dandeli, Kapadia 1654; Dandeli, Kapadia 1668; Yellapur, Kapadia 1763, 1973, 2348-2349.

Distribution : India : Tropical Himalaya, Kumaon, Dehra Dun, Bihar, Chota Nagpur, Dangs, Konkan, N. Kanara, Mysore hills at 1000 metres, Rampa hills at 600 metres, Vizagapatam hills at 700 metres. *World* : India, Nepal.

Note : This species can easily be distinguished by the strongly grooved rachis; this is covered by hyaline, subulate, irregularly serrulate, loosely sheathing bracts at the base. It is usually found in open forest, epiphytic on *Tectona grandis* L.f., rarely on *Terminalia* sp.

8. *Oberonia verticillata* Wight, Icon. 5 (1) : 3, t. 1626, 1851; Lindl. 3, (excl. aliq. var.); Hook. f. 678; Fyson, Fl. Nilg. Puln. Hill-Tops 383, 1915; Fischer 1406; Blatt. & McC. 255. *Malaxis verticillata* (Wt.) Reichb. f. in Walp. Ann. 6 : 211, 1861. *Iridorchis verticillata* (Wt.) O. Kuntze, Rev. Gen. Pl. 2 : 669, 1891. *Oberonia verticillata* var. *longibracteata* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 255, 1931. *O. spiralis* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 256, 1931 (non Griff. 1851, nec Lindl. 1852). (See Plate XIV, A-B)

Pendulous epiphytes. *Leaves* 3-20 × 0.7-1.5 cm, oblong, narrowly

ensiform, acuminate, fleshy. *Peduncle* about 3 cm long, bracteate to the base, not joined to the uppermost leaf. *Inflorescence* up to 25 cm long falcately curved or nearly straight. *Flowers* in distinct verticils or spirals (each whorl about 2-3 mm apart), shortly pedicelled, bracteate, yellow. *Bracts* 1.5-2 mm long, slightly longer than the flowers or equalling them, oblong, acute or with a short acumen, much erose or subfimbriate, ensheathing the ovary and the pedicel, sparsely gland-dotted. *Sepals* subequal; the dorsal one 0.75×0.75 mm, ovate oblong, obtuse, mucronulate, 1-nerved, subconcave; the lateral ones bigger, 1 mm long, nearly as broad, broadly ovate, mucronate, concave, 1-nerved. *Petals* slightly smaller than the lateral sepals, ovate, acute or subobtuse, crenulate or subentire, 1-nerved. *Lip* 1.75-2.25 mm long, nearly twice the length of sepals or petals, cuneate-obovate in outline, 3-nerved, sparsely gland-dotted, 3-lobed; lateral lobes minute, ear-like, (not absent, as stated by Blatt & McCann); width of lip across lateral lobes less than half that across the midlobe; midlobe cuneate-obovate, crenulate, 2-lobulate towards the apex; lobules broad, rounded or truncate, dentate or erose at the apex, with usually a narrow sinus in between. *Column* small. *Anther* opercular, yellowish. *Ovary* with the short *pedicel* about 2 mm long, greenish-yellow.

Flowering : July to October. *Fruiting* : September onwards.

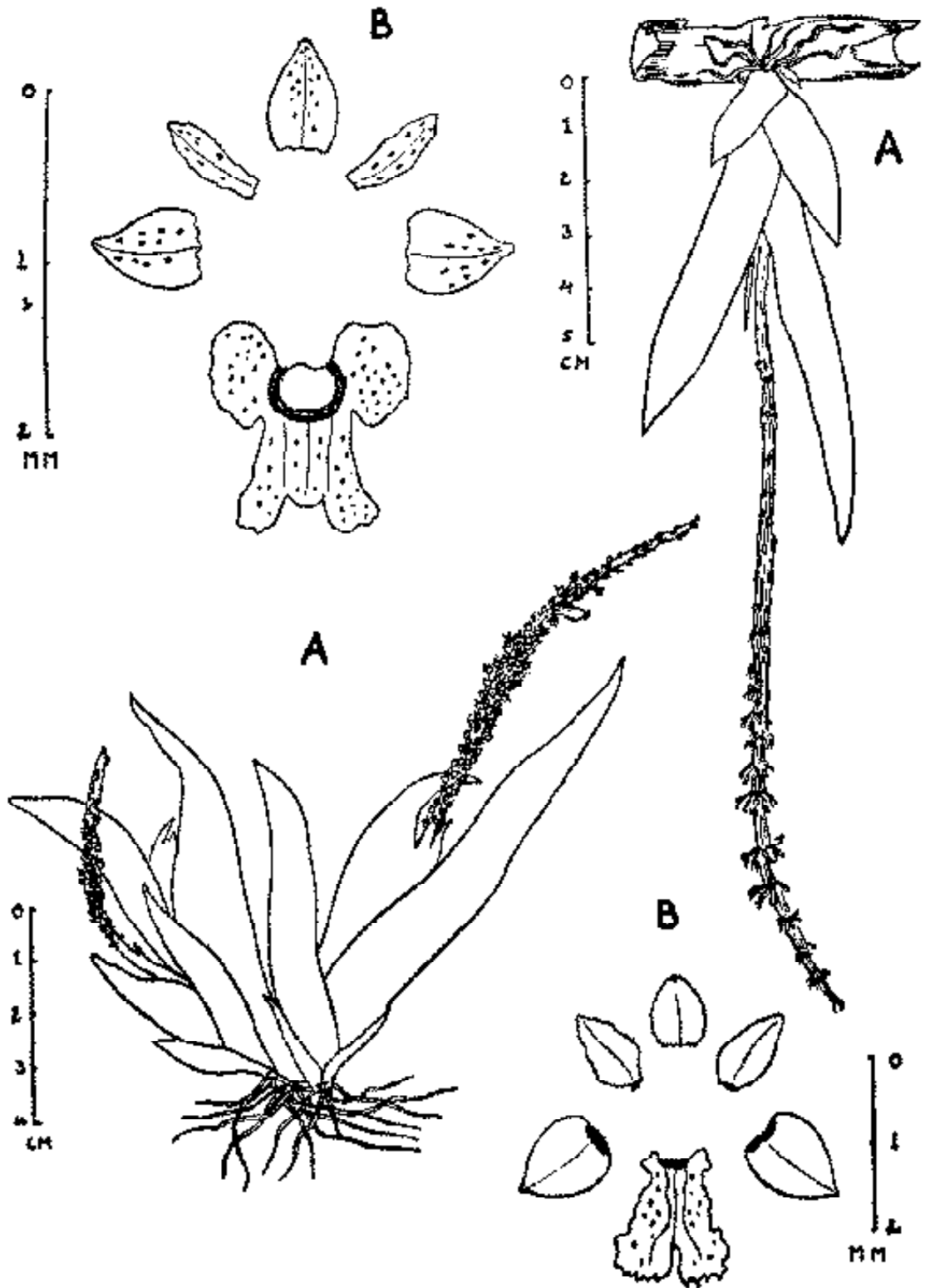
Occurrence : N. KANARA : Yellapur, Kapadia 1991-1992, 2259, 2886-2887; Sirsi, Hallberg & McCann 35059; Santapau 18649; Kapadia 2446-2448.

Distribution : India : N. Kanara, W. Ghats of S. India, Nilgiris, Pulneys, Salem hills. *World* : Ceylon, India.

Notes : Our Yellapur specimens have floral bracts equal to or even slightly longer than flowers; this variation has been observed in the same inflorescence, and is of frequent occurrence in the genus *Oberonia*. This is why we have united var. *longibracteata* Blatt. & McC. with *O. verticillata* Wt.

Careful examination of fresh specimens from Yellapur (type locality of *O. spiralis* Blatt. & McC.) and Sirsi, has shown to us that in floral structure there is hardly any difference between *O. spiralis* Blatt. & McC. and *O. verticillata* Wt. Some of the plants have flowers in spirals, others in distinct verticils; in a few specimens the flowers are arranged in distinct spirals on the lower part of the rachis, while in the upper part they are in pure uninterrupted whorls.

9. *Oberonia wightiana* Lindl. in Bot. Reg. misc. 9, 1839; Wight, Icon. 5(1) : 3, t. 1627, 1851; Lindl. 5; Hook. f. Icon. Pl. t. 1784 B, 1888, et Fl. Brit. India 5 : 683, 1890; Fyson 383; Fischer 1407; Blatt. & McC. 258. *O. stachyoides* A. Rich. in Ann. Sc. nat. (ser. 2) 15 : 15, t. 1 A, 1841. *O. arnottiana* Wight, Icon. 5 (1) : 3, t. 1628, 1851; Blatt. & McC. 258.



A-B, *Oberonia verticillata* Wt. ; A'-B', *O. wightiana* Lindl.
A-A', Whole plant ; B-B', Sepals, petals and lip.

Malaxis wightiana (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 669, 1891, (See Plate XIV, A'-B')

Pendulous epiphytes. Leaves 4-9 × 0.7-1.5 cm, ensiform, often subfalcate, acute or acuminate, the uppermost often sub-subulate, thin, not fleshy. Peduncle practically 0, joined to the uppermost leaf. Inflorescence up to 10 cm long, slightly curved; flowers in rather lax, subverticillate racemes, pedicellate, bracteate. Pedicel with ovary about 2 mm long. Bracts 1.5 × 0.75 mm, shorter than the pedicel, ovate-acuminate, (acumen often rather long drawn out), subentire or erose, gland-dotted. Sepals 1 × 0.75 mm, subequal, broadly ovate, gland-dotted, entire; the lateral ones sharply acute or mucronulate, concave; the dorsal sepal obtuse or subacute, not concave. Petals linear, shorter than the sepals, acute, entire or very slightly erose, gland-dotted. Lip 1.75 mm long, nearly twice as long as the sepals, 3-lobed with a small concave disc; nerves 3 starting from the disc and going up to the sinus; lateral lobes 0.75 × 0.5 mm, rounded, somewhat oblong-reniform, subentire or erose, gland-dotted, more or less erect and enfolded over the column; width of lip across the lateral lobes larger than that across the midlobe; midlobe obcordate-oblong, 2-lobulate, sinus broad with or without a very small mucro within, lobules diverging, rounded, erose or denticulate. Column very small. Anther opercular, minute. Capsules 5 × 3 mm, pedicelled, obovoid; pedicels about 1 mm long.

Flowering and Fruiting : March.

Occurrence : N. KANARA : Yellapur, Sedgwick; Haliyal, Sedgwick; Anmod, Sedgwick, Kapadia 1872-1873.

Distribution : India : N. Kanara, Nilgiris, Pulneys. World : Ceylon, India.

Notes : This species is usually found pendulous on *Artocarpus* trees. As to the variations in the floral structure we quote Lindley (in *Fol. Orchid.*) : 'Flowers pale green. This seems to vary more than usual in the present genus, in the form of the lip, the front lobes of which are either ligulate and denticulate at the point or entire; or short and acute; and these differences seem to occur on the same or otherwise undistinguishable individuals. I can find nothing sufficient to separate my learned friend Wight's *O. arnottiana*, whose bracts appear exactly the same as in *O. wightiana* and by no means furnished with long cilia, as is represented by his draughtsman'.

10. *Oberonia brunoniana* Wight, Icon. 5 (1) : 3, t. 1622, 1851; Lindl. 2; Hook. f. 681; Grant, Orch. Burma 29, 1895; Cooke 677; Fischer 1406; Blatt. & McC. 257 (non t. 3, quae est *O. ensiformis*). *Malaxis brunoniana* (Wt.) Reichb. f. in Walp. Ann. 6 : 209, 1861. *Iridorchis brunoniana* (Wt.) O. Kuntze, Rev. Gen. Pl. 2 : 699, 1891. (See Plate XV, A'-B')

Erect or pendulous *epiphytes*. *Leaves* 4-15 × 1-3.5 cm, very succulent, obovate to linear-oblong, often subfalcate, acute, purplish-brown to brown in colour, not green. *Scape* 1.5-3 cm long, 2-angled, usually furnished with a small leaf-like bract at its apex just below the inflorescence. *Spike* 5-20 cm long, 5-6 mm broad, erect or recurved, stiff 'like a rat's tail' (Hooker f.). *Flowers* densely imbricate, 'olive-brown in colour' (Wight), bracteate, sessile, a little less than 2 mm across. *Bracts* 1.5 × 1 mm, shorter than the flowers, oblong-ovate to ovate, acute, irregularly denticulate, 1-nerved, sparsely gland-dotted. *Sepals* 1 × 0.75 mm, subequal, gland-dotted, ovate, acute mucronulate, entire, glabrous, 1-nerved; lateral sepals spreading, concave; dorsal sepal narrower. *Petals* 0.75 mm long, shorter than the sepals, narrowly linear, acute or subobtusate, entire, glabrous, sparsely gland-dotted, 1-nerved. *Lip* 1.25 × 1.25 mm quadrately-oblong, 3-lobed, densely gland-dotted outside the large concave disc, the latter extending practically up to the sinus; lateral lobes of lip oblong, obtuse, irregularly crenulate, longer than the midlobe; midlobe 2-lobulate, lobules rounded, subobclavate, irregularly crenulate, the sinus deep, wide, usually with a minute mucro; nerves 3, all within the disc. *Column* 0.5 × 0.5 mm, quadrate, with a transversely elliptical stigmatic surface. *Anther* small, obovate, yellowish. *Ovary* with short *pedicel* 1 × 0.5 mm, inversely flask-shaped, ribbed. *Capsule* 5 × 3 mm, ellipsoid on a very short stalk.

Flowering and Fruiting : February to March.

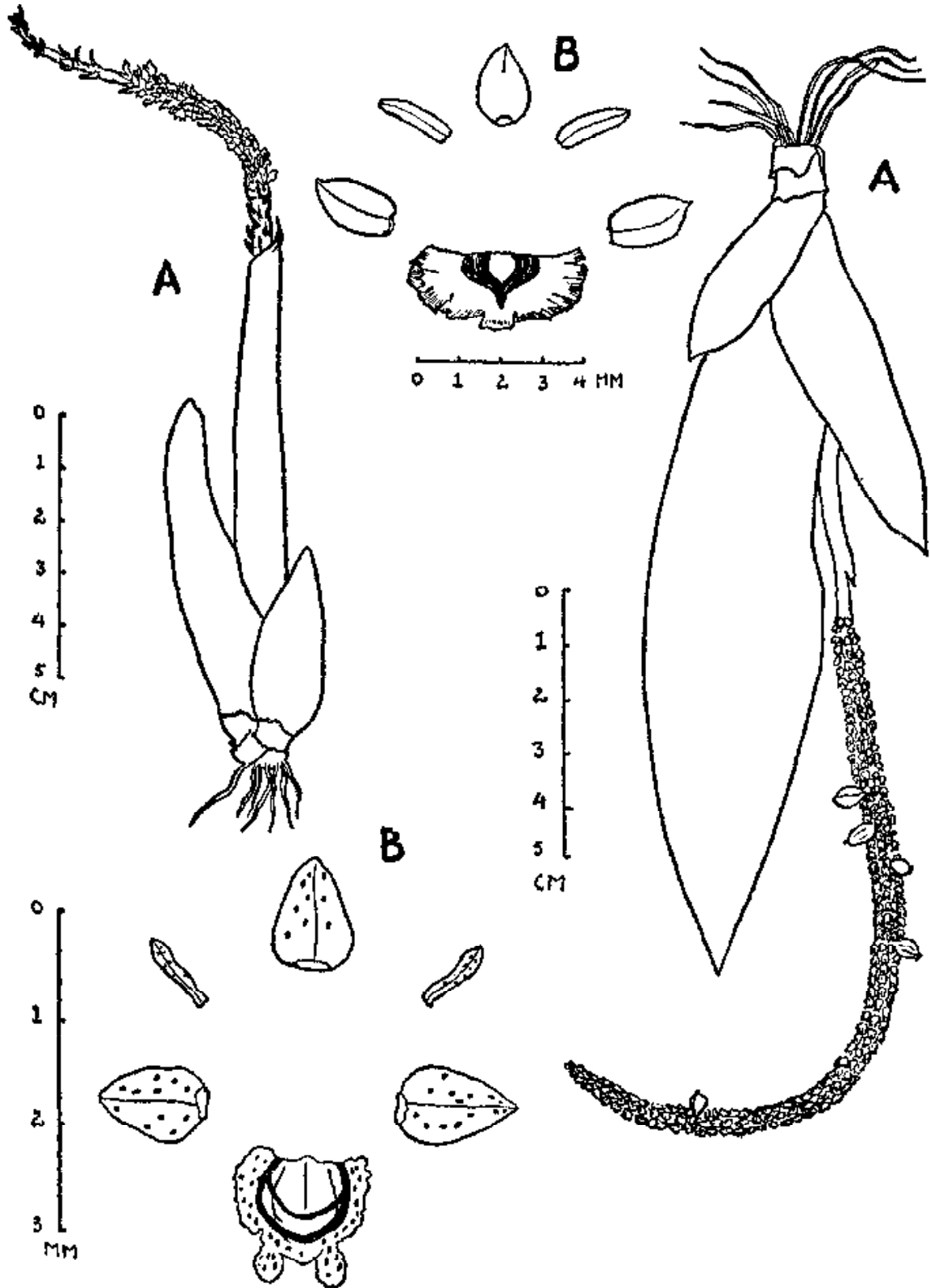
Occurrence : N. KANARA : Bell; Kalanadi, Ritchie; Anmod, Kapadia 1877-1879; Castle Rock, Kapadia 2813.

Distribution : N. Kanara, Nilgiris, Pulneys, Malabar, Travancore.

Notes : We have collected this species in both dense and open forest, usually on *Mangifera* and *Artocarpus* trees; the leaves of all the plants are of a deep purplish brown or brown colour with no sign of green. It is interesting to note that this species together with *O. bicornis* Lindl. and *O. tenuis* Lindl. are the only species found by us with brown leaves.

11. *Oberonia platycaulon* Wight, Icon. 5 (1) : 3, t. 1623, 1851; Lindl. 2; Hook. f. 628; Gammie 564; Cooke 677; Fischer 1407; Blatt. & McC. 257. *Malaxis platycaulon* (Wt.) Reichb. f. in Walp Ann. 6 : 239, 1861. *Iridorchis platycaulon* (Wt.) O. Kuntze, Rev. Gen. Pl. 2 : 699 1891. (See Plate XV, A-B)

Leaves 2-8 × 1-2 cm, ensiform, fleshy, oblong-lanceolate, acute. *Scape* arising from the central leaf, terete, bracteate. *Spike* 7 cm long, about 0.5 cm broad, somewhat curved. *Flowers* 3.5 × 1.5-2 mm, sessile, bracteate. *Bracts* 2 × 1.5 mm, oblong, ovate, acute, irregularly serrate, completely sheathing the ovary. *Sepals* 2 × 1.25 mm, subequal, acute or subobtusate, entire, 1-nerved, lying backwards along the ovary; the



A-B. *Oberonia platycaulon* Wt. ; A'-B'. *O. brunoniana* Wt.
A-A'. Whole plant ; B-B'. Sepals, petals and lip.

dorsal one ovate, the laterals ovate-oblong. *Petals* 2×0.5 mm, reflexed along with the sepals, narrow-linear, subobtusate or acute, 1-nerved. *Lip* with the lateral lobes folded inwards, parallel along the column, 4×2 mm when spread out, 3-lobed; lateral lobes very broad, wing-like, 1.75×1.5 mm, oblong-orbicular, entire, wavy, longer than the midlobe; midlobe somewhat quadrate, obscurely 3-lobed, truncate or rarely slightly retuse on the outer margin; disc broadly oblong-orbicular, apiculate. *Column* 1×0.5 mm, oblong-subclavate, with an elliptic-orbicular stigmatic surface. *Anther* ovate, acute. *Ovary* 2 mm long, sessile.

This species has been drawn and described from a specimen sent by Miss Evelyn Bowden from Travancore.

Occurrence: This species is not definitely known to occur in the State. Hooker f. cites 'W. Ghats from the Konkan south-wards'; Gammie lists it on the authority of Hooker f.; Cooke has included it as doubtful in the State; Blatter & McCann include it again on the authority of Hooker f.; we have seen no specimens from Bombay.

Distribution: Konkan, W. Ghats (Mysore southwards). Nilgiris. Pulneys, High Wavy Mountains.

12. *Oberonia santapau* Kapadia in J. Bombay nat. Hist. Soc. 57 : 265, 1960. *O. lindleyana* Wight, Icon. 5 (1) : 3, t. 1624, 1851 (non Brongn. ex Duperr. 1834); Lindl. 2; Hook. f. 681; Fischer 1406; Blatt. & McC. 258, t. 4. *Malaxis lindleyana* (Wt.) Reichb. f. in Walp. Ann. 6 : 210, 1861. *Iridorchis lindleyana* (Wt.) O. Kuntze, Rev. Gen. Pl. 2 : 669, 1891.

We have seen no specimens of this species, and therefore give Wight's original description: 'Leaves ensiform, short, very succulent, slightly falcate; stem compressed, spike drooping towards the apex, densely covered with innumerable small sessile flowers: bracts ovate, somewhat obtuse, sub-denticulate on the margin: sepals broad, ovate, obtuse entire: petals narrow linear: lip broad cordate at the base, crenate, two-lobed at the apex, with a minute tooth between; all furnished with numerous minute opaque glandular (?) dots. Flowers straw colour, lip dull orange. Iyamally Hills near Coimbatore, flowering August and September. The leaves of this species are very succulent, and with its long drooping raceme afford good distinguishing marks, which are amply confirmed by an examination of the flowers. This species is remarkable on account of the opaque gland-like points scattered over the flowers. The bract is represented too pointed in the figure. I dedicate the species to the founder of the genus'.

Occurrence: N. KANARA: In forests, Bell; Anmod, Sedgwick.

Distribution: N. Kanara, Nilgiris, Travancore hills.

Notes: Ind. Kew. lists a binomial *Oberonia lindleyana* A. Brongn. in Duperr. Voy. Coq. Bot. 200, t. 40, f. a, 1834, (*O. lindleyi* on the figure).

The binominal *O. lindleyana* Wt. (1851) is, therefore, a later homonym in the sense of the Code and must be rejected.

I name this species after Rev. Father H. Santapau under whose unflinching guidance and tremendous enthusiasm the study of the Orchids of Bombay has been undertaken. It is with the greatest pleasure that I dedicate the species to one of India's most distinguished botanists. (Z. Kapadia).

13. *Oberonia bicornis* Lindl. Gen. Sp. Orch. 16, 1830, et Fol. Orchid. Oberon. 4 ; Hook. f. 682. *Malaxis bicornis* (Lindl.) Reichb. f. in Walp. Ann. 6 : 211, 1861. *Iridorchis bicornis* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 669, 1891. *Oberonia umbonata* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 259, 1931.

Pendulous brown *epiphytes*. *Leaves* 1-8 0.3-0.8 cm, brown or mauve-brown, narrowly linear-oblong or linear-lanceolate, often falcate, acute or acuminate, often surmounted with a bristle. *Scape* 2-10 cm long, brownish ; bracts 2 mm long, sharp, bristle-like. *Inflorescence* 1.5-12 cm long, straight or bent in the upper third. *Flowers* up to 2 mm long in dense or lax verticils or subverticils, ochraceous-red, pedicellate, bracteate. *Bracts* 0.66-2 mm long, usually longer than the flowers, lanceolate from a broad base, with a sharp, long acumen, or oblong, sharply acuminate, bristle-pointed, hyaline, gland-dotted. *Sepals* equal or subequal, pale ochraceous, 1-nerved, hyaline, gland-dotted ; the dorsal one more or less equal to the lateral sepals, convex, ovate or ovate-lanceolate or oblong-ovate, acute-mucronulate or obtuse with a minute sharp acumen ; lateral sepals convex, ovate-orbicular, mucronulate. *Petals* ochraceous, about equalling the lateral lobes of the lip, oblong-subtriangular or linear-oblong or narrowly obovate, subobtusate or acute, entire or very minutely serrulate, 1-nerved, hyaline, gland-dotted. *Lip* deep red, 3-lobed ; the width across the lateral lobes more or less equal to that across the midlobe ; lateral lobes erect, linear-lanceolate, coriaceous, surrounding the column, slightly incurved towards the apices ; midlobe of lip curving upwards along with the lateral lobes in flower ; the basal margin obscurely 3-lobed ; apex straight or pointing downwards, acute or obtuse-mucronulate. *Column* broad. *Anther* brownish white, transversely oblong-orbicular, mucronulate. *Ovary* with pedicel nearly 2 mm long. *Capsule* 2.5 × 1.50 mm, pedicellate, nearly spherical ; stalk 1.2 mm long.

Flowering and Fruiting : October to November.

Occurrence : N. KANARA : Siddhapur, *Kapadia* 2389-2395 ; Siddhapur to Sirsi, *Hallberg & McCann* 35177.

Distribution : *India* : Khasia Hills, N. Kanara. *World* : India, Ceylon.

Notes : We found this species epiphytic on *Memecylon* sp.

After careful study of fresh flowers from Siddhapur (the type locality of *O. umbonata* Blatt. & McC.) we conclude that the latter is identical with *O. bicornis* Lindl. *O. bicornis* Lindl. is similar to *O. tenuis* Lindl., from which it can be distinguished by the former having (1) petals which are broadly ovate or obspathulate ; (2) lateral lobes of lip which are linear-lanceolate, erect, not filiform and incurved ; (3) midlobe of lip which is fleshy, cuneate, truncate or minutely apiculate, not broadly 3-lobed with the ends much prolonged.

14. *Oberonia tenuis* Lindl. Fol. Orchid. Oberon. 3, 1852 ; Hook. f. Icon. Pl. t. 1779 B, 1888, et Fl. Brit. India 5 : 682, 1890. *Malaxis tenuis* (Lindl.) Reichb. f. in Walp. Ann. 6 : 211, 1861. *Iridorchis tenuis* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 669, 1891.

Pendulous brown epiphytes. Leaves 0.6-6 × 0.3-0.6 cm, brown, linear or linear-lanceolate, subfalcate or ovate-oblong, acute or acuminate, often bristle-pointed. Scape terete, yellowish brown, 2-5 cm long, with spreading, hyaline, subulate bracts. Inflorescence 1.5-12 cm long, squarrose, more or less straight. Flowers brownish red, bracteate. Bracts oblong-lanceolate to linear-lanceolate, subulate, acute or acuminate, entire, gland-dotted. Sepals subequal, gland-dotted, concave ; the dorsal sepal is narrow-lanceolate, at times ovate-lanceolate or ovate-oblong, hardly bigger than the lateral sepals, acute or subacuminate ; the lateral ones orbicular or orbicular-ovate, mucronulate. Petals narrow, linear, acute or subobtuse, gland-dotted, faintly 1-nerved. Lip 3-lobed ; lateral lobes erect, surrounding the column and meeting above it, narrowly filiform, aristate, shorter than the petals ; midlobe dextrously folded upwards along the lateral lobes, lunate, the tips much-prolonged, acuminate ; the midlobe obscurely or not at all 3-lobed on the basal margin. Column short. Ovary 1 mm long, rarely slightly curved at the base. Capsule brown, strongly ribbed, orbicular or oblong-orbicular, with an equally long stalk.

Flowering and Fruiting : March.

Occurrence : N. KANARA : Castle Rock, Kapadia 2821.

Distribution : India : N. Kanara. This species has been recorded for Bombay State and India for the first time ; up to now known only from Ceylon. *World* : India, Ceylon.

Notes : Hooker f. describes the leaves as linear-oblong, the lip with very small, hatchet-shaped midlobe and linear erect incurved sidelobes that form a circle round the ovary. In our specimen the leaves are linear-oblong, acuminate, often bristle-pointed, and the lateral lobes of the lip form a circle round the column (and not round the ovary as stated by Hooker f.) ; the midlobe is narrowly lunate with much-prolonged acuminate tips.

15. *Oberonia* sp. Large pendulous *epiphytes*. Leaves thin, oblong-lanceolate, up to 17×1.5 cm. *Inflorescence* arising directly from a narrowly linear, leaf-like peduncle. *Flowers* long-pedicelled, minute, densely imbricating, often in more or less distinct whorls. The flowers are too old and decayed for careful analysis.

Flowering : probably about September to October.

Occurrence : N. KANARA : Jog, V. Patel 1915 ; Kapadia 2425-2427.

Notes : This seems to be quite a distinct species, very unlike any of those discussed above ; scarcity of materials prevents us from a definite identification.

We found these plants to be fairly common along the way to the ferry, from the Bombay side of Jog falls.

IMPERFECTLY KNOWN SPECIES

16. *Oberonia bellii* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35: 256, f. 1, 1931.

This species was described and illustrated from Bell's manuscript notes ; no actual specimens were examined by the authors. We have not been able to locate it in Bombay.

The following is Blatter & McCann's original description :

'Pertains to section *Oberonia* proper. Approaching *Oberonia verticillata*, but differing in the 8-grooved rachis, bracts lanceolate, imbricate, slightly longer than the buds, flowers sessile, petals ovate-oblong, lip oblong, midlobe bifid erose ligulate, segments obliquely truncate at the apex.

'*Scape* together with raceme almost twice as long as longest leaf. *Leaves* narrow, ensiform, falcate or subfalcate, acuminate, broad at base, up to 10×1 cm. *Rachis* fairly stout with 8 grooves, and 8 rounded ridges between the grooves. *Buds* globose, apiculate. *Flowers* sessile, 2 mm long, verticillate, one flower on each ridge, the ridge of one node being continued by a groove on the next. Internodes 2.5 mm long. *Bracts* 2 mm long, lanceolate, acute, membranous, broadest in the middle, fimbriate, slightly longer than the buds. *Sepals* ovate-acute, subequal. *Petals* narrower than the sepals, erose ; side lobes very small, rounded ; midlobe bifid with strap-shaped slightly divergent obliquely truncate segments ; sinus $1/3$ of the whole lobe. *Ovary* 1 mm long. *Column* merely a horse-shoe-shaped low wall, covered by a nearly circular, lowly convex, green, smooth little cap. *Pollinia* extremely minute, orange-yellow, pear-shaped ; point of attachment short and pointed fixed to a minute surface at each end of horseshoe rim of column).

'The pollinia fall out when the flower is ready, the cap raising itself for the purpose. The hollow in the form of the column is square. (Bell)'

Flowering : March.

Occurrence : N. KANARA : Yellapur, *Bell*.

Notes : There seems to be hardly any difference between this species and *O. verticillata* Wt., but absence of the type prevents us from attempting a definite identification.

4. *DENDROBIUM* SW.

The generic name *Dendrobium* is derived from the Greek words 'dendron'=tree, and 'bios'=life, in allusion to the epiphytic habit of the species.

DENDROBIUM Sw. in Nov. Act. Soc. Sc. Upsal. 6 : 82, 1799, nom. cons.; Endl. Gen. Pl. 192, 1837 ; Lindl. in Bot. Reg. 46, 1844, et in Journ. Linn. Soc. 3 : 1, 1858 ; Benth. & Hook. f. Gen. Pl. 3 : 498, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 172, 1889 ; Hook. f. Fl. Brit. India 5 : 710, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 38, 1898 ; Duthie, *ibid.* 9 (2) : 84, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 306, 1905 ; Kränz. in Pflanzen. 45 : 25, 1910 ; Schlecht. Orchid. 246, 1927 ; Holttum, Rev. Fl. Malaya 1 : 258, 1953. *Oeraia* Lour. Fl. Coch. 518, 1790. *Callista* Lour. Fl. Coch. 519, 1790 ; O. Kuntze, Rev. Gen. Pl. 2 : 652, 1891 ; Kränz. 313. *Desmotrichum* Bl. Bijdr. 329, 1825 (non-Kuetz. 1845) ; Kränz. 343.

Perennial *epiphytes*. *Rhizomes* short or long, simple or branching, with pseudobulbs. *Pseudobulbs* simple, uni- or multi-nodal, from sheathing cataphylls, which, when old and dry, appear as fibrous threads at the nodes. *Leaves* deciduous or persistent, either 1 or 2 at the top of the pseudobulb or many and bifarious throughout the stem. *Flowers* solitary, in fascicles or in racemes, axillary, or from the scarious clusters of bracts at the apex of the pseudobulb. *Sepals* subequal, spreading, erect or connivent ; lateral sepals more or less connivent on the foot of the column forming a mentum ; rarely mentum absent. *Petals* equalling the dorsal sepal or larger, free. *Lip* articulate with the foot of the column, or rarely connate, entire or 3-lobed. *Column* free, short, the anterior part with a large depression, occupied by the stigma, anterior side arms short, entire or bilobed ; foot long or short, or rarely absent, more or less hollowed on the front, nectariferous at the base ; rostellum small, transversely lamellate. *Anther* subglobose or conical, anterior part retuse or toothed, 2-celled, the stalk short subulate or filiform ; pollinia 4, in pairs, subequal, the external ones slightly smaller. *Capsules* ovoid or obovoid.

In a broad sense Schlechter has estimated the total number of species to be in the neighbourhood of 900. This genus occurs almost exclusively in the Old World. It is distributed from India and Ceylon to southern China and Japan, southwards through Malaysia far into the Pacific and to Australia and New Zealand.

This very large and polymorphic genus has been variously divided

into subgenera and sections by various authors. Kränzlin in his monumental monograph of the genus divides it into 10 subgenera. All our Bombay species (except one) are included under the first subgenus *Eudendrobium*; *D. lawianum* Lindl. goes with peloric forms under *Actinia*. Most modern authors divide the genus into sections; we follow them. However for *D. lawianum* Lindl. we follow Lindley in reinstating the section *Actinia*. The name of the section containing the type species, *D. crumenatum* Sw. (sect. *Eudendrobium*) must be changed to *Dendrobium* sect. *Dendrobium*, according to the Art. 22 of the Code.

Type species : *D. crumenatum* Sw.

KEY TO THE SPECIES OF *DENDROBIUM*

1. Rhizome distinct, creeping; leaf 1, from top of pseudobulb; flowers 1 or 2 borne on the top of the pseudobulb *macraei*
1. Rhizome not distinct; leaves several, bifarious; flowers many in racemes or in pairs, rarely solitary :
 2. Stems usually tufted forming small ovoid pseudobulb, rarely elongate; flowers in slender racemes, rarely solitary :
 3. Stems long, much branched; lip undivided or obscurely 3-lobed *herbaceum*
 3. Stems simple, often reduced to small pseudobulb; lip distinctly 3-lobed :
 4. Small plants with crowded, ovoid pseudobulbs; petals not broader than dorsal sepal :
 5. Leaves fleshy, coriaceous; peduncles very short, somewhat thick; racemes arising almost directly from apex of pseudobulb; midlobe of lip acute *peguanum*
 5. Leaves thin, membranous; peduncles 4-5 cm long, filiform, slender; midlobe of lip rounded, obtuse or retuse :

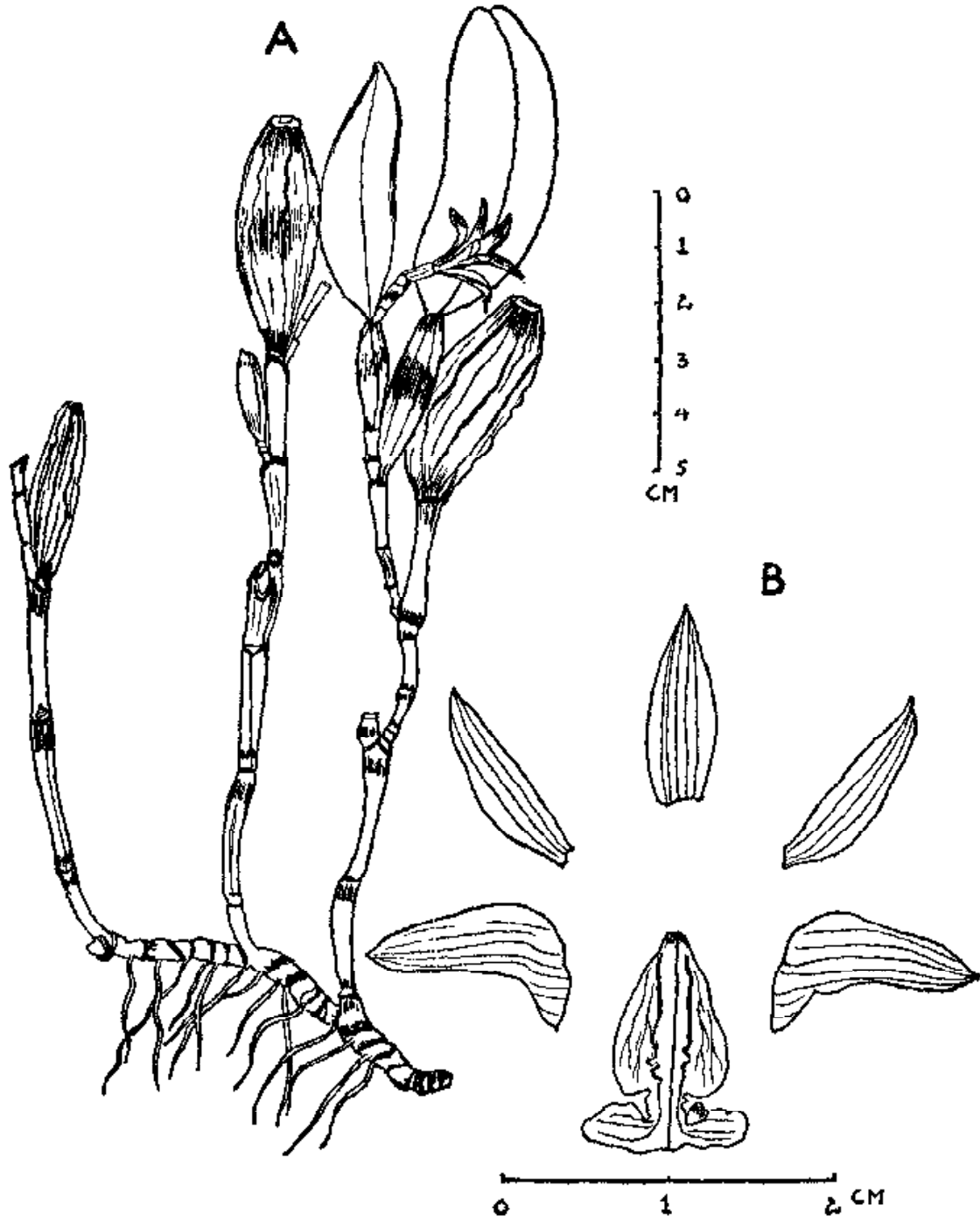
6. Lip pink with deep red-purple veins, irregularly crenulate, broader across lateral lobes than the mid-lobe ; midlobe small irregularly crenulate, truncate or subretuse *microbulbon*
6. Lip pale yellow or yellowish-green, \pm suffused with pink, equal to or narrower than midlobe ; midlobe of lip suborbicular, with 2 rows of stiff, glandular hairs on margin, rounded or subemarginate *mabelae*
4. Larger plants with elongate pseudobulbs (rarely uninodeal) ; petals much broader than the dorsal sepal :
5. Flowers cream-coloured, about 1.5 cm across ; lip about 8 mm long, the disc with pale green hairs all round ; midlobe of lip somewhat quadrate-rounded *ovatum*
5. Flowers pure white, or tinged with pink, or often strongly rosy-pink, about 2.5-4 cm across ; lip 23-30 mm long, the disc with pale yellow hairs at its base and apex only ; midlobe of lip broadly ovate, or ovate-oblong or rarely subflabellate *barbatulum*
2. Stems elongate, clavate or nodose ; flowers in lateral pairs or fascicles, rarely solitary :
3. Flowers zygomorphic ; mentum distinct column with

a distinct foot :

4. Flowers pale cream-yellow, lip with red or purple nerves ; mentum about half as long as dorsal sepal or longer ; lip entire or hardly lobed, minutely serrate, fimbriate, hairy *macrostachyum*
4. Flowers pale watery-green, lip pale yellowish on the inside ; mentum less than half the length of dorsal sepal ; lip 3-lobed ; lateral lobes broad, obovate-oblong rounded, ascending ; mid-lobe deflexed and contracted inwards at the base slightly ciliate *aqueum*
4. Flowers white or suffused with pale rose, lip with a yellow patch at the base ; mentum very small ; lip sub-entire, obscurely 3-lobed ; lateral lobes small forming a small pouch at the base ; midlobe spreading, oblong-round, puberulous *crepidatum*
3. Flowers subregular ; mentum absent ; column without a foot *lawianum*

ENUMERATION OF THE SPECIES OF *DENDROBIUM*

1. *Dendrobium macraei* Lindl. Gen. Sp. Orch. 75, 1830, et in Journ. Linn. Soc. 3 : 6, 1859 ; Dalz. & Gibs. Bomb. Fl. 260, 1861 ; Hook. f. 714, (partim) ; Grant, Orch. Burma 104, 1895, (partim) ; King & Pantl. 61, t. 86 ; Gammie in J. Bombay nat. Hist. Soc. 16 : 566, 1905 ; Cooke, Fl. Pres. Bomb. 2 : 680, 1807 ; Brühl, Guide Orch. Sikk. 66, 1926 ; V Narayanaswami in J. Indian bot. Soc. 25 : 215, 1946. *D. nodosum* Dalz. in Hook. Journ. Bot. 4 : 292, 1852. *D. rabani* Lindl. in Journ.



Dendrobium macraei Lindl.
A. Whole plant ; B. Perianth segments,

Linn. Soc. 3 : 7, 1858. *D. pardalinum* Reichb. f. in Gard. Chron. 11 : 230, 1885. *Callista macraei* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 655, 1891. (See Plate XVI)

Stems long, creeping, annulate, profusely branching; branches polynodal, more or less trigonous or terete, smooth, shining, yellowish-brown, ending in pseudobulbs. *Pseudobulbs* 2-8 × 0.5-2 cm, linear-oblong, fusiform, green or yellow, terete or compressed, and sulcate when dry. *Leaf* 4-10 × 1-2.5 cm, solitary, sessile, very coriaceous, 1-nerved, ovate-lanceolate or oblong-elliptic, acute, obtuse or rarely subretuse. *Flowers* one or rarely two, lasting for less than a day, from the axil of the leaf, on a stalk 6-7 mm long, which is sheathed at the base with several scarious bracts. *Floral bracts* at the base of the ovary about 3 mm long, oblong-lanceolate. *Ovary* with the short *pedicel* 5-6 mm long, subclavate, pale yellow, ridged, separated from the stalk by the bract. *Sepals* 12 × 4 mm, white, very slightly suffused with pink and yellow, ovate or ovate-oblong, acute, faintly 5-nerved; mentum blunt, slightly retuse, at right angles to the ovary, about 4 mm long, pale creamy-yellow with a few reddish spots at the back towards the apex. *Petals* equalling or slightly shorter and narrower than the sepals, similar to the latter, faintly 3-nerved. *Lip* obovate in outline, about 13 mm long, white speckled with red on both the surfaces, 3-lobed; lateral lobes 10-11 × 2 mm erect, narrowly oblong, obtuse; the 2-winged apex separated from the lateral lobes by 1-2 mm long subplicate claw, the wings erect in the flower, about 1 cm across, oblong-elliptic, truncate or rounded at the apex; the 2 lamellae reddish, along the centre to the end of the lateral lobes, much plicate. *Column* 2 × 1.5 mm, oblong, yellowish white, irregularly serrulate on top (i.e. margin of the clinandrium). *Stigmatic surface* broad, oblong-orbicular, margined with red. *Anther* small, pale yellowish white.

Leaves : persistent throughout the year. *Flowering* : July to August.

Occurrence : W. GHATS : Mahableshtar, Cooke; Koina Valley, Cooke; Birdwood; Ramghat, Dalzell & Gibson. N. KANARA : Joida Kumbelli Mines, about 12-15 miles from Supa, Kapadia 2575-2827; Sampkhand, Woodrow; Castle Rock, Kapadia 2824-2827; Gundh Anshi, Pirson; Siddhapur, V. Patel 1849; Kapadia 2362-2364; Anmod, Kapadia.

Distribution : India : Sikkim, Khasia Hills, W. Ghats of Bombay State and S. India, N. Kanara. *World* : Ceylon, India, and Burma.

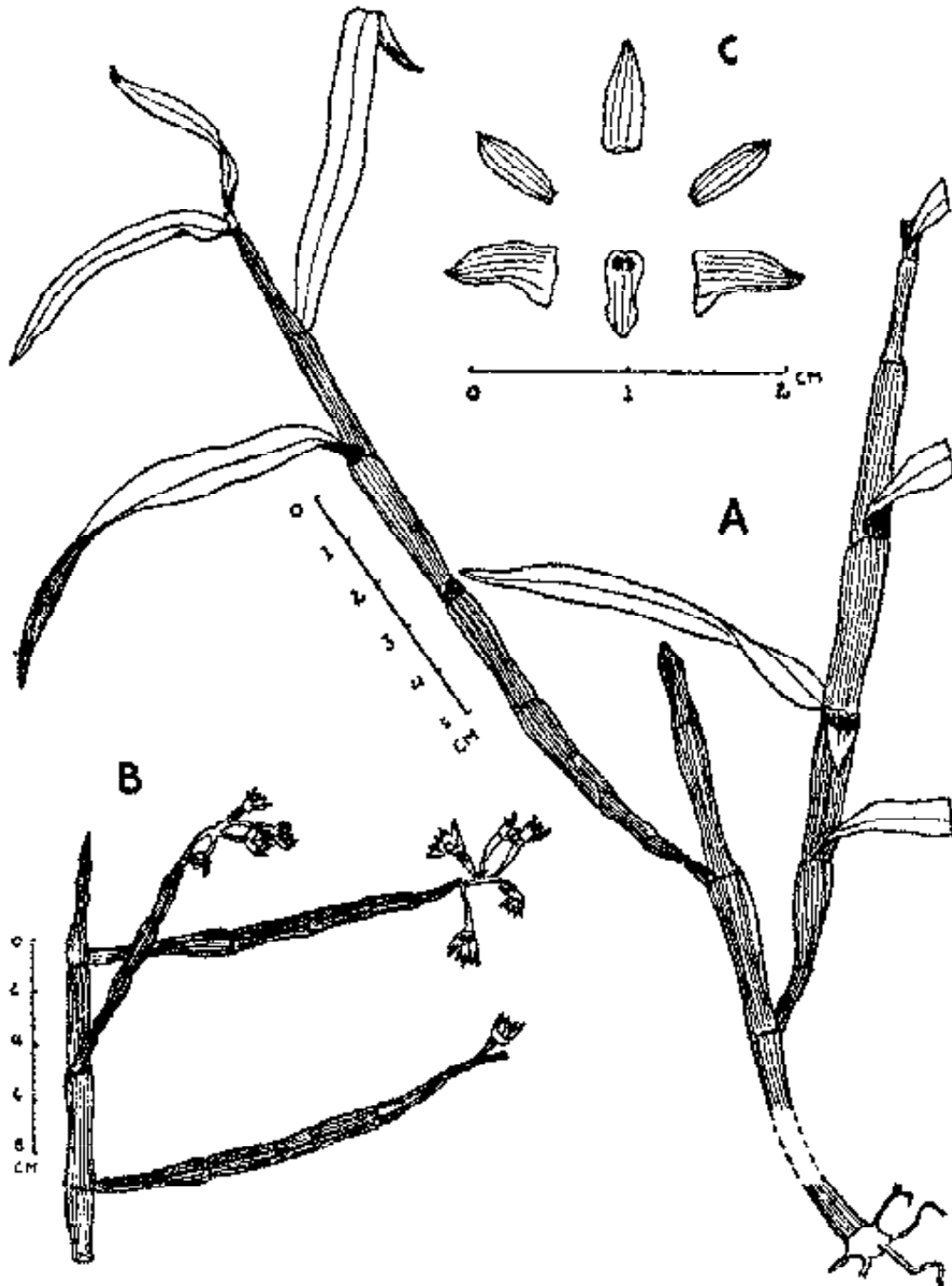
Notes : At Anmod in N. Kanara, this species is locally known as 'Ruttun-purush' and is much valued in the local market, where it is sold for a high price; this plant is extensively used by the local population for making a much-valued 'Halwa' (sweet preparation).

This species has been included by Kränzlin, Fischer (*Fl. Pres. Madr.* 1412, 1928), and Blatter & McCann (in *J. Bombay nat. Hist. Soc.*

35 : 265, 1931) under the genus *Desmotrichum* Bl. and has been considered to be synonymous with *Desmotrichum fimbriatum* Bl. V. Narayanaswami has elaborately discussed the problem and has conclusively shown that : (1) *Desmotrichum* Bl. may perhaps be retained as a sectional name for a very limited group of *Dendrobium*, consisting usually of a primary creeping stem with several polynodal branches, each branch ending in a monophyllous pseudobulb and with a solitary axillary flower, but it is preferable to sink it under *Dendrobium*. (2) *Dendrobium* of Swartz is a sufficiently comprehensive genus and also embraces the species described under *Desmotrichum* Bl. There is not much difference to distinguish the latter generically from the former. This view has been accepted by Blume himself, and *Desmotrichum* has been included by him under *Dendrobium*. (3) *Dendrobium macraei* Lindl. is the valid name for the widely distributed Ceylon species and includes under it and is conspecific with *Den. nodosum*, *Den. rabani*, *Den. pardalinum*. It is entirely different from *Des. fimbriatum* Bl. (4) *Den. plicatile* Lindl. is the earliest valid name for *Des. fimbriatum* Bl. and is conspecific with *Den. flabellum* Reichb. f., *Den. kunstleri* Hook. f., *Den. binnendijkii* Reichb. f., and *Den. fimbriatum* Lindl. (5) Confusion in synonymy originated in the Fl. Brit. Ind., wherein under *Den. macraei* Lindl. the following were included, namely *Des. fimbriatum* Bl., *Den. flabellum* and *Den. binnendijkii* Reichb. f. (6) In the *Pflanzenreich* 3 separate species of *Desmotrichum* were created from the species mentioned in (4) above, to one of which *Den. macraei* Lindl. was reduced. (7) In the Indian floras, published subsequent to the Fl. Brit. India the changes introduced in *Pflanzenreich*, were adopted apparently without scrutiny.'

2. *Dendrobium herbaceum* Lindl. Bot. Misc. 69, 1840, et Misc. 58, 1844 ; Hook. f. 719 ; Prain, Beng. Pl. 1006, 1903 ; Gammie 17 : 32, 1906 ; Cooke 682 ; Kränz. 72 ; Haines, Bot. Bih. & Or. 1173, 1922 ; Fischer, Fl. Pres. Madr. 1416, 1928 ; Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 263, 1931. *D. ramosissimum* Wight, Icon. 5 (1) : 6, t. 1648, 1851 ; Dalz. & Gibs. 261. (See Plate XVII)

Large, pendulous or erect epiphytic herbs. *Pseudobulbs* 30-90 cm long, much branched, 7-15 mm thick, thin at the base, thickening upwards ; primary ones naked ; internodes 3.5 cm long, deep purple-brown, or brown, or brown-yellow, shining and polished, deeply ridged and furrowed ; lateral branches leafy or not at the time of flowering, green or yellowish green, sheathed. *Leaves* 3-11 × 0.4-1.3 cm, sessile, sheathing at the base, caducous, alternate, distichous, linear-oblong or linear-lanceolate, acute or subobtuse, entire, glabrous. *Inflorescence* appearing after leaf-fall, short, 2-5-flowered, terminal. *Peduncles* 7-15 mm long, brownish green, slender, glabrous, sheathed at the base ; sheaths very small, membranous, oblong, subacute, entire, translucent, glabrous.



Dendrobium herbageum Lindl.

A. Leafy plant ; B. Flowering plant ; C. Perianth segments.

Flowers 7×10 mm, greenish white, pedicellate, bracteate. *Bracts* 3×1 mm, persistent, membranous, translucent, semi-amplexicaul, brownish white, ovate-oblong or oblong, acute or subobtuse, entire, glabrous, 1-nerved. *Pedicels* with ovary 12 mm long, about 0.5 mm in diam., pale green, glabrous. *Sepals* greenish white, oblong-lanceolate, subacute, with a minute mucro just below the apex, entire, glabrous, 3-5-nerved; dorsal sepal 7×2.5 mm; lateral ones 7×2.5 mm, 4 mm broad at the base, subfalcate, connate along the foot, forming the mentum; mentum 3-4 mm long, broadly funnel-shaped, rounded, enclosing the lip at the base. *Petals* 6×2 mm, greenish white, linear or linear-oblong, acute, entire, glabrous, 3-5-nerved. *Lip* 5×2.5 mm, greenish white, curved at the base, oblong-ovate in general outline, constricted somewhat below the middle, entire, 3-5-nerved, obscurely 3-lobed; the lateral lobes narrow, obsolete, slightly turned upwards along the margins; terminal lobe ovate or ovate-triangular, obtuse. *Column* 1×1 mm, greenish white, the lateral arms produced above into broad subentire obtuse wings, which completely cover the anther at the back except for a narrow linear-oblong space; from the base of the opening a short, filiform process is given out to which the back of the anther is attached; foot 2-3 mm long, pale green, curved, obtuse. *Anther* white 1.25×1 mm, oblong-suborbicular, retuse. *Stigmatic surface*, green, rounded, deep-seated in the column; rostellum white, narrowly transversely, oblong. *Capsule* 1.8×0.4 cm, narrowly fusiform, broad at the apex, sharply tapering at the base into a long pedicel, brownish green, somewhat 3-angled with yellowish ribs.

Leaves: June to September. *Flowering*: September to October. *Fruiting*: November to April.

Occurrence: KONKAN: Dalzell & Gibson; Bombay, cultivated, Kapadia 1623-1628. W. GHATS: Mahableshwar, Woodrow; Cooke; Acland; Kapadia 599, 1925; Santapau 23440. DECCAN: Manched-Bhimashankar, Kapadia 1451-1456. N. KANARA: Anmod, Sedgwick.

Distribution: Parasnath, Bengal, Godavari district, Konkan, W. Ghats of Bombay, Mysore and Madras States from 600 to 1200 metres.

Notes: Gammie mentions that this species flowers in the hot weather; this seems to be very unusual, and we have found it in flower only in the latter part of the monsoon.

3. *Dendrobium peguanum* Lindl. in Journ. Linn. Soc. 3: 19, 1859. *D. pygmaeum* Lindl. Gen. Sp. Orch. 85, 1830, et Bot. Reg. misc. 62, 1844; Hook. f. 717; Grant 116; King & Pantl. 43, t. 58; Kränz. 83; Haines 1173; Brühl 55 (non Smith ex Rees, 1808; nec A. Cunn. ex Hook. 1836). *Callista pygmaea* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2: 655, 1891. *Dendrobium microbulbon* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35: 262, (partim) f. 7, 1931, (non A. Rich. 1845).

(See Plate XVIII)

Pseudobulbs 1-6 cm long, ovoid-conical to oblong-ovoid, stout, up to 2 cm in diam., usually 2-4 noded, sheathed, pale green or yellowish green; sheaths membranous with prominent veins. *Leaves* 2-4, coriaceous, 2.5-5×0.6-2 cm, sessile, broadly elliptic or elliptic-oblong, subacute or obtuse, 1-nerved. *Racemes* 1-5, almost directly arising from the apical part of the pseudobulb, with a few scarious, sheathing bracts at the base, 1-many-flowered, up to 7 cm long. *Flowers* about 12 mm long, shortly pedicellate, bracteate, faintly perfumed. *Bracts* 5 mm long, dry, membranous, persistent, narrowly linear-lanceolate, entire, 1-nerved. *Ovary* with pedicel about 6-7 mm long, curved, pale green or purplish. *Sepals* 8×2-2.5 mm, pale green or faintly suffused with pink, oblong, slightly dilated in the middle, sharply acute, entire, 3-nerved; mentum 4-4.5 mm long, narrowly conical, curved, subacute. *Petals* 8 mm long, white, faintly 3-nerved, subacute, obspathulate, 2 mm broad a little behind the apex, tapering to 4×1 mm claw. *Lip* 8 mm long, pale green; midlobe suffused with amethyst or purplish, 3-lobed, with a small, 1-2 mm long-claw, obovate-deltoid in outline; lateral lobes erect, more or less connivent over the column, 5×1-1.5 mm, narrow, with a straight grooved disc in between continuing from the claw up to the midlobe, veins faint; midlobe 2-2.5×2 mm, slightly decurved, more or less orbicular or broadly triangular in outline, acute (often appearing retuse in pressed specimens), the margins crenulate, curving upwards. *Column* 3×2 mm, narrowly oblong, white; foot 3 mm long, conical, the base with a small pouch. *Anther* 1.25×1.25 mm, pale amethyst, its anterior lip minutely pectinate; pollinia 1 mm long, golden-brown. *Capsules* about 7×4-5 mm, deep chocolate-brown, ribbed, on a very short pedicel.

Leaves: June to October. *Flowering*: October to December.

Fruiting: December to March.

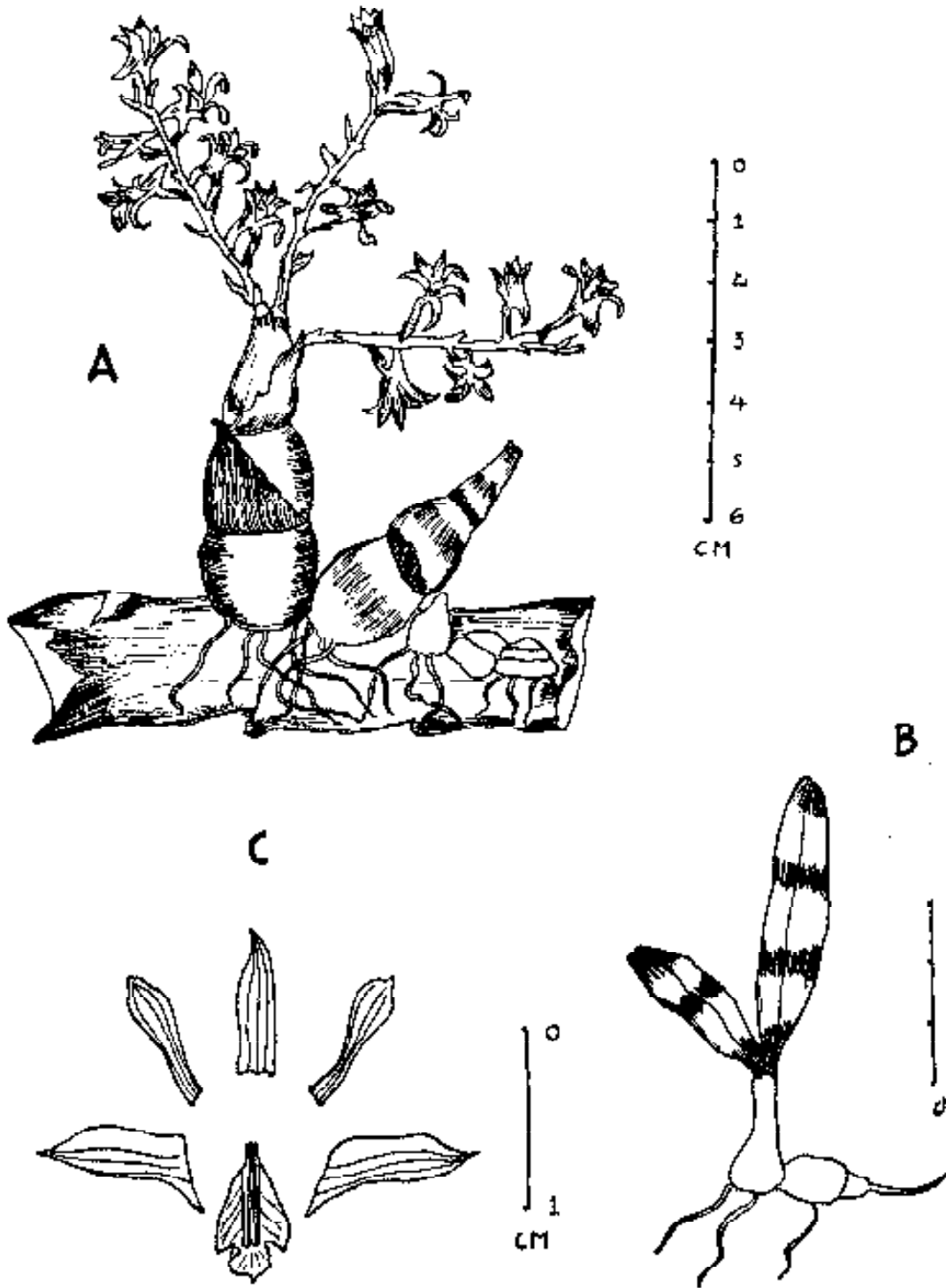
Occurrence: DANGS: Pimpri, *Kapadia* 1600-1601; Ahwa, *Kapadia*. KONKAN: Thana, cultivated, *Kapadia* 1104; Atgaon-Tansa, *Kapadia* 724-726, 1635-1636. W. GHATS: Kasara-Igatpuri, *Kapadia* 1375. N. KANARA: Dandeli, *Kapadia* 1665; Dharwar, *Sedgwick* 3788.

The plant has been recorded for the first time from Bombay State.

Distribution: India: Sikkim, Himalaya, Jaspur, Dangs, Konkan, W. Ghats and N. Kanara. *World*: India and Burma.

Notes: We have usually found this species epiphytic on *Tectona grandis* L. f.

This species is similar to *D. microbulbon* A. Rich. and may be confused with it. However, it can easily be distinguished by its broader, coriaceous leaves and the smaller, compact, dense racemes arising almost directly from the apical part of the pseudobulb. Blatter & McCann seem to have mixed up the two species as evidenced by their fig. 7, and



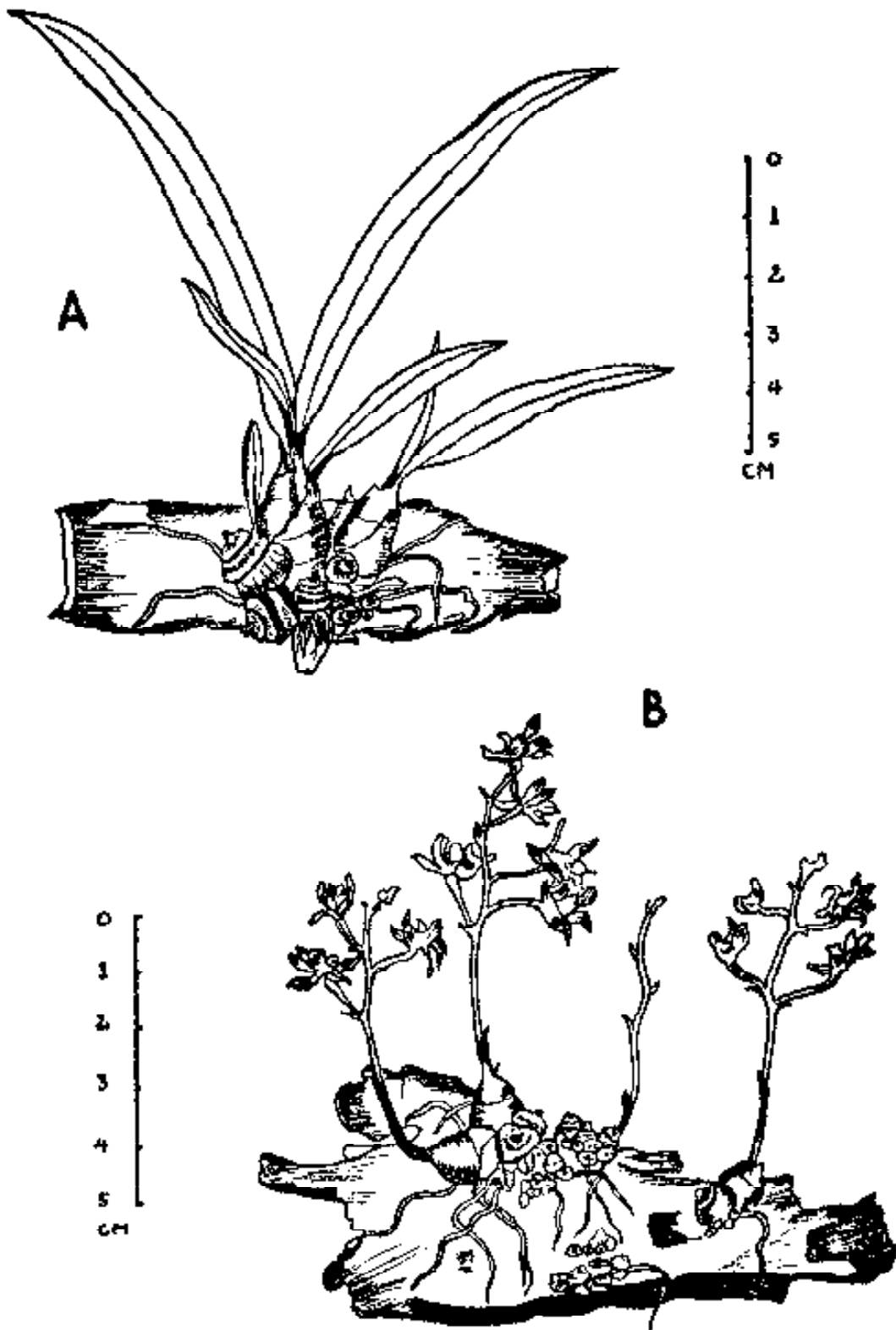
Dendrobium peguanum Lindl.
 A. Flowering plant ; B. Leafy plant ; C. Perianth segments.

also by the citation of *Sedgwick* 3788 under *D. microbulbon* A. Rich. Sedgwick's plant clearly belongs to *D. peguanum* Lindl. (= *D. pygmaeum* Lindl.)

This species goes under the name of *D. pygmaeum* Lindl. in our Indian floras, with *D. peguanum* Lindl. as a synonym. But *D. pygmaeum* Lindl. (1830) is a later homonym of *D. pygmaeum* Smith (1808); the correct name for the plant is, therefore, *D. peguanum* Lindl.

4. *Dendrobium microbulbon* A. Rich. in Ann. Sc. Nat. ser. 2, 15 : 19, t. 8, 1841 ; Lindl. in Bot. Reg. 61, 1844, et Journ. Linn. Soc. 3 : 19, 1859 ; Dalz. & Gibs. 261 ; Hook. f. 716 ; Gammie 16 : 567, 1905 ; Cooke 681 ; Kränzlin 29, f. 3 T ; Fischer 1415 ; Blatt. & McC. 261 (partim, non f. 7). *D. humile* Wight, Icon. 5(1) : 5 t. 1643, 1851. *D. crispum* Dalz. in Hook. Journ. Bot. 4 : 111, 1852. *Callista microbulbon* (A. Rich.) O. Kuntze, Rev. Gen. Pl. 2 : 255, 1891. (See Plate XIX)

Small epiphytes. Pseudobulbs 1-2 × 1 cm, crowded, mauve-brown, leafless at the time of flowering and covered with a network of fibres formed by the decayed membranous sheaths, conical, 1-3-jointed. Leaves caducous, appearing in the monsoon before the flowers, rarely with them ; 2-14 × 0.3-1.3 cm, sessile, sheathing at the base, thin, linear-lanceolate to oblong-lanceolate, acute, entire, 1-nerved. Inflorescence in racemes 1.5-10 cm long, erect, 1-3 arising from the terminal portion of the pseudobulb ; peduncles 1-6 cm long, purplish brown, slender with a few oblong, acute, membranous pale brown sheaths. Flowers 10-12 × 7-8 mm, faintly perfumed, pedicellate. Bracts 2-3 × 1 mm, scaly, membranous, light brown, semi-amplexicaul, ovate-lanceolate, acute, entire, glabrous, 1-nerved. Pedicel with ovary 7-10 mm long, pale brownish green, glabrous, faintly grooved above. Sepals white, entire, glabrous ; midnerve prominent, lateral pair faint ; dorsal sepal 4-6 × 2 mm, slightly shorter than the petals, erect, linear-lanceolate, rarely somewhat dilated a little beyond the middle, subacute ; lateral sepals 5-7 × 3-4 mm, spreading, broad at the base to form the mentum, falcate, acute or subacute, somewhat recurved ; mentum 6 × 4 mm, broadly infundibuliform at the mouth, narrowed to a fine, slightly upturned purplish apex, white flushed with purple downwards. Petals 8 × 1.5 mm, white, spatulate or oblanceolate, subacute or obtuse, entire, glabrous, faintly 3-nerved. Lip 4 × 5-5.5 mm, fused for about 1-2 mm to the apex of the foot, curved, clawed 3-lobed ; claw narrow, 2 mm long, pale mauve ; lateral lobes 5 × 1 mm, erect, more or less parallel with the column, linear, acute, entire, pale purplish green with many purple nerves on the inside ; midlobe 2 × 4 mm, white flushed with pink-purple with a few deeper-coloured nerves, transversely oblong-orbicular, truncate or slightly retuse at the apex, margins irregularly denticulate ; disc narrow, pale green, with 3 green parallel nerves, ter-



Dendrobium microbulbon A. Rich.
A. Leafy plant; B. Flowering plant.

minated by a slightly widened, free, 2-lobed callus. *Column* 2×1.5 mm pale mauve-green, produced below into a 6 mm long, pale purple, shallowly grooved foot; lateral arms white, acute. *Anther* very small, pink-purple, suborbicular; *pollinia* 4, waxy, linear, yellow. *Stigmatic surface* pale green lined with purple-brown. *Capsules* 10×6 mm, ovoid; *pedicels* 3-5 mm long, slender.

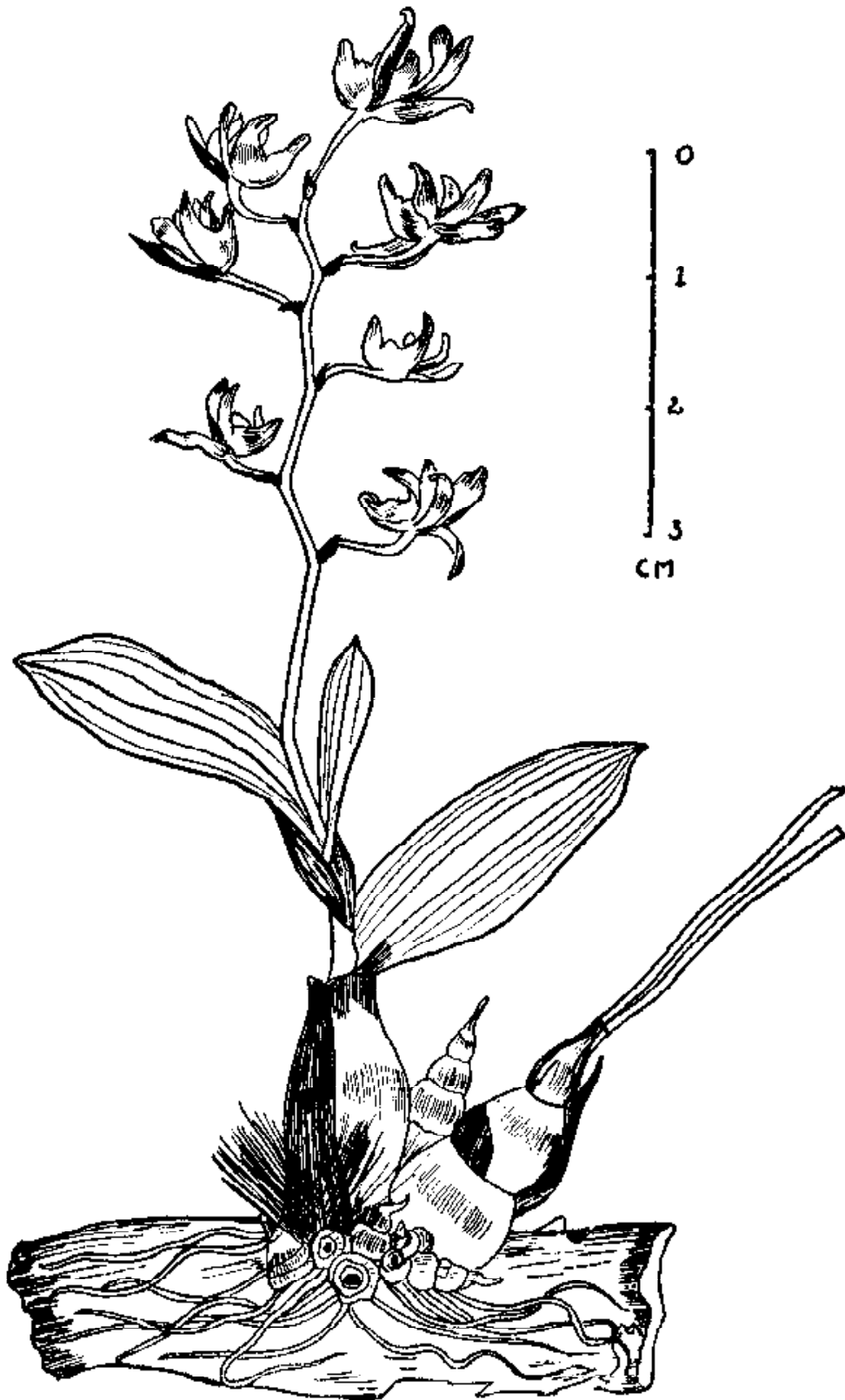
Leaves: July to October. *Flowering*: December to January. *Fruiting*: January to May.

Occurrence: KONKAN: *Stocks Thana, Bell. W. GHATS*: Kasara—*Igatpuri, Kapadia*, 1374; *Khandala, Santapau* 253.30, 1037, 1439, 2452, 4363, 4600, 4740-4742, 5049; *Kapadia* 524, 1096-1097, 1235; *Lonavla, Kapadia* 536, *Mahableshwar, Cooke*; *Sedgwick*; *Ezekiel*; *Millard*; *Chibber*; *J. Fernandez*; *Santapau* 13134; *Kapadia* 596, 2057. DECCAN: *Purandhar, Santapau* 11456; *Kapadia*; *Bhimashankar, Kapadia* 1447. N. KANARA: *Amboli Ghat, Bell.*

Distribution: Konkan, W. Ghats, Deccan, N. Kanara, Nilgiris, Anamalais.

5. *Dendrobium mabelae* Gammie in J. Bombay nat. Hist. Soc. 16: 567, 1905; *Cooke* 681; *Kränz.* 80; *Blatt. & McC.* 262. (See Plate XX)

Perennial, erect epiphytes. *Pseudobulbs* $1-4 \times 0.7-2$ cm, yellowish green, ovoid-conical, 1-4-noded, clothed with membranous sheaths, which on drying leave a network of fibres. *Leaves* 2-4, alternate, distichous, subcoriaceous, sessile, sheathing at the base and forming a short pseudostem above the pseudobulb, $3-8 \times 0.4-0.8$ cm, oblong or oblong-lanceolate, obtuse, entire, glabrous. *Inflorescence* 1-3 per plant, 5-12 cm long. *Peduncle* slender, green, terete, straight or zigzag above, with 1-3 membranous, convolute, oblong, acute bracts. *Flowers* 1.5×1 cm, brown or brownish green, convolute, membranous, oblong, acute, entire, often serrulate above, glabrous, 1-nerved. *Pedicel* with *ovary* 8 mm long, greenish white, slender, curved. *Sepals* subequal, white, entire, mucronulate, glabrous, 3-nerved, 8×3 mm; dorsal sepal broad, oblong-lanceolate; lateral sepals 6 mm; broad at the base, spreading, subfalcate, adnate along the foot, partially enclosing the lip to form an obovate, obtuse or subretuse, somewhat curved, 5 mm long *mentum*. *Petals* 8×2.5 mm, white, linear-spathulate, mucronulate, glabrous, faintly 3-nerved. *Lip* 9 mm long, obovate-suborbicular in outline, shallowly 3-lobed, curved; lateral lobes 1 mm long, white with faint, brownish red veins on the inside, or narrow, obtuse; midlobe 3×6 mm yellowish green or pure pale yellow, orbicular, emarginate, fringed with 2 rows of irregularly arranged, greenish white or yellow thick hairs; disc yellowish green, extending as far as or a little beyond the lateral lobes, with a free channelled bilobed ridge. *Column* 2×2 mm, greenish



Dendrobium nabelae Gamble

white ; foot 5×2 mm, obovate, obtuse or subretuse, yellowish on the outside, greenish white on the inside with pale red-brown short streaks. *Anther* 2-celled, yellowish green, oblong-orbicular, mobile on a thin process given out from the middle of the distal margin of the clinandrium ; pollinia 4, waxy, yellow, in pairs, oblong. *Stigmatic surface* pale-green, round, slightly broader than long. *Capsules* 2.5×0.7 cm, stalked, ovoid, ribbed ; pedicels 5 mm long.

Leaves : June to October. *Flowering* : July to September, December. *Fruiting* : October to April.

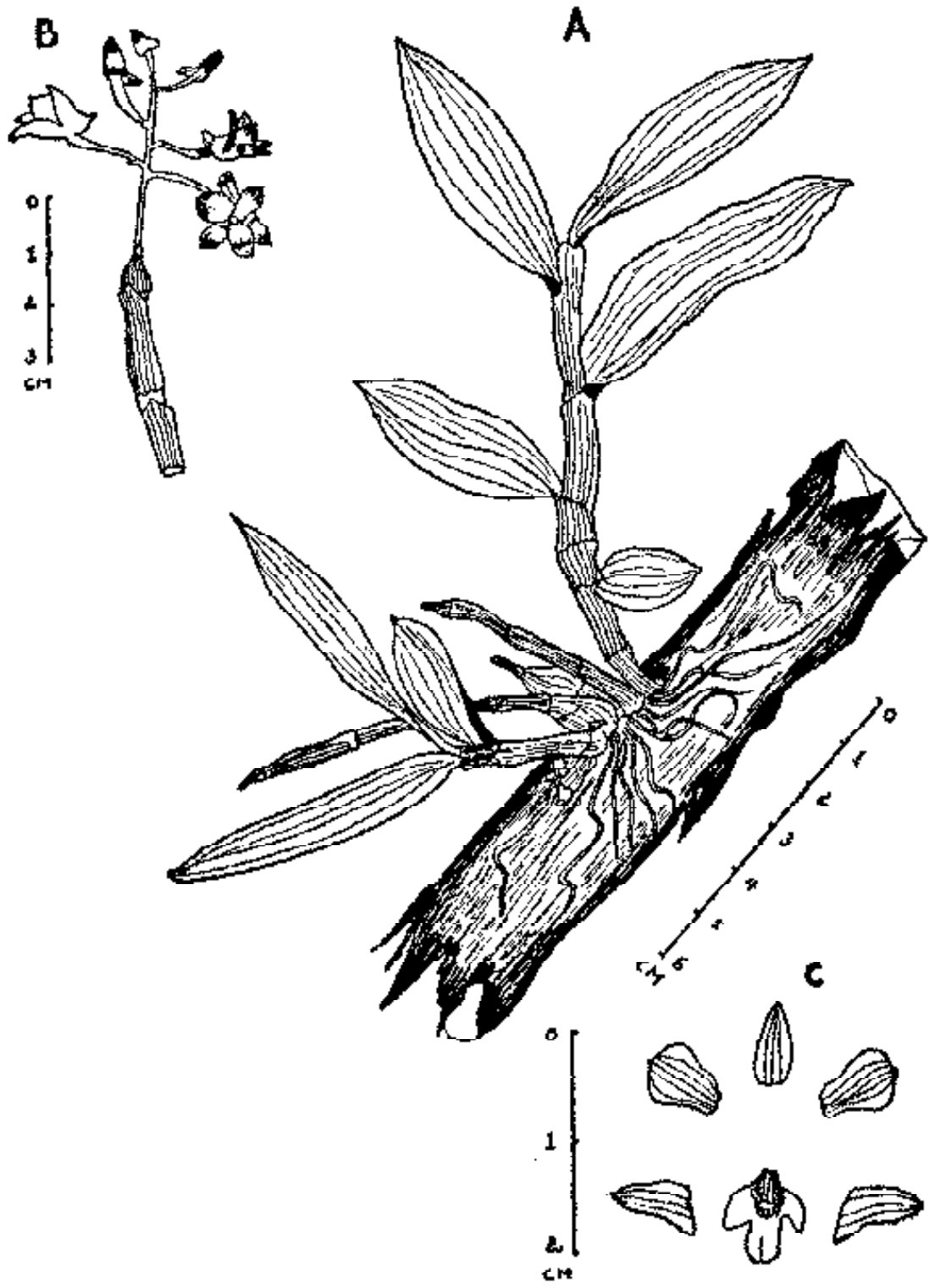
Occurrence : W. GHATS : Igatpuri, *Kapadia* 1388 ; Panchgani, *Kapadia* 2046 ; Mahabaleshwar, *Santapau* 13165, 13227 ; J. Fernandez ; *Kapadia* 597-598, 995, 1938, 2062. N. KANARA : Belgaum Ghats, *Gammie* ; Londa, *Bhiva* ; Tinai Ghat, *Sedgwick* ; *Gammie* ; Anmod, *Sedgwick* 3370 ; *Kapadia* 1871, 1907 ; Castle Rock, *Bhiva* ; *Gammie* ; *Sedgwick* ; *Santapau* 17606 ; *Kapadia* 2800-2802.

Distribution : W. Ghats, N. Kanara, apparently endemic.

Notes : There seem to be 2 distinct forms. All the plants of the northern region of the W. Ghats (Igatpuri, Panchgani and Mahabaleshwar) begin to flower by the end of July and continue till September ; in the southern parts of the State (Castle Rock, Anmod) flowers do not appear till about the third week of December. Flowers of N. Kanara plants are slightly smaller, appearing without the leaves, and are pure white with a yellow lip. Except for these, we find no other differences in the flower structure to keep them apart.

6. *Dendrobium ovatum* (Willd.) Kränz. in Pflanzenr. 45 : 71, 1910 ; Fischer 1416 ; Blatt. & McC. 262. *Cymbidium ovatum* Willd. Sp. Pl. 4 : 101, 1805 ; Graham, Cat. Bomb. Pl. 203, 1839. *Dendrobium chlorops* Lindl. in Bot. Reg. misc. 44, 1844 ; Dalz. & Gibs. 261 ; Bot. Mag. t. 5918, 1871 ; Hook. f. 719 ; *Gammie* 568, t. 1, 1905 ; Cooke 682. *D. barbatum* Wight, Icon. 3 (2) : 10, t. 910, 1844-1845 (non Lindl. 1830). (See Plate XXI)

Pseudobulbs up to 50 cm long, more or less uniformly mauve-brown, leafless at the time of flowering ; internodes one to many, 2-3.5 cm long, longitudinally ribbed, the nodes slightly swollen. *Leaves* caducous, alternate, membranous, sheathing at the base, $5-11 \times 1.2-3$ cm, elliptic-oblong or oblong-lanceolate, acute, entire, glabrous, many-nerved. *Inflorescence* in racemes from the apical part of the pseudobulb, often up to 9, coming into flower at intervals ; peduncles with sheathing bracts at the base ; racemes about 3-15 cm long, several-flowered, subpendulous. *Flowers* about 1.4-1.8 cm across, cream-yellow (or pale nankin-coloured, according to Lindley) with pale green centres, pedicellate, bracteate. *Bracts* 2-3 mm long, membranous, scarious, oblong, acute, sheathing. *Pedicel* with *ovary* about 17 mm long, pale brown. *Sepals*



Dendrobium ovatum Krass.

A. Leafy plant ; B. Flowering plant ; C. Perianth segments,

7-10 × 3-4 mm, pale creamy yellow, ovate-oblong, obtuse or mucronulate, entire, spreading, faintly 3-nerved, glabrous; dorsal sepal more tapered towards the apex; mentum 3-4 mm long, pale green, more or less keel-shaped. *Petals* 7-9 × 5-6 mm pale creamy yellow, obovate-oblong, suddenly widened just behind the minutely mucronulate apex, faintly 5-nerved, entire, glabrous. *Lip* 7-8 mm long, pale creamy yellow, slightly clawed at the base, 3-lobed; lateral lobes 4 × 2 mm oblong, obtuse, erect and connivent over the column; midlobe 4 × 3 mm, quadrate-oblong, rounded, subtruncate or subretuse at the apex, curved downwards from the lateral lobes, glabrous; disc with a callus, subretuse, surrounded all over by pale green, soft hairs. *Column* about 2-3 mm long, with a foot which is broad, tapering downwards, somewhat conical, curved, 3-5 mm long. *Anther* about 1.5-2 mm long, conical, obtuse, apiculate in front, yellowish. *Stigmatic surface* obovoid. *Capsules* about 18 × 8 mm oblong-ovoid, purple, ribbed; stalk 10 mm long.

Leaves: June to September. *Flowering*: September to January. *Fruiting*: February to March.

Occurrence: KONKAN: Salsette, *Hallberg*; Tulsi Lake *McCann*; Bassein, *Ryan*; Badlapur, *Kapadia* 1952; Thana, *Bell*; *Kapadia* 1103; Tansa, *Santapau* 15399; *Kapadia* 1634; Pen-Campoli, *Gammie*; Khardi, *Ryan*; Wada range, *Ryan*; Matheran, *Birdwood*. W. GHATS: Kasara, *Kapadia* 894-896; Kasara-Igatpuri, *Kapadia* 1369; Khandala, *Blatter & Hallberg*; Mahableshwar, *Cooke*; Phonda Ghat, *Ritchie*. N. KANARA: Gundh, *Kapadia* 896; Belgaum, *Kapadia*; Ramanguli, *J. Fernandez* 2061; Gersoppa, *J. Fernandez*; Yellapur, *Kapadia* 2037-2038; Ankola Belikeri, *Kapadia* 2169-2174; Karwar, *Blatt. Herb.* 233.19.

Distribution: Konkan, W. Ghats, N. Kanara, southwards along to S. India.

Notes: We have noted this species epiphytic on: *Tectona grandis* L. f., *Salmalia malabarica* Sch. & Endl., *Erythrina suberosa* Roxb., *Areca* trees in a plantation in N. Kanara, *Mangifera indica* L. It is usually found in open deciduous forests.

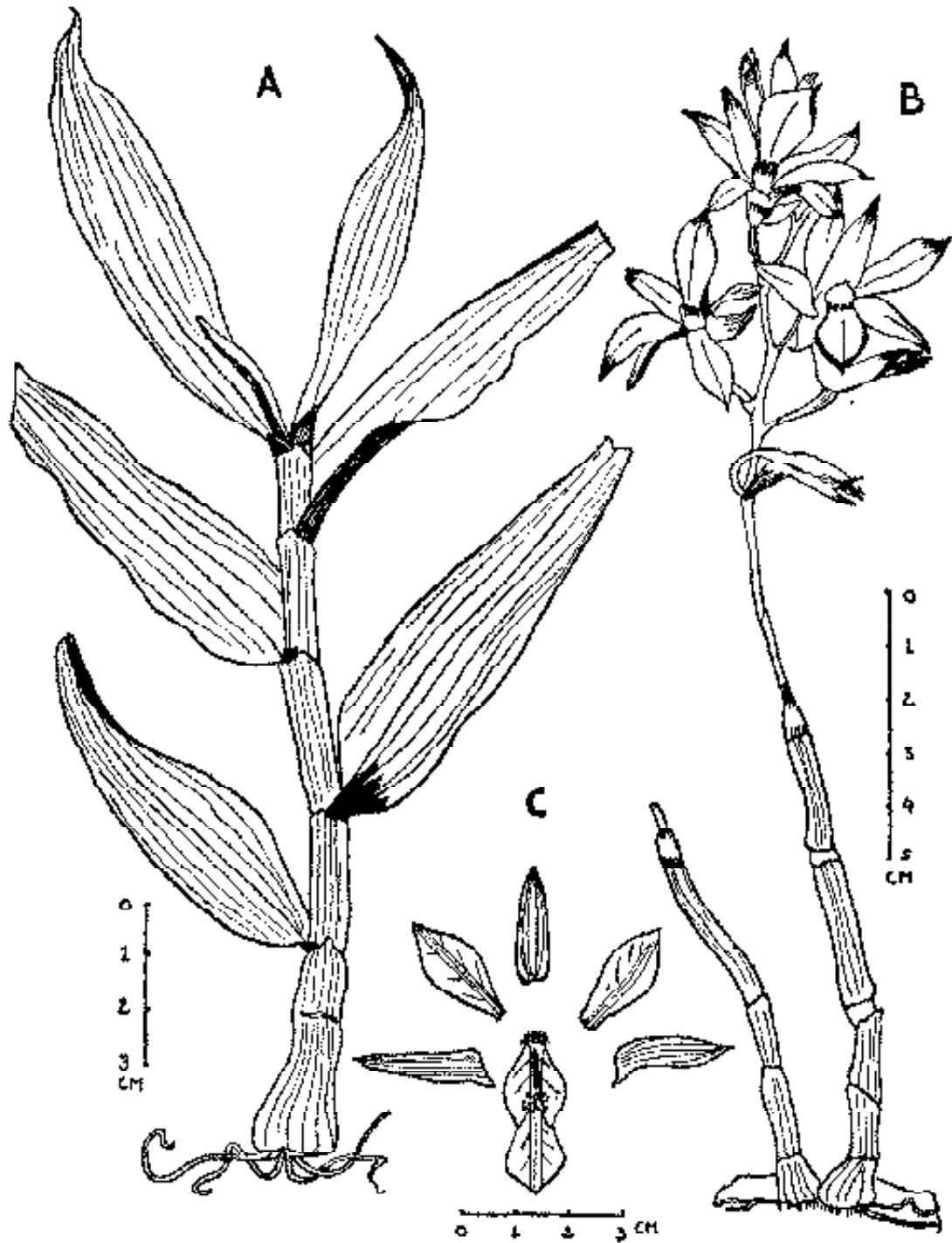
7. *Dendrobium barbatulum* Lindl. Gen. Sp. Orch. 84, 1830; Dalz. & Gibs. 261; Bot. Mag. t. 5918 (non t. 5444); Hook. f. 719; *Gammie* 17: 31, t. 2, 1906; *Cooke* 682; *Fischer* 1416; *Blatt. & McC.* 262. (See Plate XXII)

Pseudobulbs 1.5-32 cm long, leafless at the time of flowering, one- to several-noded, tapering at the apex; nodes 1.5-2.5 cm long, purplish brown, about 0.5-1 cm thick with longitudinal whitish striations. *Leaves* 4.5-13 × 1.5-3.5 cm, alternate, distichous, sheathing at the base, lanceolate to ovate-lanceolate, acute, entire. *Inflorescence* terminal or

lateral ; racemes 1-27-flowered, up to 25 cm in length, erect ; peduncles 1.5-8 cm long, pale greenish brown, slender, about 1 mm in diam., sheathed with pale brown membranous sheaths at the base. *Flowers* 2.5-4 × 2.5-4.5 cm, pedicellate, pure white, to white deeply flushed with pink-lilac. *Bracts* 3 × 1.5 mm, broadly ovate, subacuminate, pale brown, scarious, 3-5-nerved. *Pedicel* with *ovary* 1.8 cm long, pale yellowish, somewhat pink flushed. *Sepals* and *petals* white, or white flushed with pink-lilac, spreading, somewhat recurved, acute, entire ; dorsal sepal 1.5-2.6 × 0.3-0.6 cm oblong-lanceolate to ovate-lanceolate, 3-5-nerved ; lateral ones 1.7-2.7 × 0.4-0.6 cm, oblong-lanceolate, 3-5-nerved, prolonged downwards at the base to form the mentum ; mentum 0.8-1 × 0.5 cm, broadly conical, obtuse, pale yellow, straight or slightly incurved. *Petals* 1.6-2.7 × 0.6-1.3 cm, obovate-lanceolate to oblanceolate, acute, tapering to the base, entire, 3-nerved. *Lip* 1.9-3 cm long, 3-lobed ; lateral lobes 7-14 × 2.5-4 mm, more or less connivent upwards to enclose the column in a somewhat cylindrical, 9-15 mm long tube-like structure, obliquely ovate-oblong, subacute, pale creamy yellow, rarely tinged with green to deep pink flushed with mauve, with red-brown veins on the inside ; midlobe 1.3-2 × 0.8-1.7 cm, white, or white flushed with pink-lilac with several deeper-coloured veins, broadly ovate or ovate-oblong or subflabellate, acute, mucronulate or rounded-obtuse, entire. *Disc* on the lip creamy, grooved, obtuse or subemarginate, with yellow hairs at its base and apex. *Column* 3 × 2 mm, stout, short, lateral arms shortly toothed ; clinandrium prolonged into a small outgrowth from the back wall ; foot 6-8 × 3-4 mm, obovate, broadly hollowed with a small, 3-4 mm long, pouch-like nectary. *Anther* 1.5 × 1.5 mm, ovate-oblong, pale yellow ; pollinia 2 pairs, waxy, yellowish green, linear. *Stigmatic surface* broadly obovate-orbicular, creamy white. *Capsules* 2.2 × 1.2 cm, elliptic, pedicels 11 mm long, somewhat curved, subclavate and with a broad beak 5 mm long ; capsule greenish purple with 3 broad and 3 narrow bands.

Leaves : June to October. *Flowering* : January to May. *Fruiting* : March to July.

Occurrence : DANGS : Ahwa, *Kapadia* 1596-1599. KHANDESH : *Hallberg*. KONKAN : *Stocks* ; *Law* ; Thana, *Bell* ; *Kanitkar* ; Kanheri Caves, *McCann* ; Chiplun, *McCann* ; Ratnagiri, *Kanitkar*. W. GHATS : Kasara, *McCann* ; Igatpuri, *McCann* ; Khandala, *Hallberg* ; *Blatter* ; *McCann* ; *Santapau* 233.6, 233.29, 838, 1675-1676, 2223, 3613-3614, 4362, 4878, 6124, 8644-8645, 8768, 8788, 9179, 9965, 10787, 10951, 12261 ; *Herbert* ; *Kapadia* 493, 511, 1063, 1091, 1093, 1176-1177, 1836-1842, 1942, 2317. Lonavla, *D. K. Patel* ; *McCann* ; *Kapadia* ; Panchgani, *J. Fernandez* ; *McCann* ; Panchgani-Mahableshwar, *Blatter & Hallberg* ; Mahableshwar, *Cooke* ; *Ezekiel* 30321 ;



Dendrobium barbatulum Lindl.

A. Leafy plant ; B. Flowering plant ; C. Perianth segments.

Acland 1175 ; *Santapau* 12482 ; *Kapadia* 1919-1922, 2058-2059. DECCAN : Purandhar, *Santapau* 11457 ; Dapoli, *Acland* 1176 ; Kunitkar ; Bhimashankar, *Kapadia* 1448 ; Radhanagar, Kolhapur, *Acland* 1174 ; Koina nagar, Koina Valley, *Kapadia* 2878-2879. N. KANARA : Tinai Ghat, *Sedgwick* ; Anmod, *Kapadia* 1876 ; Castle Rock, *Kapadia* 2773, 2794-2795, 2828-2829, 2878-2879, 2937.

Distribution : Dangs, Khandesh, Konkan, W. Ghats of Bombay State and S. India, Deccan, N. Kanara, Travancore.

Notes : This species is epiphytic on a number of different trees and shrubs : *Terminalia* sp., *Syzygium* sp., *Heterophragma quadriloculare* Schum., *Carissa congesta* Wt., *Hymenodictyon* sp., *Sapium insigne* Benth., *Mangifera indica* L., *Salmalia malabarica* Sch. & Endl., *Vitex negundo* L., *Tectona grandis* L. f., *Ixora brachiata* Roxb., etc.

Some of the localities where this orchid is common and abundant are : Khandala, Mahableshwar and Koina nagar.

It may be of interest to point out that Rolfe (in *Gard. Chron.* 11 : 298, 1892) described *Dendrobium barbatulochlorops*, a natural hybrid between *D. barbatulum* Lindl. and *D. ovatum* Kränzl. (= *D. chlorops* Lindl.), which combines the characters of the 2 species. 'Briefly it may be described as *D. barbatulum*, a little modified in shape, with the crest and side lobes of the lip of *D. chlorops*. Good specimens from both the parent species from the same collection enable these characters to be easily traced.' (R. A. Rolfe, loc. cit.)

8. *Dendrobium macrostachyum* Lindl. Gen. Sp. Orch. 78, 1830, et in Bot. Reg. t. 1865, misc. 60, 1844 ; Wight, Icon. t. 1647, 1851, Hook. f. 735 ; Prain 1007 ; Gammie 17 : 32, 1906 ; Cooke 683 ; Kränzl. 59 ; Haines 1174 ; Fischer 1416 ; Blatt. & McC. 263. *Callista macrostachya* O. Kuntze, Rev. Gen. Pl. 2 : 255, 1891. *Dendrobium gamblei* King & Pantling in Journ. Asiatic Soc. Bengal II, 66 : 584, 1897 ; Duthie 99, t. 99 et Fl. Upp. Gang. Pl. 3 : 188, 1920 ; Kränzl. 59. (See Plate XXIII)

Pendulous epiphytes. Pseudobulbs leafless at the time of flowering slender, 7-50 cm long, more or less uniform, internodes 2-2.8 cm long, 3-5 mm thick, slightly swollen at the nodes, purplish brown with whitish longitudinal streaks. Leaves alternate, distichous, somewhat coriaceous, on drying becoming membranous, pale olive green, completely and closely sheathing the node below, 2.9 × 0.3-2.5 cm, narrowly lanceolate, oblong-lanceolate to ovate-lanceolate, acute, entire, usually with 3-5 fairly prominent nerves. Inflorescence solitary or in cymes ; at first usually 3 buds are produced in basipetal succession, indicating a distinct dichasiai cyme ; out of which generally 1 or 2, rarely all the 3, mature. Peduncles 2-3 mm long, terete, thin, brown, sheathed.

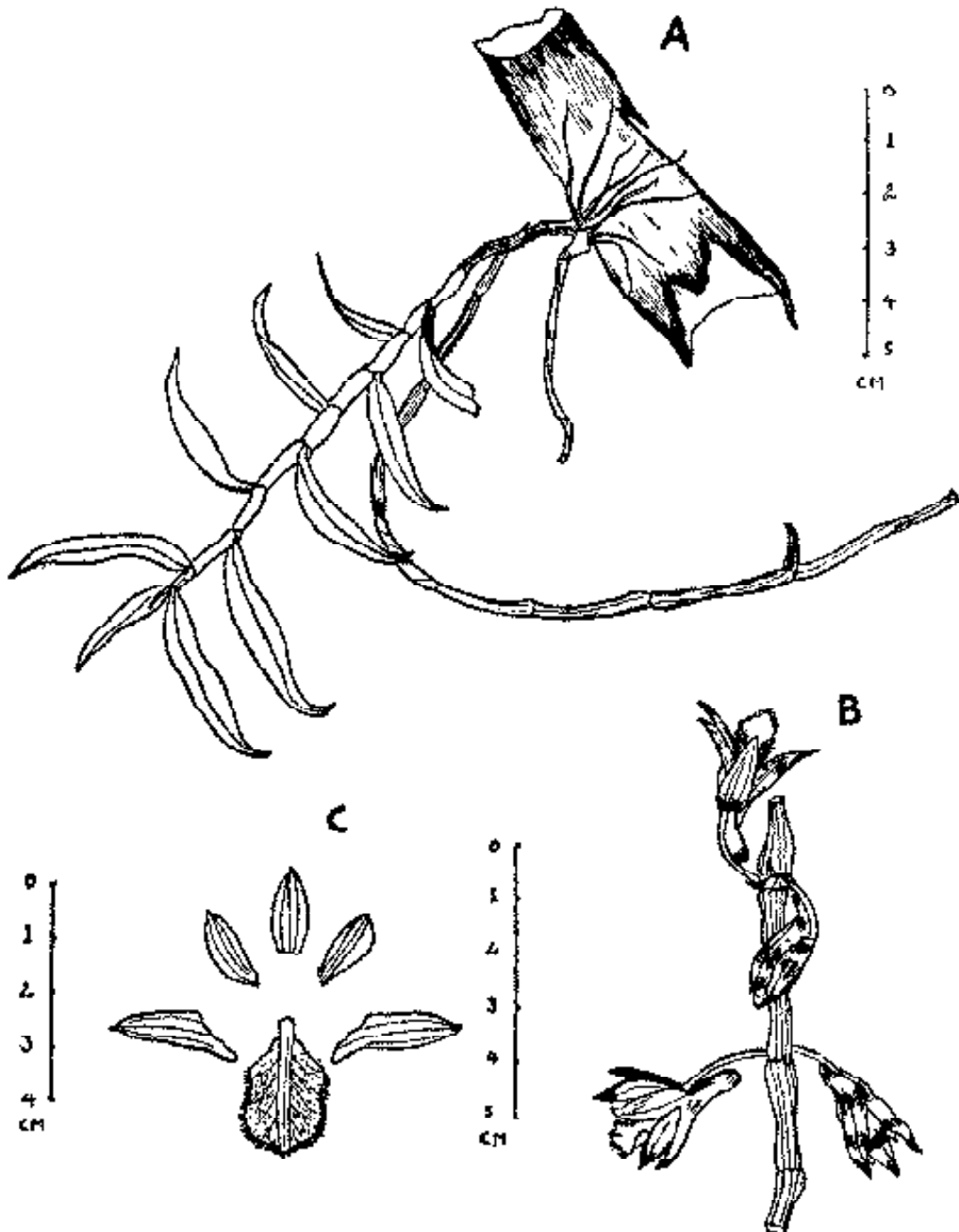
Flowers 2.5 × 2 cm, at first pale green, turning creamy yellow with age, faintly perfumed on opening, pedicellate. *Bracts* 2-3 × 1 mm, persistent, membranous, ovate, pale brown, 1-nerved. *Pedicel* with *ovary* 1.5-1.8 cm long, curved, pale green above, tinged mauve below. *Sepals* and *petals* 1.5-1.7 × 0.6-0.8 cm, similar, not much spreading, creamy yellow, somewhat brittle, acute, entire, glabrous, faintly 5-nerved; lateral sepals oblong-lanceolate, connivent below with the foot forming the mentum; mentum 7 × 3-4 mm, infundibuliform, obtuse, straight or slightly curved. *Petals* obovate or oblanceolate, tapered to the base. *Lip* pale green or creamy yellow with brownish red slightly inflated nerves on the inside, obscurely 3-lobed with a 3-5 mm long claw; lateral lobes almost completely enveloping the column, obscure; midlobe circular, half opening. The lip 25 × 15 mm, quadrately oblong or broadly subpanduriform in outline, only a shallow depression about the middle on the margin indicates the separation of the lateral lobes from the midlobe, obtuse; margins minutely fimbriate, the apical half of the lip puberulous; disc creamy yellow 3-nerved. *Column* 3 × 3 mm, greenish yellow, the lateral arms somewhat produced, acute; foot 8 mm long with a small nectarial depression at the base. *Anther* 2 × 2 mm, white, somewhat faintly pitted; pollinia 4, each 1.5 × 0.5 mm waxy, yellow, oblong. *Stigmatic surface* ovoid, pale green. *Capsules* 3.5-4 × 0.6 cm, narrowly spindle-shaped, beaked; pedicels 1.5 cm long.

Leaves: May to November. *Flowering*: May to June. *Fruiting*: May to December.

Occurrence: KONKAN: Southern parts, Dalzell, W. GHATS: Koina Valley, below Mahabaleshwar, Cooke. N. KANARA: Belgaum Ghats, Gammie; Sampkhand, Hallberg & McCann 34192; Sirsi, Blatt. Herb. 34385; Santapau 18505, 18680; Sirsi-Siddhapur, Kapadia 2444; Siddhapur, V. Patel 1852; Kapadia 2375-2378; Jog, Santapau 18616; Bhagwati, Kapadia 1754-1760; Yellapur, Sedgwick; Bell; Kapadia 1771, 1969, 2000.

Distribution: India: Madhya Pradesh, Konkan, W. Ghats of Bombay State and S. India, Deccan, N. Kanara, Travancore. World: India, Ceylon.

Notes: The differences between *D. gamblei* King & Pantl. and *D. macrostachyum* Lindl. seem to be slender. King & Pantling in their original description differentiate their *D. gamblei* from *D. macrostachyum* Lindl. in the following way: in the latter species "...the margins of the lip are slightly erose, not deeply fimbriate-serrate as in this; the disc is naked in that, or has only a few scattered hairs; the nectary and anther are entire in *D. macrostachyum*, and the flowers which are sweet-scented are in racemes". Duthie points out that *D. macrostachyum* differs from



Dendrobium macrostachyum Lindl.

A. Leafy plant; B. Flowering plant; C. Perianth segments.

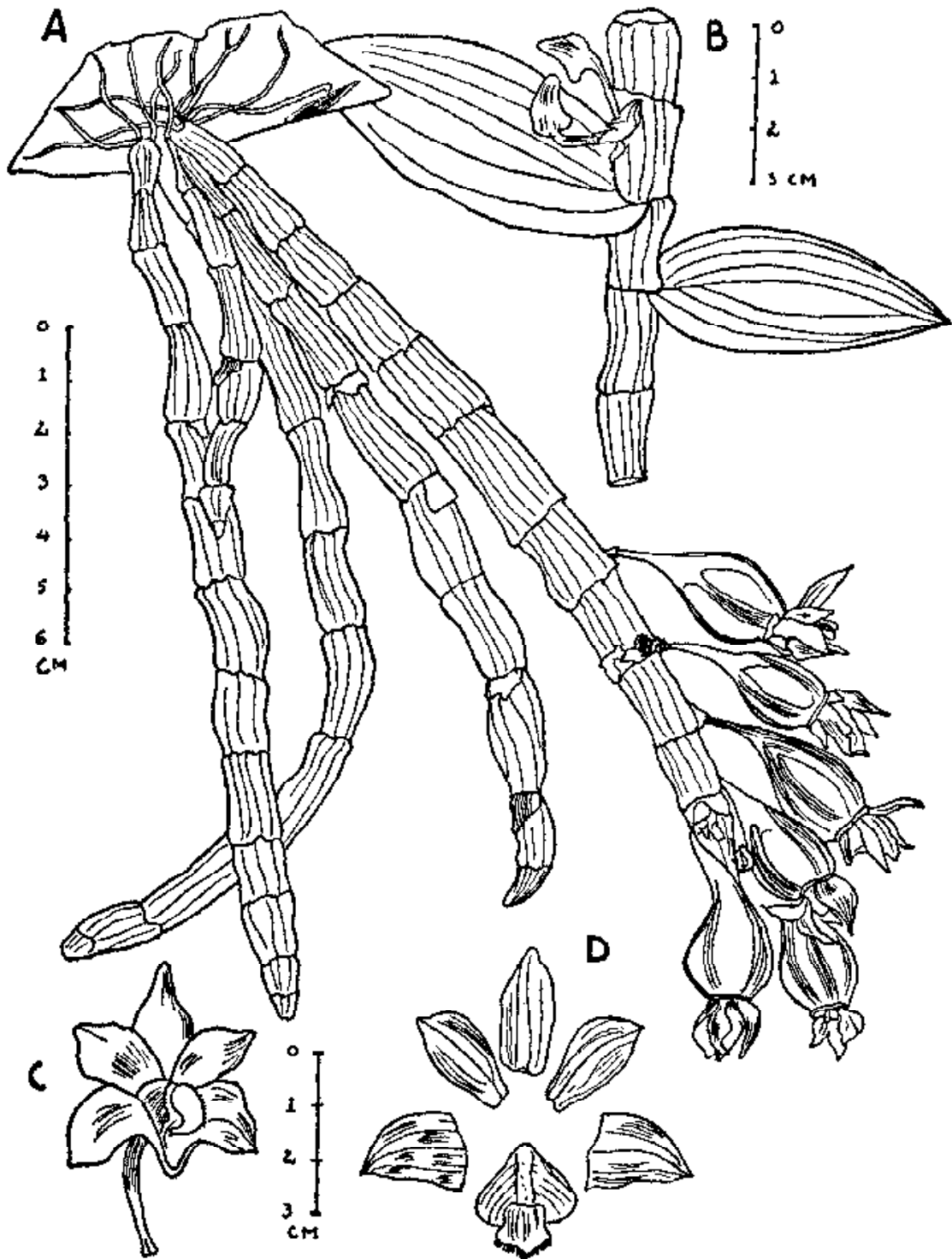
D. gamblei in the much-branched peduncles, the lip convolute at the base only and not ciliolate on the margins, and the leaves being membranous. Kränzlin distinguishes *D. gamblei* principally by the disc of the lip being villous and margins fimbriate (not serrate).

Lindley describes *D. macrostachyum* “. floribus ternatis, racemum spurium formantibus, labello cucullato venoso; limbo ovato obtuse ciliato intus pubescente”. Prain describes the lip of *D. macrostachyum* Lindl. as fringed. Blatter & McCann remark from Bell's MSS notes: midlobe of lip embraces the whole column'. After a careful examination of abundant fresh material, we have found that the hairiness of the lip and the disc and also the degree of serration of the margin of the lip varies. Lindley himself mentions the lip of *D. macrostachyum* to be ciliate and pubescent.

From these considerations, we consider the differences between the 2 species not to be sufficient for keeping them apart. It may be pointed out that Fischer makes no mention of *D. gamblei* King & Pantl., in spite of the fact that the type locality for that species happens to be the Nilgiris. Wight's Icon no. 1647 does not seem to be very accurate.

9. *Dendrobium aqueum* Lindl. in Bot. Reg. misc. 6, t. 54, 1843; Hook. in Bot. Mag. t. 54, 1843; Hook. f. 739; Kränz. 52; Fischer 1411; Blatt. & McC. 264. *D. album* Wight, Icon. 5(1): 6, t. 1645, 1851. *Callista aquea* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2: 654, 1891 (See Plate XXIV)

Pendulous, rarely erect *epiphytes*. *Pseudobulbs* 15-45 cm long, thin at the base, gradually thickening upwards; internodes 2-25 × 0.7-1.8 cm, the middle ones thickest, greyish brown, sheathed; sheaths longitudinally striated, widening upwards. *Leaves* alternate, distichous, falling off just after flowering, 7-14 × 2-5 cm, sessile, oblong or oblong-elliptic or ovate-lanceolate, acute, entire, glabrous, 8-10-nerved. *Inflorescence* consists of fascicles of 2-3 flowers produced from the upper portion of each node along the distal half of the current season's pseudobulb. *Peduncles* hardly visible. *Bracts* 2-4, very small, membranous, imbricating at the base of the flowers, oblong or ovate-oblong, acute entire, glabrous, translucent, 1-nerved. *Flowers* 3.5 × 2.8-3 cm, pedicellate, bracteate. *Pedicel* with *ovary* 2.7 cm long, about 2 mm in diameter, cylindrical, greenish white. *Sepals* white suffused with green, apiculate, entire, glabrous, 3-nerved; lateral sepals 2 × 1.5 cm, ovate-triangular, subfalcate; dorsal sepal 2.4 × 1.2 cm, broadly ovate. *Mentum* 11 × 6 mm, oblong, slightly funnel-shaped, obtuse. *Petals* 2.3 × 1.2 cm, spreading, white suffused with green, obovate-oblong or obovate, obtuse, slightly apiculate, entire, glabrous, 3-nerved. *Lip* 2.2 × 2 cm, 3-lobed, whitish green, pale yellow on the inside, sub-



Dendrobium aqueum Lindl.

A. Fruiting plant ; B. Leafy shoot ; C. Single flower ; D. Perianth segments.

rhomboid, ascending from the base to the middle, then deflexed, triangular-round in front; lateral lobes 6-7 mm broad, obovate-oblong, rounded, entire, erect, connivent upwards, enclosing the column; mid-lobe 10×10 mm, contracted inwards at the base, oblong-cuneate, acute, ciliolate; disc 4 mm broad, yellow, puberulous, extending up to the midlobe. Column 4.5×7 mm, stout, greenish white; the arms projecting upwards and forwards, partially covering the anther in front; foot 10×5 mm, stout, oblong, obtuse, curved, with a small, basal, pouch-like nectary. Anther greenish white, ovate-conical; pollinia 4, yellow, oblong, subfalcate. Stigmatic surface truncate, oblong, small, pale green. Ovary 6×4.5 mm, pale greenish white, ribbed. Capsules $4 \times 1.8-2$ cm, obovate-pyriform, with 6 strong ridges 2.4 mm deep, greyish green; pedicels 1 cm long, 2 mm in diam., curved.

Leaves: June to October. Flowering: September to October. Fruiting: December to May.

Occurrence: KONKAN: Stocks ex Kränz. W. GHATS: Mahableshwar, Santapau 12559; Kapadia 968, 1918, 1933-1935. DECCAN: Manched-Bhimashankar, Kapadia 1449.

Distribution: Konkan, W. Ghats of Bombay and S. India, Deccan.

Notes: The specific name *aqueum* refers to the pale watery green flowers.

Lindley mentions that the species is "a native of Bombay, whence it was imported by Messrs. Loddiges". Cooke and Blatter & McCann mention that the plant is often cultivated but has not been seen wild. We have found it to be fairly common at Mahableshwar.

10. *Dendrobium crepidatum* Lindl. in Paxton, Fl. Gard. 1: 63, f. 45, 1850-1851, et nov. ed. 1: 53, f. 40, 1882; Bot. Mag. tt. 4993, 5011; Hook. f. 740; Grant 78; King & Pantl. 48, t. 66; Prain 1007; Gammie 17: 33, 1906; Cooke 683; Kränz. 39; Haines 1175; Brühl 59; Blatt. & McC. 263, f. 7. *Callista crepidata* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2: 645, 1891.

Pendulous epiphytes. Pseudobulbs greenish yellow, 8-20 cm long, narrow at the base, thickening upwards, about 0.6-2 cm thick; internodes about 2 cm long, longitudinally striated, the nodes somewhat thickened. Leaves 4-11 \times 0.5-1.5 cm, membranous, sheathing, oblong-lanceolate, acute, entire, glabrous, many-nerved. Flowers in pairs from the nodes of the apical parts of the pseudobulbs, pedicellate. Bracts minute, dry, scarious. Pedicel with ovary 23-28 mm long, straight or slightly curved. Sepals about $15 \times 6-7$ mm, oblong, obtuse or mucronulate, fleshy, entire, 5-nerved; mentum 2-4 mm long, shortly quadrate-rounded. Petals 15×7 mm, broadly oblong, spreading, wavy, abruptly tapered at the very base, obtuse, 5-nerved. Lip $17 \times 11-13$ mm, hardly lobed, oblong-orbicular in outline, with a narrow, 3-4 mm long

claw ; basal portion erect, more or less connivent round the column, forming a hollow at the base ; apical half spreading, wavy or slightly crimped, puberulous, rounded or shallowly emarginate at the apex. *Column* 3-4 mm long, oblong with curved foot about 4 mm long. *Anther* conical-oblong. *Flowers* are said to be white tipped with pink, the base of lip deep yellow.

Occurrence : KONKAN : *Law* ; *Stacks* ; Vengurla, Dalzell. W. GHATS : Lonavla, Gammie ; Mahableshwar hills, Cooke. DECCAN : Koina nagar, Koina Valley, Kapadia 2872-2874.

Distribution : *India* : Sikkim, Assam, Khasia Hills, Bihar and Orissa, Deccan. Kränzlin mentions Malabar, but Fischer does not include the species in the FLORA OF THE PRESIDENCY OF MADRAS. *World* : India, Burma.

Notes : We have not been able to collect flowering specimens of this species. The details of the flowers have been studied from specimens in the Herbarium of the Botanical Survey of India (Western Circle) with the kind permission of the Regional Botanist.

Haines has taken his description from Pantling. Plants from Chota Nagpur differ in the flowers being 3.2 cm in diam. and pink with buff at the base of the lip. This seems to be *D. lawianum* Lindl. and not *D. crepidatum* Lindl.

11. *Dendrobium lawianum* Lindl. in Journ. Linn. Soc. 3 : 10, 1859 (*lawanum*) ; Dalz. & Gibs. 261 ; Kränz. 297. *Dendrochilum roseum* Dalz. in Hook. Kew Journ. 4 : 291, 1852. *Dendrobium crepidatum* Lindl. var. *avita* Gammie in J. Bombay nat. Hist. Soc. 17 : 33, 1906. *Callista lawiana* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 655, 1891. (See Plate XXV)

Pendulous *epiphytes*. *Pseudobulbs* 5-25 cm long, leafless at the time of flowering, usually all curving in one direction, rarely straight, tapering at both ends ; internodes 2 cm long, 1.2 cm thick at the nodes, clavate, green ; generally completely enclosed in a scarious, many-nerved sheath which arises at a node and extends to about the middle of the next internode ; tip of the sheath about 1 cm broad, broadly emarginate ; rarely the pseudobulbs are completely without sheaths, yellowish green. *Leaves* 4.5-10.5 × 0.5-1.7 cm, distichous, sessile, sheathing at the base, lanceolate or oblong-lanceolate, acute, entire, with usually 5 prominent nerves and several faint ones. *Flowers* subregular, shallowly cup-shaped, from the nodes in pairs or solitary ; mentum absent. *Pedicel* with *ovary* 2.5-3.5 cm long, white flushed with pink purple near the flower, terete. *Bracts* minute, 2-5 mm long, pale brownish, scarious. *Sepals* and *petals* waxy, white flushed with rose-purple towards the apex. *Sepals* 12-15 × 6-8 mm, broadly oblong, subobtuse, mucronate,

the margins meeting a little above the apex, entire, faintly 5-nerved. *Petals* 12-15 × 6.5-10 mm, broadly ovate-oblong, entire, obtuse or slightly retuse, faintly 5-nerved. *Lip* 12-17 × 8-10 mm, broadly ovate-oblong, broader than the petals, obtuse or retuse, slightly clawed at the base, waxy, similar in coloration to the sepals and petals, the rose-purple flush somewhat deeper. *Column* 2.25 × 2.5 mm, stout, white with 2 purple or white processes at the base, behind which there is a deep cavity (probably a nectary); the sides with 2 minute purple or white horns; clinandrium broad-quadrate, the back margin with a central, 1 mm long, apiculum to which the anther is attached. *Stigmatic surface* quadrate just below the clinandrium, glutinous, generally self-pollinated. *Anther* 3 × 2.5 mm, oblong, suborbicular, flat on top with a central transverse band, 2-celled, white flushed with rose-purple; *pollinia* 2 pairs, 1.5 mm long, waxy, golden-yellow, without caudicle or glandular-viscid appendage. *Capsules* 2 × 1 cm, ovoid, pale-green, ribbed, surmounted by the hardened pale brown column, pedicellate; pedicels 2.5-3 cm long, clavate, green.

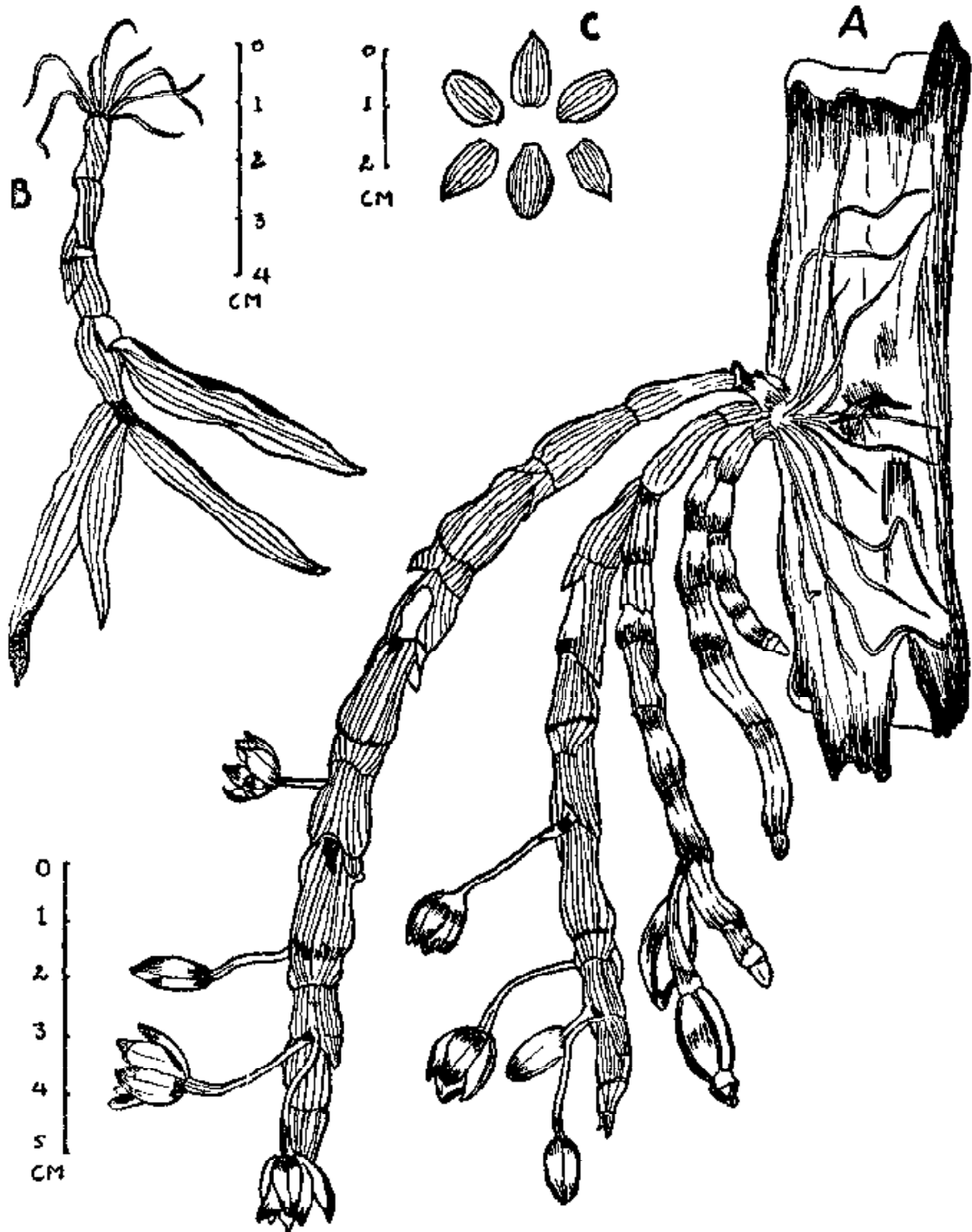
Leaves: May to October. *Flowering*: March. *Fruiting*: April onwards.

Occurrence: KONKAN: *Law*; Bombay, cultivated, *Kapadia* 1389. W. GHATS: Sahyadree Hills, *Dalzell*. N. KANARA: Yellapur, *Kapadia* 1988; Kumbelli Mines, about 17 miles from Supa, *Kapadia* 2579-2580, 2725-2726; Castle Rock, *McCann* 13768; *Kapadia* 2834, 2843-2850; Anmod, *Sedgwick* 3319; *Kapadia* 1868, 1892-1895; Siddhapur, *V. Patel* 1851; *Kapadia* 2370-2371; Jog, *Santapau* 18603; *Kapadia* 1846 (coll. *Pirson*).

Distribution: Chota Nagpur (?), Konkan, W. Ghats, N. Kanara.

Notes: We have collected abundant fresh material from the type locality (Castle Rock) of *D. actinomorphum* Blatt. & Hallb. and from other places in N. Kanara. The type specimen of *D. actinomorphum* (*McCann* 13768) is preserved in formalin in St. Xavier's College, and has been available for study. We have come to the conclusion that *D. actinomorphum* Blatt. & Hallb. and *D. lawianum* Lindl. are identical and that this species is quite distinct from *D. crepidatum* Lindl. though externally somewhat similar. It has been included under the latter species by most authors. Kränzlin has included *D. lawianum* Lindl. as a synonym of *D. crepidatum* Lindl. on page 39; but then, he also describes *D. lawianum* Lindl. as a distinct species under the heading '*Dendrobia adhuc solummodo in statu pelorioideo nota*' on page 297.

This species is quite common all over N. Kanara and may have been easily mistaken for *D. crepidatum* Lindl., from which it can be easily distinguished by the lip, which is similar to the sepals and petals with no trace of pubescence and by the yellow coloration at the base of the



Dendrobium lawianum Lindl.

A. Flowering plant ; B. Leafy plant ; C. Perianth segments,

lip; the column is also characteristic in shape and is without a foot. *D. lawtanum* Lindl. does not seem to be a mere accidental variation, for it is found to be distributed all over N. Kanara, and may probably occur in Chota Nagpur. The characteristic structure of the column at once distinguishes it from all other *Dendrobia*; but absence of foot and mentum, with the almost regular flowers throws considerable doubt as to the correctness of including it in *Dendrobium*. Its general habit, however, is that of a normal *Dendrobium* and we think it best to retain it in the genus, though in an independent section.

The earlier specific epithet *roseum* of Dalzell cannot be used for this species on account of *D. roseum* Sw. (1805).

5. *EULOPHIA* R. BR.

EULOPHIA R. Br. in Bot. Reg. t. 686, 1823, nom. cons.; Endl. Gen. Pl. 200, 1837; Benth. & Hook. f. Gen. Pl. 3 : 535, 1883; Pfitz. in Engl. & Prantl. Pflanzenf. 2 (6) : 157, 1889; Hook. f. Fl. Brit. India 6 : 1, 1890; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 176, 1898; Duthie, ibid. 9 (2) : 122, 1906; J. J. Smith, Fl. Buitenz. 6 : 223, 1905; Schltr. Orchid. 343, 1927; Holttum, Rev. Fl. Malaya 1 : 529, 1953. *Graphorkis* Thou. Nouv. Bull. Soc. Philom. Paris 1 : 318, 1809. *Graphorchis* Thou. : O. Kuntze, Rev. Gen. Pl. 2 : 661, 1891.

The generic name comes from the Greek 'eulophus' = 'handsome-crested', in allusion to the handsome lip of the species, which has elevated ridges on the upper surface.

Perennial, terrestrial herbs. *Pseudobulbs* tuberous, subterranean or partly above the ground. *Leaves* distichous appearnig with the flowers or before them, narrow and grasslike or broad and plicately-veined. *Scapes* lateral to the leaves, from the side of the pseudobulb. *Sepals* subequal, free and spreading; lateral ones often connate at the base with the column-foot. *Petals* similar to the dorsal sepal or broader, spreading or erect and connivent. *Lip* erect and more or less adnate to the base of the column with a small sac at the base in between the lateral sepals, or adnate to the column-foot and produced into a short spur beyond the lateral sepals, 3-lobed or rarely subentire; lateral lobes erect, surrounding the column, rarely obsolete, midlobe spreading or recurved, often broad, entire or bilobed; disc variously crested or lamellate in the middle or rarely naked. *Column* thick, with or without a distinct foot, often with 2 lateral wings. *Anther* terminal, opercular, incumbent, imperfectly 2-celled; pollinia 2, often deeply cleft, waxy, attached to a short broad caudicle and a narrow, flat, disc-shaped gland. *Capsule* ovoid or oblong, pendulous or erect.

A large genus of about 200 species, widely dispersed throughout the tropics and warm regions of both hemispheres. It attains its maximum development in Africa and is distributed from Africa through India,

Ceylon, Malaya, China towards Polynesia ; rather rare in Australia and America.

The genus *Eulophia* has been usually divided into 2 distinct sections : *Genuina* Lindl., J. J. Smith (l.c.), (=sect. *Eulophia proper* of Hooker f.) and *Cryptopora* Lindl. The latter is considered by Bentham & Hooker f. to be an independent genus. But, as Hooker f. has pointed out, there is a direct passage from sect. *Cryptopora* to species without a column-foot. The name of the first section, *Genuina* Lindl., or sect. *Eulophia proper*, must be changed to *Eulophia* sect. *Eulophia* since it contains the type species, *E. barbata* Spreng. (= *Serapias capensis* L.), in accordance with Art. 22 of the Code.

Holtum mentions that *E. zollingeri* J. J. Smith has a saprophytic habit. This seems strange to us ; there are several species [such as *E. pratensis* Lindl., *E. dabia* Hochr. (*E. campestris* Lindl.)] which produce leaves long before flowers ; it is possible that the leaves of *E. zollingeri* J. J. Smith may not have been collected, and therefore the plant appears saprophytic.

Type species : *E. barbata* Spreng. (= *Serapias capensis* L.)

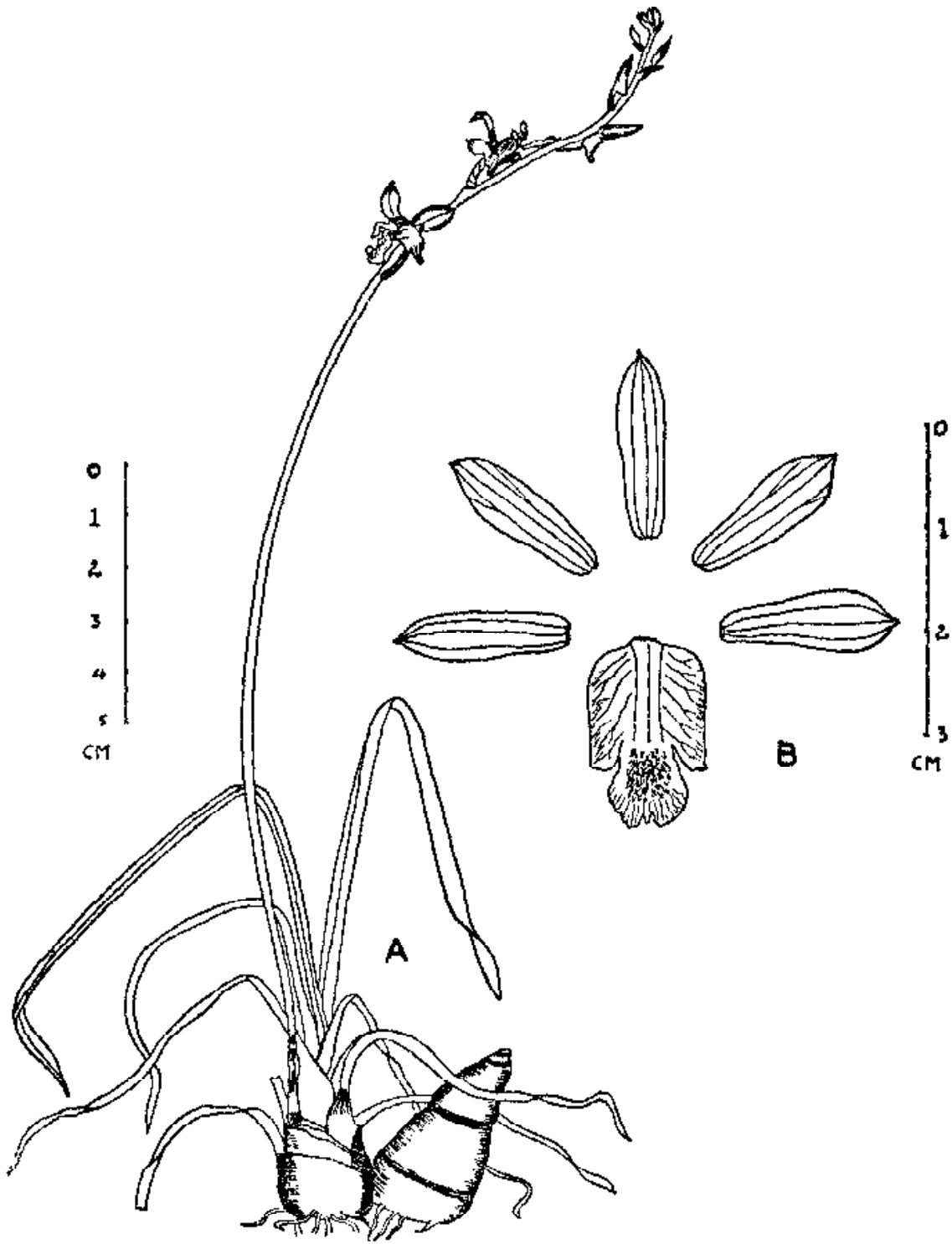
KEY TO THE SPECIES OF *EULOPHIA*

1. Column not produced into a distinct foot :
 2. Pseudobulbs epigeal, conical ; leaves grass-like, not plicate ; scape branched or not *epidendraea*
 2. Pseudobulbs hypogeal, irregularly rounded-conical or ovoid ; leaves elliptic-lanceolate or narrowly lanceolate, plicately-veined ; scape never branched :
 3. Leaves appearing with the flowers, broadly oblong-elliptic :
 4. Flowers about 12 mm long, deep yellow with a few brown spots ; lip scarcely lobed, minutely saccate at base *ochreatea*
 4. Flowers 18-22 mm long, greenish white, often flushed with pale mauve ; lip 3-lobed, spur 3-4 mm long, elliptic obtuse *herbacea*
 3. Leaves appearing much before flowers, narrow, lanceolate or linear-elliptic :
 5. Flowers about 11 mm long, yellowish or green with pink or purple markings *dabia*
 5. Flowers about 20 mm long, pale maroon suffused with yellow *ramentacea*
1. Column with a distinct foot *nuda*

ENUMERATION OF THE SPECIES OF *EULOPHIA*

1. *Eulophia epidendrea* (Retz.) Fischer in Gamble, Fl. Pres. Madras 1434, 1928 & in Kew Bull. 1928 : 283. *Serapias epidendrea* Retz. Obs. 6 : 65, 1791. *Limodorum virens* Roxb. Pl. Cor. 1 : 33, t. 38, 1795 & Fl. Ind. 3 : 467, 1832. *L. epidendrioides* Willd. Sp. Pl. 4 : 124, 1805. *Eulophia virens* R. Br. in Bot. Reg. sub. t. 573, 1822 (*Eulophus*) ; Wight, Icon. 3 (2) : 10, t. 913, 1844-1845 ; Lindl. in Journ. Linn. Soc. 3 : 24, 1859 ; Bot. Mag. t. 5579, 1866. *E. epidendrioides* Schltr. Orchid. 346, 1914. (See Plate XXVI)

Pseudobulbs 3-11 cm long, about 2-5 cm broad at the base, epigeal, greenish brown, ovate-conical or obpyriform, with narrow rings ; current season's tubers enveloped by sheaths, older ones bare and polished. *Leaves* somewhat withered at the time of flowering, alternate, distichous, sheathing at the base, the upper ones forming a smooth pseudostem about 4 cm long ; lamina 15-35×0.7-2 cm, linear or linear-lanceolate, acute or subacuminate, entire, subcarinate at the base. *Inflorescence* up to 60 cm long, laxly many-flowered ; peduncle about 3 mm in diam., greenish purple, glabrous, terete, with a few sheaths, which are 7-20 mm long, oblong-lanceolate, acute, entire, glabrous. *Flowers* 2.2×2.8-3 cm. *Bracts* 8×3 mm (5 mm broad when spread out), concave, subacuminate, entire, minutely gland-dotted, glabrous, pale greenish tinged with pale maroon towards the apex ; nerves 7, pale green ; *pedicels* with *ovary* 5-7 mm long, green. *Sepals* and *petals* subequal, oblong or oblanceolate, acute or mucronulate, entire, glabrous, 5-nerved, light yellowish green with tessellate reddish nerves. *Sepals* 17×5 mm, recurved from a little beyond the middle. *Petals* 17×6 mm, parallel to column and lip, recurved at tips. *Lip* 17×7 mm, oblong or obovate-oblong in outline, 3-lobed ; lateral lobes 10×3 mm, pale green with red, slightly wavy margins, erect, subconnivent along the column, slightly recurved at the obtuse apex, veins red impressed on the inside ; midlobe 7×7-8 mm, greenish, obovate-oblong or obcordate, retuse, mucronulate or not, crenulate. The upper surface of the lip is ridged with 3 purplish red nerves in the centre, the side nerves giving off a faint branch halfway ; the 5-nerves ending in purplish white hairs, on the midlobe. *Spur* 5-7 mm long, greenish white, slightly bulbous and incurved. *Column* 7×2-3 mm, oblong, clavate rounded at the back, shallowly grooved in front, apiculate, without foot or wings, white tinged with pale mauve at the base. *Anther* 2×1.5 mm, white, panduriform, basal lobe broader, apical lobe purplish red ; pollinia 2, yellow, 1 mm across, subquadrate-globose, deeply cleft ; caudicle broad, 0.5 mm long ; gland narrow, linear, about 1 mm across. *Stigmatic surface* 2 mm broad, transversely oblong, pale green. *Capsules* 4.5×1.1 cm, oblong, drooping, pale



Eulophia eptidendraea Fisch.

A. Whole plant ; B. Sepals and petals dissected.

mauve with 3 pale green, broad bands ; pedicels 7-9 mm long, curved.

Flowering : November to January. *Fruiting* : March.

Occurrence : KONKAN : Bombay, cultivated, Santapau 10532 ; Kapadia 1843. Tubers of this species were given to H. Santapau in Khandala in 1946 ; since then it has been successfully cultivated in St. Xavier's College, Bombay, where it comes into flower every year.

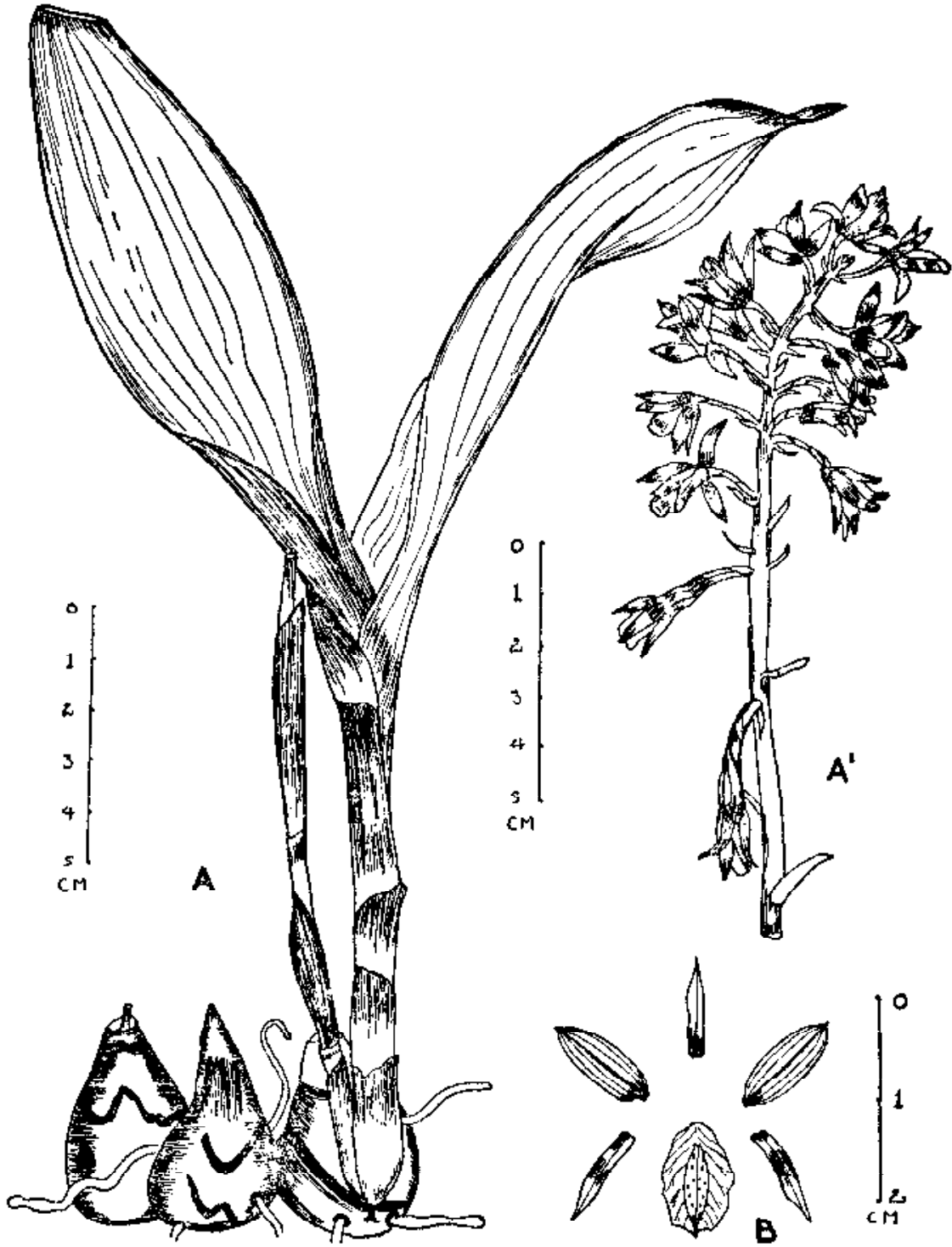
This species has not been recorded previously from Bombay State ; it, therefore, constitutes a new record for this area.

Distribution : W. Ghats, Andhra, and S. India from sea-level to 1000 metres.

Notes : The earliest legitimate epithet for this species is *epidendraea* Retz. which was changed to *epidendrioides* by Willdenow when he transferred it to the genus *Limodorum*. Schlechter in bringing the species to *Eulophia* used *epidendrioides* in the new combination ; the original form is the only valid one, and was reinstated by Fischer.

2. *Eulophia ochreatea* Lindl. in Journ. Linn. Soc. 3 : 24, 1858 ; Dalz. & Gibs. 265 ; Hook. f. 2 ; Cooke, Fl. Pres. Bomb. 2 : 693, 1907 ; Gammie in J. Bombay nat. Hist. Soc. 18 : 89, 1907 ; Blatt. & McC. *ibid.* 35 : 485, 1932 ; Fischer 1435 ; Santapau in Rec. bot. Surv. India 16(1) : 301, 1953. *Graphorchis ochreatea* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 662, 1891. (See Plate XXVII)

Pseudobulbs about 4×2.5 cm, subterranean ovoid-conical with irregular, transverse and longitudinal markings. *Leaves* 2-5, arising from the base of the pseudobulb, forming a pseudostem 8-23 cm long ; leaves 13-28×4-10 cm, sheathing at the base, oblong-lanceolate to ovate, or ovate-elliptic, acute, entire, glabrous. *Scape* appearing with the leaves from the pseudostem, 25-45 cm long, with 2 or 3 sheaths ; the latter are about 2-4 cm long, purplish brown, acute, somewhat inflated. *Flowers* in dense racemes, clustered at the top of the scape, about 1-1.5 cm across. *Bracts* 4-13×1-2 mm, narrowly linear, acute, entire, 3-nerved, pale green ; *pedicel* with *ovary* 10-13 mm long, slightly curved, twisted, faintly yellowish green. *Sepals* 10-14×2-3 mm, yellowish green with purple or brown spots on the inner surface near the base, linear-lanceolate, subacuminate or apiculate, entire, 1-nerved, the dorsal slightly broader. *Petals* 11-14×3.5-4 mm, similar to sepals in colour, broadly ovate-oblong, rarely suboblique, acute, entire, glabrous, faintly 3-nerved, somewhat conniving along the column. *Lip* 11-13 mm long, obscurely 3-lobed, elliptic-orbicular in outline when spread out ; sac minute, 1-2 mm long ; lateral lobes 7×2 mm, pale cream purplish at the base, erect, conniving over the column ; midlobe 4×2 mm yellow, oblong-orbicular, the nerves ending in hairy outgrowths. *Column* 3-4×2 mm, subclavate, whitish with a purplish rim just above the small 2 mm long foot. *Anther* 1.5×2 mm, white tinged with purple, orbicular ; cli-



Eulophia ochreatea Lindl.

A. Whole plant ; A'. Upper part of inflorescence scape ; B. Sepals and petals dissected.

andrium slightly produced behind ; pollinia 2, waxy, yellow, 1.5×1 mm, globular ; caudicle 0.5-0.75 mm long ; gland minute orbicular. *Stigmatic surface* transversely elliptic orbicular, rather large for the column. *Capsules* 28×12 mm, broadly ovoid, deflexed, strongly ridged, green ; pedicels 5 mm long, green.

Flowering : June to July. *Fruiting* : August to October.

Occurrence : GUJARAT : Khodwa, in Panch Mahals, *Raoji*. KONKAN : *Stacks*; Salsette, hills east of Tulsi Lake, *McCann* ; Borivli, top of Kanheri Caves, *Santapau* 11051 ; *R. Fernandez* 1840-1841 ; Mumbra, *Shenoy* 3535, 3556, 3558 ; *Kapadia* 1263-1268. DECCAN : Purandhar, *Santapau* 7256. W. GHATS : Khandala, *Santapau* 787, 2139. N. KANARA : *Law* ; Dharwar, *Law*.

Distribution : Gujarat, Konkan, Deccan, W. Ghats, N. Kanara, Vizagapatam hills at about 1000 metres.

Notes : We have found this species on sloping ground, usually in undergrowth of rather thin forest.

3. *Eulophia herbacea* Lindl. Gen. Sp. Orch. 182, 1833, et in Journ. Linn. Soc. 3 : 24, 1858 ; Dalz. & Gibs. 265 ; Hook. f. 2 ; Duthie 123, t. 106, et Fl. Upp. Gang. Pl. 3 : 196, 1920 ; Cooke 693 ; Gammie 90 ; Blatt. & McC. 485 ; Fischer 1435. *Limodorum bicolor* Roxb. Fl. Ind. 3 : 469, 1832. *Eulophia carinata* Graham, Cat. Bomb. Pl. 202, 1839, (non Lindl. 1833). *E. bicolor* (Roxb.) Lindl. in Journ. Linn. Soc. 3 : 24, 1858 (non Dalz. 1851). *E. brachypetala* Lindl. in Journ. Linn. Soc. 3 : 24, 1858. *Graphorchis bicolor* (Roxb.) O. Kuntze, Rev. Gen. Pl. 2 : 663, 1891.

Pseudobulbs hypogeal, tuberous, 2-3 cm in diam., ovoid to broadly conical, with transverse circular markings. *Leaves* $10-30 \times 3-9$ cm, usually 2-5 per plant, elliptic-lanceolate to broadly elliptic, acute or sub-acuminate, entire, many-nerved. *Inflorescence* 30-60 cm tall, erect, arising in the axil of a basal sheath from the pseudostem ; peduncles, green, terete, with long sheathing bracts. *Bracts* 3.5-5.2 cm long, pale green, acute to subacuminate. *Flowers* in lax racemes ; floral bracts $1-3 \times 0.2-0.8$ cm, pale green, lanceolate, acuminate, entire, 1-nerved ; *pedicel* with *ovary* 1.5-2.5 cm long, pale green, ribbed. *Sepals* $1.8-2.2 \times 0.3-0.5$ cm, green, lanceolate, acute, entire, glabrous, 1-nerved. *Petals* $1.5-1.7 \times 0.7-1$ cm, pure white or white flushed with pale lilac towards the apex, oblong-elliptic, obtuse or subacute, subentire, 1-nerved. *Lip* 1.5-2 cm long, oblong-elliptic in outline, 3-lobed ; lateral lobes 2 mm broad, erect, obtuse or acute, white faintly tipped with pale purple ; *midlobe* 10×9 mm, oblong or obovate-oblong, obtuse, apiculate, pale mauve to deep magenta with white and purple hairy nerves ; occasionally the midlobe is white with light green-yellow, hairy nerves. *Spur* 4 mm long, footless, white flushed with purple just below the stigma. *Anther*

2×2 mm, 2-celled, light maroon, crowned with a deep maroon spherica process; pollinia 2, globose-ovate, yellow, attached by a short, thick caudicle to a quadrate gland. *Stigmatic surface* white, just below the clinandrium.

Flowering : July.

Occurrence : GUJARAT : Panch Mahals, *Raoji* ; Khodwa, *Raoji*. KONKAN : *Law* ; *Stocks* ; *Dalzell* ; *Dalzell & Gibson* ; Mumbra, *Santapau* 15661-15664 ; *Shenoy* 3616, 3657-3658 ; *Kapadia* 1269, 1271-1272 ; Borivli, *Kapadia* 1252. N. KANARA : *Law*.

Distribution : W. Himalaya, Garhwal 1300-2300 m, Bengal, Gujarat, Konkan, Kanara, Bababudan hills in Mysore.

Notes : In cultivation the flowers reach a size (up to 4-4.5 cm across) seldom met with in the field.

This orchid is fairly common together with *E. ochreatea* Lindl. on hills at Mumbra. In spite of the fact that they are often found side by side, we have never seen the fruits of *E. herbacea* Lindl. whereas *E. ochreatea* Lindl. fruits regularly and abundantly.

4. *Eulophia dabia* (D. Don) Hochr. in Bull. N. Y. Bot. Gard. 6 : 270, 1910. *Bletia dabia* D. Don, Prodr. Fl. Nep. 30, 1825. *Eulophia campestris* Wall. (Cat. 7617, 1832, nom. nud.) ex Lindl. Gen. Sp. Orch. 185, 1833, cum. descr., et in Journ. Linn. Soc. 3 : 24, 1858 (excl. syn. *E. ramentacea* Wt.) ; Hook. f. 4 ; King & Pantl. 178, t. 41 ; Duthie 126, et Fl. Upp. Gang. Pl. 3 : 199, 1920 ; Prain 1016 ; Haines 1171 ; Brühl 110 ; Blatt. & McC. 486. *Limodorum ramentaceum* Roxb. (Hort. Beng. 69, 1814, nom. nud. et) Fl. Ind. 3 : 467, 1832, cum. descr. *Graphorchis dubia* O. Kuntze, Rev. Gen. Pl. 2 : 662, 1891.

Pseudobulbs tuberous, irregular in shape, generally oblong-orbicular, with a few fleshy roots at the junction of the stem. *Scape* leafless, 14-18 cm tall, erect ; sheaths oblong, acute, somewhat closely appressed, 8-16 mm long. *Racemes* 5-11 cm long, lax, subsecund. *Flowers* about 10-12 mm long, erect, drooping after fertilization. *Bracts* 3-8×3 mm, erect, pale brown, sheathing and membranous, oblong or oblong-lanceolate, acute, entire, 3-nerved. *Pedice*l with *ovary* 10 mm long, slender. *Sepals* 5-8×2-3 mm, narrowly oblong, acute, entire, 5-nerved, glabrous ; petals similar to sepals but slightly narrower. *Lip* 7-9 mm long, 3-lobed ; lateral lobes connivent with the column, obtuse, 4-5 mm long ; midlobe 3-4×2-4 mm, orbicular-quadrate, crenulate, rounded, warted above. *Spur* 2 mm long, narrow, obtuse. *Capsules* 1.8×0.4 cm, oblong-obovate, drooping ; stalk 5 mm long.

Flowering : January (Oudh), April (Bombay).

Occurrence : KONKAN : Bombay, Victoria Gardens, wild, *Hallberg ex Blatter & McCann*. We have seen no specimens from Bombay State.

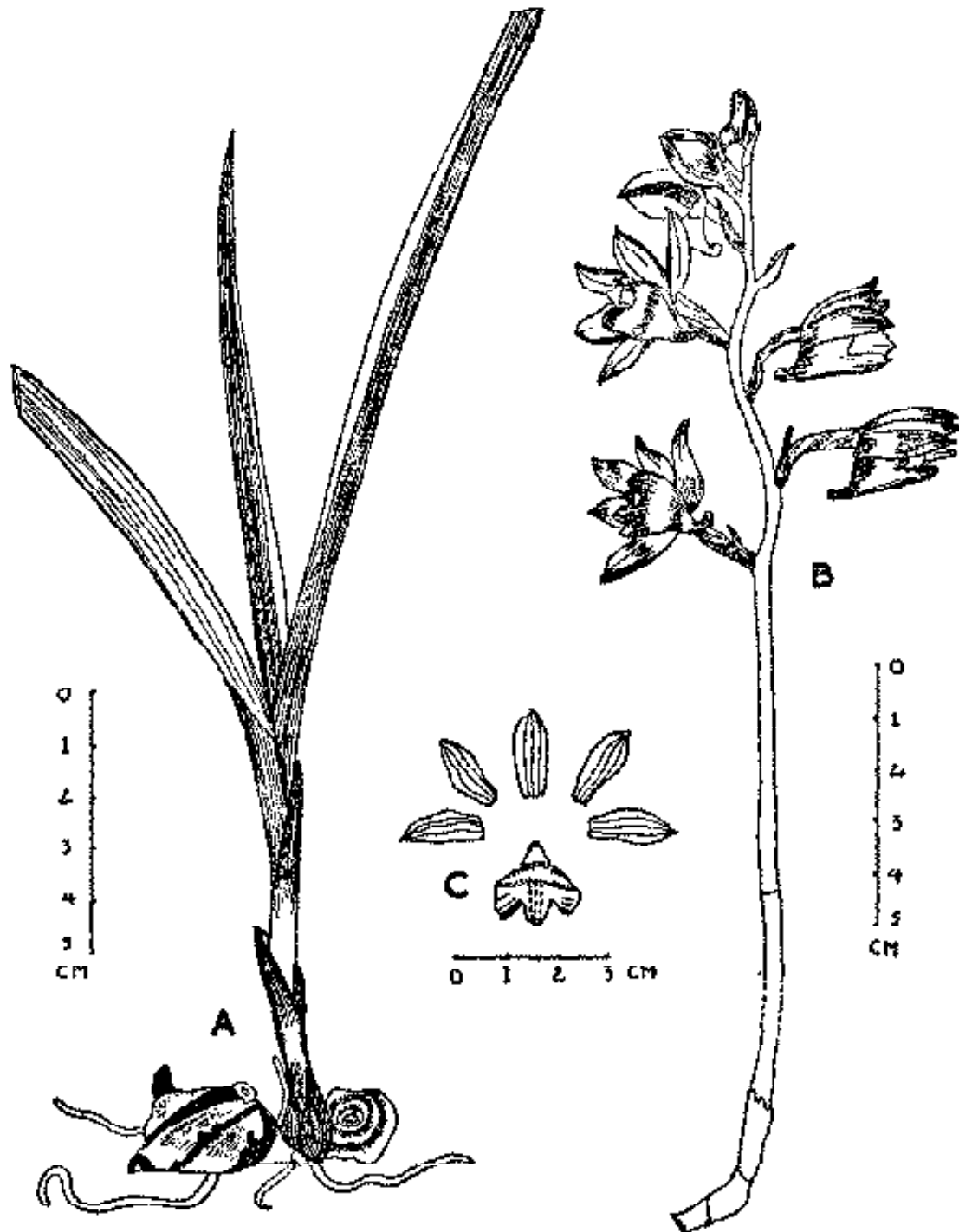
Distribution : India : Sub-Himalayan tracts of Rohilkhand and

N. Oudh, Sikkim, Bengal, Konkan, Deccan. *World*: Afghanistan, Baluchistan, India, Nepal and Upper Burma.

Notes: There is no doubt that *Bletia Dabia* was intended by D. Don and was not a mistake for *dubia*. This is shown first by the use of an initial capital letter for the specific epithet by Don, and by the reference to *Limodorum Dabia* Ham. MS. O. Kuntze has pointed out that, according to Lindley, who apparently saw the original sheet of Hamilton the specific name should be *dubia*; Hooker f. seems to be of the same opinion, for he cites *Limodorum dubium* Ham. MSS. Whatever may have been the specific name intended by Hamilton, it is quite clear that Don's *Prodromus* gives *Bletia Dabia*. Hochreutiner seems to be correct in using the same specific epithet. Our drawing and description of this species have been done from *Inayat* 24145 from Motipur, Oudh, kindly loaned by the National Herbarium, Calcutta.

5. *Eulophia ramentacea* Lindl. ex Wight, *Icon.* 5 (1) : 8. t. 1666, 1851 (non Lindl. 1858). *E. virens* Graham, *Cat. Bomb. Pl.* 202, 1839 (non R. Br. 1822). *E. pratensis* Lindl. in *Journ. Linn. Soc.* 3 : 25, 1858 ; Dalz. & Gibs. 264 ; Hook. f. 4 ; Cooke 694 ; Gammie 90, t. 4 ; Blatt. & McC. 486 ; Fyson, *Fl. Nilg. Puln. Hill Tops* 393, 1915 & t. 513, 1920 ; Fischer 1435. *Graphorchis pratensis* (Lindl.) O. Kuntze, *Rev. Gen. Pl.* 2 : 662, 1891. (See Plate XXVIII)

Pseudobulbs shortly pyramidal or irregularly 3-cornered. *Leaves* 2-4, appearing before the flowers, usually withering at the time of flowering, 11-30×1-2 cm, narrowly oblong-lanceolate, acute. *Scapes* 17-48 cm long, erect, from the top or side of the pseudobulb, 2.5 mm in diam., terete, 1-2-noded, pale green or at times tinged with purple. *Bracts* unequal, ovate to lanceolate, acute, entire, purplish green. *Flowers* 2.5×3 cm. *Bracts* persistent, 1-1.5×0.3-0.5 cm, equal to or slightly longer than pedicels, oblong or oblong-lanceolate, acute, entire, glabrous, 7-nerved, pale purplish green. *Sepals* and *petals* subequal, pale maroon suffused with varying amounts of yellow, acute, entire, glabrous, faintly 3-5-nerved ; *sepals* spreading, oblong, 1.7-1.8×0.4-0.6 cm, midnerve somewhat prominent below ; *petals* 1.6×0.6-0.7 cm, oblong-elliptic, midnerve not prominent below. *Lip* 3-lobed, 13 mm long, 6-7 mm broad at the mouth between lateral lobes ; lateral lobes 11×6 mm erect, light yellow, subfalcately oblong, obtuse ; midlobe 6×5 mm, ovate-oblong or suborbicular, mucronulate, entire, yellow ; disc of the lip with 3 central, crested, yellow nerves, ending in 3 rows of deep yellow papillae on the midlobe. *Spur* 4-6 mm long, maroon-yellow, incurved, sharply conical from a broad mouth. *Column* 9×3-4 mm, greenish white, slightly tinged with pale maroon on the dorsal surface, oblong, subclavate, footless and wingless. *Anther* orbicular, white with a maroon apiculum, the anterior lip truncate ; *pollinia* 1×1 mm, oblong-orbicular,



Eulophia ramentacea Lindl.

A. Plant in leaf; B. Inflorescence scape; C. Sepals and petals dissected.

posteriorly foveolate, caudicle 1-1.5 mm long ; gland narrow, 2 mm long, transversely placed. *Stigmatic surface* pale green, oblong-orbicular. *Capsules* 3×1.7 cm, drooping obovate-oblong, greenish purple with 3 strong longitudinal bands which are about 3 mm broad ; pedicels 1 cm long, recurved.

Flowering : December to February. *Fruiting* : March.

Occurrence : GUJARAT : Panch Mahals, *Raoji*. KONKAN : Bombay, cultivated, *Kapadia* 1175, 1359. W. GHATS : Panchgani, *Cooke*. DECCAN : Poona, *Woodrow* ; Pashan, 6 miles W. of Poona, *Tukaram Paranjpe* ; *Gammie* ; *Santapau* 6140, 18079-18083 ; *Kapadia* 1040-1042, 1820-1822. N. KANARA : Belgaum, *Ritchie* ; Dharwar, *Bourne* ; Havasbavi, in Dharwar Dist., *Sedgwick* ; Haveri, *Talbot*.

Distribution : Gujarat, W. Ghats, Deccan, N. Kanara.

Notes : This species has been found among short grasses in clay muddy soil.

While this species is in leaf, it is influenced to a considerable extent by the amount of moisture in the soil. Normally leaves are produced in the monsoon and completely wither off by October, so that at the time of flowering, in the cold season, the plant is completely leafless. On one occasion a single flowering plant was found in marshy, very moist soil with the leaves intact ; this may have been due to the abundance of moisture in the soil.

Hooker f. says that 'Lindley and the Bombay Flora err in describing this species as leafless when flowering'. Hooker seems to be incorrect ; for *usually* the species is leafless at the time of flowering. It may be that the plants seen by Hooker f. were collected from a very marshy habitat, with the leaves still persistent, as has been observed by us. Wight, loc. cit. 8, states : 'This species is leafless when in flower ; as in the case of some others, the leaves follow the flowers.' Wight does not seem to be correct, for the leaves precede the flowers ; he is right when he states that the plant is leafless at flowering time.

6. *Eulophia nuda* Lindl. [in Wall. Cat. 7371, 1832, nom. nud. et] Gen. Sp. Orch. 180, 1833 ; Hook. f. 5, et in Ann. R. Bot. Gard. Calcutta 5 : 32, tt. 47-50, 1895 ; Grant, Orch. Burma 218, 1895 ; King & Pantl. 180, t. 243 ; Duthie 127, et Fl. Upp. Gang. Pl. 3 : 200, 1920 ; Prain 1016 ; Cooke 695 ; Gammie 90 ; Blatt. & McC. 487 ; Fyson 393, t. 514 ; Haines 1435 ; Brühl 109 ; Fischer 1435. *E. squalida* Lindl in Bot. Reg. 27 : misc. 77, 1841 ; J. J. Smith 225, f. 165 ; Holttum 533, f. 158 (?). *E. bicolor* Dalz. in Kew Journ. Bot. 3 : 343, 1851 ; Dalz. & Gibs. 264. *Cryptopera fusca* Wight, Icon. 5 (1) : 11, t. 1690, 1891.

Tubers spherical, brownish green, 6 cm or more in diam. with transverse ridges. *Leaves* from the side of the tuber forming a short pseudostem, from which the inflorescence is given out ; 60 × 6 cm,

oblong-lanceolate, acute, entire, plicate, many-nerved. *Inflorescence* about 50 cm tall, the peduncles with a few oblong-lanceolate, many-nerved sheaths. *Flowers* 4.5 cm across, in lax racemes; *bracts* 2.4×0.3 cm, pale yellowish green, lanceolate, acuminate, entire. *Sepals* 2.8×0.6 cm, spreading, subequal, deep mauve-brown on the outside, paler and brownish on the inside, faintly yellowish at the tips, lanceolate, acute, entire, many-nerved, the lateral sepals falcate and attached to the foot of the column. *Petals* 2.4×0.9 cm, narrow, ovate-oblong, obtuse, entire, many-nerved, lying together over the column only the apices being slightly turned upwards; their colour is white or whitish flushed with rose-purple, the colour more prominent towards the base and on the midnerve. *Lip* 3-lobed, rose-purple, 2.4 cm long, 1.6 cm broad across the lateral lobes; lateral lobes erect, small, 3 mm broad; midlobe oblong, suborbicular, emarginate, crenate, crisped, 12 mm broad; disc of the lip with 8-10 nerves which become crisped on the midlobe. *Column* 7×4 mm, rose-purple, foot 5 mm long. *Spur* brown-mauve, 6×4 mm, projecting below between the 2 arms of the foot, obconical retuse. *Anther* 4×2.5 mm, broadly triangular-conical, mauve, with 2 deep mauve bosses on the anterior face; *pollinia* 2, ovoid-oblong, yellow, waxy, with a very short caudicle and a small narrow gland. *Ovary* with *pedicel* 2.6 cm long, twisted, ribbed.

Flowering: June.

Occurrence: KONKAN: Bombay, cultivated. W. GHATS: Ramghat, Ritchie. DECCAN: Ambenali, at the foot of Mahableshwar, Blatter & McCann. N. KANARA: Londa, Ahmed Khan; Kalanaddi, Ritchie; Foot of Arbail Ghat, Sedgwick.

We have not seen this species in Bombay, our drawing and description are based on Santapau 20830-20832 and S. K. Wagh 2900-2901, from Andhra State.

Distribution: India: Tropical Himalaya, Sikkim, N. Oudh, Chota Nagpur, Assam, Khasia Hills, southwards to the western parts of the Peninsula, W. Ghats and Vizagapatam Hills. World: India, Nepal, Ceylon, Burma, (?) Malaya, (?) Java, (?) Sumatra, (?) New Guinea, (?) Philippines and China.

Notes: This species is widely distributed and shows considerable variations both in the size and coloration of the flowers. From Holttum's and J. J. Smith's figures and descriptions of *Eulophia squalida* Lindl., the two species seem to be closely allied; this similarity has been pointed out by J. J. Smith. Should they be identical, then *nuda* is the earlier valid specific epithet for the combined species.

Hooker f. (in *Ann. R. Bot. Gard. Calcutta* 5: 32, 1895) distinguishes 4 divergent varieties, which have been based solely on slight colour and size variations; we consider them merely as forms. Consequently: *E. nuda* f. *nuda*, the typical form, is that of Hooker f. in *Ann. R. Bot.*

Gard. Calcutta 5 : 32, t. 47, 1895.

E. nuda f. *macrantha* (Hook. f.) Sant. & Kapadia, stat. nov. *E. nuda* var. *macrantha* Hook. f. loc. cit. t. 48, 1895.

E. nuda f. *purpurea* (Hook. f.) Sant. & Kapadia, stat. nov. *E. nuda* var. *purpurea* Hook. f. loc. cit. t. 49, 1895.

E. nuda f. *andersonii* (Hook. f.) Sant. & Kapadia, stat. nov. *E. nuda* var. *andersonii* Hook. f. loc. cit. t. 50, 1895.

The specimens from Andhra here described, *E. nuda* as given by Cooke, and *E. squalida* Lindl. given by J. J. Smith and Holttum, clearly belong to f. *purpurea*.

6. *AERIDES* LOUR.

AERIDES Lour. Fl. Coch. 525, 1790 ; Endl. Gen. Pl. 206, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 576, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 217, 1889 ; Hook. f. Fl. Brit. India 6 : 43, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 210, 1898 ; Duthie, *ibid.* 9 (2) : 142, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 581, 1905, Schltr. Orchid. 541, 1927 ; Holttum, Rev. Fl. Malaya 1 : 692, 1953.

The name *Aerides* is derived from the Greek word 'aer'=air, in allusion to the epiphytic nature of the plants and their power of drawing substances from the atmosphere.

Perennial *epiphytes*. *Stems* fairly long, rarely branching, stout, often sheathed by the bases of fallen leaves. *Leaves* flat or rarely terete, alternate, distichous, spreading, coriaceous, sessile, sheathing at the base. *Inflorescence* in simple or branched panicles, bearing scented flowers. *Sepals* and *petals* similar, spreading ; the lateral sepals often slightly oblique and decurrent on the column-foot. *Lip* sessile, rather stiffly articulated with the column-foot, saccate or spurred at the base, 3-lobed ; lateral lobes small ; midlobe spreading, various. *Spur* usually bent forwards. *Column* short, thick, semiterete, wingless, produced into a stout foot. *Anther* 2-celled, terminal, opercular, incumbent, convex ; pollinia 2, compressed-globose, posteriorly foveolate with long, narrow caudicles and small, somewhat square glands. *Capsules* oblong or clavate, ribbed, the ribs prominent, often narrowly winged.

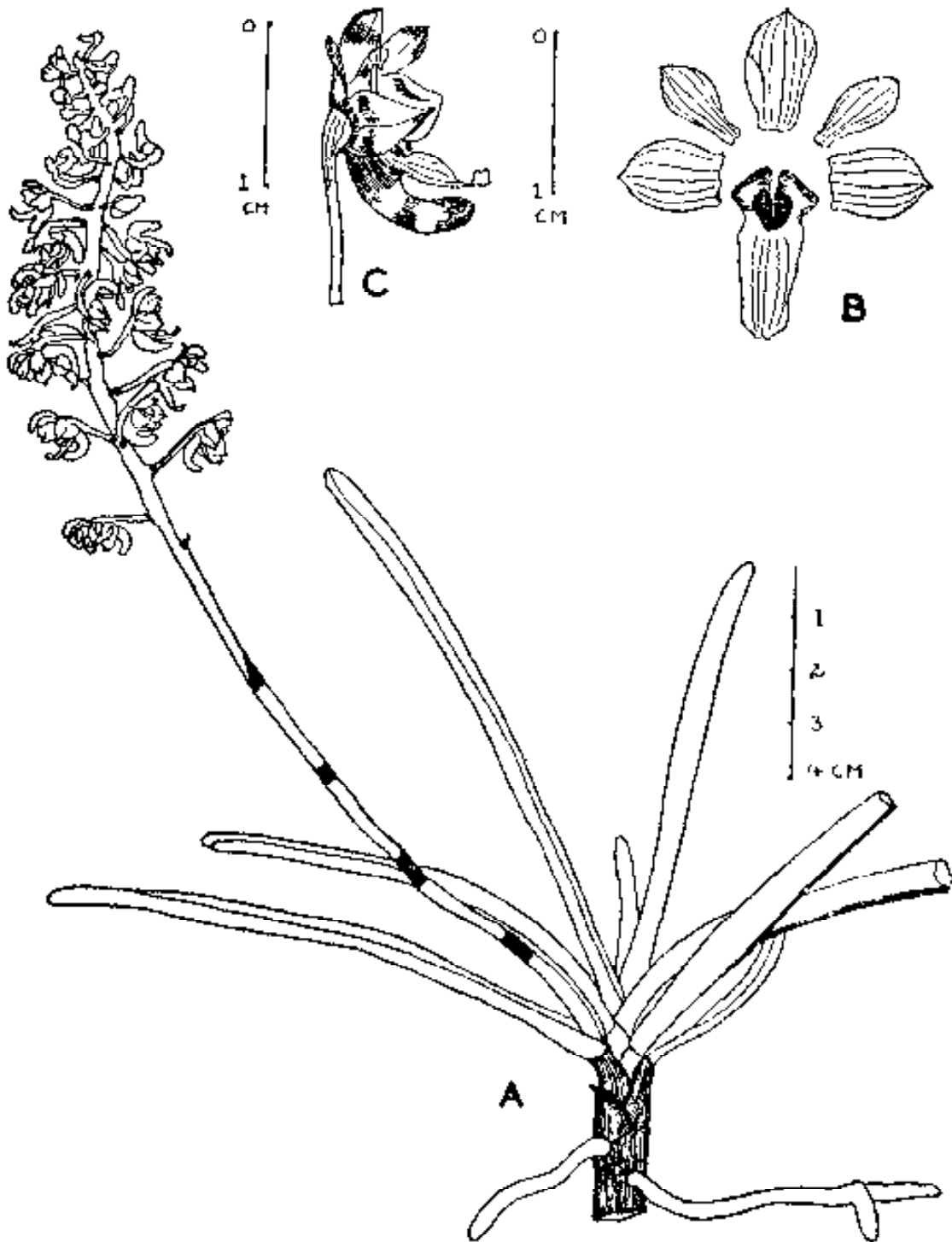
This is a small genus distributed through India, Indo-China and Malaysia, with a single species in Japan.

The 3 Bombay species belong to *Planifoliae* of Benth. & Hook. f. or to *Euaerides* of Pfitzer. The name of this section must be changed to *Aerides* sect. *Aerides*, according to Art. 22 of the Code, since it contains the type species of the genus, *A. odoratum* Lour.

KEY TO THE SPECIES OF *AERIDES*

1. Midlobe of lip linear-oblong, fleshy, about 7 mm long, white or pale lilac ; spur about equalling the lip

ringens



Aërides ringens Fisch.

A. Whole plant ; B. Sepals and petals dissected ; C. Side view of flower.

1. Midlobe of lip broadly obovate or obovate-deltoid, somewhat fleshy, about 14-22 mm long, deep pink-mauve ; spur about half as long as the lip :
2. Sepals and petals spotted ; lateral lobes of lip minute, rounded ; midlobe 12-14 mm long *maculosum*
2. Sepals and petals not spotted ; lateral lobes of lip 7-9 mm long, narrowly oblong ; midlobe 20-22 mm long *crispum*

ENUMERATION OF THE SPECIES OF *AËRIDES*

1. *Aërides ringens* Fischer in Kew Bull. 284, 1928, et Fl. Pres. Madr. 1442, 1928 ; Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 490, 1932. *Saccolabium ringens* Lindl. Gen. Sp. Orch. 221, 1833 et in Journ. Linn. Soc. 3 : 36, 1858 (excl. Khasia) ; Wight, Icon. 3 (2) : 10, t. 917, 1844-1845 (non Dalz. & Gibs. 1861). *Aërides radicosum* A. Rich. in Ann. Sc. Nat. ser. 2, 15 : 65, f. 1. c, 1841 ; Dalz. & Gibs. 265 ; Hook. f. 46 ; Cooke 2 : 700, 1907 ; Gammie in J. Bombay nat. Hist. Soc. 19 : 141, 1909 ; Fyson, Fl. Nilg. Puln. Hill-Tops 395, t. 249, 1915. *Saccolabium rubrum* Wight, Icon. 5 (1) : 9, t. 1673, 1851 ; Dalz. & Gibs. 264 (non Lindl. 1833). *S. paniculatum* Wight, Icon. 5 (1) : 9, t. 1676, 1851. *Aërides lineare* Hook. f. Fl. Brit. India 6 : 47, 1890 (See Plate XXIX)

Epiphytes. Stem 1-1.5 cm thick, sheathed. Leaves 5-21 × 0.3-0.7 cm, coriaceous, channelled, linear or linear-oblong, bilobed at the apex (the lobes unequal, rounded), purplish green very often mottled with deeper-coloured spots. Racemes 6-26 cm long, erect, rigid, often branched ; peduncles 2-3 mm thick, terete, brown, with oblong sheathing bracts. Flowers pedicellate, bracteate, about 1.5 cm long. Bracts 2 × 2 mm triangular, acute, greenish at the base, scaly and pale brown above. Sepals subequal, entire, obtuse, mucronulate, faintly 5-nerved, white tinged with pale mauve-lilac, more so towards the edges ; dorsal sepal 7 × 4 mm, obovate-oblong ; lateral ones 6 × 4 mm, parallel, not spreading, oblong, broader at the base than the dorsal sepal. Petals 6 × 3 mm, similar to the sepals in colour, obovate, tapering at the base, obtuse, entire, faintly 5-nerved. Lip 10 mm long, 3-lobed, white or pale lilac with several deeper-coloured longitudinal streaks along the middle ; lateral lobes 3 × 3 mm, erect, triangular-cuneate, obtuse, entire, rarely slightly wavy, with a callus which is 2 × 2 mm, rhomboid-orbicular, bilobed ; midlobe 7 × 4 mm, broadly linear-oblong, inflated about the middle, entire, the apex upturned, retuse or rarely truncate. Spur 8 × 2 mm, white, broadly funnel-shaped, incurved, subclavate, obtuse at the apex. Column 4 × 2 mm, white, produced below into a

foot which is 3 mm long, somewhat convex and centrally grooved; rostellum strongly beaked with a central deep groove. *Anther* 2.5 × 2.5 mm, creamy, orbicular with a sharp acute apex; pollinia 2, yellow, waxy, orbicular-ovate; caudicle 1.5 mm long, tapered at the base into an oval gland. *Stigmatic surface* orbicular, white. *Ovary* with *pedicel* 9 mm long, brownish green. *Capsules* 1.5 × 0.6 cm, obovoid-oblong, strongly ribbed; *pedicels* 11 mm long.

Flowering: March to July. *Fruiting*: July onwards.

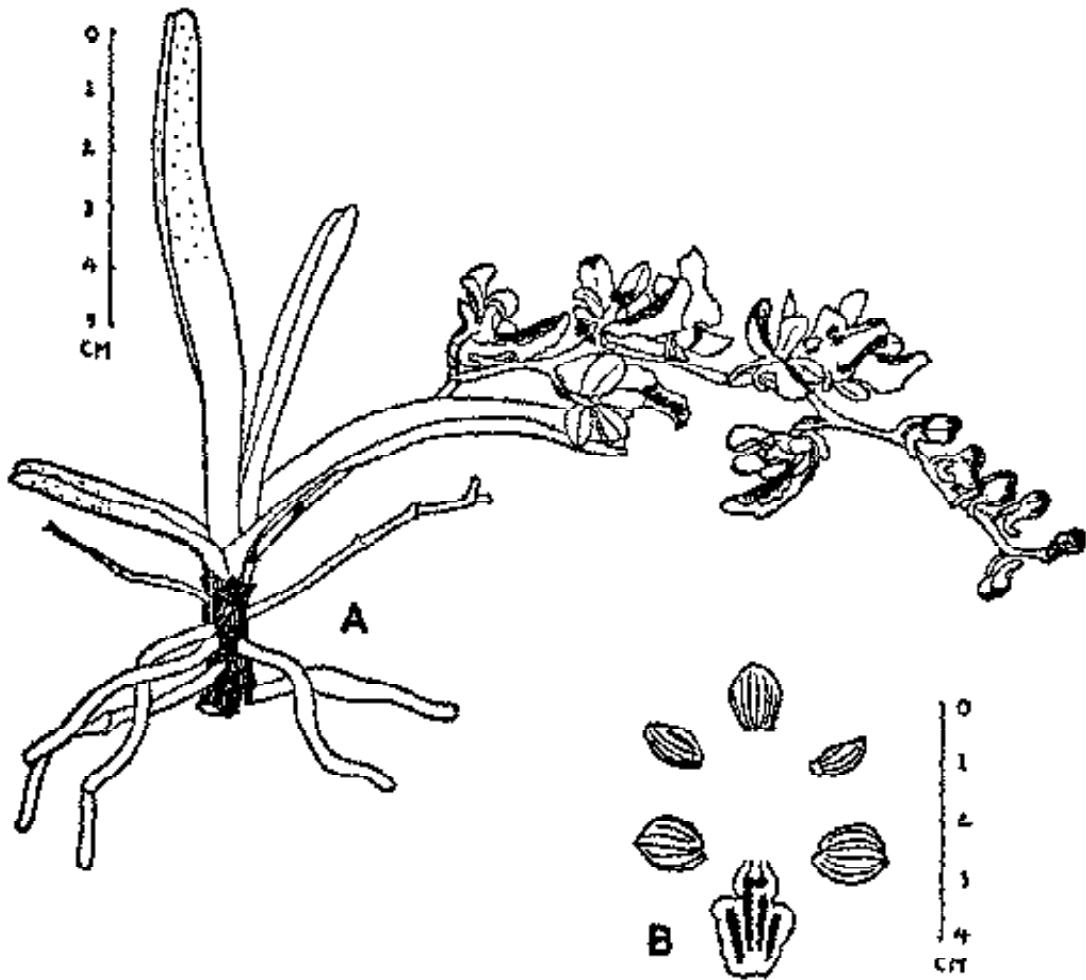
Occurrence: KONKAN: Salsette, Dalzell & Gibson. W. GHATS: Mahableshwar, Woodrow. N. KANARA: W. of ASIOLI, Sedgwick; near Kanappa on the Kalanaddi, Ritchie; Yellapur, V. Patel 1846; Kapadia 1994-1995, 2001, 2320-2322, 2346; Kumbelli Mines, about 17 miles from Supa, Kapadia 2573-2574; Bhagwati-Yellapur, Kapadia; Jog, Kapadia 1854-1855.

Distribution: Konkan, N. Kanara and the W. Ghats of south India from about 250 to 2500 metres.

Notes: Dalzell & Gibson mention the plant as abundant in Salsette; none of the subsequent collectors have recorded it from Salsette. We have found it common and fairly abundant in N. Kanara.

2. *Aërides maculosum* Lindl. in Bot. Reg. t. 58, 1845, et in Gard. Chron. 691, 1845; Dalz. & Gibs. 266; Hook. f. 45; Prain, Beng. Pl. 1020, 1903; Cooke 699; Gammie 140, t. 8; Haines, Bot. Bih. & Or. 1182, 1924; Fischer 1442; Blatt, & McC. 490; Santapau in Rec. Bot. Surv. India 16 (1): 303, 1953; Sant. & Kapadia in J. Bombay nat. Hist. Soc. 54 (1): 220, 1956, cam fig. *Saccolabium speciosum* Wight, Icon. 5 (1): 9, tt. 1674-1675-1851. (See Plate XXX)

Epiphytes. Stem 1-1.5 cm thick, sheathed. *Leaves* channelled, coriaceous, 3-23 × 2-3 cm, green mottled with purple, linear-oblong or oblong, broadest about the middle, with 2 unequal rounded lobes at the apex. *Inflorescence* up to 24 cm long, simple or branched; *peduncles* terete, stout, sheathed, brownish green mottled with purple. *Flowers* about 2.5 cm in diam., pedicellate, bracteate, faintly perfumed. *Pedicel* with *ovary* 10 mm long, pink, ribbed. *Bracts* minute, ovate, acute, entire or rarely subcrenulate. *Sepals* 11 × 8 mm, subequal, obovate-orbicular, obtuse, the lateral ones suboblique, mucronulate, entire, faintly 7-nerved, all white flushed with pink-mauve deeper towards the extremities, usually speckled with darker-coloured spots. *Petals* 10 × 5-6 mm, similar to the sepals in colour, oblong-elliptic, often subfalcate, obtuse or slightly retuse, entire, faintly 7-nerved. *Lip* 20 × 14-15 mm, 3-lobed, straight; lateral lobes small, about 2-3 mm broad, spreading, faintly pinkish white, rounded, with a fleshy white subconical bilobed callus in between; midlobe 14 × 14 mm, deep rose-pink flushed with mauve, obtusely quadrate, obtuse or truncate, rarely retuse, irregularly



Aërides maculosum Lindl.

A. Whole plant ; B. Sepals and petals dissected.

crenate and finely crisped on the margins, the upper surface with parallel ridges from the callus deflexing the sides and the apical portion of the midlobe. *Spur* 5 mm long, curved downwards, hook-like, somewhat tapering to an obtuse subclavate greenish apex; the mouth broad, formed by the backward continuation of the lip and the foot. *Column* 5 × 2 mm, pink, oblong, slightly upturned above, produced below into a 2-4 mm long, stout foot; clinandrium pale pink with 2 short deeper-coloured streaks and a central ridge. *Anther* 3 × 3.5 mm, obovate-orbicular, pink, the anterior lip truncate; pollinia 2, each 1 × 1.5 mm, waxy, yellow, broader than long, with a 2 mm long caudicle and narrow elliptic gland. *Stigmatic surface* 4 × 3 mm, oblong-orbicular. *Capsules* 3.5 × 0.8-1 cm, obovoid, strongly ribbed, shortly stalked.

Flowering: May to June. *Fruiting*: July onwards.

Occurrence: KONKAN: Badlapur, *Kapadia* 1946, 1947, 1948-1949; Karjat, *Kapadia* 1956; Tansa, *Kapadia*. W. GHATS: Khandala, *Hallberg*; Santapau 417, 417A, 498, 506, 2049, 2191, 2441, 4482, 9008, 9048, 9120-9122, 11033-11034, 27962, 28605; *Kapadia* 494, 1173-1174, 1943-1944; Lonavla, *Garade*; *Kapadia* 1122; Panchgani, *Cooke*; *Alice Pigott*; *Kapadia*; Mahableshwar, *Cooke*; *Kapadia*. DECCAN: Purandhar, *Santapau*; *Kapadia* 645; Bhimashankar, *Kapadia* 1446. N. KANARA: Belgaum, *Ritchie*; *Kapadia*; Sirsi, *Hallberg* & *McCann* 34968; Belgaum-Khanapur, *Kapadia*; Castle Rock, *Kapadia*.

Distribution: Chota Nagpur, Konkan, Deccan, N. Kanara, and W. Ghats of south India up to 1400 m.

Notes: This is one of the commoner epiphytic orchids in more or less open deciduous forests. It has been noted on various trees, among them *Terminalia crenulata* Roth being one of the more frequent.

3. *Aërides crispum* Lindl. [in Wall. Cat. 7319, 1832, nom. nud.] Gen. Sp. Orch. 239, 1833, cum descr.; Bot. Reg. t. 55, 1841; Gard. Chron. 711, 1842; et in Journ. Linn. Soc. 3: 41, 1858; Dalz. & Gibs., 265; Hook. f. 45; Grant, Orch. Burma 268, 1895; Cooke 700; Gammie 139; Fyson 394, t. 248; Fischer 1442; Blatt. & McC. 490; Santapau 303. *A. lindleyana* Wight, Icon. 5 (1): 9, t. 1677 bis, 1851; Lindl. in Journ. Linn. Soc. 3: 41, 1858; Dalz. & Gibs., 265.

Epiphytes. *Stems* 1-2 cm thick, sheathed. *Leaves* 7-24 × 1.6-3 cm, thickly coriaceous, rarely channelled, oblong, pale green with a purplish tinge at the base, with 2 unequal rounded lobes at the apex. *Inflorescence* 10-30 cm long, erect or drooping, rarely branched; peduncles 2-4 mm thick, brown with a few small closely appressed sheaths. *Flowers* about 3 cm across, bracteate, pedicellate strongly and sweetly scented especially when fresh. *Bracts* 5 × 5 mm, semi-amplexicaul, triangular-ovate, acute, entire, scabrid, brown, 3-nerved. *Pedicel* with *ovary* 1.7 cm long, straight or slightly curved, faintly ribbed, rose-pink.

Sepals spreading, minutely denticulate, acute-mucronulate, glabrous, faintly 9-nerved; lateral sepals 16×12 mm, obliquely oblong, pinkish white tinged with mauve towards the apex, more so on the back; dorsal one 15×10 mm, oblong-suborbicular, pinkish white with a broad, mauve patch on the back. *Petals* 16×10 mm, spreading in the same plane as the sepals, obovate-orbicular, rarely suboblique, acute-mucronulate, minutely denticulate, faintly 7-nerved. *Lip* 28 mm long, 3-lobed, very shortly clawed, somewhat geniculately inflexed at the claw; lateral lobes $5 \times 3-4$ mm, oblong, obtuse, entire or slightly crenulate, more or less spreading, but erect at the base, with a somewhat square hollow which leads to the spur; the entrance to the spur being somewhat arched over by 2 fleshy, pinkish white subconical calli, lying back to back with their apices diverging; midlobe 22×20 mm, pink-mauve, deeper than the sepals and petals, broadly ovate, 5-7 mm broad at the apex, retuse; margins deflexed, finely crisped, crenulate. *Spur* 10×4 mm, inflexed from below the lateral lobes, proceeding under the midlobe, obtuse, pale mauve-pink. *Column* 6×5 mm, oblong, subclavate, produced at right angles into a 10×6 mm obtuse-oblong foot, on which the lip somewhat articulates. *Anther* 6×5 mm, oblong with 2 mm long beak, pale yellow with a purple ring round the margins; pollinia 2, yellow, waxy, globose; caudicle 3 mm long, and ensheathed by a gland 2 mm long. *Stigmatic surface* 4×2 mm, elliptic-orbicular. *Capsules* 3-3.5 cm long, oblong-elliptic, strongly ridged; pedicels about 1.5 cm long, slightly curved.

Flowering: May to June. *Fruiting*: July onwards.

Occurrence: KONKAN: Vengurla, Dalzell & Gibson; Wari Country Dalzell & Gibson. W. GHATS: Khandala, Blatt, Herb. 27968; Hallberg; Santapau 8910, 10169, 11032, 12793, 12933; Panchgani, Blatter; Mahableshwar, Blatter; Ezekiel; Acland 1179; Bole 1045; Kapadia 1201, 1203, 1212. DECCAN: Bhimashankar, Kapadia 1445; Koinanagar, Kapadia. N. KANARA: Devarayi, Sedgwick; Yellapur, Bell; Anmod, Kapadia; Castle Rock, Kapadia; Poutelli-Dandelli, Kapadia 2768-2770; Sampkhand, Hallberg & McCann 34204.

Distribution: India: Konkan, W. Ghats, Deccan, N. Kanara, Nilgiri and Pulney Hills at about 800 to 1200 m. World: India; probably also found in Burma and Ceylon according to Holttum (*Rev. Fl. Malaya* 695, 1953).

Notes: This species can be easily differentiated from *A. maculosum* Lindl. by the following characters: (1) the whole plant is much stouter and more robust; (2) the flowers are larger; sepals and petals not at all or very sparsely speckled; (3) the lip is more triangular in shape, geniculately inflexed at the claw; (4) the spur is exactly below the lip, not along the ovary. In our experience, however, *A. crispum* seems to be not only scarce, but even on the verge of extinction at least in such

places as Khandala and Mahableshwar. The showy flowers and their strong perfume may be put down as the causes for the present shortage of specimens.

7. *NERVILIA* COMM. EX GAUD.

NERVILIA Comm. ex Gaud. Bot. Voy. Freycinet 421, 1826, nom. cons.; Pfltz. in Engl. & Prantl, Pflanzenf. 2 (6) : 106, 1888; Schltr. Orchid. 101, 1927; Sprague & Fischer in Kew Bull. 1927 : 363; Holttum, Rev. Fl. Malaya 1 : 104, 1953. *Pogonia* Endl. Gen. Pl. 218, 1837, p. p.; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 265, 1898, p.p.; J. J. Smith, Fl. Buitenz. 6 : 53, 1905; Duthie in Ann. R. Bot. Gard. Calcutta 9 (2) : 157, 1906 (non Juss. 1769). *Pogonia* sect. *Nervilia* Benth. & Hook. f. Gen. Pl. 3 : 615, 1883; Hook. f. Fl. Brit. India 6 : 118, 1890.

The name *Nervilia* is derived from the prominent veins in the leaves of several species.

Perennial, tuberous *herbs*, mostly coming into leaf after flowering. *Tubers* globose, usually with small warty root-knobs, generally dirty-white in colour. *Leaf* one, petiolate, broadly cordate or orbicular, plicate, glabrous or variously pubescent. *Inflorescence* erect, bearing 1, 2 or several flowers in racemes. *Flowers* erect, horizontal, nodding or drooping. *Sepals* and *petals* subequal, spreading, rather long and narrow. *Lip* inferior, adnate to the base of the column, sessile or sub-clawed, entire, or 3-lobed, often slightly saccate at the base, embracing the column in the basal region. *Column* elongate, straight or slightly curved, footless, broadening upwards to contain the stigmatic surface and the anther. *Anther* sub-stipitate, almost horizontal; pollinia 2 bifid, or 4, granular, yellow, without caudicles or glands. *Stigmatic surface* oblong, or somewhat quadrate, broad.

Species about 40 to 50, distributed from Africa to India and China and through Malaysia to Australia.

The Bombay species have been put under *Pogonia* Juss. by Cooke (in Fl. Pres. Bomb. 2 : 706, 1907); in this he follows Hooker f. and Bentham & Hooker f.'s treatment of this genus, though the latter authors distinguish *Nervilia* Gaud. as a section of *Pogonia* Juss. We consider *Nervilia* Gaud. a distinct genus, differing primarily from *Pogonia* Juss. by the production of their flowers before the leaves, and by having a separate stem which bears no leaves but may have scales or scaly sheaths.

The generic name *Aplostellis* attributed in *Ind. Kew.* to Thouars, *Orch. Hles Austr. Afr.* t. 24, 1822, has been adopted by Ridley (Fl. Malay Penins. 4 : 203, 1924) in place of *Nervilia* Gaud. (1826) on the ground of priority of publication. Sprague and Fischer have shown that *Aplostellis* Thouars is '...not a generic name but the name of a species. A

critical examination of Thouars's preliminary paper "Sur l'histoire des plantes orchidées des îles australes d'Afrique" (Nouv. Bull. Soc. Philom. Paris 1 : 314-319, 1809) and of his "Orch. Iles Austr. Afr." (1822) shows that he attempted to introduce two innovations into the nomenclature of Mascarene Orchids : (1) that all generic names of *Orchidaceae* should end in *orkis* (orchis) ; and (2) that each Mascarene species of that family should be known by a single name instead of a binary combination. These innovations were not accepted by other botanists and when Thouars published his plates of *Mascarene Orchidaceae* in 1822 he employed a double system of nomenclature in the tables and plates, the names of these genera and species according to his own peculiar method being followed by corresponding names in accordance with the established system. Thus *Aplostellis* Thou. was the uninomial name of a new species from Mauritius, which he placed under the new genus *Stellorkis* (*Stellorchis*) ; he appended the new binary combination *Arethusa simplex* for those who preferred to follow the generally accepted methods of nomenclature. The mode of formation of the uninomial names of the species was explained in Thouars's preliminary paper. The first half was an abbreviation or Greek translation of the trivial name ; and the second half was composed of the first part of the generic name with the suffix *-is*. Thus *Aplostellis* is a portmanteau word composed of *Aplo-*, the Greek equivalent of *simplex*, and *stellis* a contraction of *Stellorkis*.

'*Aplostellis* as a generic name was proposed by A. Richard in 1828, but this is antedated by *Stellorkis* Thou. (1809) and *Nervilia* Comm. ex Gaud. (1826)'. The name *Nervilia* Comm. ex Gaud. has been conserved for the genus.

The following is the synonymy of *Nervilia* (*Aplostellis*) as given by Sprague and Fischer (loc. cit.) :

Nervilia Commerson ex Gaud. in Bot. Voy. Freycinet 421, t. 35, 1826, *nomen conservandum*. *Stellorkis* Thou. in Nouv. Bull. Soc. Philom. Paris 1 : 317, 1809. *Stellorchis* Thou. Orch. Iles Austr. Afr., Tabl. Genres, 8, t. 24, 1822. *Cordyla* Blume, Bijdr. 416, 1825 (non Lour. 1790). *Aplostellis* A. Rich. in Mem. Soc. Hist. Nat. Par. 4 : 36, 1828. *Roprostemon* Blume, Fl. Jav. vi, 1828, sub nomine *Cordyla*. *Haplostellis* Endl. Gen. Pl. 219, n. 1603, 1837. *Rephostemon* Endl. loc. cit. 216, n. 1578, 1837. *Haplostellis* Reichb. Nomencl. 1 : 56, 1841.

Most species of *Nervilia* are found in a definite ecological habitat. In open fields they are often found under the shade of hedges of cultivated fields. Very often one or more rows of the orchid in leaf or in flower may run parallel to the hedge. In forests these species are found growing in spots with plenty of rotting leaves. The tuber produces an inflorescence ; one leaf per plant appears after the wilting of flowers ; each plant gives usually 2 slender horizontal, underground stolons, which produce

new tubers at their end. The latter at first produce leaves, but in subsequent years flowers are first produced, then leaves. Thus vegetative propagation is quite prolific in this genus. We have observed that flowering in *Nervilia* strictly coincides with the very first showers of the monsoon; in N. Kanara, where the monsoon sets in early, often by the last week of May, flowering is practically over by the first week of June; in Salsette Island the monsoon generally does not begin till about the middle of June, and the flowers of these plants usually come about the third week of June.

Type species : *N. aragoana* Gaud.

KEY TO THE SPECIES OF *NERVILIA*

BASED ON LEAF CHARACTERS

- | | |
|---|--|
| 1. Petioles 2-5 cm long; leaf-blade lying more or less flat on the ground : | |
| 2. Leaf-blade glabrous, green with 5-7 broad chocolate-coloured bands along the nerves | <i>infundibulifolia</i> |
| 2. Leaf-blade pubescent, green or purple : | |
| 3. Leaf-blade pure green, with pale green or somewhat white hairs : | |
| 4. Leaf-blade 2-12 cm in diam., orbicular-cordate, subreniform, subplicate, hairy on the upper surface, glabrous or glabrescent below | <i>monantha</i> |
| 4. Leaf-blade 4-16 cm in diam., ovate-cordate, acute or sub-acute, plicate, hairy on both surfaces | <i>discolor</i> |
| 3. Leaf-blade deep purple or green-purple to rusty-brown with stiff pale or deep purple hairs in regular rows on both the surfaces | <i>discolor</i> |
| 1. Petioles 8-20 cm long; leaf-blade not lying flat on the ground | <i>juliana</i>
<i>aragoana</i>
<i>carinata</i> |

BASED ON FLOWERS

1. Scape 1-flowered :
2. Sepals and petals 13-15 mm long; lip 3-lobed; midlobe glabrous, entire, obovate or obovate-oblong,

- rounded, midnerve prominent and callus-like *infundibulifolia*
2. Sepals and petals 17-25 mm long ; lip scarcely lobed ; midlobe or its apical portion much wrinkled, subfimbriate, somewhat 3-4-lobulate, hairy on the nerves *monantha*
2. Sepals and petals 25-35 mm long ; lip 3-lobed ; midlobe rhomboid or rhomboid-ovate to rhomboid-lanceolate, acute or subacuminate, hairy within *juliana*
1. Scape 2-flowered ; flowers at right angles to the scape ; lip scarcely lobed, the apex somewhat retuse *discolor*
1. Scape several-to many-flowered ; flowers drooping ; lip 3-lobed :
2. Floral bracts deflexed ; lip slightly saccate at the base ; midlobe not constricted at the base ovate or ovate-oblong, rarely suborbicular, rounded with incurved, erect edges ; column rounded on the dorsal side, flat in front *aragoana*
2. Floral bracts erect ; lip not saccate at the base ; midlobe somewhat constricted at the base, straight, ovate or rhomboid-ovate, tapered to an acute or subacuminate apex ; column with a strong keel on the dorsal side, making it 3-angled *carinata*

ENUMERATION OF THE SPECIES OF *NERVILIA*

1. *Nervilia infundibulifolia* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35: 725, t.3, 1932 ; Santapau in Rec. bot. Surv. India 16(1) : 304, 1953. *N. hallbergii* Blatt. & McC. *ibid.* 726, 1932 ; Santapau 304. (See Plate XXXI)

Tubers 6-12 mm in diam., subspherical, slightly flattened above and below, sparsely covered with small root-knobs. *Leaf* flat on the ground or slightly above the surface ; sheaths about 1-2 cm long, light brown, translucent, oblong, acute to subacuminate, entire, purple-nerved ; petioles 2-4 cm long, dark-brown purple above, turning lighter below, terete, grooved, ridged, opening into a slightly enlarged funnel-shaped mouth at the base of the lamina ; lamina 2-3 × 3-4 cm glabrous, broadly

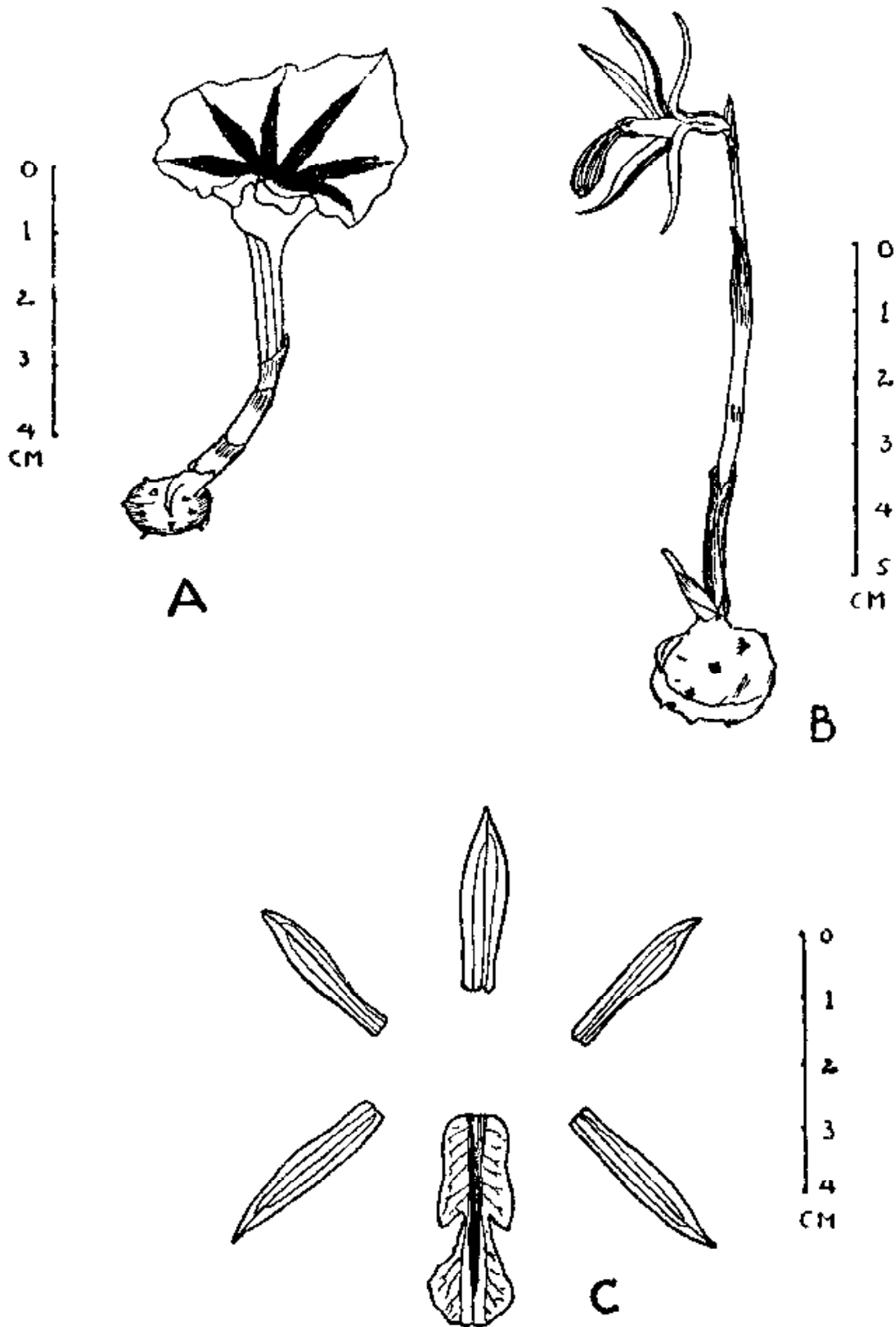
ovate, cordate to suborbicular, subacute, obtuse or slightly retuse at the apex; margins brown-maroon, crimped, irregularly and minutely dentate-crenulate; nerves 5-7, rarely 9 pairs, the last pair generally thin; upper surface dark grass-green with broad chocolate-coloured bands along the nerves, broadening in the middle but not reaching the margin; lower surface light green with prominent dark-brown nerves, corresponding to the depressed ones above. *Inflorescence* one-flowered; scape 6-15 cm (often reaching 27 cm in fruit) tall, terete, pale maroon, of 2 internodes; sheaths linear-oblong, obtuse, entire, 5-nerved; the upper sheath about 3-3.5 cm long, wide-mouthed, the lower much shorter, closely appressed. *Flower* at about right angles to the scape or nodding, greenish purple. *Bract* 3-7 × 2-3 mm, subconcave, ovate, or ovate-oblong, acute, entire, 3-nerved, maroon, the nerves deeper in colour. *Pedicel* 1-1.5 mm long, curved, pale purple. *Sepals* and *petals* similar, slightly concave, light maroon-green with maroon veins, linear-lanceolate, broader in the middle, acute, entire, glabrous. *Sepals* 13-15 × 3-4 mm, 3-nerved. *Petals* 12-14 × 2-2.5 mm, sparsely or not at all gland-dotted, 3-nerved, the midnerve more prominent. *Lip* 16-17 × 5-6 mm, saccate at the base, gland-dotted, 3-lobed; lateral lobes 8 × 2 mm, pale apple-green, acute or subobtuse, entire, more or less embracing the column to form a tube, the latter about 3 mm broad at the mouth, narrower behind; midlobe 9-10 × 6-7 mm, broadly obovate to even suborbicular, rounded (rarely subretuse) at the apex, the margin somewhat wavy, deflexed on the sides, minutely denticulate; the midlobe white or pink suffused irregularly all over with more or less deep patches of rose-maroon, the midnerve callus-like, white. *Column* 8 mm long, 2 mm broad at the top, 1 mm below, straight flat in front, rounded behind, pale apple green with at times faint red-maroon narrow longitudinal streaks. *Anther* 3 × 2 mm white or faintly tinged with purple-maroon in front; pollinia 2, in the shape of a broad exclamation mark. *Stigmatic surface* large, longer than broad, occupying the whole of the enlarged top portion of the column. *Ovary* 4-5 × 3 mm, maroon, 6-keeled with alternate low and high ridges. *Capsules* 18 × 6 mm, elliptic, maroon.

Flowering: May to June. *Leaves*: July to November.

Occurrence: W. GHATS: Khandala, Blatter 35235; Cooke; Santapau 634, 643, 824, 2036-2037, 2060, 4510, 4515, 6812, 9140, 18843; Kapadia 520, 582, 1228-1230; Lonavla Kapadia. N. KANARA: Yellapur, Santapau 18709; Sedgwick 6066 A.

Distribution: Konkan, W. Ghats, N. Kanara.

Notes: Blatter & McCann described this species but did not cite any specimens actually examined by them. In the circumstances a neotype must be selected for the taxon [Art. 7 (3), *Int. Code Bot. Nomencl.* edit. 1956]. There are two old specimens in Blatter Herbarium; one is Blatter 35235 (from Khandala), the other is a flowering plant, Sedgwick



Nervilla infundibulifolia Blatt. & McC.

A. Plant in leaf ; B. Plant in flower ; C. Sepals and petals dissected.

6066 A (from Yellapur). These might possibly be counted among the original collections, but were not cited as such by the authors. We select, then, *Sedgwick* 6066 A as the *neotype* for *Nervilia infundibulifolia* Blatt. & McC.

As Santapau has pointed out, there is no distinctive feature which can separate *N. hallbergii* Blatt. & McC. from *N. infundibulifolia* Blatt. & McC. After a very careful study of the descriptions of the two species, we have come to the conclusion that they are identical. Since the latter species is much more fully described and also figured, we adopt *infundibulifolia* Blatt. & McC. as the epithet for this species, in accordance with Art. 57 of the Code.

This species is usually found under dense shade, in loose, moist soil.

2. *Nervilia monantha* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 724, 1932.

Tubers 12-22 mm in diam., subglobose with several root-knobs. *Leaf* broadly funnel-shaped on opening, latter spreading on the ground, appearing after the flowers ; petiole 2-4 cm long ; lamina 2-12 cm in diam., orbicular-cordate or subreniform, uniformly green, subplicate and velvety with short, glandular, greenish-white hairs on the upper surface, glabrous below ; the hairiness is more prominent when the leaf is freshly expanded. *Scape* 5-10 cm long in flower, up to 25 cm in fruit, 1-flowered, pale pink with 2-3 acute or subacuminate pale-pink, wide-mouthed sheaths. *Flowers* erect on opening, becoming suberect, then at maturity nodding and deflexed. *Bracts* small, triangular, acute, about 2 mm long. *Sepals* and *petals* similar, greenish white, often rose tinted, linear-oblong, broader above the middle, tapering to the base, entire, acute ; midnerve subcarinate below, with 1-2 pairs of faint lateral nerves. *Sepals* 17-22 × 3-5 mm, subconcave. *Petals* slightly shorter and narrower. *Lip* 18-20 mm long, scarcely saccate, more or less tubular, obscurely 3-lobed ; lateral lobes connivent around the column, narrow-oblong, entire ; midlobe 3-4-lobulate, lateral lobules entire or subentire, slightly divergent, the middle one obscurely 2-lobed or entire, much wrinkled, subumbriate in the sinuses between the lateral lobules. *Lip* pale pink, white at the base with 3 main nerves at the centre giving off papillate, purplish, hairy outgrowths on the midlobe, the lateral nerves on the midlobe also somewhat hairy. *Column* 7-9 × 2 mm, broad and clavate, flat in front, rounded behind, glabrous, walls of the clinandrium denticulate. *Anther* 2 × 1.5 mm, squarish. *Ovary* 5 × 2 mm long, oblong-ovoid ; pedicel 2 mm long, curved. *Capsules* 21 × 7 mm decurved, broadly fusiform, 6-ribbed ; beak 5-7 mm long.

Flowering : June. *Leaves* : July to December.

Occurrence : N. KANARA : Bell 4073 ; Dandeli, Kapadia 1690 ; Yellapur, Bell ; J. Fernandez 1627 ; V. Patel 1845 ; Kapadia 1967,

1987, 2010-2015, 2213, 2242, 2344-2345 ; Nagargali, *Sedgwick* ; Karwar, *Bell*.

Distribution : Apparently endemic in N. Kanara.

3. *Nervilia juliana* (Roxb.) Schltr. in Bot. Jahrb. 45 : 402, 1911 ; Blatt. & McC. 726. *Epipactis juliana* Roxb. Fl. Ind. 3 : 453, 1832. *Pogonia juliana* Wall. Cat. 7399, 1832, nom. nud. ; Hook. f. 119.

Tuber 10-15 mm in diam., orbicular, warted with 2 or 3 transverse bands. *Scape* 1-flowered, 7-9 cm tall, erect ; sheaths 2-3, oblong, acute, the uppermost much dilated. *Flower* 30-35 mm long, bracteate, very shortly pedicellate. *Bracts* 12-15 mm long, erect, oblong, acute, somewhat cymbiform, longer than the ovary. *Sepals* 28-33×3 mm, straight (rarely curved), lanceolate, acute, entire, 5-nerved ; midnerve keeled below. *Petals* 25-28×2-3 mm, lanceolate, acute, 3-nerved. *Lip* 30-32 mm long, very slightly saccate at the base, 3-lobed ; lateral lobes 15×2 mm, falcate, subacute, connivent with the column and concealing it, only the anther projecting beyond ; midlobe 13-15×7 mm, rhomboid or rhomboid-obovate, acute, entire or rarely subundulate, pubescent within.

The leaf and the colour of flowers are given by Blatter & McCann as follows : 'Leaf solitary, developing after the flowering of the scape, petioled, broadly ovate-cordate, acute, about 5 cm in diameter, membranous, plicate with 5-7 veins radiating from the top of the petiole, green or purplish beneath ; ... sepals and petals green ; lateral lobes white ; terminal white mottled with pink ...'

Flowering : March (Assam).

Occurrence : N. KANARA : *Bell*.

Distribution : India : Assam, Lower Bengal, N. Kanara. *World* : Ceylon, India, Burma.

Notes : The description has been drawn up from *Collect* 199, from the Naga Hills ; the specimen was kindly loaned by the National Herbarium, Calcutta.

4. *Nervilia discolor* (Bl.) Schltr. in Bot. Jahrb. 45 : 403, 1911 ; Holttum 105, f. 16e ; Santapau in Proc. nat. Inst. Sci. India 24B : 139. *Cordyla discolor* Bl. Bijdr. 417, 1825. *Pogonia discolor* Blume, Mus. Bot. Lugd.-Bat. 1 : 32, 1849, & 128, t. 57, 1858 ; J. J. Smith 54, f. 33. *P. biflora* Wight, Icon. 5(1) : 22, t. 1758, 1851 ; Hook. f. 119. *Nervilia biflora* (Wight) Schltr. in Bot. Jahrb. 45 : 403, 1911 ; Fischer 1459 ; Blatt. & McC. 726. (See Plate XXXII)

Tubers 1-3 cm in diam., globose to oval, with a few rootlet knobs and 2-4 transversely circular bands. *Leaf* appearing just after the flowers, flat on ground and spreading ; petiole 3-4 cm long, arising from one end of the tuber, and giving rise to 2 stolons just below the lamina ; lamina 4-16×5-16 cm, ovate-cordate, rounded, acute or subacuminate, plicate ;

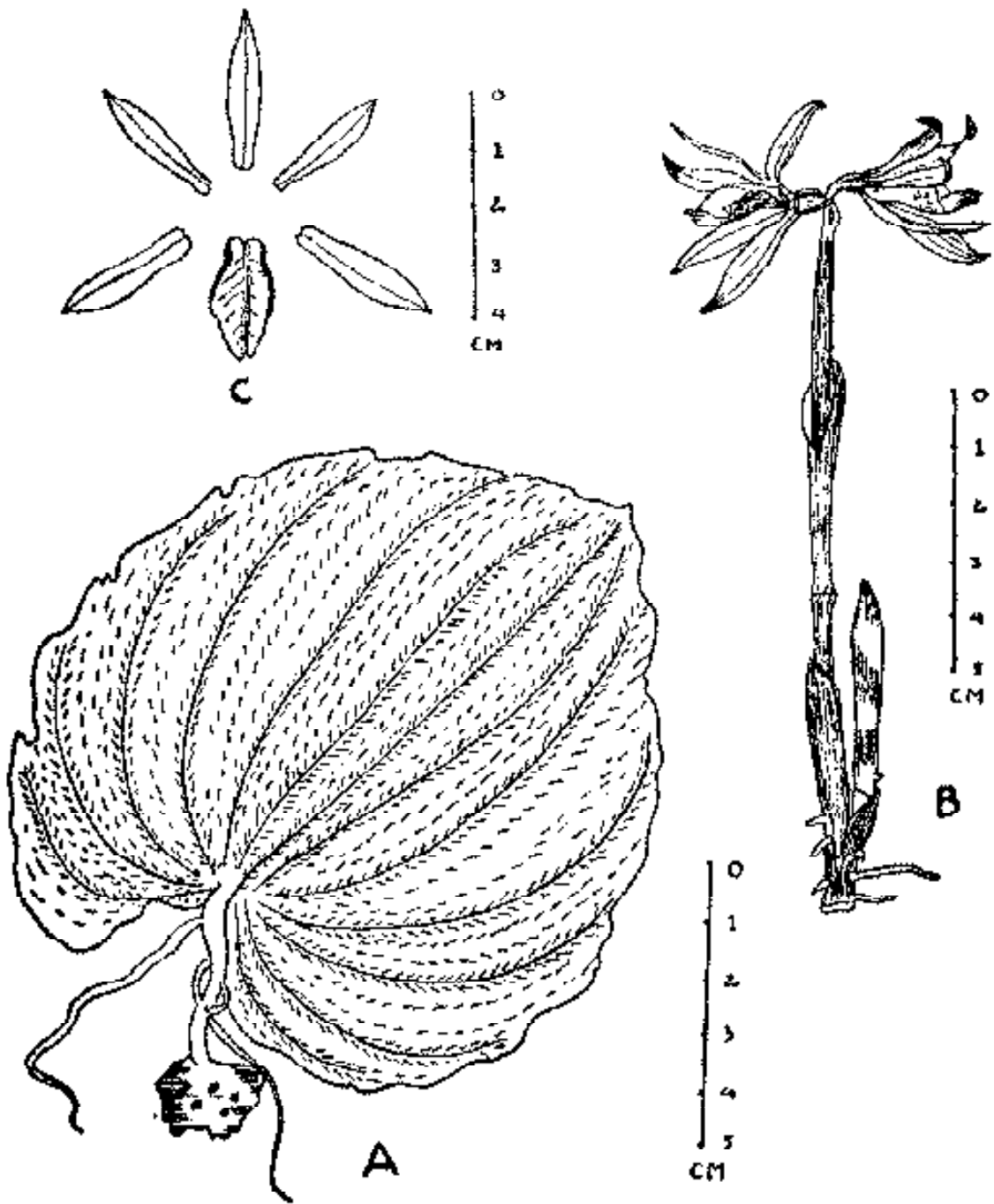
margins with stiff hairs ; upper surface pale green to dark green-purple with many prominent purple or green nerves and an equal number of depressed ones in between, hairy all over ; hairs 1-2 mm long, purple or pale green, stiff, in rows parallel to and on the nerves ; lower surface pale green to light mauve-purple with smaller and fewer hairs similar to the ones above. *Scape* 4.5-17 cm long, up to 30 cm in fruit, brownish-mauve, longitudinally striated with deeper colour, greenish-white below, sheathed, sparsely tubercled, sheaths 2-3, the lowermost subterranean and colourless, enclosing part of the foliar bud at the base ; the upper ones 2.5-3.5 cm long, brown-mauve tinged with green, about 9-nerved, oblong acute, glabrous. *Flowers* 2 at the apex of the scape, one slightly below the other, nodding, 20-25 mm long. *Bracts* 3-8×1-4 mm, ovate-lanceolate to subulate, acute, entire or very slightly toothed at the apex, faintly 1-3-nerved, glabrous, brown-maroon tinged with green. *Pedivels* 5×1 mm pale purple, faintly ribbed. *Sepals* and *petals* spreading, brown-mauve, oblong-lanceolate, acute, entire, glabrous, sparsely gland-dotted ; sepals 20-27×4-5 mm, midnerve prominent below. *Petals* 23-24×3-4 mm, 7-nerved. *Lip* 18-20×11 mm, obovate-oblong or nearly elliptical, shallowly 3-lobed, slightly saccate at the base, convolute round the column, the tube narrowest a little above the base, widening, outwards, opening just beyond the column ; lateral lobes very small, entire, obtuse, purple-veined ; midlobe 6×6 mm, oblong or oblong-ovate, obtuse, narrowly emarginate, faintly crisped and crenulate ; midnerve swollen and prominent, impressed on the underside. Colour of lip rose-mauve with deeper lateral veins, the midnerve on the midlobe much paler or white. *Column* 10-12×4-5 mm, erect, pale rose-pink, sigmoidally curved, clavate at the apex, shallowly grooved in front. *Anther* rose-pink, red in front, somewhat square ; pollinia oval, in 2 masses. *Stigmatic surface* 3×2 mm, broadly funnel-shaped. *Ovary* 5×3 mm, oblong-orbicular, brownish-maroon, with 3 strong and 3 shallow ridges. *Capsules* fusiform, 10-16×6-8 mm, ribbed, winged along the ribs ; generally only 1 fruit develops.

Flowering : May to June. *Leaves* : June to November.

Occurrence : DANGS : Waghai, *Santapau* 19136-19140, 19206-19207 ; *Kapadia* 671, 1254-1259, 1409-1411 ; Pimpri, *Santapau* ; *Kapadia*. DECCAN : Bhimashankar, *Kapadia* 1464-1467. N. KANARA : Yellapur, *Bell* 6066 (excluding A) ; *Kapadia* 2017-2018 ; Sirsi, *Bell* ; *Santapau* 18660.

Distribution : *India* : Dangs, Deccan, N. Kanara, S. India. *World* : India, Malaya, Java.

Notes : From the literature, *N. biflora* Schltr. and *N. discolor* Schltr. seem to be identical ; the only point of difference seems to lie in the raised, median band of lip (the midnerve) which is yellow in the latter and white or pale rose-coloured in the former species ; the basic floral



Nervilia discolor Schltr.

A. Plant in leaf ; B. Plant in flower ; C. Sepals and petals dissected.

structure (including the position of the individual floral parts) is identical, and, therefore, we have fused the two species under the earlier specific epithet, *discolor* of Blume.

The colour scheme of this species is strikingly variable. In dense undergrowth, where little light reaches the forest floor, leaves are deep purple to almost black in colour with deep purple stiff hairs. With an increase of light, leaves turn brownish, often somewhat rusty-brown in colour. We collected tubers from dense forest in the Dangs (where the leaves were purple) and planted them in St. Xavier's College garden; they gave pure green leaves with pale green hairs. Leaves collected from Bhimashankar in a rather open habitat were also green. It would seem, then, as if the deep colour of our Dangs plants was intimately connected with light intensity; as to the colour of the flowers themselves, we have noted sepals and petals in the Dangs as brownish-mauve; Blatter & McCann recorded that in Yellapur they were brownish-yellow with a green shade. Malayan plants have them pale olive-green to dull purplish, the veins of the lip being yellow to brown or purplish, the midnerve itself being yellow.

This species is locally known as *Dukkarkand* in the Dangs Dist., and is used to promote lactation in women.

5. *Nervilia aragoana* Gaud. in Bot. Voy. Freycinet 422, t. 36, 1826; Fischer 1459; Blatt. & McC. 729; Holttum 105, f. 16 d; Santapau in Fl. Purandh. 128. *Pogonia flabelliformis* Lindl. (in Wall. Cat. 7400, 1832, nom. nud.; et) Gen. Sp. Orchid. 415, 1840; Hook. f. 121; Prain 1026; J. J. Smith 57, f. 36; Duthie 158, t. 125; Haines, Bot. Bih. & Or. 1163, 1924. *P. nervilia* Bl. Mus. Bot. Lugd.-Bat. 1: 32, 1849; & 130, t. 56, 1858. *P. carinata* Wight, Icon. 5 (1): 15, t. 1720, 1851. *P. scottii* Reichb. f. in Flora 276, 1872; Hook. f. 120, et in Ann. R. Bot. Gard. Calcutta 5: 62, t. 93, 1895; King & Pantl. 269, t. 360; Prain 1026. *Nervilia scottii* (Reichb. f.) Schltr. in Bot. Jahrb. 45: 404, 1911.

Tuber 1.5-2 cm in diam., subglobose, white, with parallel lines along the circumference dividing into obscure lobes. *Leaf* appearing after the flowers, erect, petiolate. *Petiole* 8-20 cm long, purple turning light green with purple lines; generally 2 stolons arise on opposite sides from the petiole just above the tuber. *Lamina* 9-12 × 8-11 cm, cordate, broadly ovate to almost orbicular, acute, acuminate or apiculate, glabrous, dark green above, pale green below; nerves up to 18 in number. *Scape* 10-25 cm tall, 2-sheathed, green above, light purple below; lower sheath 2 cm long, white with brown streaks, loose, acute; upper sheath about 2 cm long, closely fitting round the peduncle, similar to the lower one. *Raceme* few-to many-flowered, lax. *Flowers* drooping, green, shortly stalked, about 20-25 mm long. *Bracts* 14 × 2 mm, decurved, linear-lanceolate, subacuminate, glabrous, light green, faintly tinged with purple.

Pedicels 3 mm long, green, curved. *Sepals* 17-25×2-4 mm, green or yellowish-green, oblanceolate, acute or subacute, entire, glabrous, often the midnerve subcarinate below, the lateral pair of nerves fainter. *Petals* 14-25×2-5 mm, green, similar to sepals, often narrower at the base. *Lip* 17-24 mm long, subsaccate and subclawed at the base, obovate in outline, 3-lobed, lateral lobes erect, 1-3 mm broad, parallel and embracing the column; narrowly oblong, acute or obtuse, pale green; midlobe 4-6×5-7 mm, variable in shape, not constricted or deflexed, obtuse or subacute, irregularly-crenulate, somewhat crimped with incurved edges, pale yellowish-green, nerves red-pink, parallel, subwavy along the midlobe. The 3 central prominent nerves along the entire length of the lip are yellowish-green, minutely hairy, the pubescence extending to some of the lateral nerves also. *Column* pale green, 7-10 mm long, dilated above, placed at an angle to the ovary. *Anther* posticous, white above, reddish towards the base; midnerve red-purple. *Stigmatic surface* fairly broad, circular trapezoid. *Ovary* 4-5 mm long, drooping, green often flushed with pink, the ridges often winged.

Occurrence : DANGS : Waghai, *Santapau* 19141; Dungarda, *Santapau* 19280. KONKAN : Bombay, cultivated, *Kapadia* 1357, 1917-1920; Neral, *Blatter*; Tansa, *Santapau* 2706; Borivli, *Santapau* 2343-2344, 15026; R. Fernandez 1287, 1816-1817, 1838-1839, 1862; Herbert 2348; *Kapadia* 1244-1247; Wajreshwari, *Kapadia* 1293-1294; Mumbra, *Shenoy* 3462, 3641-3642, 3656, 3667; Badlapur, *Kapadia* 1284, 1288; Karjat, *Irani* 90; *Kapadia* 1217-1218, 1239. DECCAN : Purandhar, *Santapau* 7130, 7246, 7248, 7254, 7263; *Kapadia* 1316. N. KANARA : Yellapur, *Kapadia* 2233-2235; Sampkhand, *Sedgwick & Bell*; Guddehalli, near Karwar, *Kapadia* 2127.

Distribution : India : Tropical Himalayas from Garhwal (1400 to 1600 m) eastwards to Kumaon, Bengal, southwards to Saurashtra, Dangs, Konkan, Deccan, N. Kanara, Mysore, Rampa and Pulney hills and Travancore. *World* : India, Malaya and Java.

Notes : This species is often found under clumps of *Euphorbia neriifolia* Linn. in open fields and around bamboo clumps in forests.

From the descriptions and plates of Hooker f. (in *Ann. R. Bot. Gard. Calcutta* 5 : 62, t. 93, 1895) and King and Pantling, *Pogonia scottii*. Reichb. f. seems to be identical with *N. aragoana* Gaud. The latter is a very variable species with respect to the shape of the lip. Duthie mentions that the leaves, at least the younger ones, are hairy on the margins, and the midlobe, as figured in his t. 125 and described in the text, is supposed to be deflexed from the general upward rising of the lip. These characters are not in agreement with our observations and those of others. The leaves are completely glabrous and the midlobe is not deflexed.

6. *Nervilia carinata* (Roxb.) Schltr. in Bot. Jahrb. 45 : 406, 1911 ; Fischer 1459 ; Blatt. & McC. 729. *Epipactis carinata* Roxb. Fl. Ind. 3 : 454, 1832 ; Graham, Cat. Bomb. Pl. 205, 1839. *Pogonia carinata* Lindl. Gen. Sp. Orchid. 414, 1840 ; Dalz. & Gibs. Bomb. Fl. 270, 1861 ; Hook. f. 121, et in Ann. R. Bot. Gard. Calcutta 5 : 62, t. 94, 1895 ; Prain 1026 ; Duthie 159, t. 124, et Fl. Upp. Gang. Pl. 3 : 217, 1920 ; Cooke, Fl. Pres. Bomb. 2 : 707, 1907.

Leaves similar to those of *N. aragoana* Gaud. ; authors do not seem to be in agreement about the characters of the leaves of this species ; Hooker f., Duthie, etc., give the leaves as 7-9-nerved, and this number is said to be distinctive of the species ; Hooker f., however, in *Ann. R. Bot. Gard. Calcutta* states that the number of nerves is 7-9-12. As for size, leaves are said to be 3.8-6.4 cm wide ; but these figures seem rather low and probably refer to young, not yet fully developed leaves. *Scape* 10-17 cm long, 2-sheathed, bearing a terminal lax raceme of few flowers ; sheaths 2-4 cm broad, oblong, obtuse. *Flowers* 18-22 mm long, drooping. *Bracts* 6-8 mm long narrowly linear-lanceolate, acute, somewhat erect ; *pedicels* 3-4 mm long. *Sepals* and *petals* 19-21 × 3-4.5 mm, oblanceolate, acute, entire, the midnerve prominent below with a pair of fainter lateral nerves ; petals slightly shorter than sepals, narrower in the lower third portion. *Lip* 20-21 mm long, 3-lobed, not saccate, subclawed at the base, rhomboid in outline ; lateral lobes 2-2.5 mm broad, subacute, narrowly oblong ; midlobe ovate or rhomboid-ovate, slightly constricted at the base, tapering to an acute or subacuminate apex, irregularly crenulate ; disc 3-nerved, sparsely pubescent. *Column* 9 mm long, subclavate and slightly curved at the apex, strongly carinate along the back, the column being trigonous. *Ovary* 5 mm long, strongly ridged, ovoid.

Flowering : June.

Occurrence : W. GHATS : Khandala, Santapau 4501-4502. N. KANARA : Dhatwar, Law ; Kulgi. *Bell*.

Distribution : *India* : Sub-Himalayan tracts of Rohilkhand and N. Oudh, Kumaon, Bengal, Konkan, W. Ghats, N. Kanara, Mysore, Pulneys, Cochin. *World* : India, Burma.

Notes : Very similar to, if at all distinct from, *N. aragoana* Gaud. Duthie stresses the number of nerves on the leaf, the erect bracts and the shape of the midlobe of lip as typically distinguishing this species from *N. carinata* ; these points appear far from clear on examination of the actual specimens.

Prain separates the two species thus : Midlobe ovate, acute, crenate, white with red or purple veins=*carinata* ; Midlobe ovate, acute, pure white=*aragoana*. All our specimens show a white or greenish-white, rarely yellowish lip, with various shades of red or purple or brown on the veins.

In our opinion, the only more or less constant features on which *N. carinata* Schltr. can be separated from *N. aragoana* Gaud. are : in *carinata* the floral bracts are erect, the lip is neither saccate nor gibbous ; the midlobe of the lip is narrow at the base, ovate and acute to acuminate. To judge from the descriptions of this plant, the diagram of Hooker f. in *Ann. R. Bot. Gard. Calcutta* 5 : t. 94, seems to represent the present plant correctly ; our Khandala plants are very close to Hooker's plant.

Nevertheless, the position of *N. carinata* Schltr. remains rather doubtful.

IMPERFECTLY KNOWN SPECIES

1. *Nervilia hispida* Blatt. & McC. in *J. Bombay nat. Hist. Soc.* 35 : 728, 1932.

This species was described from T. R. Bell's manuscript notes.

According to Blatter & McCann, the species is distinguished from *N. aragoana* Gaud. by its leaf being much smaller and densely hispid, the hairs being minute, white and tubercular ; the scape is shorter and the flowers several, smaller and appearing with the leaves ; the base of the lip is somewhat saccate. From *N. carinata* Schltr. it is distinguished by the much longer petiole, and the hispid, many-nerved leaf.

Flowering and Fruiting : June.

Occurrence : N. KANARA : Yellapur, Bell.

2. *Nervilia plicata* (Andr.) Schltr. in *Bot. Jahrb.* 45 : 403, 1911 ; Blatt. & McC. 727 ; Santapau 304. *Arethusa plicata* Andr. *Bot. Rep.* t. 321, 1803. *Epipactis plicata* Roxb. *Fl. Ind.* 3 : 454, 1832. *Pogonia plicata* Lindl. *Gen. Sp. Orchid.* 415, 1840 ; Hook. f. 119 ; King & Pantl. 268, t. 358 ; Cooke 707.

We have not seen any specimen which may, with certainty, be said to belong to this species ; hence we give the original description of Andrews :

'*Generic Character.* Calyx sheath leafy. Cup none. Blossom gaping. Five petals oblong, nearly equal, 2 outer, all converging into a helmet. Honey-cup one leaved, tubular at the base, within the bottom of the blossom two-parted ; lower lip reflexed, broad, wrinkled, the length of the petals, hanging down forwards, upper lip linear, very delicate, fixed to the shaft, lobed at the top. Stamens 2 threads, very short, fitting on the top of the pointal (pistil). Tips egg-shaped, flattened covered by the folding of the inner lip of the honey-cup. Pointal (pistil) seedbud oblong, beneath. Shaft oblong, incurved, clothed by the inner lip of the honey-cup. Stigma funnel-shaped. Seed-vessel capsule oblong, egg-shaped, one celled, 3-valved, splitting at the angles. Seeds numerous, chaffy. *Specific Character.* Arethusa with a globular root ; leaf heart-shaped, hairy.'

Flowering : July.

Occurrence : KONKAN : Bombay, Millard.

Distribution : India : Konkan (?), W. Ghats (?), Bengal (?), Sikkim (?). *World* : India, Philippines.

Notes : *N. plicata* Schltr. (= *Pogonia plicata* Lindl.) as described in our provincial floras seems to be quite a different plant from *Arethusa plicata* Andr., which is the basionym of both Schlechter and Lindley ; the descriptions seem to agree with *N. discolor* Schltr. We feel quite sure about the characteristics of the latter plant, but are rather doubtful about those of *N. plicata*. To add to these doubts, we have studied Cooke's specimens in Kew Herbarium and in Poona, collected from Khandala ; such specimens do not agree with the description and diagram of *Arethusa plicata* Andr., but with *N. infundibulifolia* listed above. The plant mentioned as *N. plicata* in our floras is *N. discolor* Schltr. and not *N. plicata* Schltr. nor *Arethusa plicata* Andr.

8. MALAXIS SOLAND. EX SW.

MALAXIS Soland. ex Sw. Prodr. Veg. Ind. Occ. 119, 1788, non Swartz 1789 nec auct. ; O. Kuntze, Rev. Gen. Pl. 2 : 672, 1891 ; Correl, Nat. Orch. N. America 255, 1950 ; Holttum, Rev. Fl. Malaya 1 : 191, 1953. *Achroanthes* Rafin. in Amer. Monthly Mag. Crit. Rev. 4 : 195, 1819. *Microstylis* (Nutt.) Eaton, Man. Bot. North Am. (ed. 3) 115, 347, 353, 1822 ; Lindl. Orchid. Seel. n. 18, 1826 ; Endl. Gen. Pl. 189, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 494, 1883 ; Ridley in Journ. Linn. Soc. (Bot.) 24 : 308 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 130, 1880 ; Hook. f. Fl. Brit. India 5 : 686, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 14, 1898 ; Duthie, *ibid.* 9 (2) : 87, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 247, 1905 ; Schltr. Orchid. 155, 1927.

The generic name *Malaxis* is a Greek word meaning *softness* or *tenderness*, probably in allusion to the soft texture of the leaves or may be with reference to the delicacy of the entire plant.

Terrestrial, rarely epiphytic or lithophytic *herbs*. *Stems* creeping, with erect leafy apex ; or short, fleshy and close together, bearing few to many leaves. *Leaves* broad, often unequal-sided at the base, thin, more or less plicate, inarticulate, sheathing at the base. *Inflorescence* terminal, in few- to many-flowered subumbellate racemes, or in an elongated raceme of small flowers. *Sepals* free, or the lateral ones more or less connate, spreading. *Petals* ovate-lanceolate to narrowly linear or filiform, often strongly coiled. *Lip* sessile, superior, erect or spreading, entire or 3-lobed, concave to saccate, often with a hollow near the base, usually with 2 large lobes (called auricles) close to the sides of the column and extending downwards below it, the apex often toothed. *Column* very short, terete, hollowed on top, often toothed at the apex, with or without fleshy arms. *Anther* terminal, sessile, erect on the

back of the column, its tip pointing upwards ; pollinia 4, waxy, ovoid, free or cohering in pairs to a viscid mass. *Capsule* small ovoid, ellipsoid.

This genus consists of about 250 species distributed in the warmer parts of the World, extending into North Temperate regions. It attains its maximum development in Asia & Oceania ; it is also widely distributed in the Western Hemisphere.

Bentham & Hooker f. attribute the name *Malaxis* to Swartz in *K. Vet. Acad. Nya Handl.* 21 : 233, 1800, where Swartz published the species *M. paludosa* (L.) Sw. ; O. Kuntze, however, has pointed the existence of an earlier homonym, *Malaxis* Swartz, *Prodr. Veg. Ind. Occ.* 119, 1788, with two species *M. spicata* and *umbellifera* Sw. In the opinion of O. Kuntze, *Malaxis* Sw. 1800 is the same as *Malaxis* of Bentham & Hooker f., but is different from *Malaxis* Sw. 1788. The name *Hammarbya* was proposed by O. Kuntze for *Malaxis* Sw. 1800 ; and this has been accepted by Summerhayes (in *Wild Orch. Britain* 315, 1951) and other recent authors, with *H. paludosa* O. Kuntze as the only species.

In most of the earlier works the generic name *Microstylis* is attributed to Nuttall, 1818 ; this is not correct, for Nuttall made *Microstylis* a section of *Malaxis*. The first author to treat *Microstylis* as a generic name is undoubtedly Eaton (1822), and not Lindley (1826) as stated by O. Kuntze.

KEY TO THE SPECIES OF *MALAXIS*

- | | |
|---|--------------------|
| <p>1. Leaves flat and spreading on the ground, sub-coriaceous and subplicate ; inflorescence lax ; petals involute behind the large lip, hardly visible ; side lobes of lip produced upwards into acute or obtuse auricles, the apex bilobed</p> | <i>mackinnonii</i> |
| <p>1. Leaves erect, not flat on the ground, membranous, much plicate ; inflorescence dense ; petals not involute, clearly visible in flower ; sidelobes of lip not produced upwards into auricles, the lip somewhat suborbicular, reniform, pectinate :</p> | |
| <p>2. Stem stout, not pseudobulbous at base ; leaves 5-18 cm long, with a petiole 2-6 cm long</p> | <i>versicolor</i> |
| <p>2. Stem slender, much swollen and distinctly pseudobulbous at base ; leaves 2.5-7 cm long, sessile or nearly so</p> | <i>densiflora</i> |

ENUMERATION OF THE SPECIES OF *MALAXIS*

1. *Malaxis mackinnonii* (Duthie) Ames in Orchid. 6 : 289, 1920. *Microstylis mackinnonii* Duthie in Journ. As. Soc. Bengal 11, 71 : 37, 1902, et in Ann. R. Bot. Gard. Calcutta 9 (2) : 88, t. 95, et Fl. Upp. Gang. Pl. 3 : 184, 1920. *M. cardonii* Prain, Beng. Pl. 1004, 1903, et in Journ. As. Soc. Bengal II, 73 : 189, 1904 ; Haines, Bot. Bih. & Or. 1165, 1924 ; Mooney, Suppl. Bot. Bih. & Or. 210, 1950.

Terrestrial herbs. *Tuber* small, corn-like, 7-10 mm in diam., whitish. *Leaves* 1-3, clustered and spreading on the ground, subfleshy, subplicate, green or purplish on the under surface, continued below the ground level into a sheath which is more or less rigid, greyish, 1-4 cm long ; lamina 3-13 × 1.3-7 cm, variable in shape, oblong-lanceolate, elliptic, oblong, ovate-lanceolate, or broadly ovate to rarely suborbicular, acute or obtuse, entire, about 5-9-nerved, the nerves often purplish below. *Scape* together with the raceme 12-40 cm long, erect, subflexuose, yellowish green, angled, often slightly winged, rarely much thickened towards apex. *Flowers* 3-4 mm across, pale yellow or yellowish green. *Bracts* 4 × 1-1.5 mm, deflexed, pale yellowish green, narrowly subulate, sub-acuminate or acute, entire, 1-nerved. *Sepals* 2.5 × 1.5 mm, narrowly oblong, obtuse with the entire margins folded backwards, 3-nerved, pale yellowish green to yellow. *Petals* 1.5-2 mm long, very narrowly linear to filiform, obtuse, twisted and much reflexed, normally not visible in the flower, 1-nerved, pale yellow. *Lip* 5-5.5 mm long, pale yellow, superior, ovate-oblong in outline, somewhat constricted just beyond the middle ; basal portion 3.5 × 3 mm, suborbicular with the auricles about 1.5 mm long, obtuse or acute, concave in the middle about the attachment of the column, again convex on the sides outwards ; the apical part 2 × 2 mm, broadly ovate-oblong, slightly curved forwards, somewhat hooded, bilobed at the apex with a narrow sinus in between, the lobes obtuse. *Column* about 1 mm long, pale yellow, with fleshy rounded arms. *Anther* minute, broader than long or suborbicular ; pollinia 4, in pairs, ovoid-pyriform. *Pedicel* with the ovary 2-3 mm long, pale greenish yellow, ribbed. *Capsules* 10 × 4 mm, erect, obovoid, ridged, greenish yellow ; stalk 2-3 mm long.

Flowering : August to September. *Fruiting* : September to November.

Occurrence : DANGS : Waghaj, Santapau 19088, 19142, 20000 ; Kapadia 688, 1421-1428.

This orchid has been recorded for the first time in Bombay State.

Distribution : N. W. Himalaya 1800-2000 m, Upper Gangetic Plain, Bengal, Chota Nagpur, southwards to the Dangs District.

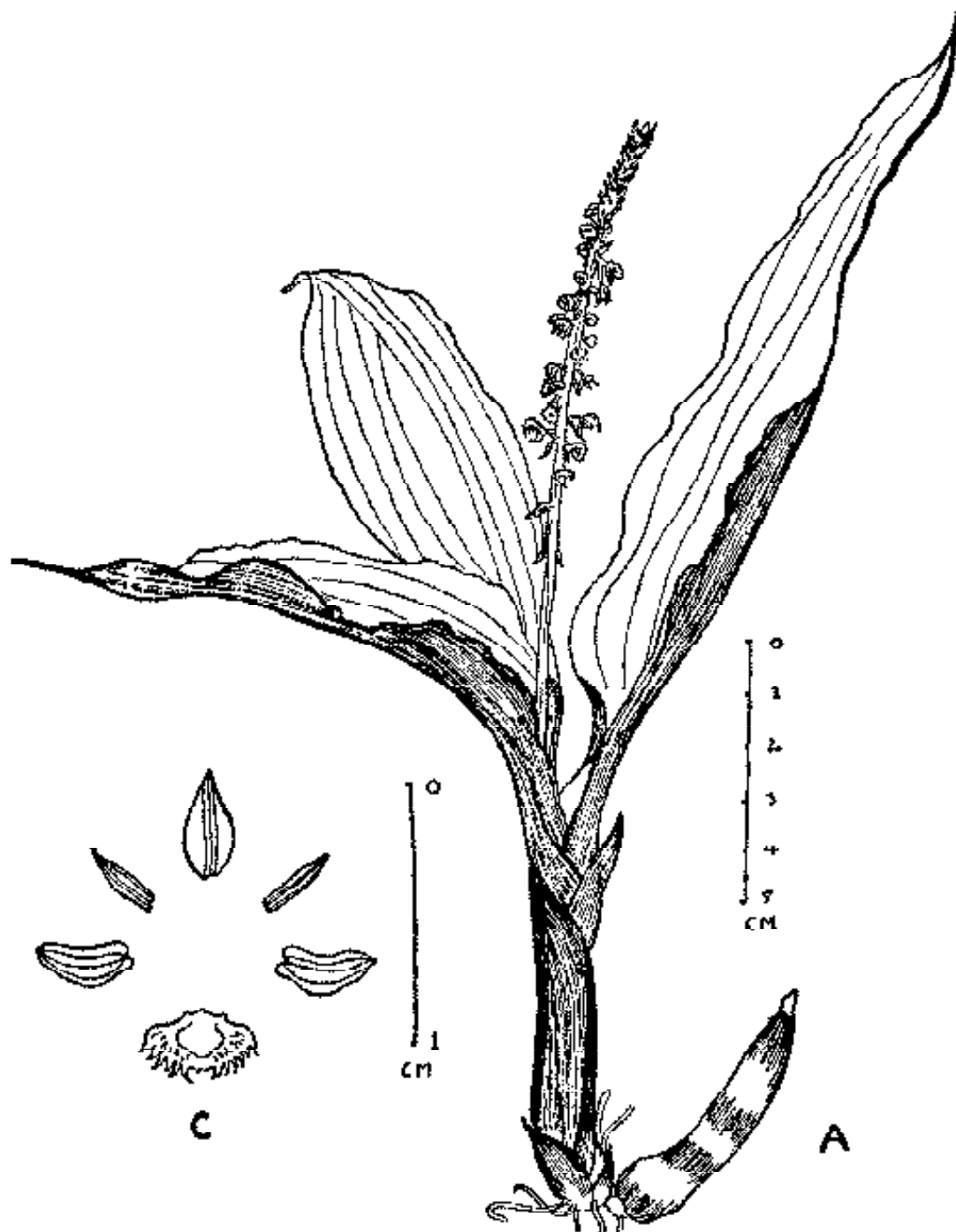
Notes : This species is locally abundant in open patches of forest, usually around bamboo clumps.

We have checked our specimens with Mackinnon's specimens in the National Herbarium, Calcutta, on which Duthie based his *Microstylis mackinnonii*. Except for the absence of the slight purple coloration in the flowers, our specimens are identical with the ones in Calcutta.

Microstylis cardonii Prain seems to be identical with *Malaxis mackinnonii* (Duthie) Ames. Further, both Duthie and Prain point out the similarities in the floral structure of their plants to *Microstylis wallichii* Lindl. ; but the structure and position of the leaves at once distinguish these two plants.

2. *Malaxis versicolor* (Lindl.) Sant. & Kapadia, in J. Bombay nat. Hist. Soc. 58 : 347, 1961. *Microstylis versicolor* Lindl. Gen. Sp. Orchid. 21, 1830 (non Wight 1844-45) ; Ridley 343 (excl. syn. *Malaxis rheedii* Sw.) ; Cooke 678 ; Haines 1165, 1924 ; Fischer 1408 ; Blatt. & McC. 259. *M. rheedii* Heyne ex Wall. Cat. 1939, 1828, nom. nud. ; Graham, Cat. Bomb. Pl. 202, 1839. *Microstylis rheedii* Wight. Icon. 3 (2) : 9, t. 902, 1844-1845 ; Dalz. & Gib. Bomb. Fl. 260, 1861 (excl. syn.) ; Hook. f. Icon. Pl. t. 1883, et Fl. Brit. India 5 : 690, 1890 ; Prain 1004 ; Gammie 565 ; Fyson, Fl. Nilg. Puln. Hill-Tops 384, 1915, et t. 510, 1920. *Liparis intermedia* A. Rich. in Ann. Sc. nat. ser. 2, 15 : 17, 1841 (?). (See Plate XXXIII)

Terrestrial, lithophytic or rarely epiphytic herbs. Stem erect, 3-25 cm tall, slightly swollen at the base, sheathed greenish-purple ; sheaths 2.5×1-1.5 cm, ovate-lanceolate, acute or acuminate, green-purple with 3-5 prominent purple nerves. Leaves 3-5, petiolate, sheathing plicate ; petioles 2-6 cm long, amplexicaul, green-purple with a few purple nerves ; lamina 5-18×2.5-11 cm, ovate-lanceolate or broadly ovate or elliptic-lanceolate, acute, glabrous, 8-10-nerved ; margins slightly crimped, denticulate ; nerves depressed above, prominent below, purple-green. Inflorescence 8-35 cm high, dense or lax ; peduncles 3-10 cm long, angled, purple with a few bracts at the top. Buds green when young, turning yellowish to purple at maturity, ovate, obtuse, slightly curved. Flowers 4×4 mm, yellow with a pale purple tinge when young, becoming deep reddish-purple with age, and again somewhat yellow on fading, pedicellate. Bracts 3.5×1-1.5 mm, erect and green in bud, deflexed and slightly purple at the base after anthesis, lanceolate, acuminate, entire. Sepals unequal, purple, obtuse, entire, 3-nerved ; the dorsal one 4 mm long, linear and reduplicate with a broad base ; the lateral ones 3×1 mm, broadly ovate and conduplicate with a broad back, subfalcate. Petals 3.5 mm long, purple, slightly curved, acute, entire and reduplicate. Lip superior through a twist of 180 degrees, 2.5×4 mm, purple, rounded, reniform and somewhat fan-shaped, pectinate except for a small portion in the middle ; teeth usually about 8-11, curved, pointing towards the centre ; the claw small



Malaxis versicolor Sant. & Kapad.

A. Plant in flower ; C. Sepals and petals dissected.

concave, just opposite the column. *Column* about 1.5×1 mm, yellow, footless, somewhat constricted in the middle with 2 very short arms. *Anther* whitish, globose; pollinia 4, waxy, in pairs, broadly ovoid. *Stigmatic surface* yellow, oblong-truncate. *Pedicel* with *ovary* 2.5 mm long, deep brown-maroon, strongly ridged. *Capsules* 10×6 mm obovate, pyriform.

Flowering : July to August. *Fruiting* : September to March.

Occurrence : KONKAN : *Law* ; *Stocks* ; Bombay, cultivated, *Kapadia* 1358 ; Hills west of Mulund, *McCann* ; Matheran, *Chibber*. W. GHATS : *Khandala*, *Cooke* ; *Hallberg* ; *Blatter* 35233 ; *Blatter & McCann* ; *Kapadia* 640-641 ; Lonavla, *Garade* ; Panchgani, *Blatter* ; Mahableshwar, *Cooke* ; *McCann* ; Santapau 11804-11805, 13197-13199, 13201, 13240 ; *Kapadia* 2086-2093. DECCAN : Koinanagar, *Kapadia* 2880-2883, 2902. N. KANARA : *Sedgwick* ; Yellapur, *Santapau* 18710 ; *Kapadia* 1983-1986, 2241 ; Castle Rock, *Kapadia* 2851-2853 ; Guddehalli, near Karwar, *Bell* ; *Kapadia* 2143-2144.

Distribution : *India* : Chota Nagpur, Konkan, W. Ghats of Bombay State and S. India, Deccan, N. Kanara. *World* : India, Ceylon.

Notes : The colour of the plant bears a striking relation to the kind of light under which it grows. The Khandala plants were green tinged with purple, with very deep purple prominent nerves, and the plant as a whole looked purplish. These plants were cultivated in St. Xavier's College garden, more or less under the open sky ; the new shoots given off from old stumps did not have the slightest trace of purple, leaves being pure green. Thus the purple coloration seems to be inversely proportional to the light intensity. This effect of light has been more clearly observed in the variations in the colour of the flowers. A number of plants were collected from spots with varying light intensity, from Mahableshwar : (1) In dense forest undergrowth ; (2) at the edges of dense forest ; and (3) along the road among shrubs. At (1) the spikes of flowers were deep purple ; at (2) the flowers were purplish tinged with greenish-yellow ; at (3) the lowermost flowers, which were practically hidden in the shade were of a deep purple colour, the middle ones, receiving some light, were yellowish ; the uppermost, receiving the full sunlight, were pure green.

It is probably due to these variations in colour that Lindley gave the specific epithet *versicolor* to this species.

The nomenclature of this plant is complicated by the fact that two different plants have often been considered identical. O. Kuntze gives the following plants as specifically identical : *Malaxis resupinata* (Forst.) O. Kuntze (1891) ; *Malaxis rheedii* Sw. ; *Epidendrum resupinatum* Forst. ; *Microstylis versicolor* Lindl.

Hooker f. in *Icon. Pl.* t. 1883, distinguishes two plants : (a) *Microstylis rheedii* Wt. (= *Malaxis rheedii* Heyne ex Wall., non Sw. ; Rheede,

Hort. Mal. 12 : t. 27), which is our Indian Plant, and (b) *Microstylis plantaginea* (= *Malaxis rheedii* Sw., non Heyne ex Wall., *Epidendrum resupinatum* Forst.) ; this is a Javanese and Pacific Islands plant, not found in India.

It would seem, therefore, that if these 2 species are accepted as distinct, the oldest legitimate name for our plant is *Microstylis versicolor* Lindl. (non Wt.) and for this reason we herewith propose the new combination, *Malaxis versicolor* Sant. & Kapadia.

3. *Malaxis densiflora* (A. Rich.) O. Kuntze, *Rev. Gen. Pl.* 2 : 673, 1891. *Liparis densiflora* A. Rich. in *Ann. Sc. nat. ser. 2*, 15 : 18, t. 1 B, 1841. *Microstylis versicolor* Wight, *Icon.* 3 (2) : 9, t. 901, 1844-1845 (non Lindl. 1830) ; Hook. f. 691. *M. luteola* Wight, *Icon.* 5 (1) : 4, t. 1632, 1851 ; Ridley 345. *M. pratensis* Ridley in *Journ. Linn. Soc.* 24 : 344, 1888. *M. densiflora* (A. Rich.) Fischer in *Gamble, Fl. Pres. Madr.* 1409, 1928.

We have been unable to collect fresh flowers for detailed examination ; the following is the translation of A. Richard's original description : * Pseudobulbs ovoid, sheathed ; leaves often in pairs, ovate, acute, sheathing at the base, 7-nerved, plicate, glabrous ; scape longer than the leaves, many-angled ; the spike many-flowered, very dense, 2-3 inches long ; the bracts lanceolate, acute, as long as the flowers ; the lip foveolate at the base, flabellate, its margins reflexed and fimbriate into narrow linear strips. Grows among grasses on the hills near Ootacamund and Dodabetta.

Flowers : July to December.

Notes : This species has rather small flowers, which are purple, at times very deep purple. It approaches near many species, which are already known, and like the present one, native of India, among others *Liparis atropurpurea*, *L. nepalensis* ; from all these the present species is clearly distinguished by the beautiful spike and the lip that is concave in its lower part, the margins of which are reflexed and cut into deep, linear and narrow segments. Its flowers are very numerous and form a very dense spike.

Fruiting : October.

Occurrence : N. KANARA : Sirsi, *Hallberg & McCann* 34975.

This species is not mentioned by Blatter & McCann in their Revision. It constitutes a new record for Bombay State.

Distribution : *India* : N. Kanara, W. Ghats of Madras State at high elevations. *World* : India, Ceylon.

Notes : This species is similar to *M. versicolor* Sant. & Kapad. from which it differs in being much smaller and more slender, and the base of the stem is swollen into a more or less distinct pseudobulb.

9. *ERIA* LINDL.

ERIA Lindl. Bot. Reg. t. 904, 1825, nom. cons. ; Endl. Gen. Pl. 192, 1837 ; Benth. & Hook. f. Gen. Pl. 3 ; 509, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 175, 1889 ; Hook. f. Fl. Brit. India 5 : 785, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 115, 1898 ; Duthie, ibid. 9 (2) : 110, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 375, 1905 ; Kränz. in Engl. Pflanzenr. 50 : 15, 1911 ; Schltr. Orchid. 278, 1927 ; Holttum, Rev. Fl. Malaya 1 : 353, 1953. *Pinalia* Buch.-Ham. ex D. Don, Prodr. Fl. Nep. 31, 1825, pro syn. ; O. Kuntze, Rev. Gen. Pl. 2 : 678, 1891.

The generic name *Eria* is derived from the Greek word 'erion' = 'wool', referring to the inflorescence and flowers which are woolly-tomentose in many of the species.

Epiphytic herbs. Each branch of the sympodium with a creeping basal portion ; the erect part pseudobulbous, 1 - to several-noded, one-leaved near the apex only or leafy throughout, the basal portions sheathed. *Racemes* lateral or apparently terminal, with one to many flowers. *Rachis*, *ovary* and *flowers* externally often densely woolly, rarely the leaves and the inner side of the flowers also. *Dorsal sepal* and *petals* similar, free ; lateral sepals produced at the base, connate with the foot of the column to form a more or less prominent mentum. *Lip* affixed to the foot, slightly or not at all mobile, erect, simple, or \pm deeply 3-lobed ; the base of lip never forms a spur but unites with the edges of the foot ; disc 2-callate, or in the form of 2 elevated lines. *Column* free, with an elongate foot. *Anther* 2-celled, each cell again falsely 4-celled ; pollinia 8, pyriform, united in 2 groups of 4, with slender membranous caudicles. *Capsules* oblong, fusiform.

A large and varied genus of over 400 species, distributed throughout the East. It occurs in India, Ceylon, Malaya, Java, Pacific Islands and New Guinea.

In the list of *Nomina conservanda*, *Eria* is marked with a sign indicating that conservation is unnecessary. This is correct only as far as *Pinalia* Buch.-Ham. is concerned. O. Kuntze lists *Dendrolirium*, *Myrcaranthus*, *Trichotosia*, *Ceratium*, *Cylindrolobus* of Blume, July 1825, as earlier names for *Eria* Lindl., Aug. 1825. Conservation against these names is certainly necessary.

Eria Lindl. has been variously divided into sections by different authors. The 5 Bombay species belong to the following 3 sections of Hooker. f. : *Eria* sect. *Conchidium* (*E. reticosa* Wt.) ; *Eria* sect. *Bryobium* (*E. dalzellii* Lindl., *E. microchilos* Lindl., *E. exilis* Hook. f.) ; and *Eria* sect. *Hymenaria* (*E. mysorensis* Lindl.).

Type species : *E. stellata* Lindl.

KEY TO THE SPECIES OF *ERIA*

1. Pseudobulbs discoid ; flowers 20-30 mm

- long, solitary *reticosa*
1. Pseudobulbs discoid or conical-ovoid ; flowers under 12 mm long, in racemes ;
 2. Pseudobulbs conical-ovoid, 3 × 1.2 cm ; leaves 5-13 cm long ; scapes shorter or rarely equalling the leaves ; pedicels and ovary puberulous *mysorensis*
 2. Pseudobulbs discoid, 4-15 mm in diam. ; leaves up to 8 cm long ; scapes longer than leaves ; pedicels and ovary glabrous ;
 3. Scape usually without (rarely with) leaves, zig-zag, 1-4 cm long ; flowers 2 mm long, greenish-white *exilis*
 3. Scape always with leaves, straight, 3-9 cm long ; flowers 7-9 mm long, pale yellow :
 4. Flowers secund ; bracts up to 3 times longer than ovary ; sepals and petals fringed with capitate glands, acute ; lip panduriform without callosities at the base *dalzellii*
 4. Flowers usually not secund ; bracts slightly longer than ovary ; sepals and petals entire, without glands, acuminate ; lip narrowly obovate-lanceolate, base with 2 callosities, apex tapered, distinctly crenulate *microchilos*

ENUMERATION OF THE SPECIES OF *ERIA*

1. *Eria reticosa* Wight, Icon. 5 (1) : 4, t. 1637, 1851 ; Hook. f. 787 ; Gammie in J. Bombay nat. Hist. Soc. 17 : 36, 1906 ; Blatt. & McC. ibid. 35 : 272, 1931 ; Cooke, Fl. Pres. Bomb. 2 : 690, 1907 ; Santapau in Rec. bot. Surv. India 16 (1) : 300, 1953. *E. uniflora* Dalz. in Hook. Journ. Bot. 4 : 111, 1852. *E. braccata* Dalz. & Gibs. Bomb. Fl. 262, 1861 (non Lindl. 1859) ; Kränz. in Engl. Pflanzenr. 50 : 18, f. 1 A-B, 1910 ; Fyson, Fl. Nilg. Pult. Hill-Tops 2 : 386, t. 243, 1915 ; Fischer in Gamble, Fl. Pres. Madr. 1425, 1928 (an Lindl. ?). *Pinalia reticosa* (Wight) O. Kuntze, Rev. Gen. Pl. 2 : 679, 1891. *Eria rupestris* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 270, f. 6, 1931. (See Plate XXXIV)

Epiphytes or *lithophytes*. Pseudobulbs 7-15 mm across, discoid, covered with a reticulate sheath, which becomes loose on drying. *Shoots*

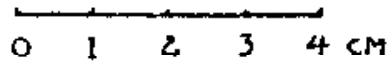
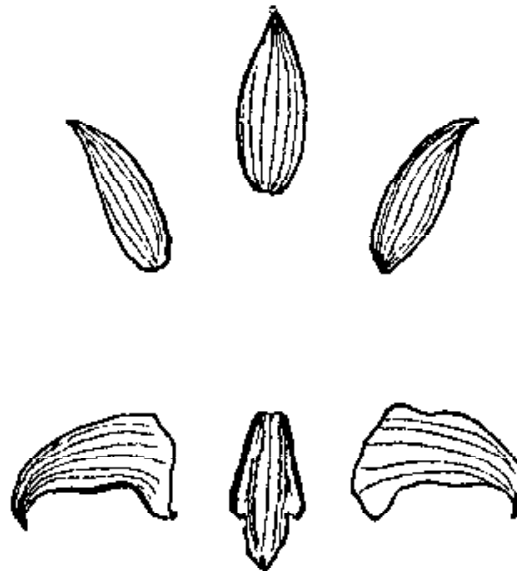
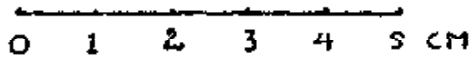
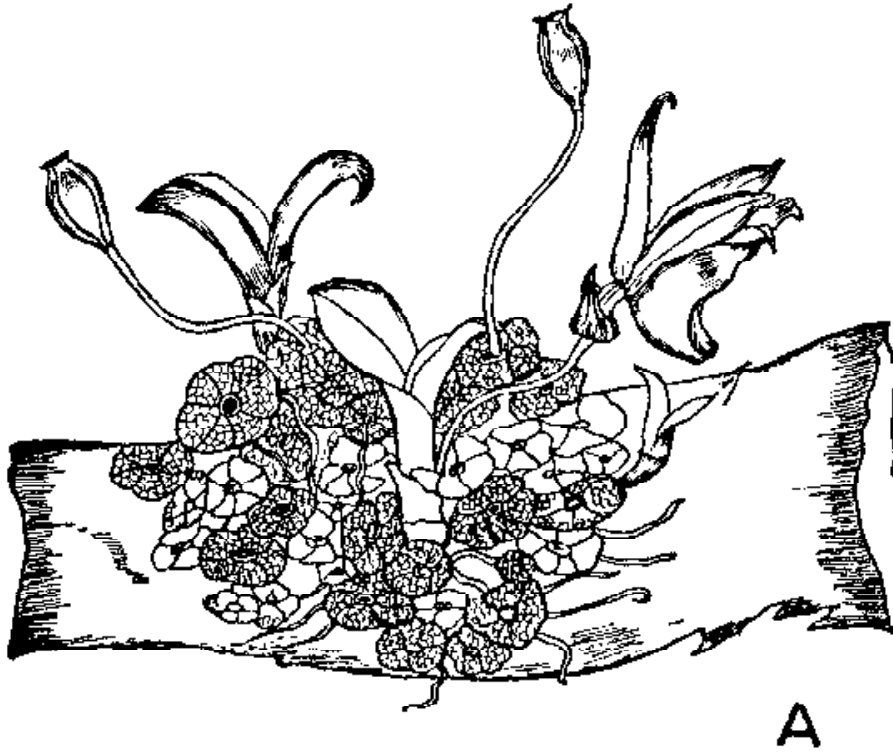
1-2, arising from the base of the pseudobulb, sheathed at the base ; sheaths 2-3, each 7-13 mm long, cylindrical, oblique at the mouth, denticulate, mucronate, greenish below, dingy purple above. *Leaves* 2, appearing together with the flowers, 2-7 × 0.8-2 cm, ovate, broadly oblong or oblong-lanceolate, tapered at base, acute, mucronulate, entire, dark green, often tinged with brownish purple. *Buds* boat-shaped, pale greenish purple. *Scapes* 1-flowered, arising from the upper sheath generally from the side, about 1 mm thick, 2-4 cm long, purplish curved by the weight of the flower. *Flowers* white, variable in size, sweetly and strongly scented. *Pedicels* with ovary 4-5 mm long, slightly curved, white within the bract, light brown on emergence. *Bracts* 9 × 3-5 mm membranous, pale brown-purple, almost orbicular in outline, cordate, mucronate, sheathing pedicel and ovary to a little more than half their length ; margins frilled, wavy, slightly turned outwards ; midrib and 2 lateral veins distinct. *Sepals* subequal, white or often suffused with pale pink, broadly oblong-lanceolate, mucronate, entire, glabrous, 9-nerved ; dorsal sepal 20-37 × 5-7 mm ; lateral ones 19-34 × 5-7 mm, somewhat broadly falcate ; mentum 8-11 mm long, curved, oblong-conical, white, emarginate. *Petals* 18-32 × 5-7 mm, white, often suffused with pink, oblong-lanceolate, acute or submucronulate, 7-nerved, glabrous. *Lip* 19-23 mm long, oblong-obovate in outline, sessile on foot of column, 3-lobed ; lateral lobes 5-7 × 1-2 mm, narrowly oblong, ± ear-like, acute or rounded, entire, red-margined, with 2 orange-yellow crests running from base of lip to beyond lateral lobes ; tips of lateral lobes and area in between orange-yellow ; midlobe 8-10 × 4 mm, oblong, often slightly dilated in apical half, rounded or tapering at apex, crenulate. *Column* short, white, tinged with green ; foot 10 × 3 mm, curved, narrowly oblong, yellow with reddish purple margins and parallel purple veins on inner face, paler towards apex. *Anther* 3 × 3 mm, white above, reddish inside, obovate-oblong, produced into ± conical apiculum in front, subconcave at back ; pollinia 8, yellow, the upper 4 ovoid-oblong, lower 4 minute, all attached to short granular membrane. *Stigmatic surface* pale green with stellate marking in centre. *Capsules* 12 × 8 mm, oblong to obconical, truncate at apex, erect, with 6 strong ridges.

Flowering : June to July. *Fruiting* : August to March.

Occurrence : KONKAN : *Woodrow*. W. GHATS : *Dalzell* ; *Khandala*, *Blatter ex Santapau* ; *Lonavla*, *Gammie* ; *Panchgani*, *Blatter* 228-229 ; *May Langham* ; *Kapadia* 1348-1349, 2052-2053 ; *Mahableshwar*, *McCann* ; *Sedgwick* 7631 ; *Santapau* 13225 ; *Kapadia* 610, 615, 1198, 1200, 2094-2095 ; *Rumghat*, *Ritchie*. N. KANARA : *Castle Rock*, *Bell* 4336 ; *Kapadia*.

Distribution : Konkan, W. Ghats, southwards to Nilgiris and High Wavy Mountains.

Notes : On perpendicular rocks or tree trunks in open situations,



Eria reticosa Wight

A. Plant with support ; C. Sepals and petals dissected.

always directly facing the monsoon currents.

We have examined *Blatter* 228, 229, 'Co-types' of *E. rupestris* Blatt. & McC., and have collected fresh material from its type locality. *Blatter & McCann* distinguish their *rupestris* from *reticosa* Wt. by the presence of a bilobed mentum. But *Wight's* Icon of *E. reticosa* shows the mentum emarginate, and in appearance bilobed. After careful examination of fresh flowers we can see no difference by which to keep the two species apart. There are, however, considerable variations in the size of the floral parts, the Panchgani flowers being considerably smaller than those collected from Mahableshwar.

2. *Eria mysorensis* Lindl. in Journ. Linn. Soc. 3 : 54, 1858 ; Hook. f. 793 ; *Gammie* 37 ; *Cooke* 692. *E. pubescens* Wight, Icon. 5 (1): 4, 1851 ; Hook. f. 793 ; *Kränz.* 64 ; *Fischer* 1425 ; Blatt. & McC. 275 (non Lindl. 1825). *E. polystachya* Wight, Icon. t. 1634, 1851 (non A. Rich. 1841). *Pinalia mysorensis* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 679, 1891.

Pseudobulbs 3 cm long, about 1.2 cm broad at the base, conico-ovoid, sheathed ; the older ones dry, rugose, irregularly and longitudinally furrowed. Leaves 3-5, arising \pm from apical portion of pseudobulb, 5-15 \times 1.2-2 cm, oblong-lanceolate or elliptic-lanceolate, acute, distinctly tapered, glabrous or sparsely pubescent. Scapes shorter than the leaves, rarely equal to them, 1-2 per plant ; peduncles slender, glabrous or sparsely puberulous, terete. Flowers 12-16 mm long. Bracts about 8 \times 3-4 mm ovate or ovate-lanceolate, often reflexed, entire, glabrous, acute. Pedicel with ovary 10 mm long, slender, curved, sparsely puberulous. Sepals and petals linear-lanceolate, broad at base, falcate, subacuminate, glabrous, entire, 3-nerved ; dorsal sepal 11-13 \times 3 mm ; lateral ones 10-11 \times 3 mm. Petals 9-10 \times 2 mm. Lip 7-8 mm long, minutely clawed, arcuate, subcordate at base, oblong, subpandurate, about 4 mm across the lateral lobes ; midlobe 2-3 mm long, obovate-triangular, acute or apiculate, finely irregularly crenulate ; the base of the lip with 2 arched, slightly thickened ridges. Column 4 mm long, slender, \pm straight ; foot at right angles to column, about 2.5-3 mm long, narrow. The colour of the flowers is given in the literature as white tipped with pink ; lip with purple blotches at the base, apical part yellow.

Flowering : July.

Occurrence : KONKAN : *Stocks*. W. GHATS : Mahableshwar, *Hallberg* ex *Blatter & McCann*. DECCAN : Koina Valley, below Mahableshwar, *Cooke*. N. KANARA : *Law*.

Distribution : Konkan, W. Ghats, Deccan, N. Kanara, western slopes of the Nilgiris.

Notes : Our description has been made from specimens examined in

the herbarium of the Bot. Surv. India (West. Circle), Poona, with the kind permission of the Regional Botanist.

There is a certain amount of confusion in the literature about the present and related species. The identity of *E. pubescens* Wt. with *E. mysorensis* Lindl. seems to be beyond doubt ; some of the confusion seems to have arisen with Hooker f. who assigned to the former species some of the characters of *E. polystachya* A. Rich.

In *E. polystachya* A. Rich. pedicel and ovary are densely pilose, sepals densely pilose on the outer side, lip entire, ovate-lanceolate, flowers pale yellow. *E. mysorensis* Lindl. has pedicel and ovary sparsely puberulous, sepals glabrous, lip oblong constricted in the middle, flowers white. The true *polystachya* does not seem to occur in Bombay.

3. *Eria exilis* Hook. f. Fl. Brit. India 5 : 788, 1890, et Icon. Pl. t. 2074, 1891 ; Kränz. 21 ; Fischer 1425 ; Blatt. & McC. 274. *Pinalia exilis* (Hook. f.) O. Kuntze, Rev. Gen. Pl. 2 : 679, 1891. *Eria microphyton* Schltr. in Fedde, Repert. 2 : 170, 1906. *E. minima* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 274. f. 2, 1931.

Minute epiphytes. Pseudobulbs 3-12 mm across, flat, irregularly orbicular, usually in 3's forming a chain on tree trunks ; veins usually running the whole length of the pseudobulbs, rarely branching. Leaves sessile, appearing usually before the flowers, often persistent till flowering, 2-3, arising from a pseudostem 2-3 mm high, lamina 2-25 × 2-11 mm, obovate-elliptic or oblong to obovate, glabrous, 7-9-nerved, tapering to the sheathing base, rounded apiculate at apex, margins entire, minutely papillate. Scape 1-4 cm long, from between the leaves, sheathed at base, flexuose, capillary, bracteate at every bend. Bracts 1-2 mm long, broadly ovate, cordate, cymbiform, acute or apiculate or acuminate, semi-amplexicaul, hyaline, entire, about as long as the ovary. Flowers up to 12 in a raceme, each 2 mm long, subsessile, bracteate, translucently greenish white ; generally only 1-2 flowers mature at a time. Sepals ± equal ; dorsal one 2 × 1.25 mm, oblong, entire, obtuse, 1-nerved ; lateral sepals 2 mm long, 1.5 mm broad at base, subfalcate, obtuse or apiculate ; midnerve prominent, lateral pair of nerves indistinct. Mentum stout, saccate, about equaling the upturned tips of the sepals. Petals 1.25 × 0.75 mm, shorter than sepals, 1-nerved, narrowly oblong or sub lanceolate, acute, broadest about the middle, entire. Lip 1.5 mm long, very slightly stipitate, arcuate, oblong-ligulate, apiculate, equal to petals, fleshy, olive-green, enclosed within the much longer sepals. Column very small with 2 small hook-like arms ; foot 1.25 mm long, curved, stout. Ovary about 1 mm long, oblong, with a very short pedicel. Capsules 5 × 1.5 mm, broadly ovoid, green, faintly ribbed.

Leaves : June to October. Flowering : October to December.

Fruiting : October to May.

Occurrence : W. GHATS : Mahableshtar, Cooke ; Blatter & Hallberg 1683 ; Sedgwick 7631 ; Ezekiel ; McCann ; Santapau 11873, 11979, 13133 ; Bole 329 ; Kapadia 583, 606, 611, 902, 937, 1210, 1917. N. KANARA : Anmod, Sedgwick ; Bell ; Siddhapur, Sedgwick ; Jog, Sedgwick ; Gersoppa Falls, Hallberg & McCann 34855 ; Castle Rock, Santapau 17695.

Distribution : India : W. Ghats, N. Kanara, Travancore. World : India, Siam.

Notes : Blatter & McCann give *E. exilis* Hook. f. for Bombay Presidency on the evidence of Cooke's sheet from Mahableshtar, preserved in the National Herbarium, Calcutta.

Santapau in his MSS notes points out that the type of *E. exilis* Hook. f. in Kew Herbarium (Travancore, Johnson, Herb. R. Wight Propr.) has a bracteate scape. Hooker f. in his *Icones* refers to this specimen, from which the Icon was drawn ; the latter remarkably fits Blatter & McCann's description of *E. minima*.

In our specimens from Mahableshtar the petals very slightly, being more or less half as long as the sepals ; the lip more or less equalling the petals.

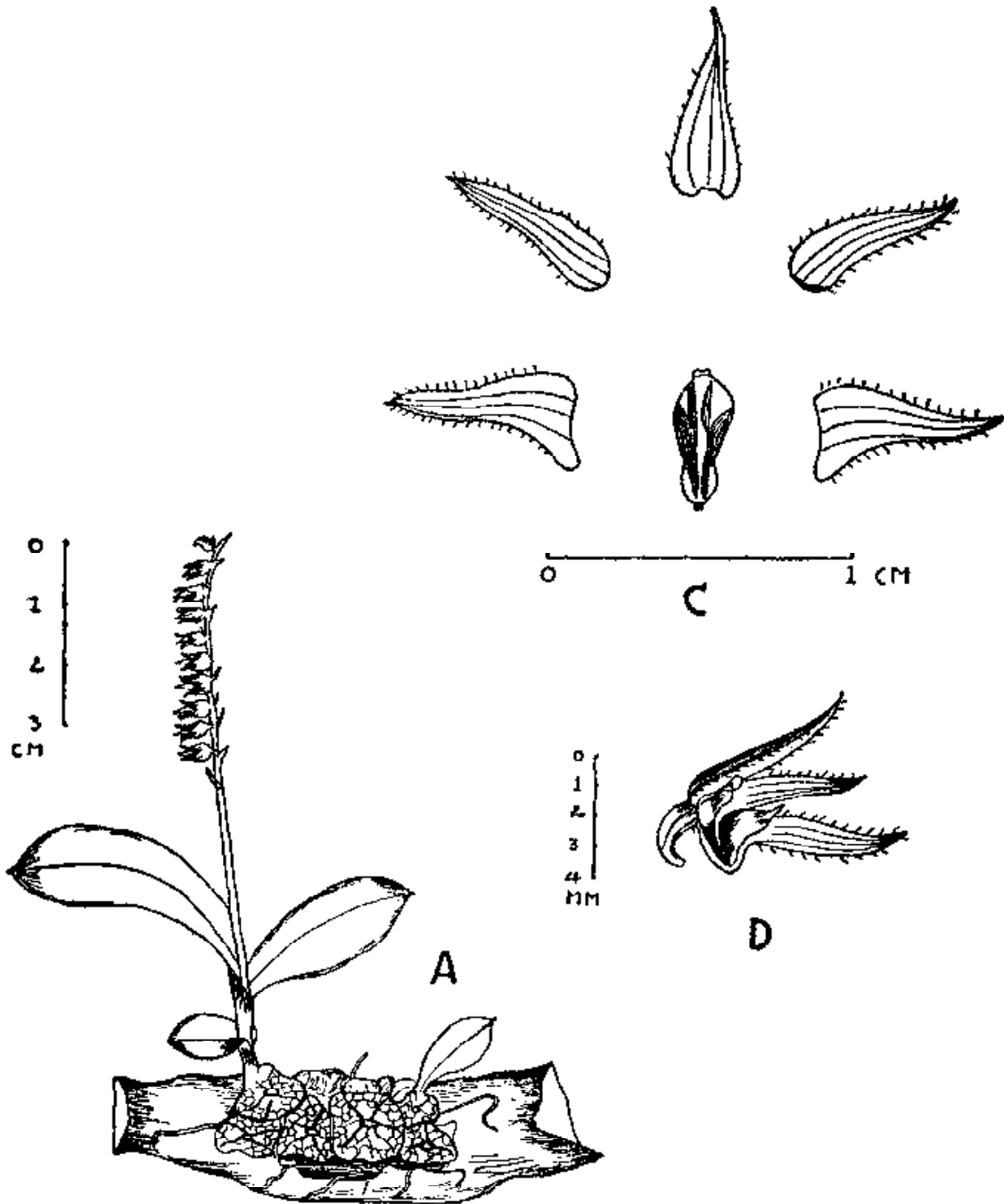
Blatter & McCann describe the floral bracts of *E. exilis* Hook. f. as lanceolate ; but Hooker f. in his original description notes them as large and cymbiform, (this is exactly like in *E. minima* Blatt. & McC.). Actually Blatter & McCann's description of *E. exilis* Hook. f. seems to be more or less completely based on Schlechter's description of *E. microphyton* (which has been reduced to a synonym of *E. exilis* Hook. f. by Kränzlin).

The flowers of *E. exilis* Hook. f. as given by Blatter & McCann are 3 mm in length ; on the other hand, Sedgwick 7631, identified by Blatter & McCann as *E. minima*, has flowers up to 3 mm long.

It is clear, then, that *E. minima* Blatt. & McC. is identical with *E. exilis* Hook. f. and cannot stand as an independent species.

4. *Eria dalzellii* Lindl. in Journ. Linn. Soc. 3 : 47, 1858 (nom. et syn. tantum, non descr.). *Dendrobium dalzellii* Hook. in Hook. Journ. Bot. 4 : 292, 1852. *D. fimbriatum* Dalz. ibid. 4 : 292, 1852, nom., pro syn. (non Hook. 1825, nec Lindl. 1830). *Eria microchilos* Lindl. in Journ. Linn. Soc. 3 : 47, 1858 ; Dalz. & Gibs. 262 ; Gammie 36 ; Cooke 691 ; Blatt. & McC. 273 (excl. syn. *D. microchilos* Dalz.) ; (omnes descr. tantum, non nom.). *E. dalzellii* Hook. f. Fl. Brit. India 5 : 789, 1890 ; Kränz. 19 (partim). *E. dalzellii* var. *fimbriata* Hook. f. Fl. Brit. India 5 : 789, 1890 ; Kränz. 20 ; Fischer 1425. (See Plate XXXV)

Epiphytes. *Pseudobulbs* 0.8-1.5 cm in diam., discoid, the principal



Eria dalzellii Lindl.

A, Plant with support ; C, Sepals and petals dissected ; D, Side view of single flower with lateral sepal and petal removed,

veins white and flabellate. *Leaves* 3-5, sessile, sheathing at the base, 1-7 × 0.7-1 cm, elliptic to oblanceolate, obtuse, minutely micronulate, olive-green, paler, entire, minutely papillate at the margins, the midnerve depressed above, prominent below with 2 to 4 faint lateral nerves. *Racemes* 3-9 cm tall, erect, generally secund or subsecund; peduncles 3 cm long, 0.5-1 mm thick, greenish yellow, terete, glabrous, ebracteate, usually slightly curved. *Flowers* faintly perfumed, pedicellate, bracteate. *Bracts* 3-6 mm long, 0.5-1 mm broad at base, erect, pale greenish yellow, lanceolate, subacuminate, entire, curved at apex. *Sepals and petals* 6 × 1.5-3 cm, pale creamy yellow, triangular-ovate to lanceolate, acute or subacuminate, 3-nerved; the margin entire with hyaline, stalked glands. *Mentum* about 0.5 mm long, rounded, pale orange-yellow. *Petals* slightly narrower than sepals and rounded at base. *Lip* 3-4.5 × 1.5 mm, falcate, concave in basal half, straight upwards, minutely papillate, panduriform on spreading, the basal part broad, ovate with edges entire incurved, and 2 fairly thick yellowish orange ridges, which unite in the middle of lip and pass as one furrow into the white, much smaller, rounded apical lobe; the latter has the edges somewhat crenulate and slightly decurved. *Column* about 1 mm long, pale yellowish, oblong, broad at base; foot 2 mm long, ± at right angles to column, broad at base, pale yellow tinged with orange at the obtuse apex. *Anther* ovate, yellow; pollinia yellow, waxy, 8, in 4 pairs, each pair consisting of one broadly pear-shaped pollinium and another smaller narrowly linear. *Stigmatic surface* minute, yellowish. *Ovary and pedicel* 2 mm long, curved, greenish yellow. *Capsules* 5 × 1.5 mm, elliptic to obovate.

Flowering: July to August. *Fruiting*: August to October.

Occurrence: KONKAN: *Stocks*; *Gammie*; Wari Country, *Dalzell & Gibson*. W. GHATS: *Khandala*, *Hallberg*; *Sedgwick*; *Santapau* 233.9, 233.13, 582, 624, 720, 1036, 2244, 2451, 4613-4614, 4706, 4743, 4894, 5050, 6828, 6829, 12903, 14488, 15688; *Kapadia* 522, 556, 580; Mahableshwar, *Cooke*; *Santapau* 13164, 13167; *Bole* 408; *Kapadia* 602-603. DECCAN: *Koinanagar*, *Kapadia* 2885, 2901. N. KANARA: *Devimane*, *Hallberg & McCann* 34466.

Distribution: Konkan, W. Ghats of Bombay and south peninsular India, Deccan, N. Kanara.

Notes: There is great confusion in our botanical literature about *Eria dalzellii* Lindl. and *E. microchilos* Lindl. These species are based respectively on *Dendrobium dalzellii* Hook. and *D. microchilos* Dalz. Some authors have actually fused the two species into one. We are convinced that the two species are quite distinct, and may be separated by the following characters.

E. microchilos
Slender herbs

E. dalzellii
More robust herbs

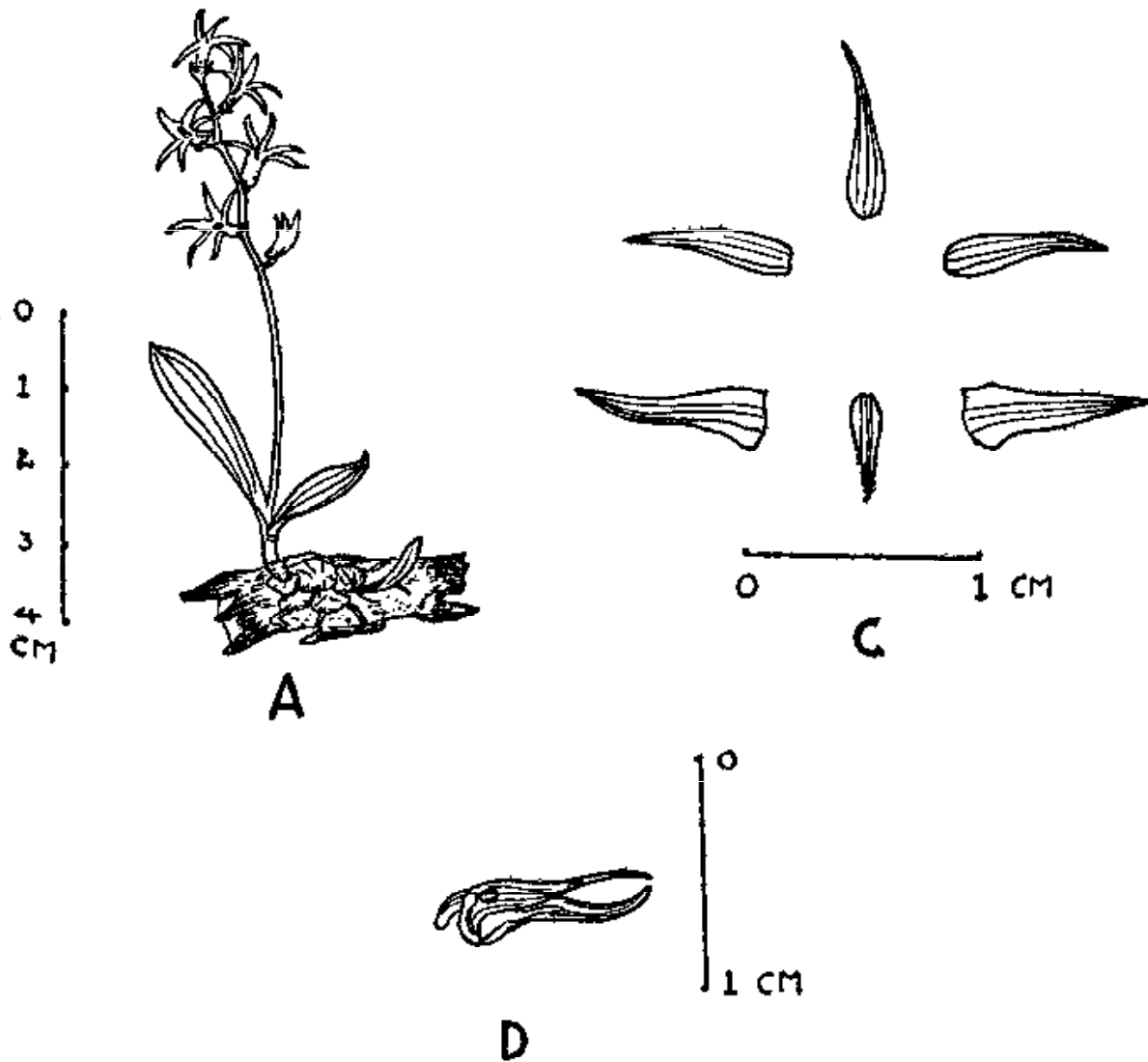
Peduncle \pm filiform	Peduncle \pm stout
Racemes not secund or subsecund	Racemes secund or subsecund
Floral bracts just longer than ovary	Floral bracts up to 3 times longer than ovary
Sepals and petals longer, acute. Margins without glands	Sepals and petals shorter, acute. Margins with capitate glands.
Lip \pm fleshy, scarcely lobed, ovate-lanceolate, with 2 clear callosities at base, apical portion distinctly crenulate	Lip thin, pandurate, without callosities at base, apical portion subcrenulate

5. *Eria microchilos* Lindl. in Journ. Linn. Soc. 3 : 47, 1858 (nom. et syn. tantum, non descr.). *Dendrobium microchilos* Dalz. in Hook. Journ. Bot. 3 : 345, 1851. *Eria dalzellii* Lindl. in Journ. Linn. Soc. 3 : 47, 1858 ; Dalz. & Gibs. 262 (partim) ; Gammie 36 ; Blatt. & McC. 273 ; Cooke 691 ; Fischer 1425 ; (omnes descr. tantum, non nom.). *E. dalzellii* Hook. f. Fl. Brit. India 5 : 789, 1890 ; Kränz. 19, f. 2 A-C (partim). *E. filiformis* (Wt.) Reichb. f. in Walp. Ann. 6 : 268, 1891 (partim). (See Plate XXXVI)

Epiphytes. *Pseudobulbs* 4-10 mm across, pale dull green, discoid principal veins reticulate. *Leaves* 2-5, sessile, 1.5-8 \times 0.2-6 cm, oblong lanceolate or narrowly linear-oblong, distinctly tapered to the base, rounded mucronulate at apex, entire, 1-nerved. *Scape* slender, often filiform, 2.5-8 mm long, ebracteate, pale yellow. *Flowers* usually not secund, pale yellowish white, pedicellate. *Bracts* about 3 mm long, longer than ovary, narrowly lanceolate, acute, entire. *Sepals* and *petals* pale yellowish, spreading, often slightly reflexed at apex, narrowly lanceolate-acuminate, thin, 3-nerved, margins entire without capitate glands. *Sepals* 8 mm, long, 1.5 mm broad at base ; mentum 1.5-2 mm long, obtuse, slightly curved, somewhat saccate. *Petals* 7 mm long, about 1.5 mm broad at base. *Lip* 4 mm long, narrowly oblong, lanceolate, hardly divided ; basal half about 1 mm broad with 2 thickened yellow ridges throughout entire length ; apical half very narrow, margins crenulate, much tapered to acute apex. *Column* minute, broad ; foot 1.5 mm long, slightly curved. *Anther* more or less quadrately-orbicular with a rounded apiculum on top ; pollinia 8, in 4 unequal pairs. *Ovary* with *pedicel* 1.5-2 mm long. *Capsules* 3-3.5 \times 2 mm long, ribbed ; stalk 1 mm long.

Flowering : July to August. *Fruiting* : August to October.

Occurrence : KONKAN : Stocks. W. GHATS : Igatpuri, Kapadia 1386 ; Khandala, Hallberg ; Blatter ; McCann ; Santapau 623, 2450, 4604, 4707, 4895, 6903 ; Kapadia 505, 533, 2297 ; Lonavla, Chibber ; Mahableshwar, McCann ; Kapadia 2099. DECCAN : Bhimashankar, Kapadia 1461. N. KANARA : Yellapur, Bell 3909 ; Karwar, Bell ;



Eria microchilos Lindl.

A. Plant with support ; C. Sepals and petals dissected ; D. Side view of single flower with lateral sepal and petal removed.

Jog, *Sedgwick* 7171.

Distribution : Konkan, W. Ghats of Bombay, Mysore, Madras, and Kerala States, Deccan, N. Kanara.

Notes : In the field, this species stands out from *E. dalzellii* on account of the type of inflorescence ; it is not secund as in the latter species.

10. *PORPAX* LINDL.

PORPAX Lindl. in Bot. Reg. 31 : misc. 66, 1845 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 176, 1889 ; King & Pantl. in Ann. R. Bot. Gard Calcutta 8 : 113, 1898 ; Kränz. in Pflanzenr. 50 : 162, 1911 ; Holttum Rev. Fl. Malaya 1 : 393, 1953. *Eria* sect. *Porpax* Benth. & Hook. f. Gen. Pl. 3 : 509, 1883. *Aggeianthus* & *Lichenora* Wight, Icon. 5 (1) : 18, 1851.

The generic name *Porpax* is derived from a Greek word meaning 'the handle of a shield' probably referring to the shape of the lip of the flower. According to E. Cooper (in *Dict. Gard.* 3 : 1646, 1951) the generic name refers to the form of the flower.

Minute epiphytic herbs. *Pseudobulbs* close together form a short rhizome, nearly flat, discoid, covered with reticulately nerved sheaths. *Leaves* 2, usually deciduous. *Flowers* solitary, sessile, terminal, large for the plant. *Sepals* more or less connate below into a tube, free and spreading above of the dorsal sepal occasionally connate up to half its length ; lateral sepals somewhat oblique and prominent at the base, adnate to the column-foot, glabrous or pilose. *Petals* free, short, more or less included within the tube and inserted on the dorsal side of the column. *Lip* short, fleshy, entire or somewhat 3-lobed, loosely articulated on the foot of the column, rarely very minute. *Column* short, terete, extended into a long foot. *Anther* opercular, semi-globose or depressed, 2-celled, each of the loculi falsely 4-celled ; pollinia 8, cohering in pairs, one mass in each pair being usually smaller than the other, more or less pyriform. *Capsules* small, ovoid-orbicular.

This is a small genus of about 6 species, distributed through the Malayan Peninsula and tropical Himalayas to south peninsular India and Ceylon.

The genus *Porpax* approaches nearest to *Eria*, but has the habit of *Trias* and the calyx of *Musdevallia*, as has been pointed out by Lindley. It differs from *Eria* in its habit and in the sepals which are formed into a tube.

Type species : *P. reticulata* Lindl.

KEY TO THE SPECIES OF *PORPAX*

Leaves developing after the flowers, obovate-elliptic or spatulate, minutely papillate, more so on margins ;

flowers tubular, deep red-brown, glabrous outside,
papillate or pilose within

reticulata

Leaves appearing with the flowers, oblong-orbicular,
ciliolate, tessellated ; flowers 2-lipped, dirty orange-
brown, densely setulose, almost tomentose outside,
glabrous and smooth within

jerdoniana

ENUMERATION OF THE SPECIES OF *PORPAX*

1. *Porpax reticulata* Lindl. in Bot. Reg. 31 : misc. 66, 1845 : Cooke 689 ; Kränz. 165 ; Fischer 1422 ; Blatt. & McC. 268. *Aggeianthus marchantioides* Wight, Icon. 5 (1) : 18, t. 1737, 1852, (Hook. f. et Kränz. *A. reticulatus* per sphalm.). *Eria reticulata* (Lindl.) Benth. & Hook. f. Gen. Pl. 3 : 509, 1883 ; Hook. f. 786 ; Gammie in J. Bombay nat. Hist. Soc. 17 : 35, 1906. *Pinalia reticulata* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 679, 1891. *Porpax papillosa* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 268, f. 4, 1931 ; Santapau in Rec. bot. Surv. India 16 (1) : 300, 1953.

Pseudobulbs about 2 cm across, whitish green, button-like, orbicular, covered with white lacy sheaths of reticulate nerves. *Shoot* 0.5-1 × 0.2-0.3 cm, slightly dilated at the base or not, sheathed ; sheath 5 × 3-4 mm, light brown, membranous, crisped, broadly oblong-suborbicular, acute, entire, minutely papillate, glabrous, gland-dotted, many-nerved. *Leaves* very small at flowering, about 5 × 3-4 mm, becoming 5-5.5 × 1.5 cm later, sheathing, sessile, broadly oblong or obovate-elliptic or spatulate, entire, minutely papillate (papillae more prominent in young leaves), acute or rounded with a minute blackish mucro ; both surfaces minutely papillate ; the papillae often disappearing in old and mature leaf-surfaces. *Flower* solitary, arising from below the pseudobulb from a tube-like structure formed by the young leaves and the sheaths surrounding them ; tubular, deep red-brown ("Brazil Red" [Ridg. I, 5-i] according to Santapau), very shortly pedicellate. *Pedicel* with *ovary* 3-4 mm long, deep red-brown. *Bract* 6 × 7 mm, pale dirty brown, membranous, ± flabellate, suborbicular, retuse, irregularly denticulate, gland-dotted, 1-nerved. *Sepals* united to form a subcampanulate tube, 14 × 6-8 mm, deep red-brown, saccate at base, 3-lobed at the apex, glabrous outside, densely and minutely papillose in regular rows inside ; lobes broadly ovate, rounded, mucronulate. *Petals* 8 × 3 mm, deep red-brown, parallel, reaching the sinus of the calyx-tube, spatulate, subfalcate, acute, densely and minutely papillose, 3-nerved, rarely indistinctly 5-nerved. *Lip* 5 × 4 mm, panduriform, somewhat arcuate, 3-lobed, toothed at the base, shortly clawed ; tooth about 2 mm long, subulate, acute, entire, rounded at back, shallowly grooved in front ; nerves of lip 3 ; lateral lobes 3 × 2 mm, parallel, erect, broadly triangular, rounded, entire or slightly wavy, minutely and sparsely

papillose ; midlobe 2×3 mm, broader than long, suborbicular, obtuse or subentire, irregularly denticulate, densely papillose. *Column* 2×1 mm, oblong, produced below into foot 2 mm long, curved ; *clinandrium* \pm square with 2 longitudinally parallel ridges. *Anther* 1×1 mm, broadly oblong with a rounded apiculate apex, seated on top of column and articulated at back. *Stigmatic surface* broad, rounded, oblong ; *Capsules* $10 \times 6-8$ mm, obovoid-orbicular, pale green, ribbed, tumid ; stalk 3-4 mm long.

Leaves : July to October. *Flowering* : June. *Fruiting* : August to October.

Occurrence : W. GHATS : Khandala, Hallberg ; Blatt. Herb. 27629 ; Santapau 743, 823, 2150, 2252, 2620, 2808, 4516, 6930 ; Kapadia 525 ; Lonavla, Kapadia 549, 1168-1170. DECCAN : Koina Valley, Kapadia 2916. N. KANARA : Chandwar, Ritchie ; Yellapur, Kapadia 2237-2239 ; Sirsi, Sedgwick & Bell 7002 ; Kumbharwada, Bell 6040 ; Castle Rock, Kapadia 2822-2823 ; Anmod, Kapadia 1896-1897 ; Guddehalli Hill, near Karwar, Bell & Sedgwick.

Distribution : Throughout the Western Ghats, Deccan, N. Kanara, Iyamaalai Hills, and South Malabar.

Notes : Khandala on the W. Ghats is the type locality of *P. papillosa* Blatt. & McC. We have examined numerous flowers of this plant, and cannot see how we can maintain it separate from *P. reticulata* Lindl. It is true that in the literature we find no reference to the papillate leaves, on which Blatter & McCann lay much stress. Such papillae are quite clear in young fresh plants, but seem more or less to disappear in old, especially dry plants. The lip is said to be ligulate, not panduriform in *papillosa* ; but in our collections from Khandala we have always found the lip to be distinctly panduriform when properly spread out. We consider *P. papillosa* to be conspecific with *P. reticulata* Lindl.

2. *Porpax jerdoniana* (Wt.) Rolfe in Orch. Rev. 16 : 18, 1908 ; Kärnz. 163 ; Fischer 1422 ; Blatt. & McC. 269, f. 5. *Lichenora jerdoniana* Wight, Icon. 5(1) : 18, t. 1748, 1851. *Eria lichenora* Lindl. in Journ. Linn. Soc. 3 : 46, 1859 ; Hook. f. 787 ; Gammie 35. *E. jerdoniana* (Wt.) Reichb. f. in Walp. Ann. 6 : 267, 1861. *Pinalia jerdoniana* (Wt.) O. Kuntze, Rev. Gen. Pl. 2 : 679, 1891. *Porpax lichenora* (Lindl.) Cooke, Fl. Bomb. Pres. 2 : 689, 1907.

Epiphytes or *lithophytes*. *Pseudobulbs* about $10 \times 3-6$ mm, variously shaped, often discoid with reticulately veined sheaths, olive-green. *Leaves* 2, appearing with the flowers, opposite, sheathing at the base, about $1-2 \times 1-2$ cm, oblong-orbicular, retuse or mucronulate, ciliolate ; midnerve depressed above, prominent below, lateral ones whitish beautifully tessellated on a deep green background. *Flowers*

2 or 3 from the centre of the leaves, dirty orange-brown, almost sessile, clearly 2-lipped, densely setulose almost tomentose, bracteate. *Bracts* about 3×5 mm, transversely oblong-orbicular, membranous, translucent, sparsely gland-dotted, ciliolate. *Sepals* unequal, glabrous and deep reddish brown inside, fleshy, densely setulose almost tomentose, dirty orange-brown outside, with thick margins; dorsal sepal 7×5 mm, broadly obovate-oblong to almost orbicular, obtuse, 3-nerved, concave and forming the upper lip of the flower, united at the base with the lower lip; lateral sepals united to form the lower lip; which is 9×5 mm, concave, connate along the foot of the column, slightly produced below to form a small globular sac. *Petals* $5-6 \times 1-2$ mm pale yellowish orange, parallel, narrowly linear-oblong, \pm sinuately curved and \pm dilated at obtuse apex, entire, 3-nerved minutely papillate. *Lip* minute, 3 mm long, subarcuate, \pm mobile on the column-foot, minutely clawed, shallowly lobed, yellowish-orange, sides erect; limb very obscurely pandurate-oblong, about 1.5 mm broad, apical part minutely papillate, with a small obtuse apiculum which is also minutely papillate. *Column* minute, pale yellowish, foot 2-3 mm long, slightly curved and upturned at apex. *Anther* 1×1.5 mm broadly orbicular, with a minute apiculum; pollinia 8, waxy, narrowly pyriform, apiculate, all equal. *Ovary* shortly pedicellate, densely setulose, about 3-4 mm, long.

Flowering : June to July. *Fruiting* : July.

Occurrence : KONKAN : *Stocks*; *Law*; Tungar Hill, N. Y. Das. DECCAN : Koina Valley, *Kapadia* 2917-2919. N. KANARA : Belgaum Ghats, *Spooner*; Kadra, *Bell*; Anshi, *Bell*.

Distribution : Konkan, W. Ghats of Bombay State, Deccan, Kanara, Bababudan Hills, Malabar and Travancore.

Notes : Our plants were found about 2 metres high on a tree trunk; they were directly exposed to the strong monsoon blasts. It may be of interest to point out that Cooke remarks that this species is very poorly represented in Kew Herbarium, there being but one specimen with imperfect flowers.

We include this species within the genus *Porpax* with some hesitation. In 1845, Lindley erected the genus *Porpax* with the type species *P. reticulata* wherein the sepals are united in a tube, the lip has a distinct erect slender tooth at the base, and each pollinium pair consisting of an obpyriform and a very narrow linear mass. In this species (*P. jerdoniana* Rolfe) the sepals are 2-lipped, the dorsal and lateral ones united at the very base only; the lip is without a tooth and the 8 pollinia masses are all equal in size and shape.

Lately we have seen very abundant material of this species collected by N. Y. Das on tree trunks at Tungar Hill, at an altitude of approx. 300 m, and 1-3 m from the ground.

11. *SPIRANTHES* L. C. RICH.

SPIRANTHES L. C. Rich. in Mem. Mus. Paris 4 : 50, 1818, nom. cons.; Endl. Gen. Pl. 212, 1837; Benth. & Hook. f. Gen. Pl. 3 : 396, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 113, 1888; Hook. f. Fl. Brit. India 6 : 102, 1890; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 276, 1898; Duthie, *ibid.* 9 (2) : 163, 1906; J. J. Smith, Fl. Buitenz. 6 : 81, 1905; Schltr. Orchid. 109, 1927; Correl, Nat. Orch. N. America 184, 1950; Holttum, Rev. Fl. Malaya 1 : 139, 1953. *Gyrostachis* Pers. Syn. 2 : 511, 1807. *Ibidium* Salisb. in Trans. Hort. Soc. 1 : 291, 1812, nom. nud.

The name *Spiranthes* is derived from the Greek words *speria* = a spiral or a coil, and *anthes* = a flower, in allusion to the spiral arrangement of the flowers in many of the species.

A polymorphic genus of about 300 species, widely distributed throughout the temperate zones of both hemispheres. One of the few orchid genera with round-the-world distribution.

According to Correll, these plants flourish under a variety of habitats. This ability to adapt themselves to various habitats may be the reason for the world-wide distribution of the genus.

Spiranthes lancea (Thunb. ex Sw.) Backer, B. v. d. Brink Jr. & v. Steenis in Blumea 6 : 361, 1951; Holttum, 734, add *Ophrys lancea* Thunb. ex Sw. in Vet. Acad. Handl. Stockh. 21 : 233, 1800. *Aristotelia spiralis* Lour. Fl. Coch. 522, 1790, (non *Spiranthes spiralis* Koch. 1849). *Epidendrum aristotelia* Raeusch. Nomencl. ed. 3, 265, 1797. *Neottia sinensis* Pers. Syn. 2 : 511, 1807. *Spiranthes australis* Lindl. in Bot. Reg. 10 : sub t. 823, 1824; Lindl. in Journ. Linn. Soc. 1 : 178, 1857; Wight, Icon. 5 (1) : 15, t. 1724, 1851 (media fig. et dextra tantum); Dalz. & Gibs. Bomb. Fl. 270, 1861; Hook. f. N. Zeal, Fl. 272, 1867; Hook. f. 102; King & Pantl. 278, t. 369; Prain, Beng. Pl. 1038, 1903; J. J. Smith, 81, f. 55; Cooke, Fl. Pres. Bomb. 2 : 707, 1907; Fyson, Fl. Nilg. Puln. Hill-tops, 397, t. 251, 1915; Haines, Bot. Bih. & Or. 1161, 1924; Brühl, Guide Orch. Sikk. 162, 1926; *Spiranthes longispicata* A. Rich. in Ann. Sc. Nat. ser. 2, 15 : 78, 1841. *Spiranthes sinensis* (Pers.) O. Ames, Orchid. 2 : 53, 1908; Fischer, Fl. Pres. Madr. 1454, 1928; Blatt. McC. in J. Bombay nat. Hist. Soc. 35 : 730, 1931; F. T. Hubbard in Bot. Mus. Leaf. Harv. Univ. 4 : 85, 1937; Holttum 139. *Spiranthes aristotelia* (Raeusch.) Merrill in Philipp. Jour. Sci. 15 : 230, 1919, et in Trans. Amer. Phil. Soc. n. s. 24 : 122, 1935.

Herbs 6-52 cm or more high, slender. *Roots* clustered, tuberous up to 6 cm or more in length. *Leaves* present or absent at the time of flowering, subclustered at the base of stem or not, broadly sheathing below, subpetiolate, passing above into bracts, 1.5-6 × 0.3-1 cm, narrowly linear-lanceolate, or oblong-lanceolate or narrowly elliptic,

acute or subobtusate, entire. *Peduncle* 4-22 cm, spirally twisted, somewhat terete, with a few oblong-lanceolate, acute or subobtusate, entire, subamplexicaul bracts, \pm glandular pubescent. *Spikes* 3-22 cm long, secund or subsecund. *Flowers* sessile, bracteate. *Bracts* 5-7 \times 1-1.5 mm, narrowly oblong-lanceolate, acute, glabrous or pubescent, 1-nerved. *Sepals* 3-5.5 \times 0.75-1.5 mm, whitish, 1-nerved, connivent and slightly spreading at apex, glabrous or glandular-pubescent on the outside, narrowly linear-oblong, obtuse or subacute, entire. *Petals* 2-4.5 \times 1 mm, \pm cohering with the dorsal sepal but slightly shorter, 1-nerved, narrowly oblong-spathulate, obtuse, glabrous. *Lip* 5.5 mm, long with 2 spherical calli at the subconcave base, obscurely 3-lobed; lateral lobes 1.5-3 mm long, very narrow, acute, slightly widening about middle, pale green, connivent above to enclose column; midlobe 1-2 \times 1-2.25 mm, white, deflexed, somewhat cuneately ovate, the apical part irregularly crenulate, retuse or obtuse, the margins somewhat erect. *Column* pale greenish-white, about 2-2.5 mm long, narrow below, widening about middle and again tapered to the retuse, shallowly 2-toothed rostellum. *Anther* about 1.5 \times 1.5 mm, cuneately-ovate; pollinia obpyriform-ovate, lamellate with a small, opaque, suborbicular, exposed gland. *Ovary* sessile or shortly stalked, 2-4 mm long, glabrous or glandular-pubescent.

Flowering : March to September.

Occurrence : KONKAN : *Stocks*. W. GHATS : Panchgani, *Kapadia* 1916 (coll. *Rukminibai*); Chorla Ghat, *Dalzell & Gibson*.

Distribution : *India* : Throughout India from Punjab to Upper Assam and southwards to Chittagong and the Nilgiris and Palniys. *World* : Ceylon, India, W. Tibet, Afghanistan, N. Asia, Siberia, China, Java, Philippines, Australia and N. Zealand.

Notes : The plant described here was discovered by accident on St. Xavier's College terrace garden. Mrs. Rukminibai collected a group of lily bulbs from Panchgani, just below the 1st Tableland and planted them in pots for their flowers. The next year in March, this orchid was found in flower among the lilies.

Our plant from Panchgani is glandular-pubescent all over including the flowers, whereas the Kotagiri specimens of Saldanha are more or less glabrous.

12. DIDYMOPLEXIS GRIFF.

DIDYMOPLEXIS Griff. in *Calcutta Journ. Nat. Hist.* 4 : 383, 1844. Hook. f. *Fl. Brit. India* 6 : 121, 1890; King & Pantl. in *Ann. R. Bot. Gard. Calcutta* 8 : 260, 1898; J. J. Smith, *Fl. Buitenz.* 6 : 76, 1905; Schltr. *Orchid.* 102, 1927; Holttum, *Rev. Fl. Malaya* 1 : 107, 1953.

The generic name *Didymoplexis* is derived from the Greek *Didymos* = double, and *plexis* = a plaiting or weaving, probably in

allusion to the connate sepals and petals.

A genus of a few species (about 10), distributed from India through Malaysia to New Caledonia and Fiji.

D. pallens Griff. was the only species described when the genus was first erected; it must be considered the type species of the genus *Didymoplexis* Griff.

The genus *Didymoplexis* Griff. has not been mentioned by Cooke nor by Blatter & McCann for Bombay State.

Type species: *D. pallens* Griff.

Didymoplexis pallens Griff. in Calcutta Journ. Nat. Hist. 4: 383, t. 17, 1844; Hook. f. 122; King & Pantl. 260, t. 346; Prain, Beng. Pl. 1025, 1903; J. J. Smith 77, f. 51; Holttum 108. *Apetalon minutum* Wight, Icon. 5(1): 22, t. 1758, 1851. *Cheirostylis kanarensis* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35: 732, f. 4, 1932.

We have collected only fruiting specimens of this species. The details of the flowers are taken from Blatter & McCann's description.

Rhizome 20×8 mm, usually horizontal about 2-7 cm below surface level; one to several per plant, ellipsoid. *Scape* 3-7 cm long, leafless, pinkish-brown, erect, bracteate, terete. *Bracts* minute, cupular, persistent, brown. *Flowers* usually 3, at right angles to scape, 10×6 mm pure white, light brownish in bud. *Dorsal sepal* linear-oblong, 9×2.5 mm; *petals* 5×2 mm, similar to dorsal sepal, subfalcate, entire. *Lateral sepals* 5 mm long, nearly semi-circular; sepals and petals 3-nerved, the veins very prominent on the back. *Lip* 5×4 mm, with 2 large, rounded, ± incurved lateral lobes, the midlobe shorter, shortly rounded; attached to the short foot of the column, with a central yellow, broad, furry ridge which is transversely very irregularly and deeply impressed, not pinnately divided, leaving the central axis entire. *Column* white, with 2 large, square expansions parallel to each other occupying the upper one-third or more, one on each side of the round stigmatic surface; pollinia greyish, powdery, long-ovoid. *Ovary* slightly twisted at the base, 7 mm long.

Flowering and Fruiting: June.

Occurrence: N. KANARA: Tatwal, about 10 miles from Yellapur, Bell; Kapadia 2002-2009.

Distribution: *India*: Distributed over the whole of Bengal and Assam from the base of Sikkim Himalayas to the Bay of Bengal; also in N. Kanara, and South India. *World*: India, Malaya, Java.

Notes: We have found this species in black soil, locally abundant in dense undergrowth, usually around bamboo clumps.

Our specimens have been collected from the exact locality mentioned by Blatter & McCann for *Cheirostylis kanarensis*. The leafless saprophytic habit, the structure of the flowers and the considerable

elongation of the fruiting pedicel are typical and preclude this species from *Cheirostylis* Bl., the plant clearly belongs to the genus *Didymoplexis* Griff.

13. *SIRHOOKERA* O. KUNTZE

SIRHOOKERA O. Kuntze, Rev. Gen. Pl. 681, 1891. *Josephia* Wight, Icon. 5(1) : 19, 1851 (non Salisb. et Kn. 1809) ; Benth. & Hook. f. Gen. Pl. 3 : 516, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 126, 1888 ; Hook. f. Fl. Brit. India 6 : 823, 1890 ; Schltr. Orchid. 129, 1927.

The generic name *Sirhookera* commemorates the distinguished botanist Sir J. D. Hooker.

There are only 2 species in the world, endemic to S. India and Ceylon.

Josephia Wt. (1851) is a later homonym of *Josephia* Salisb. & Kn. (1809), *Josephia* Vell. (1825), and *Josephia* Steud. (1840). *Josephia* Salisb. & Kn. commemorates Sir Joseph Banks ; Wight named his plant in honour of Sir Joseph D. Hooker.

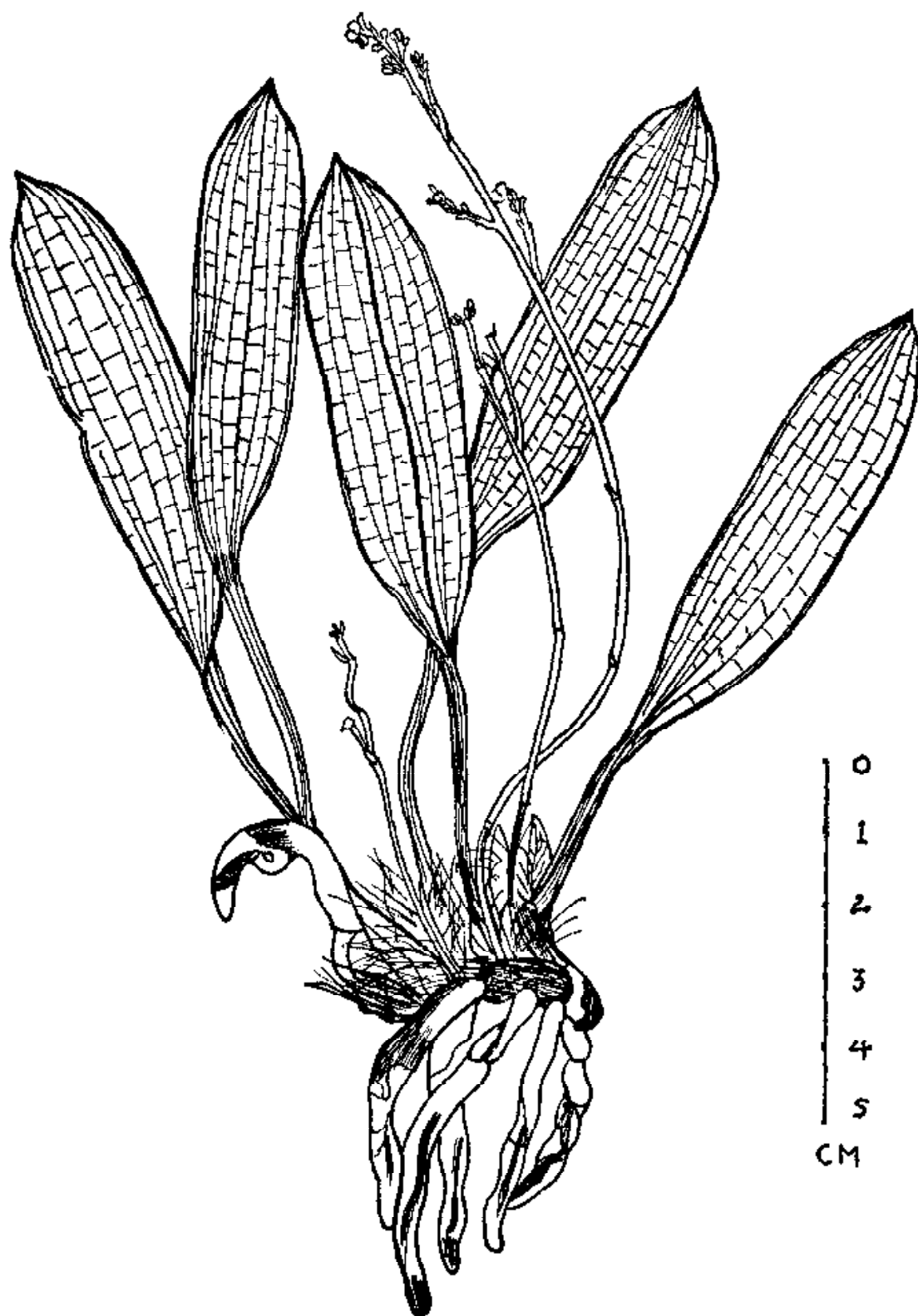
The name *Sirhookera* has not been accepted in any of the major provincial floras of India published after 1891. The conservation of *Josephia* Wt., which is the only name used in our floras, deserves careful attention.

Sirhookera lanceolata (Wt.) O. Kuntze, Rev. Gen. Pl. 681, 1891. *Josephia lanceolata* Wight, Icon. 5 (1) : 19, t. 1742, 1851 ; Hook. f. 823 ; Cooke, Fl. Pres. Bomb. 2 : 681, 1907 ; Gammie in J. Bombay nat. Hist. Soc. 17 : 942, 1907 ; Blatt. & McC. ibid. 35 : 268, 1931 ; Fischer, Fl. Pres. Madr. 1428, 1928. (See Plate XXXVII)

Perennial *epiphytes*. *Roots* stout, with a thick velamen. *Leaves* sheathing at the base, somewhat coriaceous ; petioles 2-5 cm long, sulcate ; lamina 6-8×1.5-2.5 cm, oblanceolate, oblong or oblong-elliptic, acute, entire ; in dried leaves, the nerves are fairly prominent beneath, giving the lamina a tessellated appearance ; there is a marginal nerve running near the margin. *Inflorescence* 5-14 cm long, axillary ; peduncles 0.5 mm thick, sheathed with scaly bracts at the nodes, and bearing panicles towards the apex ; branches racemose. *Buds* minute, about 2 mm in diam.

We have had no means of examining fresh flowers in details. According to Wight the flowers are whitish tinged with purple and with a reddish-lilac lip. Blatter & McCann on the authority of Hallberg add : 'Sepals white tinged with yellow. Petals and lip white. Anthers opercular, yellow with a brown spot on the connective. Stigmatic lobes just in front of tip of anther.'

Flowering : August to September.



Sirhookera lanceolata O. Kuntze

Occurrence : N. KANARA : *Stocks*. This species has never been gathered in the State after *Stocks*.

Distribution : N. Kanara, W. Ghats of Madras State, High Wavy Mtns., Ceylon.

Notes : Our description has been made from *Stocks*'s specimen, kindly loaned by the National Herbarium, Calcutta.

Cooke and later Blatter & McCann state that there has been an error in *Wight's Icones* 1742 and 1743, in that the inflorescence and flowers have been interchanged ; in our opinion there has been no such interchange.

Wight on *Jerdon's* authority mentions that the same spike of *Sirhookera latifolia* O. Kuntze comes into flower repeatedly.

14. *TROPIDIA* LINDL.

TROPIDIA Lindl. [in Wall. Cat. 7386, 1831, nom. nud.; et] in Bot. Reg. sub t. 1618, 1833 ; Endl. Gen. Pl. 214, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 592, 1883 ; Pfitz. in Engl. & Prantl. Pflanzenf. 2(6) : 121, 1888 ; Hook. f. Fl. Brit. India 6 : 92, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 274, 1898 ; J. J. Smith, Fl. Buitenz. 6 : 131, 1905 ; Schltr. Orchid. 124, 1927 ; Correll, Nat. Orch. N. America 247, 1950 ; Holttum, Rev. Fl. Malaya 1 : 140, 1953. *Govindooia* *Wight*, Icon. 6 : 35, t. 2090, 1853.

The generic name *Tropidia* is derived from a Greek word meaning 'keel', in allusion to the boat-shaped lip.

This is a small genus of about 20-30 species, mainly of the East Indies, Malaya, China and Japan, with only one or two found in the Americas.

Type species : *T. curculisoides* Lindl.

Tropidia angulosa Bl. Orch. Arch. Ind. 122, 1858 ; Hook. f. 92 ; King & Pantl. 275, t. 355 ; Fischer 1452 ; Mooney, Suppl. Bot. Bih. & Or. 208, 1950. *Govindooia nervosa* *Wight*, Icon. 6 : 35, t. 2090, 1853. *Tropidia bellii* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 736 ; 1932.

We have not seen any flowering specimens of this species. In absence of the original description of the species, we give King & Pantling's description : 'Stem 8 to 12 in high, slender, erect, clothed with obtuse sheaths an inch or more in length, and bearing at the apex two broadly elliptic plicate many-nerved leaves with acute apices and widely sheathing bases, 4 or 5 in long and 2 to 3 in broad. Spike solitary, terminal, conical, shorter than the leaves, its peduncle bearing numerous linear spreading bracts nearly as long as the flowers. Flowers resupinate, crowded, 0.65 in long ; floral bract lanceolate, caudate-acuminate, curving upwards, longer than the sessile ovary. Sepals subequal, oblong-lanceolate, the lateral pair connate nearly to the apex. Petals

somewhat smaller and less acute. *Lip* about as long as the petals, oblanceolate-oblong, obtuse, entire, concave towards the base, adnate to the column, the base with a cylindric, blunt spur half as long as and parallel to the column. *Column* short; the rostellum and anther very long, lanceolate, acuminate; *pollinia* clavate-cylindric, elongate, deeply grooved, united below; the caudicle long and slender; gland linear half as long as the caudicle. *Capsule* clavate-cylindric, boldly ridged, 0.75 in long. . . . The flowers are white flushed with pale ochre-colour.

Occurrence: N. KANARA: Siddhapur, *Blatter & Hallberg* 34634; Guddehalli, *Bell*.

Distribution: India: Sikkim Himalaya at about 1000 m, N. Kanara, Bababudan Hills, Malabar, Travancore. *World*: India, Burma, Malaya, Java.

Notes: Although we have not seen the type of *T. bellii* Blatt. & McC. (*T. R. Bell* 2992), we cannot find any significant character in Blatter & McCann's description to differentiate the above species from *T. angulosa* Bl. We, therefore, unite *T. bellii* Blatt. & McC. with the earlier *T. angulosa* Bl.

15. ZEUXINE LINDL.

ZEUXINE ("Zeuxina") Lindl. Coll. Bot. App. n. 18, 1826; Orch. Scel. 9, 1826, et Bot. Reg. 19; sub t. 1618, 1833, nom. cons.; Endl. Gen. Pl. 216, 1837; Benth. & Hook. f. Gen. Pl. 3: 599, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6): 116, 1888; Hook. f. Fl. Brit. India 6: 106, 1890; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8: 285, 1898; Duthie, *ibid.* 9 (2): 168, 1906; J. J. Smith, Fl. Buitenz. 6: 107, 1905; Schltr. Orchid. 120, 1927; Correll, Nat. Orch. N. America 244, 1950; Holttum, Rev. Fl. Malaya 1: 130, 1953. *Adenostylis* Blume, Bijdr. 414, 1825 (non *Adenostyles* Cass. 1816).

The name *Zeuxine* is a Greek word meaning 'joining', in allusion to the partial union of the lip and column.

Perennial, terrestrial, rhizomatous *herbs*. *Rhizome* creeping, fleshy ascending or erect. *Leaves* membranous on drying, somewhat fleshy when fresh, sessile or petiolate, ovate to lanceolate or linear. *Inflorescence* of few to many small flowers. *Flowers* scarcely opening. *Sepals* subequal; dorsal one erect, concave connivent with the petals to form a hood; laterals free, enclosing the base of the lip. *Petals* somewhat narrower. *Lip* with a saccate base, which usually contains two glands edges usually inflexed; limb (blade) transversely widened, entire or 2 lobed, small, connected to the saccate base by a short neck or more or less elongated claw. *Column* short with or without appendages in the front. *Anther* erect or antrorsely inclined, membranous dehiscent, oblong shortly apiculate, somewhat stipitate; *pollinia* 2, entire or 2-partite lamellate, with a caudicle, and a small gland from the base in between

the narrow divided, rostellar arms. *Stigmatic surface* at the base of the rostellum, convex, broad, depressed or in the form of viscous calli. Capsules small, erect, ovoid to subglobose.

About 30 species, extending from tropical Africa, through India and Malayasia to Samoa ; Correll writes that *Z. strateumatica* Schltr. has been recently and accidentally introduced in Florida in the U. S.

This genus is closely related to *Hetaeria* Bl. but is distinguished, according to Holttum, by the flowers, which have the lip in the usual inferior position and usually with a distinct, transversely widened blade at the end of the lip.

Type species : *Z. sulcata* Lindl.=*Z. strateumatica* (L.) Schltr.

KEY TO THE SPECIES OF *ZEUXINE*

- 1. Leaves sessile, linear or linear-lanceolate, grass-like ; peduncles, ovary and sepals glabrous ; lip equalling the sepals or slightly shorter, narrowly panduriform, apical lobe suborbicular or transversely elliptic *strateumatica*
- 1. Leaves petiolate, broad, ovate or ovate-oblong ; peduncle, ovary and sepals glandular-pubescent outside with long, retrorse, lax or dense hairs ; lip equalling the sepals or longer, the apical portion (or blade) 2-lobulate :
 - 2. Dorsal sepal and petals about 7 mm long ; lip about 12 mm long, white, thin, with a small globular sac at the base ; claw connecting the sac and the blade 3-4 mm long ; blade 2-lobulate, lobules about 8×2-3 mm narrowly and obliquely oblong, irregularly toothed on the outer margin *longilabris*
 - 2. Dorsal sepal and petals about 3-4 mm long ; lip 4-4.5 mm long, very fleshy ; sac orange-red with 2-curved papillae within ; claw very short, hardly 1 mm long ; blade 2-lobulate, lobules white, 1.5-2×1.5-2 mm, oblong-orbicular, entire *gracilis*

ENUMERATION OF THE SPECIES OF *ZEUXINE*

- 1. *Zeuxine strateumatica* (L.) Schltr. in Fedde, Repert. Beih. 1 : 77 ; 1911 ; Fischer, Fl. Pres. Madr. 1456, 1928 ; Blatt. & McC. in J.

Bombay nat. Hist. Soc. 35 : 731, 1932 ; Correll 244 ; Holttum 131. *Orchis strateumatica* Linn. Sp. Pl. 2 : 943, 1753. *Zeuxine sulcata* Lindl. Gen. Sp. Orch. 485, 1840, et in Journ. Linn. Soc. 1 : 186, 1857 ; Hook. f. 106 ; King & Pantl. 286, t. 381 ; Prain, Beng. Pl. 1029, 1903 ; J. J. Smith, 108, f. 76 ; Duthie 168, et Fl. Upp. Gang. Pl. 3 ; 219, 1920 ; Cooke, Fl. Pres. Bomb. 2 : 708, 1907 ; Haines, Bot. Bih. & Or. 1161, 1924 ; Brühl, Guide Orch. Sikk. 170, 1926. *Pterygodium sulcatum* Roxb. Fl. Ind. 3 : 452, 1832. *Zeuxine bracteata* Wight, Icon. 5 (1) : 16, t. 1724 bis, 1851. *Z. brevifolia* Wight, Icon. t. 1725. *Z. robusta* Wight Icon. t. 1726. *Adenostylis strateumatica* (L.) Amcs in Orchid. 2 : 57, 1908 ; Mooney, Suppl. Bot. Bih. Or. 209, 1950, (See Plate XXXVIII)

Herbs 7-40 cm tall from an underground rhizome which is covered over by a fine network of thin hair-like roots. *Stems* leafy upwards, terete, fleshy, the underground portion reddish-brown, aerial parts greenish or creamy-white. *Leaves* several, alternate, pentastichously arranged all along the stem, pale olive-green to yellowish, 1.8-9 × 0.3-0.6 cm linear or linear-lanceolate, acute, the margins entire, slightly turned outwards. *Inflorescence* erect or slightly decurved, 1.5-18 cm long. *Flowers* sessile, bracteate, in dense spirally arranged secund or subsecund spikes. *Bracts* 5-18 × 2-5 mm, longer than ovary, ovate-lanceolate, acute or subacuminate, entire, glabrous, 5-nerved greenish-white tinged with pale pink. *Sepals* unequal, white, obtuse, entire glabrous ; lateral ones 5 × 2 mm, subobliquely linear-oblong, cymbiform 1-nerved ; the dorsal one 7 × 3 mm, ovate-oblong, concave, faintly 3-nerved. *Petals* 6 × 3 mm, white, obliquely oblong-elliptic, obtuse, entire, glabrous. *Lip* 4.5 × 2 mm, minutely glandular-papillate slightly saccate at base, narrowly panduriform, obtuse or sub-emarginate with 2-subconcave depressions in continuation with each other, in the 2 lobes ; colour of lip pale purple at base, yellow from a little above middle. *Column* very short, produced into 2 white, iridescent wings folded on top of column. *Anther* 1.7 × 1 mm, brown, broadly comma-shaped, apiculate and opening longitudinally, depressed in the folds of the columnar wings ; pollinia 2, 1 × 0.5 mm lamellate, yellow obpyriform ; caudicle 1 mm long, narrowly oblong tapering at base with a small oblong-orbicular gland. *Stigmas* 2, subobliquely cuneate, parallel, dull-brown, situated just below the columnar wings. *Ovary* 7-8 × 3-4 mm, ovoid, tumid, greenish-white, sessile, ribbed. *Capsule* broadly ovoid, beakless, strongly ribbed. *Seeds* minute, powdery, deep brown in colour.

Flowering : January to March.

Occurrence : Baroda, *Shah* 7061. DANGS : Banks of Ambika Nalla, Waghai, *Bell. W.* GHATS : Deolali, *Acland* 1180. DECCAN : Pasehan, near Poona, *Gammie* ; *Kapadia* 1823-1827, 1049, 1052 ; Gokak Falls, *Sedgwick. N.* KANARA : *Law* ; Dharwar, *Law*.

Distribution : India : Hooker f. mentions this as the commonest orchid in India. It is found abundantly in grassy places throughout India, ascending to about 1600 m on the outer Himalayan ranges Bengal, Bihar, Orissa, Upper Gangetic Plain, Gujarat, Dangs, W. Ghats, N. Kanara, Ganjam, Mysore. *World :* Afghanistan, Pakistan, India, Ceylon, Malaya, China, Japan, Philippines ; recently reported from the United States.

Notes : According to Correll the specific name *strateumatica* is a Latin adjective meaning 'military', doubtless in allusion to the erect, soldier-like aspect of the plant or to the ascending rigid, sword-shaped or bayonet-like leaves. This species is commonly found in moist, swampy ground, often in running water, among short grasses.

The type locality of this species is Ceylon. Correll has pointed out that this is the only Asiatic terrestrial orchid which has been introduced into the eastern parts of the U. S. According to him, Ames in 1938 rightly conjectured that this orchid was brought from China into Florida with the seeds of *Eremochloa ophiuroides*, which was first introduced in 1917 and is now a common lawn-grass in Florida and other parts of the Southern states.

Correll credits the combination *Z. strateumatica* to Schltr. in Bot. Jahrb. 45 : 394, 1911 ; Mooney credits *Adenostylis strateumatica* (Linn.) to Ames, in Fedde, Repert. Beih. 1 : 77, 1911 ; *Index Kewensis* gives the references as mentioned in our synonymy.

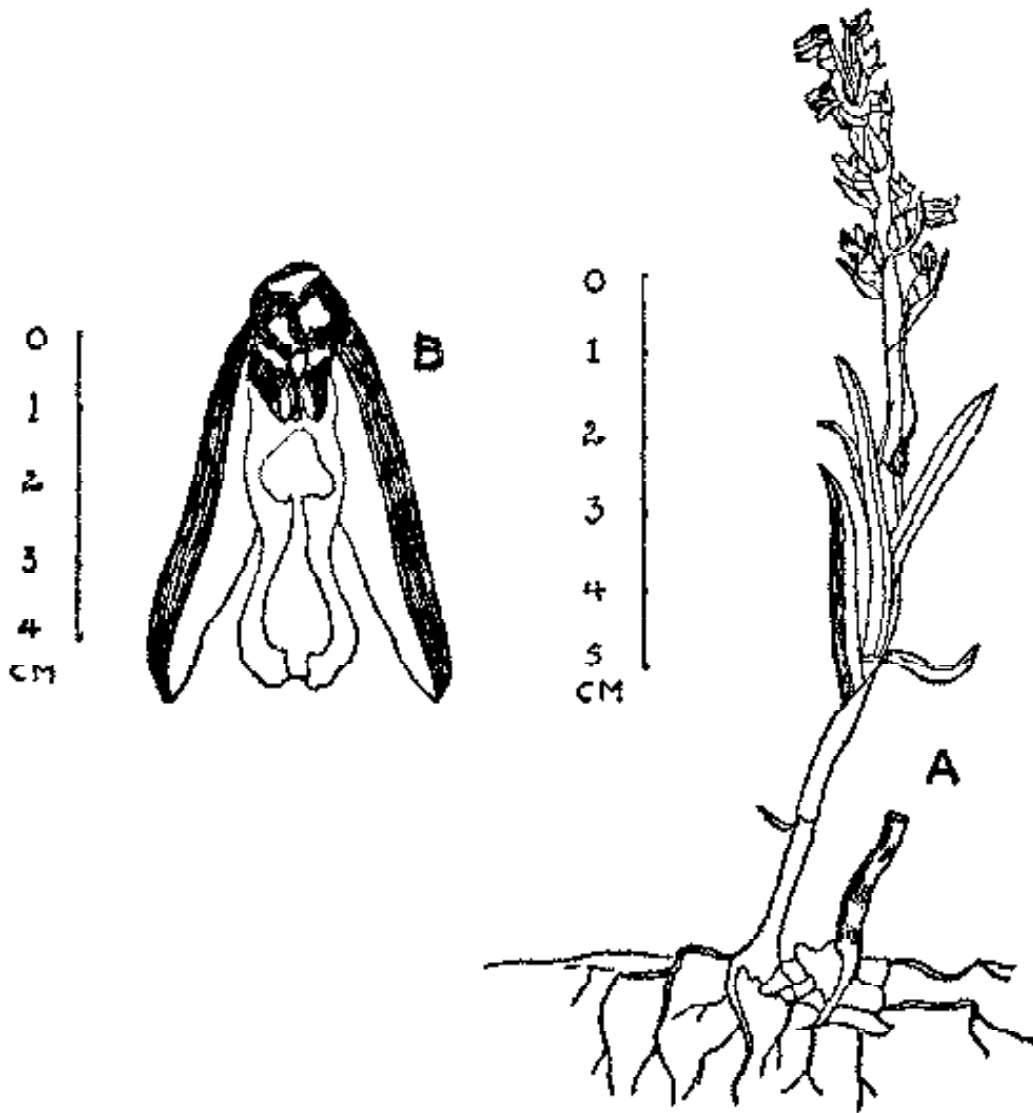
Haines considers *Z. membranacea* Lindl. distinct from *Z. strateumatica* Schltr. (= *Z. sulcata* Lindl.). The 2 species are distinguished by him on the following characters :

Median sepal 0.2-0.25", lip with terminal lobes, anther broad-ovate, cuspidate	<i>Z. sulcata</i>
Median sepal 0.1", lip with 2 lateral wings, anther narrow saggitate	<i>Z. membranacea</i>

Blatter & McCann follow Haines in keeping the 2 species separate.

2. *Zeuxine longilabris* Benth. ex Hook. f. Fl. Brit. India 6 : 107, 1890 ; Prain 1029 ; Cooke 709 ; Fischer 1456 ; Blatt. & McC. 731. *Monochilus longilabre* Lindl. Gen. Sp. Orch. 487, 1840, et in Journ. Linn. Soc. 1 : 186, 1857 ; Dalz. & Gibs. Bomb. Fl. 271, 1861. *Monochilus affine* Wight. Icon. 5(1) : 16, t. 1728, 1851, (non Lindl. 1840). (See Plate XXXIX)

Herbs 23-48 cm tall. *Rhizome* fleshy, greenish-brown, up to 6 mm thick, swollen at the nodes. *Leaves* clustered at the base, pale olive-green, subcoriaceous, membranous on drying, 1-7 × 0.8-3 cm, somewhat loosely sheathing, ovate-oblong to ovate-lanceolate, acute, entire ; midnerve prominent with 3-5 faint, lateral ones ; petioles up to 2 cm long. *Peduncle* 8-22 cm long, terete, bracteate, densely and



Zeuxine strateumatia Schltr.

A. Whole plant : B. Top view of column, lip and lateral sepals.

retrorsely villous-tomentose ; bracts 0.7-2 cm long, ovate-lanceolate, acute, entire, villous-tomentose, the lower ones sheathing the peduncle. *Racemes* 2-17 cm long, lax, secund or subsecund. *Flowers* greenish white, bracteate, very shortly pedicellate. *Sepals* unequal, brownish-green, villous-tomentose outside, glabrous inside, acute, entire 1-nerved ; dorsal sepal 7×5 mm, ovate-triangular ; lateral ones 5 × 2.5 mm ovate, subfalcate. *Petals* 7×2.5 mm slightly shorter than the dorsal sepal. *Lip* white, 1.2 cm long ; claw 3-5 mm long with a small globose pouch-like sac at the base, pubescent outside, conduplicate, spreading into a broad, white limb, which is about 8×4-6 mm and 2-lobed ; lobules obliquely oblong, irregularly toothed on the outer margins about 8×2-3 mm. *Column* small. *Anther* about 3×1.5 mm the apiculus about 1½-2 times as long as the cells covering the caudicle only the gland being exposed ; the dorsal surface with 2 broad parallel, red bands meeting about the centre and then again diverging ; pollinia 2, oblong, lamellate, with an oblong tapering caudicle and a small, ovate-orbicular gland. *Stigmatic surfaces* 2, pale brown. *Ovary* brownish-green, 1×0.2 cm oblong, with long woolly interwoven hairs.

Flowering : February to March.

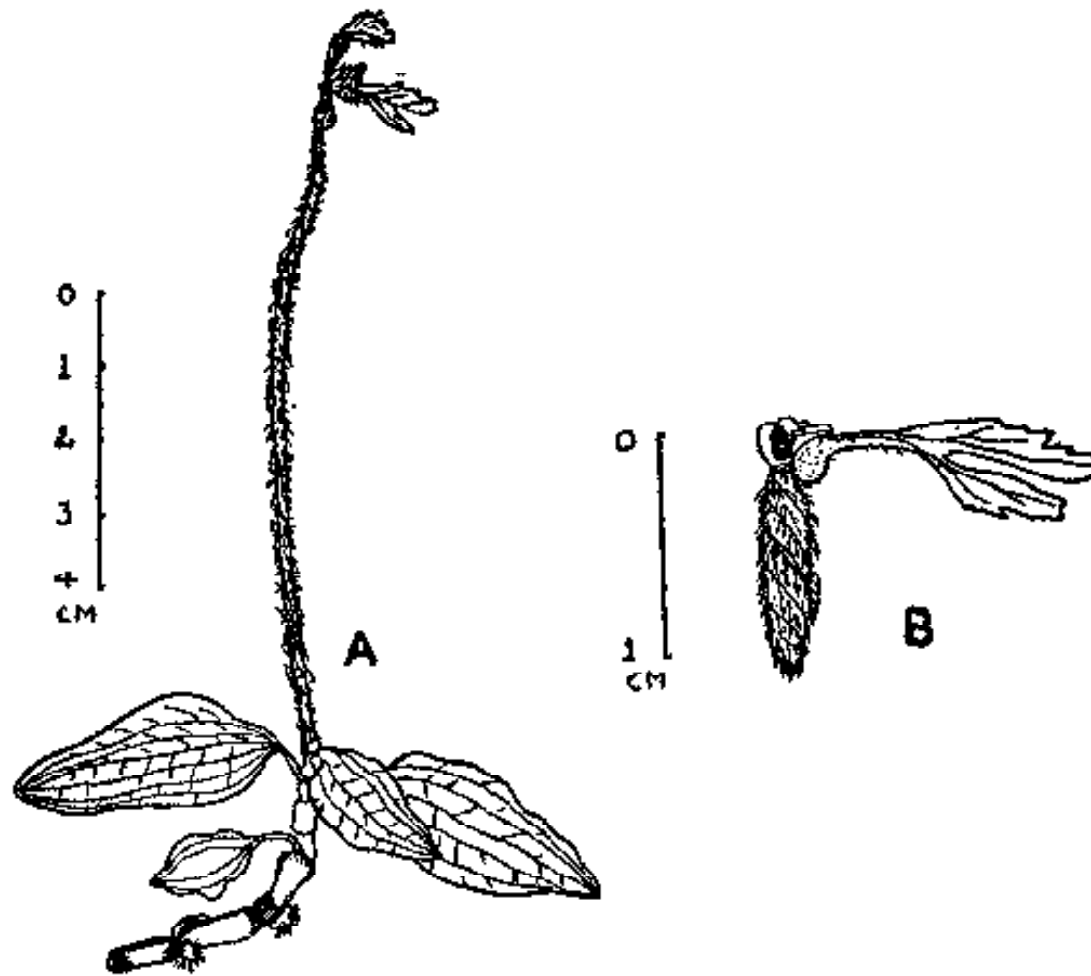
Occurrence : KONKAN : *Law* ; *Stocks*. N. KANARA : Kumbelli Mines, about 17 miles from Supa, *Kapadia* 2697-2698, 2708-2713 ; Anshi, *J. Fernandez* ; *Kapadia* 2860, Anmod, *Talbot* ; *Sedgwick* ; *J. Fernandez* 8671.

Distribution : *India* : Bengal, Assam, N. Kanara, W. Ghats of S. India from the low country to 1300 m, High Wavy Mountains. *World* : India, Ceylon.

Notes : This species is generally found at the edges of high sloping ground, with the rhizome creeping under a covering of dry, decaying leaves.

In the literature the binomial *Z. longilabris* is attributed to Bentham (in Benth. & Hook. f. *Gen. Pl.* 3 : 600, 1893). But Bentham, did not actually make the combination (see Art. 32 of the *Int. Code Bot. Nomencl.*, 1956). He merely reduces the genus *Monochilus* Lindl. to a section of *Zeuxine*, stating that all the *Monochilus* species should pass to the genus *Zeuxine*. It was Hooker f. who actually published *Z. longilabris* and the combination should be credited either to Benth. ex Hook. f. or simply to Hook. f.

3. *Zeuxine gracilis* (Breda) Bl. *Fl. Jav. N. S.* 56, t. 18, f. 2. t. 23 D, 1858 ; J. J. Smith 110, f. 78 ; *Holtum* 134, f. 22. *Psychechilos gracile* Breda, *Gen. Sp. Orch.* t. 9, 1827. *Monochilus affine* Lindl. *Gen. Sp. Orch.* 487, 1840. *Zeuxine affinis* Benth. ex Hook. f. *Fl. Brit. India* 6 : 108, 1890 ; King & Pantl. 290, t. 387 ; *Zeuxine blatteri* Fischer in *Kew Bull.* 1928 : 76, et. *Fl. Pres. Madr.* 1456, 1928.



Zeuxine longilabris Benth.

A. Whole plant ; B. Lateral view of ovary, column and lip.

Herbs 15-50 cm tall. *Rhizome* creeping but becoming erect, sheathed at the nodes, fleshy, smooth, dark green. *Leaves* 4-6, fading at the time of flowering, olive-green to greyish-green, or often somewhat reddish-brown, sheathing at the base, very shortly petiolate ; sheaths about 1 cm long, laxly embracing the stem, tubular, nerved, glabrous ; petioles about 5 mm long ; lamina 3-6 × 0.7-2.5 cm, oblong or oblong-lanceolate or ovate or ovate-lanceolate, acute, rounded at the base, glabrous. *Peduncles* with spike 15-35 cm glandular-pubescent with long, lax, retrorse hairs, and with 2-3 bracts which are sheathing, oblong-lanceolate, about 7-12 mm long, glandular-pubescent. *Flowers* 4-6 mm long, sessile, bracteate, scarcely opening. *Bracts* 4-7 mm long, equalling the ovary or shorter, pale green, lanceolate, acute or acuminate, entire, glandular-pubescent, the hairs retrorse. *Sepals* subequal, ovate or ovate-oblong or ovate-lanceolate, obtuse, entire, 1-nerved, somewhat gland-dotted, glandular-pubescent, the hairs long, lax, retrorse, pale green with paler tips ; dorsal one 4 × 2-2.5 mm concave at the base ; laterals slightly shorter and narrower. *Petals* 3.25-4 × 1.5 mm, oblong-lanceolate, obtuse, entire, 1-nerved, somewhat gland-dotted, pale green with white tips or pale pink, cohering with the dorsal sepal. *Lip* 4 mm long, fleshy, strongly saccate at base, with 2 curved papillae within the sac, the margin of the very short neck cohering ; limb of 2 lobes, which are oblong or oblong-orbicular to even subcuneate, glabrous 1.5-2 × 1.5-2 mm, about 4 mm across. Sac orange-red with the blade white. *Column* 1.5 × 1.5 mm. *Anther* ovoid, pale pink, shortly stipitate, dehiscent ; pollinia narrowly oblong with short caudicle and a small gland. *Stigmatic surfaces* 2, brownish at base of rostellum ; rostellum of 2 subulate processes, containing the gland of the pollinia in between at the base. *Ovary* about 9 mm long, green with long, retrorse, lax glandular-pubescent hairs, sessile. *Capsule* about 10 mm long, narrowly ellipsoid, glabrescent.

Flowering and Fruiting : March.

Occurrence : N. KANARA : Kumbelli Mines, about 17 miles from Supa, Kapadia 2665-2672, 2704-2707.

This species has been recorded for the first time for Bombay State.

Distribution : *India* : Khasia Hills, Sikkim, N. Kanara, High Wavy Mtns. *World* : India, Burma, Malaya, Java, Sumatra, Borneo.

Notes : After a very careful examination of the descriptions, it seems to us that all the above names belong to one and the same species. All the descriptions seem to fit our specimens from N. Kanara. Fischer distinguishes *Z. blatteri* from *Z. affinis* Hook. f. by the broader leaves, narrow petiole, glabrous sheaths and the lip which is saccate, fleshy, ecalcarate within the lobes of the lip, orbicular, glabrous, distant. The leaf-sheaths in *Z. affinis* are not pubescent, and the lip is not calcarate within ; in our specimens the lobes of the limb vary from oblong, oblong-

orbicular to subcuneate, and are glabrous.

In the literature the combination *Z. affinis* is attributed to Bentham (in Benth. & Hook. f. *Gen. Pl.* 3 : 600, 1883). But it was Hooker f. who actually published the combination and therefore it should be attributed to him, or to Benth. ex Hook. f.

J. J. Smith remarks that *Z. gracilis* Bl. is similar to the Indian *Z. affinis* Hook. f. Holttum writes : 'Whether the Malayan plants are quite identical with *Z. gracilis* from Java, or with *Z. affinis* from India, is not certain. There is much variation in this group of Zeuxines and the exact limitation of species is not certain without more careful observation of living plants.'

In our opinion the 3 species, *Z. gracilis* Bl., *Z. affinis* Hook. f. and *Z. blatteri* Fisch. are identical. The earliest valid specific epithet is *gracilis* and the correct name for the plant *Z. gracilis* (Breda) Bl.

There are variations in the colour of the lip. J. J. Smith describes it as pale flesh-coloured at the base, becoming paler and whitish or yellowish upwards. Holttum gives it as yellowish at the base with a white blade, King & Pantling describe the lip as yellow ; the blade is also coloured yellow in their plate. Fischer gives the sac of the lip as orange, and the limb white. We have noted the following colour details : sepals greenish with paler or white tips ; petals greenish, paler or white at the tips, rarely pale pink ; sac of the lip orange-red to orange, with the limb white or pale-yellowish. In formaline preserved flowers the sac changes to a pale yellow colour. The anther is pink.

It may be further pointed out that this species has not been recorded for Bombay State until now. It constitutes a new record.

16. *PHOLIDOTA* LINDL.

PHOLIDOTA Lindl. in Hook. Exot. Fl. sub t. 138, 1825 ; Endl. Gen. Pl. 190, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 520, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 127, 1888 ; Hook. f. Fl. Brit. India 5 : 844, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 144, 1898 ; Duthie ibid. 9(2) : 115, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 150, 1905 ; Pfitz. & Kränz. in Pflanzenr. 32 : 142, 1907 ; Schltr. Orchid. 152, 1927 ; Holttum, Rev. Fl. Malaya 1 : 233, 1953.

The generic name *Pholidota* is derived from the Greek words *Pholidos*=scale, *ous* or *otis*=ear or ear-like, in allusion to the scaly bracts of the flowers which are ear-like.

There are about 40 species distributed from India and southern China to Australia.

Along with the generic diagnosis, *Pholidota imbricata* Lindl. was the only species described ; this must, then, be considered the type species of the genus *Pholidota* Lindl.

Type species : *P. imbricata* Lindl.

Pholidota imbricata (Roxb.) Lindl. loc. cit. 1825 ; Wight, Icon. 3 ; 9, t, 907, 1844-1845 ; Dalz. & Gibs. Bomb. Fl. 262, 1861 ; Hook. f. 845 ; Grant, Orch. Burma 161, 1895 ; King & Pantl. 144, t. 201 ; Duthie 115, et Fl. Upp. Gang. Pl. 3 : 190, 1920 ; Prain, Beng. Pl. 1012, 1903 ; J. J. Smith 151, f. 112 ; Pfitz. & Kränz. 154 ; Gammie in J. Bombay nat. Hist. Soc. 17 : 942, 1907 ; Blatt. & McC. ibid. 35 : 267, f. 3, 1931 ; Cooke, Fl. Pres. Bomb. 2 : 688, 1907 ; Haines, Bot. Bih. & Or. 1167, 1924 ; Brühl, Guide Orch. Sikk. 96, 1926 ; Fischer, Fl. Pres. Madr. 1431, 1928 ; Holttum 234. *Cymbidium imbricatum* Roxb. Hort. Beng. 63, 1814, nom. nud. et Fl. Ind. 3 : 460, 1832. (See Plate XL)

Pseudobulbs 2-6 × 1.5-3 cm broadly ovoid-conical, dull grey-green or dull brown to mauve-brown, with broad grooves on the sides making them somewhat 4-angled. *Leaf* solitary, from the top of pseudobulb, coriaceous, subplicate, pseudopetiole 2-5 cm long ; lamina 12-30 × 3-6 cm, elliptic to broadly oblanceolate or oblong, entire, acute, many-nerved. *Rachis* from the base of pseudopetiole and from the top of pseudobulb, raceme up to 45 cm long, smooth, terete, pendulous. *Raceme* synanthous, drooping. *Flowers* dirty-pink arising in a closely distichous manner, pedicellate, bracteate, not wide opening. *Bracts* 7.5 × 2.5-3 mm convolute, round the shorter ovary, dirty pinkish-brown, broadly elliptic on spreading, obtuse, entire, the apical portion minutely irregularly serrulate. *Pedicel* with ovary about 5 mm long. *Sepals* subequal, pale pinkish-brown, concave, 3-nerved, entire ; the dorsal one 5 × 4 mm broadly oblong-suborbicular, obtuse ; the lateral ones 6 × 2.5-3 mm, broadly sickle-shaped, subacute, strongly carinate. *Petals* 5-6 × 1-2 mm narrowly linear-oblong, subfalcate, acute, entire, glabrous, somewhat gland-dotted, 1-nerved. *Lip* pale pink, 5-7 mm long, deeply saccate, almost globose ; hypochil (or base of lip) up to the lateral lobes with a circular callus in the middle, the lateral lobes 4 × 3 mm erect, broadly oblong, entire, obtuse, the lip about 7.5-8 mm broad ; epichile (or blade of lip) consisting of the midlobe 2 × 3-4 mm deflexed, somewhat incurved, 2-lobulate with a broad sub-truncate sinus, the lobules subobliquely truncate, subacute. *Column* 3-3.5 × 2-3 mm, broadly winged, the margins irregularly serrulate. *Anther* 1.5 × 1 mm golden-brown ; pollinia 4, in pairs, each pair consisting of a large ovoid pollinium and a small one on the inner side. *Stigmatic surface* broadly funnel-shaped, brownish. *Capsules* 20 × 12 mm tumid, pale-brown, shiny, ovoid.

Flowering : June to July. *Fruiting* : September to May.

Occurrence : KONKAN : Stocks ; Dalzell ; Vengurla, Dalzell & Gibson. N. KANARA : Sampkhand, Sedgwick & Bell ; Sirsi, Santapau 18506 ; Siddhapur, Kapadia 2360-2361 ; Shintneri Rocks between Dandeli and Gundh, Kapadia 1751-1753 ; Jog-Mavingundi, Santapau 18614.

Distribution : India : Chota Nagpur, Konkan, N. Kanara, W. and E. Ghats of S. India, 600-1000 m. *World* : Ceylon, India, Nepal, Burma, Malaysia, Southern China, Philippines, Pacific Islands, Australia.

Notes : The life-history of this plant deserves attention. Towards the end of the dry season, leaves are given off from the rhizome in the axils of large bracts near the base of old pseudobulbs. In the early part of the monsoon the inflorescence comes out from near the base of a leaf ; gradually with the advance of the season, the base of the leaf begins to swell and thus eventually pseudobulbs are produced ; the rachis of the fruiting inflorescence is attached to the top of the pseudobulb.

Hottum distinguishes his *Pholidota longibulba* from *P. imbricata* Lindl. in the following way :

Pseudobulbs not angled ; lip deeply bilobed	<i>P. imbricata</i>
Pseudobulbs angled ; blade of lip entire	<i>P. longibulba</i>

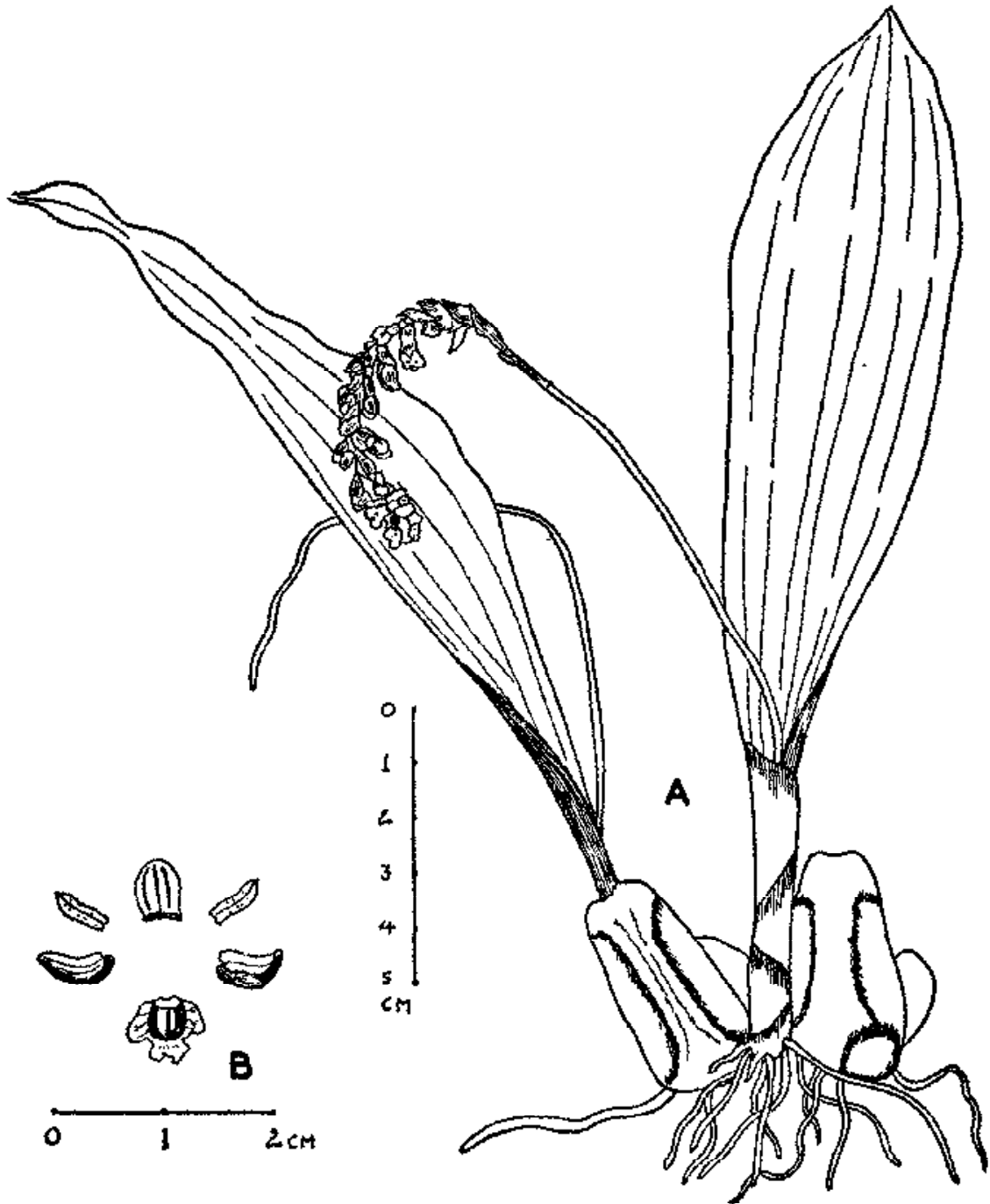
Pfitzer and Kränzlin describe the pseudobulbs of *P. imbricata* Lindl. as tetragonal ; King and Pantling speak of them as furrowed ; Lindley in his original description gives them as sulcate. We have noted that very young pseudobulbs are ovoid and completely smooth without any furrows ; with advance in age and size, the longitudinal grooves make their appearance, so that the mature pseudobulbs become conspicuously angled. The colour of pseudobulbs and leaves in *P. imbricata* Lindl. varies from green to brown or mauve-brown, the shape of the pseudobulbs varying from ovoid-conical to almost suborbicular.

Hooker f. and J. J. Smith have united *P. pallida* Lindl. with *P. imbricata* Lindl. Smith is unable to differentiate *P. imbricata* Lindl. from *P. loricata* Reichb. f., as *P. imbricata* Lindl. varies greatly in the shape of the pseudobulbs, the colour and size of the flowers ; in consequence he has fused the two species into one.

Pfitzer and Kränzlin distinguish 3 species, *P. loricata* Reichb. f., *P. pallida* Lindl. and *P. imbricata* Lindl. thus :

Bracts ovate, acute, clearly longer than broad, about equalling the flowers	<i>P. loricata</i>
Bracts broadly ovate or almost orbicular :	
Midlobe of lip trilobulate, midlobule round	<i>P. pallida</i>
Midlobe of lip emarginate, lobules round	<i>P. imbricata</i>

In view of their acceptance of these 3 species, it is difficult to see how these authors can give *Coelogyne pallida* Reichb. f. as a synonym of both *P. imbricata* Lindl. and *P. pallida* Lindl. Further they list *P. imbricata* Bot. Reg. t. 1213, 1825 (non Lindl.) as a synonym of *P. pallida* Lindl. (1835) ; in the same book they give the reference to Bot. Reg. t. 1213 under *P. imbricata* Lindl. (1825). All this is very confusing to say the least. In the key they accept the separate identity of the three plants, but this is denied in subsequent pages.



Pholidota imbricata Lindl.

A. Whole plant ; B. Sepals and petals dissected.

We consider the three species *P. pallida* Lindl., *P. loricata* Reichb. f. and *P. imbricata* Lindl. as identical.

17. *LIPARIS* L. C. RICH.

LIPARIS L. C. Rich. in Mem. Mus. Hist. Nat. Paris 4 : 43, 1818, nom. cons. ; Endl. Gen. Pl. 189, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 495, 1883 ; Pfitz. in Engl. & Prantl. Pflanzenf. 2(6) : 130, 1887 ; Ridley in Journ. Linn. Soc. 22 : 252, 1887, Hook. f. Fl. Brit. India 5 : 691, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 22, 1898 ; Duthie, ibid. 9(2) : 89, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 258, 1905 ; Schltr. Orchid. 157, 1927 ; Correll, Nat. Orch. N. America, 271, 1950 ; Hoktum, Rev. Fl. Malaya 1 : 197, 1953. *Leptorkis* Thou. in Nouv. Bull. Soc. Philom. Paris. 1 : 319, 1809. *Leptorchis* Thou. O. Kuntze Rev. Gen. Pl. 2 : 669, 1891.

The generic name is derived from the Greek word meaning 'fat' or 'smooth' or 'oily', in allusion to the typically fleshy-thickened shiny leaves.

Perennial, epiphytic or terrestrial herbs. Stems \pm creeping, branches somewhat pseudobulbous and short and thick, or long and narrow, sheathed. Leaves one or more, from the top of pseudobulb or stem, sheathing, \pm plicate. Scape terminal, terete or angled and winged. Racemes dense or lax. Sepals and petals erect or reflexed ; sepals mostly oblong-lanceolate, free, spreading ; petals narrowly linear to filiform, very rarely broader. Lip clawed, \pm parallel to column, narrow ; limb broad, entire or bifid ; calli absent, or if present 1 or 2, conic, at base of lip. Column footless, rather long, curved, with narrow lateral wings above, rarely short. Anther ovate, 2-celled, terminal, incumbent, opercular : pollinia 4, waxy, ovoid, united in pairs at their apices. Capsules ellipsoid or pyriform, erect or subpendulous.

This is a large and complex genus of about 260 species, one of the most widely-spread genera of the family. It is found in most parts of the world except in polar regions ; the greatest concentration of species being found in tropical Asia.

Liparis Rich. is closely allied to *Malaxis* Sw. in its habit (particularly the terrestrial species), but can easily be distinguished by the lip being inferior, without auricles and nearly always sharply bent at or below the middle ; also by the rather long curved column with 2 small membranous wings on the sides of the stigmatic surface.

Type species : *L. loeselii* (L.) L. C. Rich.

KEY TO THE SPECIES OF *LIPARIS*

Leaves flat on ground, almost sessile and opposite ; flowers green, often faintly tinged with yellow ; bracts deflexed ; lip minutely

clawed, green with 2 fleshy, shiny, conical calli at base, lamina orbicular or transversely oblong-orbicular, minutely denticulate with a central oblong shiny patch

prazeri

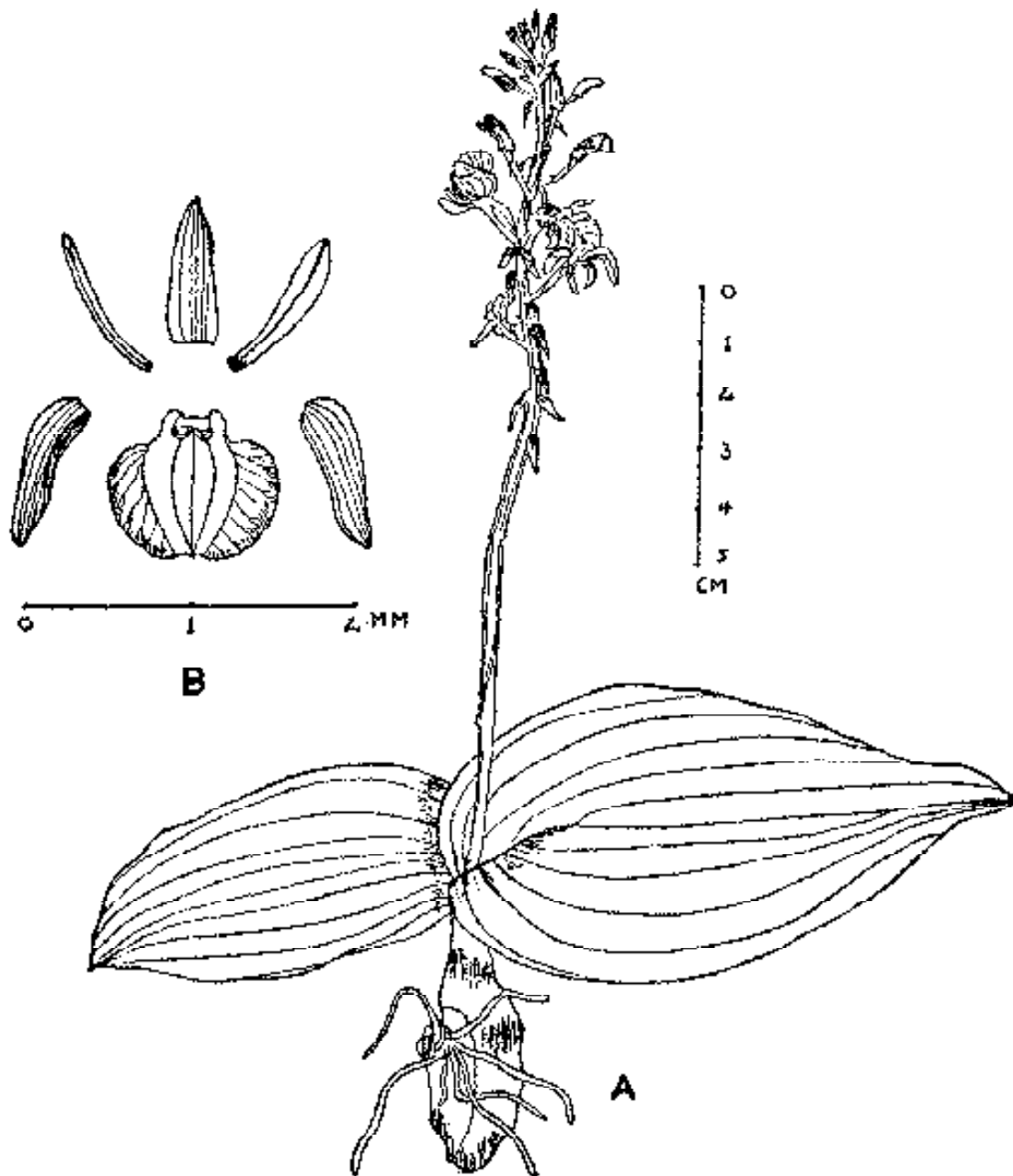
Leaves erect, alternate on stem, \pm shortly stalked ; flowers pale yellow, often tinged with purple ; bracts erect ; lip sessile, pale yellow with a purple tinge ; calli 2, meeting at the base, often with a minute third one in between ; the lip obcordate in outline on spreading

nervosa

1. *Liparis prazeri* King & Pantl. in Journ. As. Soc. Bengal II, 66 : 582, 1897. *L. flavo-viridis* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 260, f. 6, 1931. *L. paradoxa* Reichb. f. ? Gammie in J. Bombay nat. Hist. Soc. 16 : 565, 1905. (See Plate XLI)

Terrestrial herbs. Corm tuberous, about 7-11 mm in diam. Stem underground, not more than 2 cm high, sheathed. Leaves usually 2, often up to 5, flat and spreading on ground, sessile, sheathing at base, 6-16 \times 2-9 cm, broadly ovate, elliptic, or ovate-lanceolate, acute or abruptly tapered to an acuminate apex, fleshy, plicate, green, about 7-nerved. Scape 7.5-32 cm long, 0.75-2 mm thick, green, angled, winged. Flowers in lax racemes, long-pedicelled, bracteate, green, often somewhat yellow. Bracts 4-6 \times 1-2 mm, deflexed, lanceolate, sub-acuminate, entire, pale green. Pedicel with ovary about 10 mm long, green, erect. Sepals 9 \times 3 mm, pale green, acute, 5-nerved, lanceolate ; the dorsal one bent backwards almost along the ovary, with involute margin ; lateral ones straight, slightly incurved at base and apex, lying behind the lip. Petals 9 \times 1 mm, pale green, lying behind the lip, along with lateral sepals, margins involute narrowly linear, on spreading about 2 mm broad, linear-obspathulate, acute 1-nerved. Lip dark green, clawed ; claw about 2 mm long, erect, \pm parallel to the column, with inflexed edges, the base with 2 conical, shiny, dark green calli nearly touching the column ; limb about 7 \times 7 mm, bent at right angles to the claw ; transversely oblong-orbicular or obcordate-orbicular or orbicular-reniform, emarginate at apex with or without a minute apiculum, minutely denticulate on the margin with a narrowly-oblong, shiny, subconcave, nectar-secreting patch extending up to the middle or a little beyond. Column 4 mm long, pale green, strongly curved forwards at the top, linear-oblong, base much dilated ; lateral wings small. Anther 0.75 \times 0.75 mm, ovate-oblong, pale green. Stigmatic surface deep seated. Capsules 15 \times 7 mm long, obovoid, strongly ribbed ; pedicels 7-9 mm long.

Flowering and Fruiting : August.



Liparis prazeri King & Pantl.

A. Whole plant ; B. Sepals and petals dissected.

Occurrence : N. KANARA : Londa, Spooner ; Dandeli, Bell ; Yellapur, Bell ; Kapadia 2243-2250.

Distribution : India : N. Kanara. *World* : India, Burma.

Notes : Our specimens have been collected from one of the original localities given for *L. flavo-viridis* by Blatter & McCann. They may, therefore, be considered authentic for the purpose of clarification of the identity of the species.

We have examined the type specimen of *L. prazeri*. Our specimens exactly match it. On the type specimen there is a note in Rolfe's hand ' Not identified, but not in condition for comparison. The few flowers are badly dried and tightly glued to the sheet '. This sheet is labelled *Liparis prazeri* King & Pantling. King & Pantling in their original description point out that the species resembles *L. deflexa* Hook. f. but differs in having nearly sessile broader leaves and an entire lip. Actual examination of flowers of the type specimen, shows that the lip is not entire but minutely denticulate, just as in our specimens from N. Kanara.

There seem to be very slender differences between *L. prazeri* King & Pantling and *L. deflexa* Hook. f. King & Pantling describe the stem of *L. deflexa* Hook. f. as 5-7 cm long ; in our specimens of *L. prazeri* King & Pantl., the stem is never more than 2 cm high. This seems to be the only difference, which does not seem to be enough for specific differentiation. They also mention that the lip is deflexed from the very base, and give this as another distinguishing character for *L. prazeri*. This again does not seem to be quite correct ; from our specimens examined in the fresh condition it is clear that the lip has a very small claw, which is inflexed parallel to the column ; this can scarcely be seen in pressed specimens, especially in the badly preserved material at the disposal of the authors. The 2 species certainly seem to be identical.

Hooker f., Duthie, Cooke and Blatter & McCann cite *Liparis diphyllus* Nimmo (in Graham, *Cat. Bomb. Pl.* 252, 1839) as synonymous with *Habenaria diphylla* Dalz. We quote Nimmo's description, which although short seems adequate : ' Leaves pressing on the ground, ovate, acute, plaited ; flowers greenish, lip large and round '. In *Habenaria diphylla* Dalz. the leaves are pressing on the ground and fleshy, but are certainly not *plaited* ; the lip is 3-partite with long, somewhat filiform slender spreading segments, and definitely not large and round. Nimmo's description clearly fits one of the *Liparis* discussed above and cannot be referred to *Habenaria diphylla* Dalz. The locality given by Nimmo is Konkan, and most probably refers to *L. prazeri* King & Pantling, but the description is too short for a satisfactory identification of the plant.

2. *Liparis nervosa* (Sw.) Lindl. *Gen. Sp. Orchid.* 26, 1830 ; Cooke, Fl.

Pres. Bomb. 2 : 678, 1907 ; Haines, Bot. Bih. & Or. 1166, 1924 ; Fischer, Fl. Pres. Madr. 1410, 1928 ; Blatt. & McC. 259, f. 5. *Melaxis nervosa* Sw. in Vet. Akad. Nya Handl. Stockh. 21 : 235, 1800. *Liparis paradoxa* (Lindl.) Reichb. f. in Walp. Ann. 6 : 218, 1861 ; Ridley 261 ; Hook. f. 697 ; Grant, Orch. Burma 24, 1895 ; King & Pantl. 27, t. 34 ; Prain, Beng. Pl. 1005, 1903 ; Brühl, Guide Orch. Sikk. 49, 1926. *L. dalzellii* Hook. f. Fl. Brit. India 5 : 698, 1890 ; Gammie 565. *L. nervosa* (Lindl.) O. Kuntze, Rev. Gen. Pl. 2 : 671, 1891. (See Plate XLII)

Terrestrial herbs. *Corm* 5-10 mm in diam., whitish. *Stem* erect, 3-13 cm tall, slender to 8 mm thick, 1-2-sheathed. *Leaves* generally 2, rarely 3, \pm erect, shortly stalked, plicate, alternate, 4-15 \times 1-5 cm, elliptic or oblong-elliptic or oblong-lanceolate, acute, entire, 5-7-nerved. *Inflorescence* about 10-20 cm long, erect, lax ; peduncle ebracteate, greenish, subterete. *Flowers* long-pedicelled, pale yellow or yellow tinged with pale purple on the lip, bracteate. *Bracts* about 3 mm long, erect or suberect, narrowly linear, acute. *Pedicel* with ovary about 9 mm long, the apical portion straight or curved upwards, yellowish-green. *Sepals* unequal, subacute, entire, 3-5-nerved, pale yellow ; the dorsal one 6 mm long, curved, at first erect, later reflexed with the margins much involute giving the sepal a narrow linear appearance, linear-oblong, about 2 mm broad on spreading ; lateral sepals 5-6 mm long, spreading. *Petals* 5-6 mm long, pale yellow, narrowly linear-oblong, slightly broader in upper half, margins involute, acute, 3-nerved. *Lip* 6 mm long, 4.5 mm broad on spreading, obcordate in outline ; the basal half erect, parallel to the column, the calli meeting at the base, often with another minute one in between ; the colour of the lip is pale yellow, often tinged with pale, brown or purplish on the sides of the deflexed apical half. *Column* 4-4.5 \times 1-1.5 mm, erect, at about right angles to the ovary, curved forwards at the apex. *Anther* 2 \times 1.5 mm ovate, acute.

Flowering and Fruiting : August.

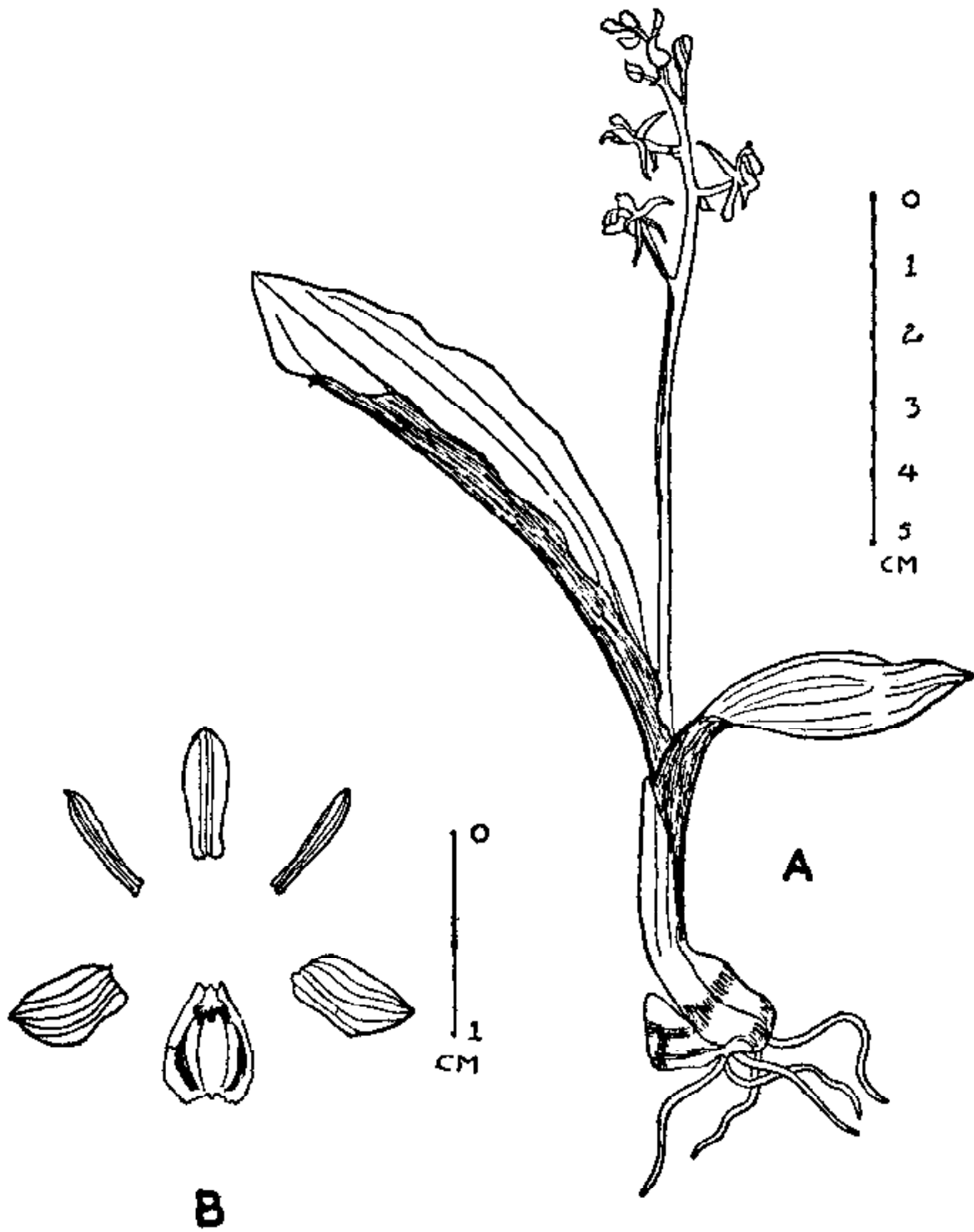
Occurrence : N. KANARA : Law ; Londa, Spooner ; Yellapur, Kapadia 2251-2258 ; Castle Rock, Sedgwick ; Guddehalli, near Karwar, Kapadia 2126 ; Karwar, Hallberg & McCann 34263.

Distribution : India : Punjab, Kumaon, Khasia Hills, 1200-1900 m, Bengal, Konkan, N. Kanara, Nilgiris, Annamalais at 1000 m. *World* : India, Nepal, Burma, Japan.

18. THUNIA REICHB. F.

THUNIA Reichb. f. in Bot. Zeit. 764, 1852 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 122, 1887 ; Schltr., Orchid. 244, 1927 ; Holttum, Rev. Fl. Malaya 1 : 183, 1953. *Phaius* Hook. f. Fl. Brit. India 5 : 816, 1890 (partim, non Lour. 1790).

The generic name *Thunia* was erected in honour of Franz A. Graf



Liparis nervosa Lindl.

A. Whole plant ; B. Sepals and petals dissected.

von Thun (1786-1873) of Bohemia, a great orchid collector and enthusiast.

Species about 4, found in India and Burma, extending southwards to the extreme north of Malaya.

This genus has been included under *Phaius* Lour. by several of the older authors. According to Gammie (in *J. Bombay nat. Hist. Soc.* 17 : 941, 1907), Reichenbach f. distinguishes the genus *Thunia* from *Phaius* by the former having terminal inflorescence on top of leafy shoots, fleshy membranous leaves, persistent bracts, and 4 pairs of pollen masses ; further the flowers turn brownish or remain white, not blue as in *Phaius*, on drying.

The only species described when the genus *Thunia* was erected is *T. alba* Reichb. f., which must, therefore, be considered as the type species.

Type species : *T. alba* Reichb. f.

Thunia venosa Rolfe in *Orchid Rev.* 13 : 206, 1905 ; *Cooke* 2 : 692, 1907 ; Haines, *Bot. Bih. & Or.* 1167, 1924 ; Fischer, *Fl. Pres. Madr.* 1427, 1928 ; Blatt, & McC. in *J. Bombay nat. Hist. Soc.* 35 : 845, 1932. *Phajus albus* Hook. f. 818 (partim) ; Gammie in *J. Bombay nat. Hist. Soc.* 17 : 940, t. 3, 1907. (See Plate XLIII)

Leaves 10-13 × 1.8 cm, alternate, distichous, sessile, sheathing at the base, elliptic to elliptic-lanceolate, acute, entire, 3-7-nerved. *Inflorescence* in compact, somewhat compressed racemes terminating the leafy stem, from a cluster of apical leaves. *Peduncle* very short, about 0.3-0.5 cm thick, terete. *Flowers* pedicellate, bracteate. *Bracts* 3.5-5 × 1-1.5 cm, spathaceous, ovate-oblong or ovate-elliptic, acute, entire, several-nerved. *Pedicel* and *ovary* about 3 cm long. *Sepals* 4 × 1 cm, oblong-elliptic, acute, entire, glabrous, 5-nerved. *Petals* similar, but slightly smaller. *Lip* much shorter than sepals and petals, fimbriate at apex, spurred. *Spur* 5-7 mm long, linear, obtuse or emarginate.

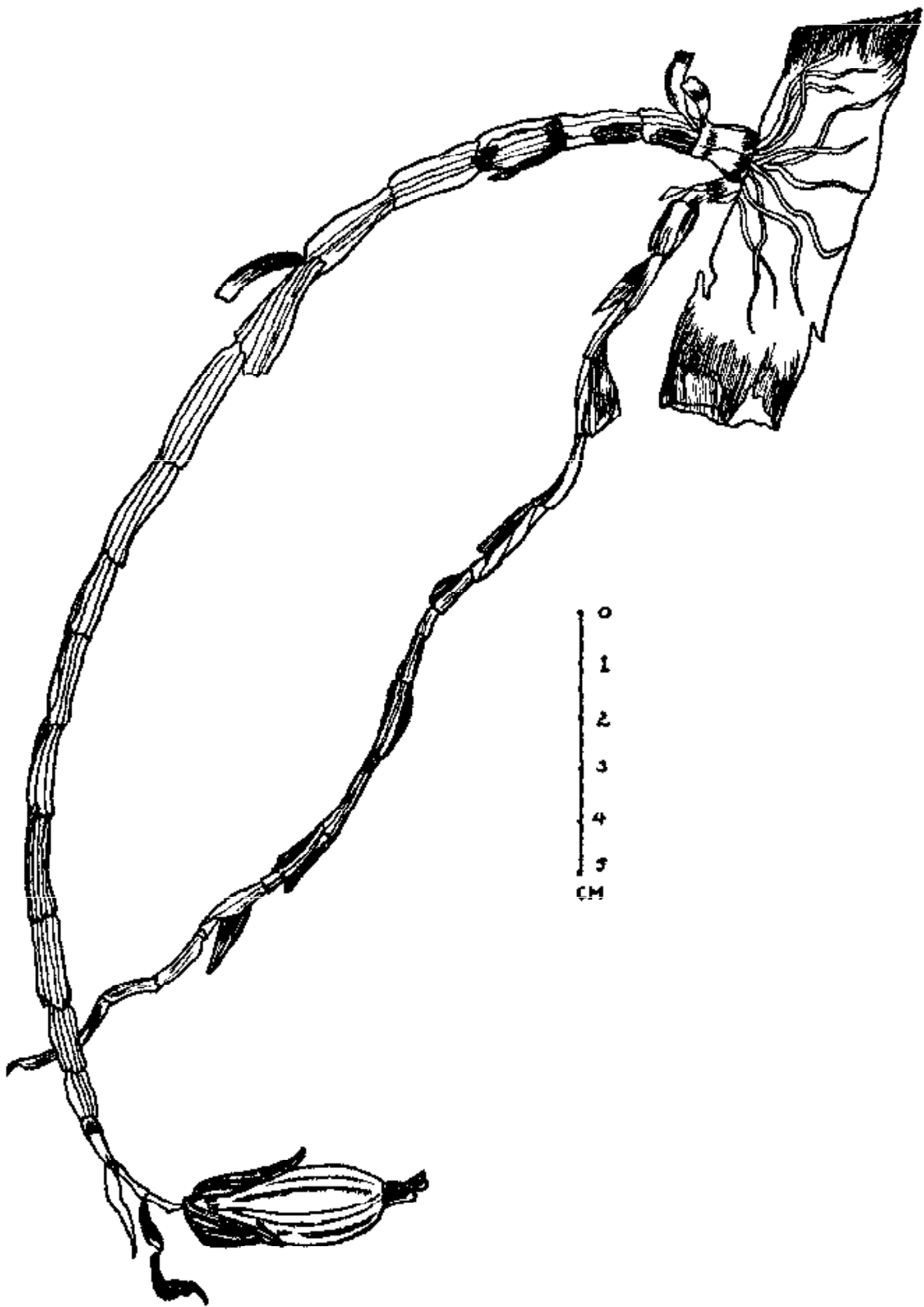
The description has been drawn from Carstenson's sheet from Mahableshwar (loaned by the National Herbarium, Calcutta). The specimen unfortunately is badly preserved and the structure of the flowers is not very clear. Moreover, the colour of the flowers is not mentioned. We have collected this species only in fruit.

Flowering : July. *Fruiting* : March.

Occurrence : KONKAN : Matheran, eastern side, Dalzell. W. GHATS : Khandala, Graham ; Santapau 4645 ; Mahableshwar, Carstenson ; *Fairbanks ex Birdwood*. N. KANARA : Anmod, Kapadia 1912.

Distribution : India : Kumaon, Mussoorie, Sikkim, Assam, Khasia, Chota Nagpur, Konkan, W. Ghats, Travancore, Andamans. World : India, Burma.

Notes : According to Haines *T. venosa* Rolfe is distinguished from



Thunia venosa Rolfe.

T. alba Reichb. f. by the latter species having a more elongate raceme, more numerous and much larger flowers, a yellow disc to the lip and a few lilac radiating veins on the side lobes.

Gammie describes the veins on the lip as purple or red. Dalzell mentions the veins to be carmine.

19. *POLYSTACHYA* HOOK.

POLYSTACHYA Hook. Exot. Fl. t. 103, 1825, nom. cons.; Endl. Gen. Pl. 192, 1837; Benth. & Hook. f. Gen. Pl. 3 : 540, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 133, 1889; Hook. f. Fl. Brit. India 6 : 20, 1890; J. J. Smith, Fl. Buitenz. 6 : 284, 1905; Schltr. Orchid. 292, 1927; Correll, Nat. Orch. N. America 309, 1950; Holttum, Rev. Fl. Malaya 1 : 542, 1953. *Dendrorhiza* Thou. Nouv. Bull. Soc. Philom. Paris 1 : 318, 1809. *Dendrorchis* Thou. Hist. Pl. Orch. 1822; O. Kuntze, Rev. Gen. Pl. 2 : 658, 1891.

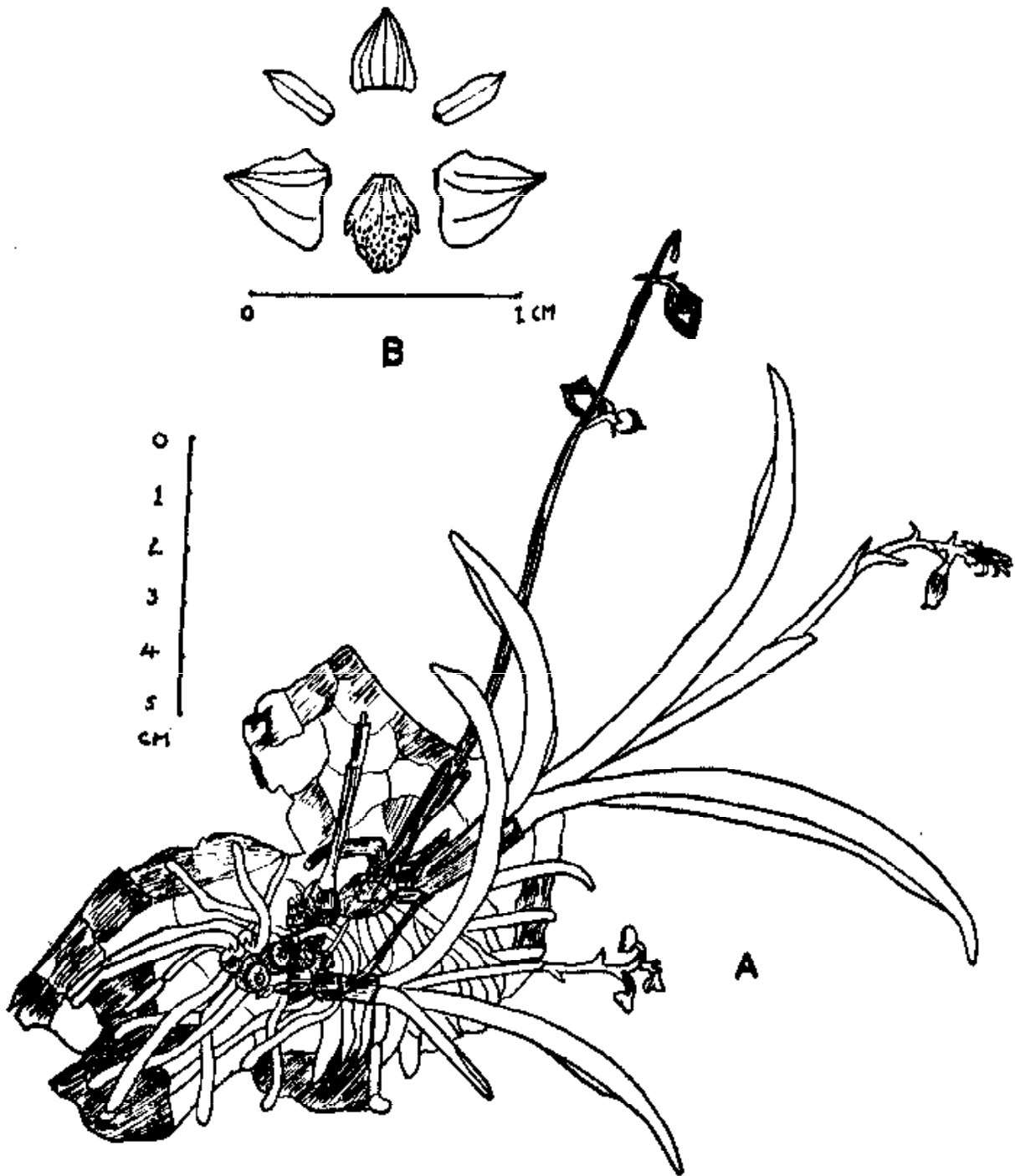
The generic name is derived from the Greek words *polys*=many, *stachys*=spike, in allusion to the numerous spikes borne upon the scape.

This genus has over 100 species, mostly tropical in distribution. It attains its maximum development in Africa, with a few species (probably only one) in India, Malaya, Java and tropical America.

Type species : *P. luteola* Hook.=*P. minuta* (Aubl.) Britt.

Polystachya flavescens (Bl.) J. J. Smith, Fl. Buitenz. 6 : 284, f. 218, 1905; Holttum, 542, f. 161. *Onychium flavescens* Bl. Bijdr. 325, 1825. *Polystachya zeylanica* Lindl. Bot. Reg. misc. 78, 1838; Hook. f. 21; Alston, Kandy Fl. 75. f. 398, 1938. *Polystachya wightii* Reichb. in Walp. Ann. 6 : 640, 1861; Hook. f. 21; Gammie in J. Bombay nat. Hist. Soc. 18 : 588, 1908; Fischer, Fl. Pres. Madr. 1437, 1928. *Polystachya purpurea* Wt. Icon. 5(1) : 10, t. 1679, 1851; Hook. f. 21(?). *Polystachya luteola* Hook. Exot. Fl. t. 103, 1825; Wight, Icon. 5 (1) : 10, t. 1678, 1851. (See Plate XLIV)

Pseudobulbous epiphytes. *Pseudobulbs* 5-10 mm long, close together, ovate, usually 2-3-noded, pale green with dense clusters of thick fibrous roots. *Leaves* 2-5, each 4-10 × 6-12 cm, narrowly oblong-lanceolate, tapering at the base, glabrous, entire, acute or emarginate, often unequal-sided at apex, midnerve prominent; lower ones the smallest; sheaths keeled on back. *Inflorescence* terminal, erect, 4-11 cm long, simple in all our specimens; scape with usually 2-3 large sheaths, which are glabrous, oblong, obtuse or sub-acute, flattened, sharply 2-angled, yellowish green. *Flowers* small, ± distichous, somewhat close together towards apex of peduncle, bracteate, shortly pedicellate, greenish-yellow. *Bracts* 3-5 mm long, persistent, broadly sheathing and concave at base, becoming strongly apiculate and sharp-pointed at apex. *Ovary* with *pedicel* about 3 mm long, ribbed, pale greenish-yellow. *Sepals*



Polystachya flavescens J. J. Smith

A. Whole plant with support ; B. Sepals and petals dissected.

subequal, pale greenish-yellow, subfleshy, entire, glabrous ; dorsal sepal 3×2.5 mm subobtusely, faintly 5-nerved ; lateral ones 4 mm long, 3.5 mm broad at base, broadly and obliquely ovate-triangular, apiculate, 3-nerved ; mentum wide, 2.5 mm long, pale greenish-yellow, obtuse, subtruncate. *Petals* 3×1.5 mm somewhat incurved, narrowly linear-oblong, apiculate, entire, 1-nerved. *Lip* 3.5 mm long, strongly arcuate sessile, hinged on the foot of column, 3-lobed, pale yellow ; lateral lobes 1×0.75 mm erect, small, triangular, acute or subobtusely, entire ; midlobe 1.5×2 mm, broadly oblong-suborbicular, not constricted at base, crenulate, rounded or subretuse, with a white mealy covering composed of single loose round cells (Holtum), the apical part deflexed. *Column* nearly 2 mm long, oblong ; foot about 2 mm long, stout, at right angles to column, both forming a wide obtuse angle with the ovary. *Anther* 1-1.5 mm long, transversely oblong-orbicular, mucronate on the upper lip. *Capsule* $9 \times 3-4$ mm, turgid, fusiform ; pedicel 2-3 mm long.

Flowering : August. *Fruiting* : September onwards.

Occurrence : N. KANARA : Gammie ; Belgaum, Gammie ; Yellapur, Bell ; Kapadia 1761, 1962, 2210-2212, 2347 ; Sampkhand, Hallberg & McCann 34199 ; Kumbelli Mines, Kapadia 2678 ; Anned, Kapadia 1900.

Gammie has recorded this species from Bombay State ; but Blatter & McCann do not include it among their revised list of Bombay orchids.

Distribution : India : N. Kanara, W. Ghats southwards at 600-1200 m. *World* : Ceylon, India, Malaya, Sumatra, Philippines.

20. CALANTHE R. BR.

CALANTHE R. Br. in Bot. Reg. t. 573, 1821, nom. cons. ; Endl. Gen. Pl. 207, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 520, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 153, 1889 ; Hook. f. Fl. Brit. India 5 : 847, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 164, 1898 ; Duthie, ibid. 9(2) : 118, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 201, 1905 ; Schltr. Orchid. 302, 1927 ; Holtum, Rev. Fl. Malaya 1 : 146, 1953. *Alismorkis* Thou. Nouv. Bull. Soc. Philom. Paris 1 : 318, 1809. *Alismorchis* Thou. Hist. Pl. Orch. 1822 ; O. Kuntze, Rev. Gen. Pl. 2 : 650, 1891.

The generic name *Calanthe* has been derived from the Greek *kalos* = beautiful, and *anthos* = flower, in allusion to the brightly coloured flowers in many of the species.

A fairly large genus with about 40 or more species, widely distributed from South Africa and the islands of the Indian Ocean through India to China and Japan, and southwards and eastwards through Malaysia to Australia and Tahiti.

The characteristic feature of the genus *Calanthe* R. Br. is the union of the column with the base of the lip. It can be readily distinguished from its very near ally, *Phaius* Lour., by the adhesion of the pollen

masses to a separable gland ; whereas its other closely allied genus, *Limatodes* Bl., can be separated by its lateral inflorescence and a free cucullate lip.

Type species : *C. veratrifolia* R. Br.

KEY TO THE SPECIES OF *CALANTHE*

- Leaves sparsely puberulous only in lower surface ;
floral bracts 20-25 mm long, sparsely puberulous ; sepals about 3-7 cm long ; lip
20-25 mm long, lateral lobes falcate-oblong .. *masuca*
- Leaves densely puberulous on both surfaces ;
floral bracts 4-7 mm long, densely puberulous ; sepals about 11 mm long ; lip 6-7
mm long, lateral lobes oblong-suborbicular,
obtuse. .. *purpurea*

1. *Calanthe masuca* (D. Don) Lindl. (in Wall. Cat. 7337, 1832, nom. nud. et) Gen. Sp. Orch. 249, 1833, et in Bot. Reg. misc. 51, 1842, t. 37, 1844 ; Reichb. f. in Walp. Ann. 6 : 915, 1861 ; Hook. f. 850 ; King & Pantl. 173, t. 234 ; Brühl, Guide Orch. Sikk. 108, 1926 ; Fischer, Fl. Pres. Madr. 1432, 1928 ; Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 485, 1932. *Bletia masuca* D. Don, Prodr. Fl. Nep. 30, 1825. *Calanthe versicolor* Lindl. Sert. Orch. t. 42, 1826, et Bot. Reg. sub. t. 37, 1844. *C. emarginata* Wight, Icon. 3 (2) : 10, t. 918, 1844-1845.

We have not seen any specimens. In the absence of the original description of Lindley, we give the one of King & Pantling : 'Pseudobulbs narrowly conical, with annular scars, 2 to 3 inches in length. Leaves more or less broadly elliptic, acute, narrowed at the base into a petiole, or sessile ; length 6 to 15 in, breadth 2.75 to 4.25 in ; petiole 2 to 6 in, or 0. Peduncle exceeding the leaves in length, stout, with two or three scattered acute lanceolate bracts. Raceme about 6 in long, many-flowered, pubescent. Flowers rather crowded, depressed, 2 in across, with a curved slender cylindrical spur longer than the ovary. Sepals elliptic or elliptic-lanceolate, acute, spreading, the lateral pair slightly longer than the dorsal. Petals smaller than the sepals, subacute. Lip as long as the sepals, attached to almost the whole length of the column, 3-lobed ; the basal lobes oblong, blunt, subfalcate, directed forwards ; apical lobe large, sub-rhomboid, or cuneately reniform, deeply emarginate at the apex ; the disc between the side lobes with three unequal elongate tubercular calli. Column very short. Stigmatic surface in two halves and the rostellum consisting of two projecting plates. Anther pointed ; pollinia 8, subequal, clavate, subsessile on a small oblong gland. Capsule elliptic, 1.5 in long.

The flowers are of an almost uniform violet tint, becoming of a rusty colour when beginning to wither. The calli of the lip are yellow. The coloration however varies. In the form which was named *C. versicolor* the perianth is white, the lip being purple, changing to yellow. In another form the sepals are crimson and the lip deep purple.

Occurrence : N. KANARA : Malemani Ghat, Sedgwick.

Distribution : India : Tropical Himalaya in Sikkim 500-1300 m, Deccan, N. Kanara, southern part of W. Ghats at 1000-2000 m. *World* : India, Nepal, Malaya, Java.

2. *Calanthe purpurea* Lindl. Gen. Sp. Orch. 249, 1833, et Bot. Reg. sub. t. 37, 1844 ; Reichb. f. 915 ; Hook. f. 851. *C. masuca* Thwaites, Enum. Ceyl. Pl. 308, 1884 (?). (See Plate XLV)

Pseudobulbs not seen. *Stem* sheathed at the base ; foliar sheaths 2 or 3, sessile, plicate, oblong-lanceolate, acute, shortly hirsute, the hairs whitish ; the sheaths forming a pseudostem about 7 cm long. *Leaves* 4, clustered at the base, somewhat spreading, long-petioled ; petioles 13-15 cm long, 2-5 mm thick, sheathing at base, prominently ribbed, sub-hirsute ; lamina 20-28 × 3.5-7 cm, oblong-lanceolate to lanceolate tapering to an acute apex, entire, plicate, many-nerved, darkgreen, hirsute with whitish shiny hairs, more so on the upper surface. *Peduncle* 72 cm long, about 1.5-3 mm thick, ridged, twisted towards the apex, ± fulvous-hirsute, with bracteate sheaths ; lowermost basal sheath 7 cm long, the other 3, 1-2 cm long, lanceolate, hirsute. *Flowers* long-pedicelled, bracteate, in few-flowered lax racemes at apex of peduncle. *Bracts* 4-7 × 1.5-3 mm, persistent, lanceolate, acute, entire, 1-nerved, hirsute. *Pedicels* 8 mm long, thin, hirsute. *Ovary* 12 × 2 mm, hirsute. *Sepals* 11 × 5-7 mm, entire, 5-nerved, acute with a minute curved apiculum ; dorsal one slightly broader than laterals, broadly ovate ; lateral one oblong, broadest a little beyond the middle. *Petals* 11 × 6 mm, elliptic, ovate acute, without an apiculum, entire, glabrous, 3-nerved. *Lip* 6-7 mm long, 3-lobed, very shortly clawed ; lateral lobes 4 × 2 mm, erect, oblong, obtuse, the lip across the lateral lobes 8 mm broad ; midlobe 4 × 5.5 mm, deltoid-oblong, dilated at apex, retuse, subentire ; calli 3, small, in between the lateral lobes in the centre of the lip. *Spur* 17 mm long, linear, straight. *Column* structure not distinct in dried flowers. *Anther* 2 × 3 mm oblong-ovoid, with a somewhat long apiculum ; pollinia 8, each 1.2 mm long, waxy, in pairs, narrowly oblong-linear, clavate, with a small, somewhat orbicular, separable gland. *Capsules* 2.6 × 1-1.2 cm, elliptic, hirsute ; *pedicels* 1.6 cm long hirsute.

Flowering and Fruiting : October.

Occurrence : N. KANARA : Gersoppa Ghat, Hallberg & McCann

34754. This species has been mentioned by Hooker f. only for Ceylon. It is not given in any of the regional floras of India ; this, therefore, constitutes a new record for India and Bombay.

Distribution : India : N. Kanara. World : India, Ceylon.

Notes : Thwaites has united this species with *C. masuca* Lindl. But as Hooker f. has pointed out, *C. purpurea* Lindl. can be distinguished from *C. masuca* Lindl. by the former having much smaller flowers, leaves hairy on both surfaces, much smaller bracts and slender spur, which more or less equals the pedicel and the ovary.

21. *PACHYSTOMA* BL.

PACHYSTOMA Bl. Bijdr. 376, 1825 ; Benth. & Hook. f. Gen. Pl. 3 : 511, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 156, 1889 ; Hook. f. Fl. Brit. India 6 : 811, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 101, 1898 ; Duthie, *ibid.* 9(2) : 108, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 186, 1905 ; Schltr. Orchid. 312, 1927 ; Hoittum, Rev. Fl. Malaya 1 : 145, 1953.

The name *Pachystoma* is derived from the Greek words *pachys*=thick, and *stoma*=mouth, in allusion to the thick lip.

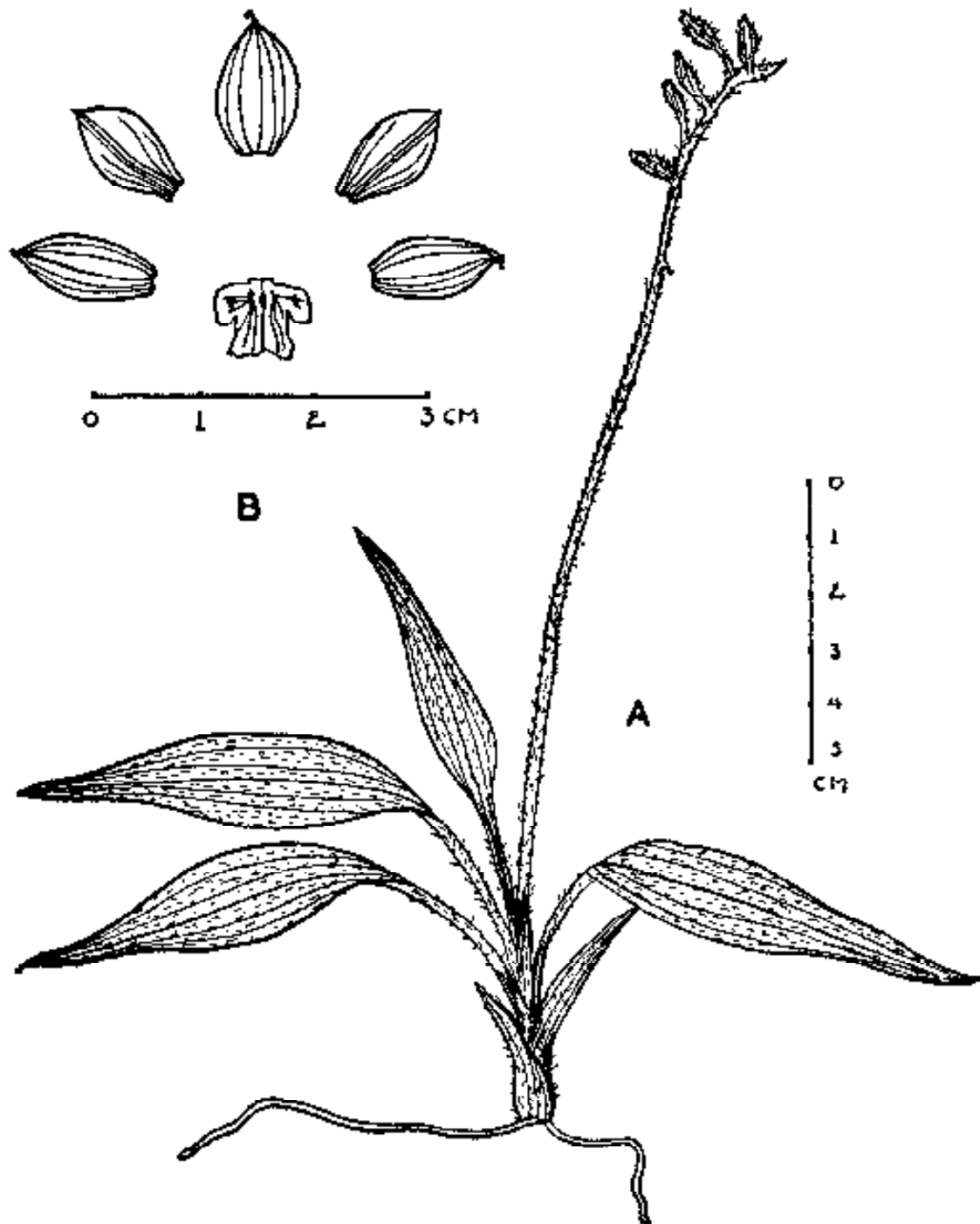
A small genus of about 6-8 species, distributed from India, through Malaysia to New Guinea.

The only species described at the time of erection of the genus *Pachystoma* was *P. pubescens* Bl., this must, therefore, be considered the type species.

Type species : *P. pubescens* Bl.

Pachystoma senile (Lindl.) Reichb. f. in Bonpland. 3 : 250, 1858 ; Hook. f. 812 ; King & Pantl. 101, t. 140 ; Duthie 108, et Fl. Upp. Gang. Pl. 3 : 192, 1930 ; Haines, Bot. Bih. & Or. 1169, 1924 ; Brühl, Guide Orch. Sikk. 74, 1926 ; Fischer, Fl. Pres. Madr. 1426, 1928 ; Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 484, 1932. *Apaturia senilis* Lindl. (in Wall. Cat. 3739, 1831, nom. nud. et) Gen. Sp. Orch. 130, 1831. *Apaturia lindleyana* Wight, Icon. 5(1) : 8, t. 1662, 1851. (See Plate XLVI)

Leaf one, about 30×1.2 cm, narrowly oblong-lanceolate, acute, entire, subplicate, sheathed below. *Inflorescence* 30-40 cm long, erect, sheathed in the basal region ; sheaths 3-5 cm long, ± hyaline, lanceolate, acute or acuminate, entire, glabrous. *Flowers* at first erect, drooping after fertilization, bracteate, pedicellate in lax racemes. *Bracts* 1-2.5×0.3-0.5 cm, erect, ± hyaline, membranous, narrowly lanceolate, acute or sub-acuminate, entire, many-nerved, glabrous. *Sepals* about 10×3.5 mm, entire, 5-nerved, shortly pubescent ; dorsal one oblong, subobtuse ; the laterals oblong-lanceolate, suboblique, slightly saccate at base, ± sharply acute. *Petals* 10×1-2 mm



Calanthe purpurea Lindl.

A. Whole plant ; B. Sepals and petals dissected.

narrowly spathulate, acute, sparsely pubescent, 3-nerved. *Lip* 10 mm long, subsaccate at base, 3-lobed, sparsely pubescent; lateral lobes 3-4 × 2.5 mm, erect, ± connivent over the column, oblong, entire, truncate-rounded at apex; midlobe 5 × 3 mm, obovate-oblong, entire, apex shortly-pointed and slightly deflexed; disc with 5 longitudinal, parallel ridges. *Column* 6 mm long, curved, pubescent, apical part much dilated, 3-lobed. *Anther* 1.75 × 1.5 mm broadly orbicular, sparsely subrugose, anterior lip truncate-subretuse. *Ovary* 6 × 2.5 mm, pubescent; *pedicel* 5 mm long.

Leaves : August. *Flowering* : March.

Occurrence : N. KANARA : Belgaum, Bell 942, Chikkannah.

Distribution : India : Plains and foothills of N. India from Garhwal to Sikkim, Khasia Hills, Manipur. W. Ghats of Bombay and Madras, N. Kanara. *World* : India, Malaya, (?) Java.

Notes : This species was found by Bell in black soil of grasslands in Belgaum. Specimens of this species were kindly sent to us by Prof. P. G. Chikkannah, Head of the Botany Department, Lingaraj College, Belgaum.

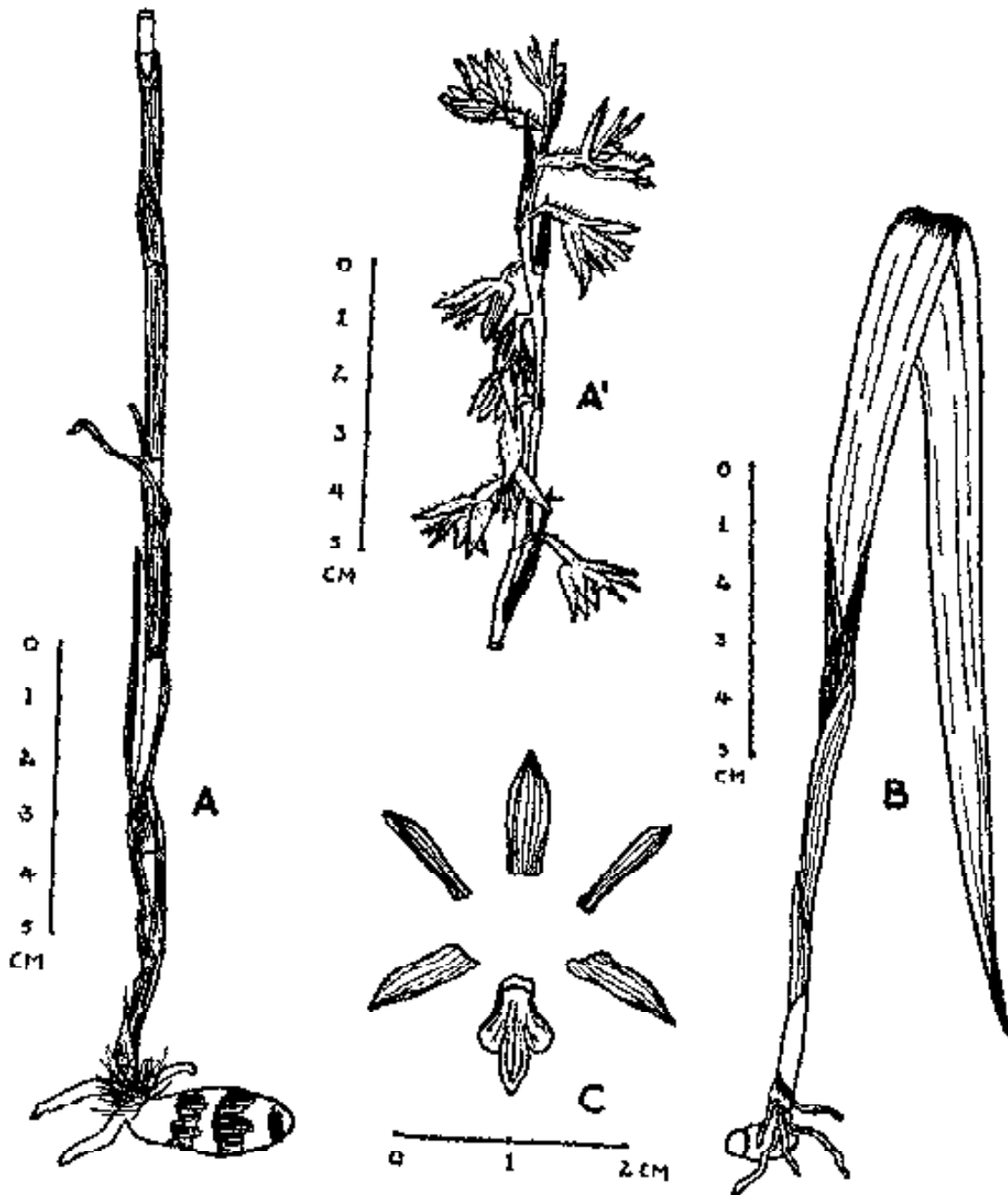
22. BULBOPHYLLUM THOU.

BULBOPHYLLUM Thou. Hist. Pl. Orch. Tabl. esp. 3, 1822, nom. cons. ; Endl. Gen. Pl. 191, 1837 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 178, 1889 ; Hook. f. Fl. Brit. India 5 : 752, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 64, 1898 ; Duthie, ibid. 9(2) : 103, 1906 ; J. I. Smith, Fl. Buitenz. 6 : 414, 1905 (partim) ; Schltr. Orchid. 319, 1927 ; Holttum, Rev. Fl. Malaya 1 : 394, 1953 (partim). *Phyllorkis* Thou. Nouv. Bull. Soc. Philom. Paris 1 : 319, 1809.

The name *Bulbophyllum* is derived from the Greek words *bolbos*=bulb, and *phyllon*=leaf, in allusion to the bulb which bears leaf on top. Certain authors, like Sprengel (*Syst. Veg.* 3 : 732, 1826) and Pfitzer adopt *Bolbophyllum* ; Sprague notes (in *Kew Bull.* 349, 1928) : 'It is a pity that Thouars did not adopt the form *Bolbophyllum* from Bohhoa and Yuhhov instead of compounding the Latin word *bulbus* with the latter. Nevertheless the generic name must stand as published by Thouars (Art. 50)'. (Art. 73, ed. 1956 of the Code)

One of the largest of all orchid genera. In a wide sense there are probably 1000 species, distributed through tropical Africa and Asia, extending into S. Africa, Australia, New Zealand, Japan, and Korea, and also into Brazil and S. America.

This large genus has been variously divided into sections on the basis of the wide range in vegetative form and floral structure. As pointed out by Holttum, 'A full survey of the genus, and a comparative account of the various sections based on modern knowledge, has still to be written'. Here we have considered the genus *Bulbophyllum*



Pachystoma senffe Reichb. f.

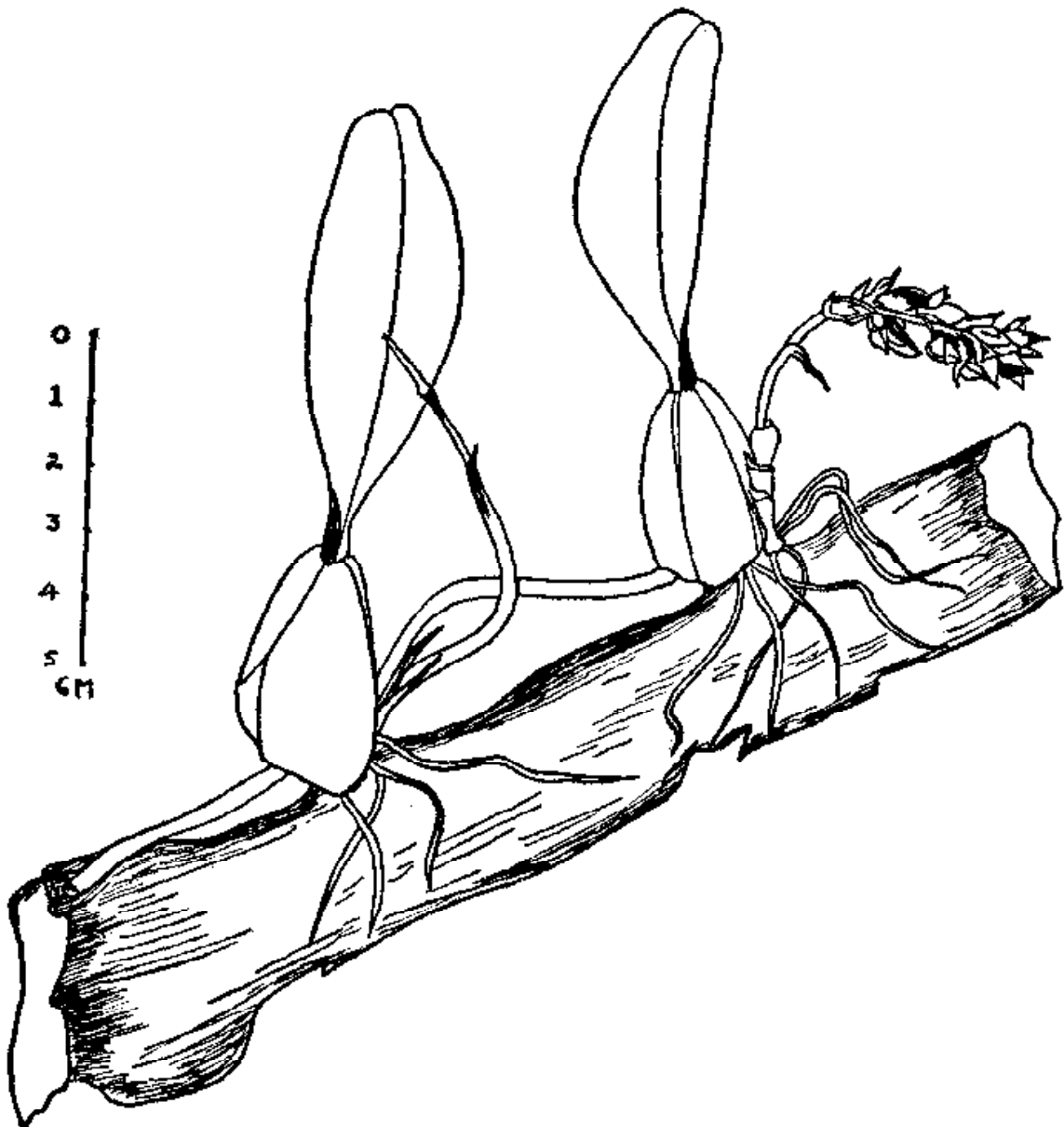
A-A'. Plant in flower; B. Plant in leaf; C. Sepals and petals dissected.

in a restricted sense, excluding *Cirrhopetalum*, which has been included as a section of the former genus by J. J. Smith and Holttum. The former (in *Bull. Jard. Bot. Buitenz.* ser. 2, 8 : 19-29, 1912) has shown that when all known species of the genus are considered, the distinctive features of the genus *Cirrhopetalum* can be easily accommodated within *Bulbophyllum*. However, orchidologists like Pfitzer, Rolfe and Fischer are of opinion that *Cirrhopetalum* should be maintained as an independent genus. As far as our Bombay orchids are concerned, the 2 species *Cirrhopetalum fimbriatum* Lindl. and *Bulbophyllum neilgherrense* Wt. are quite distinct in many respects and can be well separated into 2 independent genera. It may be worth noting that both these species are sympodial in structure, as *Dendrobium*, although the rhizome appears to be continuous, and the pseudobulbs to rest upon it. Each new branch of the sympodium begins as a bud at the base of a pseudobulb, grows horizontally as a rhizome for a short distance, and ends in a new pseudobulb with a leaf upon it ; next year's growth continues by a new bud produced from the old pseudobulb.

Type species : *B. nutans* Thou.

Bulbophyllum neilgherrense Wight, *Icon.* 5(1) : 6, t. 1650, 1851 ; *Bot. Mag.* t. 5050, 1858 ; *Hook. f.* 761 ; Gammie in *J. Bombay nat. Hist. Soc.* 17 : 33, 1906 ; Blatt. & McC. *ibid.* 35 : 266, t. 1, 1931 ; Cooke, *Fl. Pres. Bomb.* 2 : 686, 1907 ; Fischer, *Fl. Pres. Madr.* 1418, 1928. *Phyllorchis neilgherrense* (Wt.) O. Kuntze, *Rev. Gen. Pl.* 2 : 677, 1891. (See Plate XLVII)

Epiphytes or *lithophytes*. *Rhizome* 2-3 mm thick, creeping, giving out at intervals a pseudobulb and a cluster of roots. *Pseudobulbs* 2-8 × 2-3 cm, ovoid or conical-ovoid, yellowish-green, fleshy, irregularly 3-5-angled. *Leaf* 1, from the top of the pseudobulb, fleshy, coriaceous, tapering into a petiole 1 cm long ; the lamina 4-15 × 1.5-3.5 cm, oblong or elliptic, obtuse, emarginate, entire, glabrous ; midnerve depressed above, prominent below with faint 4-6 lateral nerves ; upper surface deep grass-green, lower much paler. *Inflorescence* up to 12 cm long, generally shorter than the leaves, arising from the base of a pseudobulb, somewhat drooping, dense ; peduncle 2 mm thick, mauve-purple, sheathed at the base. *Flowers* 14-15 mm long, pedicellate, bracteate, chrome-yellow, smelling of highly rotten meat. *Bracts* 7 × 2 mm, about as long as or shorter than the ovary, membranous, pale brown, oblong-lanceolate, acute or subacuminate, entire, 3-nerved. *Pedicel* with *ovary* 5 mm long, pale green. *Sepals* unequal, yellow very lightly tinged with green, entire, glabrous, faintly 5-nerved ; dorsal sepal 6 × 3.5 mm, concave, ovate, the acute apex upturned ; lateral ones 9 × 5 mm, subfalcate, sharply acute, obliquely united by the inner margins to form a hollow concave, cymbiform



Bulbophyllum neilgherrense Wight.

structure, which is produced below about the middle, into a short subglobular sac. *Petals* 4×1.5 mm, pale yellow, gland-dotted, parallel along the column, subobliquely ovate-triangular, entire, 1-nerved, with an apiculum 1 mm] long. *Lip* 7×4 mm, strongly arcuate, hinged on the column-foot, 3-lobed; lateral lobes $2-3 \times 1$ mm, purplish-brown with red margins, erect along the foot, linear, acute, entire; midlobe $4-5 \times 2-3$ mm, ovate-lanceolate, fleshy, subacute, serrate, yellow with 2 brownish ridges in between the lateral lobes. *Column* 5×2 mm, flat or subconcave and red on the inner side, rounded and yellow on the dorsal; produced above from the sides into 2 slender acute teeth 1 mm long; foot 3 mm long, slightly curved, at about right angles to the column, rounded and orange-yellow on the dorsal surface, broadly red-streaked and subconcave on the ventral, truncate at the apex. *Anther* yellow, subconical, obtuse, with the anterior lip minutely serrulate; pollinia 4, attached in pairs, waxy, brownish-yellow; glandular disc small, somewhat flask-shaped. *Stigmatic surface* yellow with red margins, elliptic.

Flowering : December.

Occurrence : N. KANARA : Belgaum Ghats, *Gammie*; Sampkhand, *Woodrow*; *Hallberg & McCann* 34842; Yellapur, *Sedgwick*; *Kapadia*; Kumbarwada, *Bell*; Shintheri Rocks between Dandeli and Gundh, *Kapadia* 1740-1746; Londa, *Santapau* 10840-10841; Siddhapur, *Kapadia* 2357; Jog, *Kapadia* 2330-2431.

Distribution : N. Kanara, W. Ghats of Bombay State and S. India.

Notes : This species has been observed by us to be both epiphytic and lithophytic, and rarely flowers in cultivation. The flowers have a most disgusting odour of carrion, probably a great attraction for carrion flies, which may be serving as agents for pollination.

23. *CIRRHOPE TALUM* LINDL.

CIRRHOPE TALUM Lindl. (in Bot. Reg. t. 832, 1824, nom. nud. ; et) Gen. Sp. Orch. 58, 1830, cum descr., nom. cons. ; Endl. Gen. Pl. 191, 1837; Benth. & Hook. f. Gen. Pl. 3 : 504, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 178, 1889; Hook. f. Fl. Brit. India 5 : 772, 1890; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 85, 1898; Duthie, ibid. 9(2) : 105, 1906; Schltr. Orchid. 328, 1927. *Bulbophyllum* Thou. sect. *Cirrhopetalum* J. J. Smith, Fl. Buitenz. 6 : 467, 1905, et. Bull. Jard. Buitenz. ser. 2, 8 : 19, 1912; Holttum, Rev. Fl. Malaya 1 : 400, 1953. *Zygoglossum* Reinw. ex Blume, Cat. Gew. Lands Pl. Buitenz. 100, 1823, nom. nud. et in Hornsch. Syll. Pl. Nouv. Ratisb. 2 : 4, 1828, cum descr. *Ephippium* Blume, Bijdr. 308, 1825. *Hippoglossum* Breda, Gen. Sp. Orch. t. 14, 1827.

The name *Cirrhopetalum* is derived from the Greek *kirrhos* = yellowish, and *petalon* = petal, referring to the prevailing yellow colour

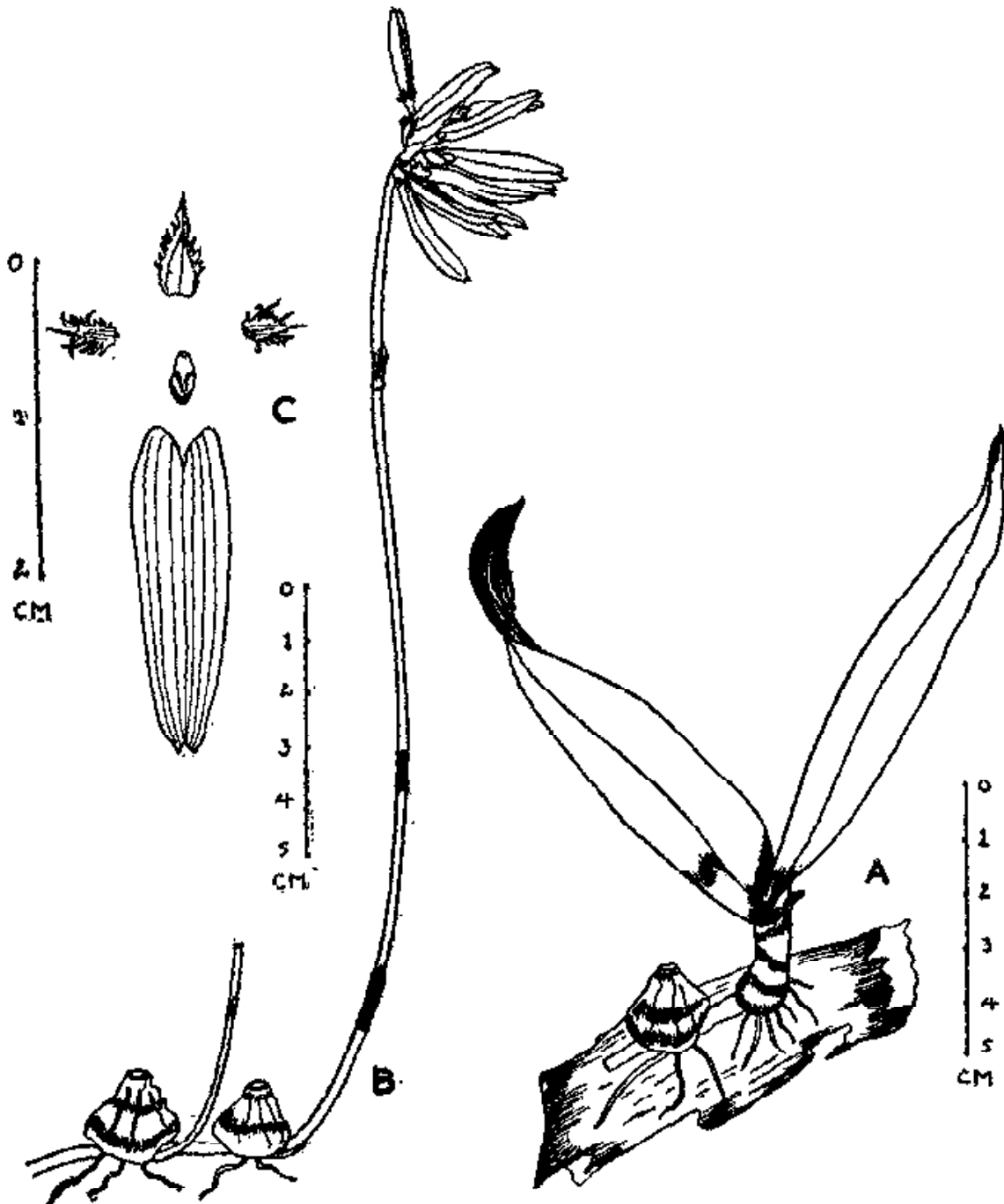
in the sepals of the first species ; Graham (*Cat. Bom. Pl.* 205, 1839) and Chibber (in *J. Bombay nat. Hist. Soc.* 24 : 280, 1916) incorrectly give the derivation of the generic name from *Cirrhus* = a tendril, and *petalum* = a petal, in allusion to the long filiform tendril-like termination of the lateral sepals.

Species about 50 ; this genus is more or less confined to the Old World from Madagascar through India and Malaysia to the Philippines and New Guinea.

Type species : *C. thouarsii* Lindl. (= *Bulbophyllum longiflorum* Thou.)

Cirrhopetalum fimbriatum Lindl. in *Bot. Reg. misc.* 72, 1839 ; Wight, *Icon.* 5(1) : 6, t. 1655, 1851 ; *Bot. Mag.* t. 4391, 1848 ; Dalz. & Gibs. *Bomb. Fl.* 261, 1861 ; Hook. f. 774 ; Gammie in *J. Bombay nat. Hist. Soc.* 17 : 34, 1906 ; Cooke, *Fl. Pres. Bomb.* 2 : 686, 1907 ; Fischer, *Fl. Pres. Madr.* 1420, 1928. *Cirrhopetalum wallichii* Graham, *Cat. Bomb. Pl.* 205, 1839 (non Lindl. 1830). *Bulbophyllum fimbriatum* Reichb. f. in *Walp. Ann.* 6 : 260, 1861 ; Blatt. & McC. in *J. Bombay nat. Hist. Soc.* 35 : 265, 1931. (See Plate XLVIII)

Epiphytes. *Rhizome* 2-4 mm thick, brown, woody, bearing pseudobulbs not more than 2 cm apart. *Pseudobulbs* 10-25 × 8-20 mm, yellow, leafless at the time of flowering, conical ovoid, irregularly and longitudinally grooved. *Leaves* usually 2 per shoot, spreading from a short pseudostem which is 5-15 × 4-8 mm, sheathed ; leaves 4-12 × 1.1-2 cm, sessile, subcoriaceous, oblong-lanceolate or elliptic, acute, 1-nerved, margins whitish, entire, minutely papillate. *Scape* 8-20 cm long, 1-2 mm thick, brown-green, rigid, erect, with a few sheaths which are 5-10 mm long, oblong, acute, brown ; the apex with an umbellate raceme is erect in bud, gradually becoming reflexed with the opening of flowers. *Buds* pale green ; with the expansion of the flowers, the lateral sepals turn yellow. *Flowers* about 2 cm long, bracteate, pedicellate, foul-scented, ± radiating in all directions from the apex of the peduncle. *Bracts* 4 × 1 mm, ovate-oblong, acuminate, entire, pale greenish-brown, 3-nerved. *Pedicel* about 1 mm long. *Ovary* 2 × 1 mm, subclavate, ribbed, pale green. *Sepals* unequal ; dorsal sepal 6 × 2.5 mm, deep pinkish-yellow with purple fimbriae, ovate, acuminate 3-nerved, the lateral nerves faint ; lateral sepals 2 × 0.6 cm green in bud, changing to yellow with age, oblong, acute, 3-nerved, more or less saccate at base, united by their inner margins into a subcymbiform, structure which is emarginate at the apex. *Petals* 4 × 2.5 mm, similar to dorsal sepal in colour, but with longer fimbriae, oblong to ovate, acuminate, 3-nerved. *Lip* 3 × 1.5 mm, yellow at base and along the centre, the sides crimson, elliptic-oblong, obtuse, thick, fleshy, somewhat ligulate. *Column* 2 × 1 mm, oblong, white with 2 deep crimson curved horns ; foot 1.5 mm long, narrow, white with a few, small, reddish spots on the inner face.



Clirhopetalum fimbriatum Lindl.

A. Leafy plant with support ; B. Flowering plant ; C. Sepals and petals dissected.

Stigmatic surface yellow. *Anther* minute, reddish-brown, papillate. *Pollinia* 4, waxy, ovoid, with a small glandular viscid mass. *Capsules* 12 × 6 mm, obpyriform, green ; pedicels 5 mm long.

Leaves : June to November. *Flowers* : March to April.

Occurrence : W. GHATS : Mahableshwar, James ; Hallberg ; Mahableshwar-Pratapgad, Kapadia 1924-1927, 1937, 2096. DECCAN : Purandhar, Kapadia. N. KANARA : Tinai Ghat, Bhide ; Anmod, Kapadia 1869-1870, 1901-1904 ; Castle Rock, Kapadia 2835-2836 ; Astoli, Bell ; Astoli-Chandwadi, Bell.

Distribution : Konkan, W. Ghats, N. Kanara, Deccan, Coorg.

Notes : This species is often known as the 'Umbrella Orchid' on account of its characteristic umbellate racemes, where the flowers more or less radiate from the apex of the peduncle like the ribs of an umbrella. It is usually found in open deciduous forests. The flowers give off a foul scent.

C. wallichii Grah. seems to be this species ; Graham gives the locality as Rotunda Ghat ; we have found this species very abundant on Rotunda Ghat along the short cut to Pratapgad from Mahableshwar.

24. *TRIAS* LINDL.

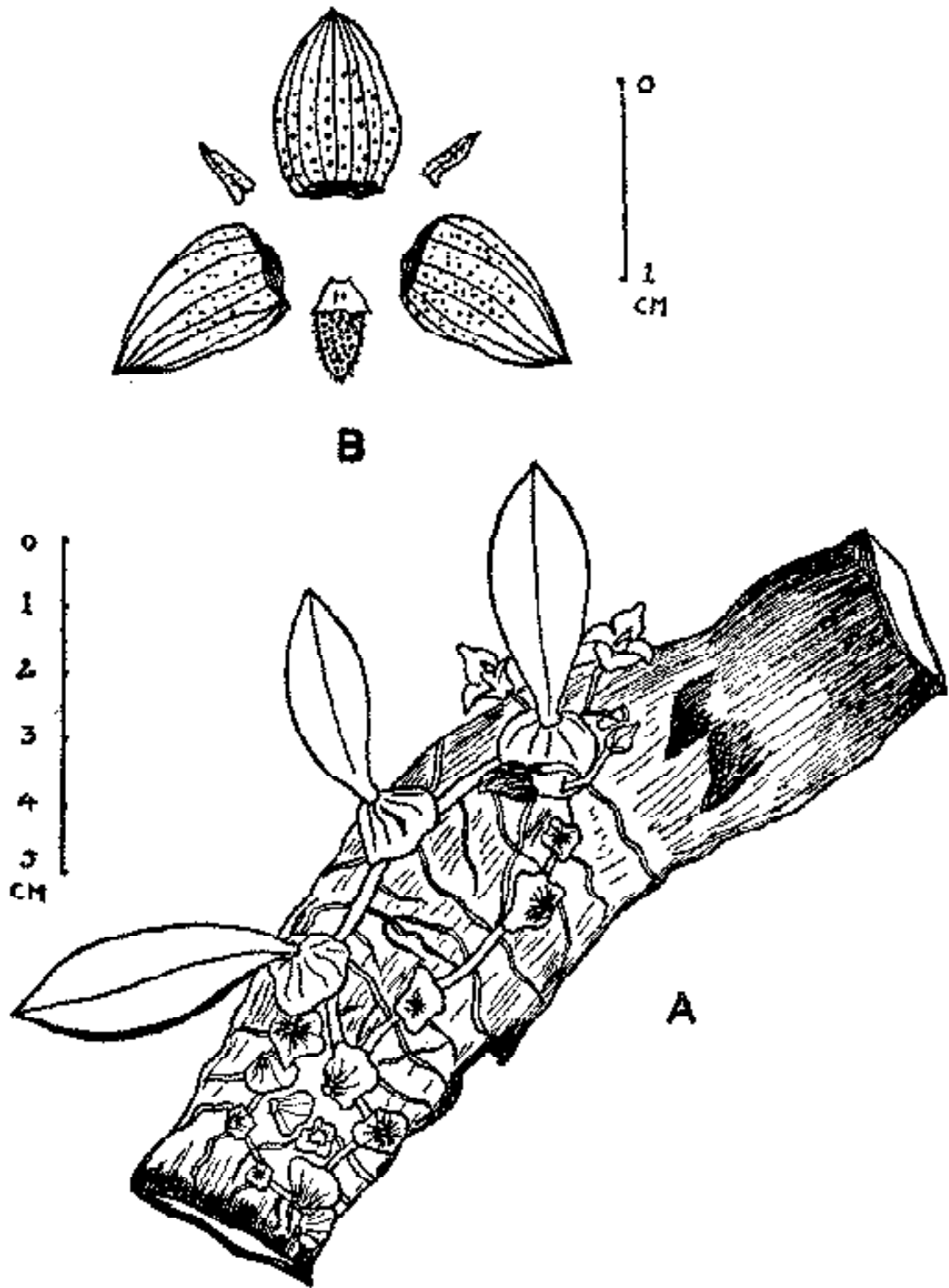
Trias Lindl. (in Wall. Cat. 1977, 1829, nom. nud. et) Gen. Sp. Orch. 60, 1830 ; Endl. Gen. Pl. 191, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 505, 1883 ; Pfitz. in Engl. & Prantl. Pflanzenf. 2(6) : 180, 1889 ; Hook. f. Fl. Brit. India 5 : 780, 1890 ; Schltr. Orchid. 333, 1927.

The generic name *Trias* is derived from the Greek word *treis*=three, alluding to the arrangement of the sepals.

This genus has only 4 to 5 species endemic in India and Burma ; restricted to Tenasserim, but for one, which is found in south India. *T. ovata* Lindl. is a native of S.E. Asia.

Trias stocksii Benth. ex Hook. f. Fl. Brit. India 5 : 781, 1890 ; Gammie in J. Bombay nat. Hist. Soc. 17 : 34, 1906 ; Blatt. & McC. ibid. 35 : 267, 1931 ; Cooke, Fl. Pres. Bomb. 2 : 687, 1907. (See Plate XLIX)

Rhizome dirty brown, terete, about 2-3 mm thick. *Pseudobulbs* 1 × 1.3-1.7 cm, shortly conical-ovoid, dark olive-green or brownish-purple, with a few faint grooves. *Leaf* one, 1.5-4.5 × 0.7-2 cm, coriaceous, erect or deflexed, entire, acute or obtuse, 1-nerved, dark olive-green above, brown-purple below. *Scape* 0.61-1 cm long, thin, 1-flowered, with 2 loose, membranous, gland-dotted sheaths. *Flowers* 9-11 mm across, pedicellate, bracteate, deep chrome-yellow ; all the floral parts thick and coriaceous. *Bracts* tubular, oblong, just above the sheaths of the scape and similar to them. *Pedicel* with ovary about 1 cm long, slightly curved, the ovary clavate, ribbed. *Sepals* subequal 9 × 6 mm, deep chrome-yellow spotted with orange in the basal



Trilas stocksil Benth.

A. Plant with support ; B. Sepals and petals dissected.

region, ovate-oblong, obtuse, mucronulate, entire, glabrous, faintly 7-nerved; dorsal sepal concave; lateral ones subsaccate and concave at base, and adnate to foot of column to form a broad mentum 3-4 mm long, emarginate. *Petals* 3-4 × 1-2 mm, narrowly linear-oblong, broad at base, acute, entire, 1-nerved, gland-dotted. *Lip* mobile on the apex of the column-foot, the basal third inflexed and parallel to the foot, glabrous; the upper two-thirds of lip deflexed at right angles to basal portion, oblong, tuberculate on upper surface, rounded, entire, faintly grooved down the middle, or not; at the junction of the glabrous and tuberculate portions, there are 2 minute, apiculate, erect auricles on the sides representing the lateral lobes of the lip. *Column* 7-9 × 2-4 mm broad, oblong, produced in front at the apex into 2 broad, subentire, apiculate wings; back of the deep clinandrium produced into an apiculum to which the back of the anther is attached; foot broad, slightly curved, at right angles to the column, about 2-3 mm long. *Anther* cells about 1 × 1 mm, with a horn 1-2 mm long, slender; pollinia 4, waxy, in pairs, oblong. *Stigmatic surface* deep seated. *Capsules* 12-14 × 12 mm, ovoid-orbicular; *pedicels* about 7 mm long, curved; the capsule with 6 strong, 1-2 mm deep grooves.

Flowering : February to March. *Fruiting* : November.

Occurrence : N. KANARA : Castle Rock, *Kapadia* 2819-2820; Siddhapur, *Kapadia* 2358-2359; Anmod, *Kapadia* 1864; Jog, *Kapadia* 1844-1845.

Distribution : Apparently endemic in N. Kanara and the Konkan parts of Bombay State.

Notes : A few flowering specimens of this species were given to us by Prof. Ladhwa of Karnatak College, Dharwar, for which we are very grateful; they have been of real help in framing our description.

25. GEODORUM JACKS.

GEODORUM Jacks. in Andr. Bot. Rep. 1, 626, 1810; Endl. Gen Pl. 200, 1837; Benth. & Hook. f. Gen. Pl. 3 : 538, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 156, 1889; Hook. f. Fl. Brit. India 6 : 16, 1890; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 181, 1898; Duthie, ibid. 9(2) : 130, 1906; J. J. Smith, Fl. Buitenz. 6 : 222, 1905; Schltr. Orchid. 340, 1927; Holttum, Rev. Fl. Malaya 1 : 534, 1953.

The generic name *Geodorum* is derived from the Greek words *ge* = the earth, and *doron* = a gift, meaning a gift of the earth, in allusion to its terrestrial habit.

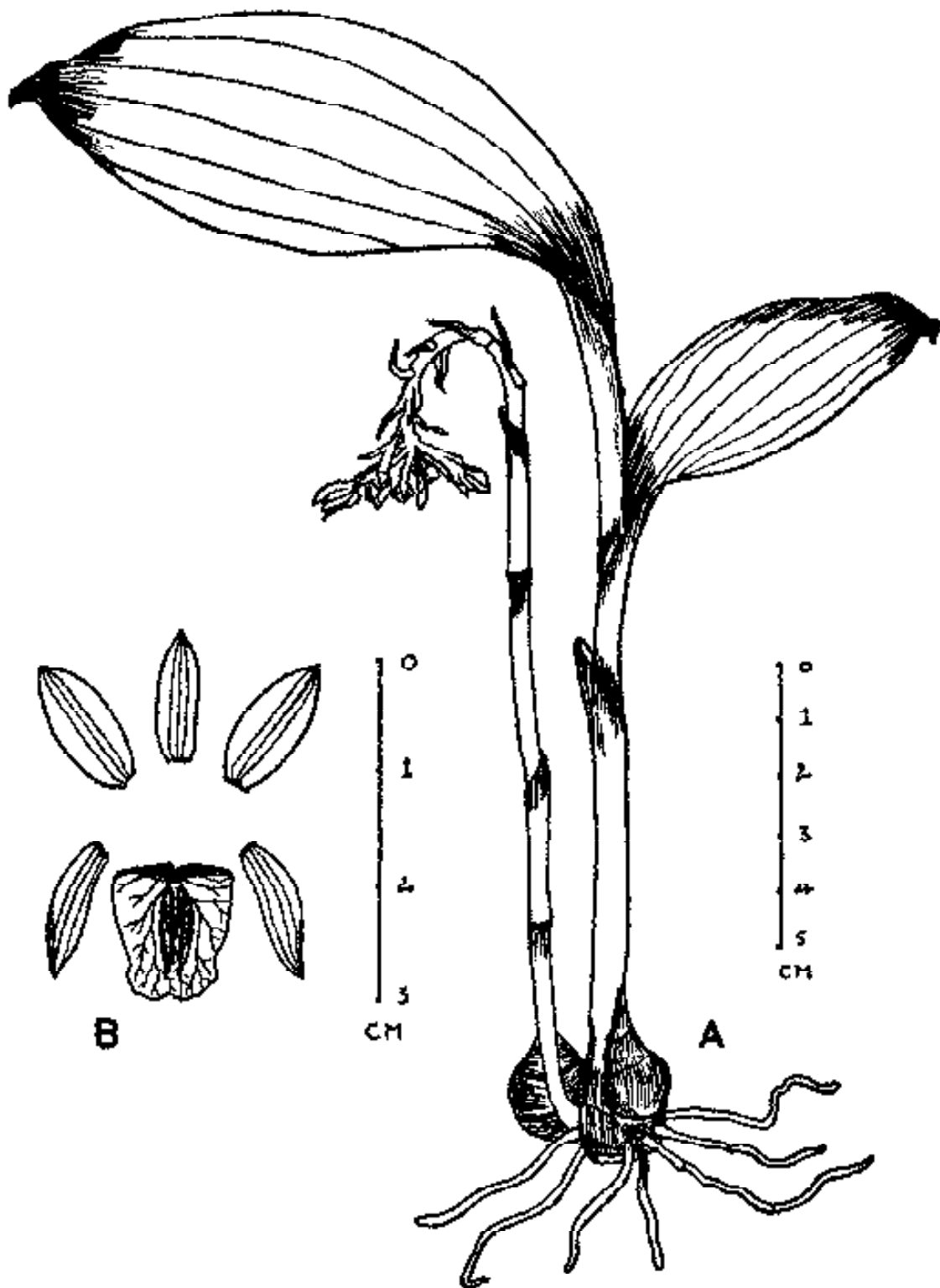
A small genus of about 10 species distributed from India, Ceylon, Burma, Malaya and Java to Australia.

The species on which the genus *Geodorum* was erected is *G. citrinum*; this, therefore, must be considered the type species.

Type species : *G. citrinum* Jacks.

Geodorum densiflorum (Lam.) Schltr. in Fedde, Repert. Beih. 4 : 259, 1929 ; Fischer, Fl. Pres. Madr. 1437, 1928 ; Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 487, 1931. *Limodorum densiflorum* Lam. Encycl. 3 : 516, 1791-1792. *L. recurvum* Roxb. Pl. Corom. 1 : 33, t. 39, 1795, et Fl. Ind. 3 : 469, 1832. *L. nutans* Roxb. Pl. Corom. 1 : 34, t. 40, 1795, et Fl. Ind. 3 : 469, 1832 (?). *Malaxis nutans* Willd. Sp. Pl. 4 : 93, 1805(?). *M. cernua* Willd. Sp. Pl. 4 : 93, 1805 ; Graham Cat. Bomb. Pl. 203, 1839. *Geodorum purpureum* R. Br. in Ait. Hort. Kew. ed. 2, 5 : 207, 1813 ; Spreng. Syst. Veg. 3 : 726, 1826 ; Dalz. & Gibs. Bomb. Fl. 266, 1861 ; Hook. f. 16 ; King & Pantl. 181, t. 245 ; Duthie 130 ; J. J. Smith 222, f. 163 ; Holttum 535. *G. dilatatum* R. Br. in Ait. Hort. Kew. ed. 2, 5 : 207, 1813 ; Spreng. 726 ; Wight, Icon. 3(2) : 10, t. 912, 1844-1845 ; Hook. f. 17 ; Grant, Orch. Burma 233, 1898 ; Prain, Beng. Pl. 1017, 1903 ; Cooke, Fl. Pres. Bomb. 2 : 695 ; 1907 ; Gammie in J. Bombay nat. Hist. Soc. 18 : 587, 1908 ; Haines, Bot. Bib. & Or. 1170, 1924 ; Duthie, Fl. Upp. Gang. Pl. 3 : 203, 1920. *G. recurvum* (Roxb.) Alston in Trimen, Handb. Fl. Ceyl. 6 : 276, 1931. (See Plate L)

Terrestrial herbs. *Pseudobulbs* tuberous, ovoid-conical, \pm regular in shape, greenish-brown with transverse circular bands, about 5×3 cm. *Leaves* 1 or 2, forming a pseudostem about 16 mm tall, and 1-1.4 cm thick ; the leaves $11-40 \times 5-10$ cm, sheathing at base, subplicate, many-nerved, obovate-oblong, elliptic or elliptic-lanceolate, acute, entire, the upper ones tapering into a long narrow petiole. *Scape* 28-32 cm tall, arising from the tuber away from the leaves, green, terete, with a few oblong-lanceolate sheaths ; the apical part decurved. *Inflorescence* about 4 cm long, a compact subcorymbose raceme, facing downwards. *Flowers* 1.5 cm. long, pinkish-white or white, opening very little, bracteate, shortly pedicellate. *Bracts* $1.2-1.4 \times 0.2-0.3$ cm, lanceolate, acute or subacuminate, entire, glabrous, 3-nerved, green. *Sepals* 12×4 mm, pure white or white flushed with very pale mauve, more so in the basal regions, acute, entire, 3-nerved ; dorsal sepal obovate-oblong, slightly broader ; lateral ones suboblique, narrowly oblong, somewhat keeled. *Petals* 12×6 mm, similar to sepals but slightly broader, elliptic-oblong, acute, entire, 3-nerved. *Lip* attached all along to the foot, forming a 5 mm deep, concave, rounded trough, flattening out a little at the apex ; in colour white flushed with pale pink or mauve on the outside as sepals and petals, the inside with deep purple veins on the sides, a central yellow disc bordered with deep mauve and with 2 thin purple veins in the centre of the disc. The lip 12 mm long, 10 mm broad on flattening, deltoid-oblong in outline, obscurely 3-lobed ; lateral lobes broad, subentire, middle one crenulate, emarginate. *Column* 5×2 mm, white, subclavate, minutely puberulous, produced upwards from behind into an apiculum to which the back of the anther is attached ; clinandrium white with a central faint, transverse, pink line. *Foot* short, broad



Geodorum densiflorum Schltr.
A. Whole plant ; B. Sepals and petals dissected.

above, narrowing downwards, margined and tipped with deep mauve. *Anther* 2-2.5 mm broad, suborbicular, dorsal surface very pale yellow, with the flaps purple-margined. *Stigmatic surface* broad, pure white. *Ovary* with *pedicel* 0.8-1 cm long, green, clavate, ribbed, not twisted.

Flowering : June.

Occurrence : KONKAN : *Stocks* ; *Law* ; *Dalzell* ; S. Konkan, *Graham* ; Ghats in S. Konkan, *Stocks* ; Wari Country, *Dalzell & Gibson* ; Cultivated in St. Xavier's College Garden, *Kapadia* 2921. N. KANARA : *Kalanadi, Ritchie* ; Yellapur-Arbail, *Kapadia* 2044.

Distribution : Considerable confusion has resulted in the synonymy of this species since Roxburgh's publication of 2 species of *Limodorum*, *L. recurvum* and *L. nutans*. In his FLORA INDICA he distinguishes *L. nutans* from *L. recurvum* in the following way : ' Here (*L. nutans*) the bulbs are smooth, there striated. Here the leaves are oval, there lanceolate ; here the scape is longer than the leaves, there not half as long. Here the spike is oblong, and pendulous, there globular retrofracted. Here the flowers stand at some distance from one another, there they are crowded. Here they are of a beautiful rose colour, there white. Here the lip is sharp-pointed, there circular and crenulate '.

R. Brown based his *G. purpureum* and *G. dilatatum* on Roxburgh's plates of *Limodorum nutans* and *L. recurvum*, of which unfortunately no specimens exist.

The inflorescence scape is definitely known to elongate after flowering, as has been pointed out by King & Pantling, and has been observed by us. The flower colour varies from rose-purple to pure white ; our specimens, when first collected, had fairly deep rose-purple flowers ; the next year in cultivation the flowers were white. Therefore, it seems that the only significant characteristic between *L. nutans* and *L. recurvum* which cannot be easily accounted for, is the ' . . sharp-pointed tip . . ' of the lip. Hooker f. remarks that the characters described for *L. nutans* Roxb. such as scape longer than the leaves, a lax-flowered raceme, and an acute lip have not hitherto been found in any *Geodorum*. Further : ' . . if it be allowed that the elongate scape and lax-flowered raceme are due to the lengthening of the axis of the scape after flowering, and that the appearance of an acute lip is due to the infolding of its margins towards the apex, then *G. purpureum* is the commonest and widest-distributed Indian species. Dalzell & Gibson alone identify a plant with *G. purpureum* Br., and I have examined authentic specimens of it, which they did not, for they give Brown's characters for this species, whilst those of their specimens are what I have given above ' . (i.e. the tip of the lip 2-lobed, not acute). Thus Hooker f. while showing the very close similarity between these two species, keeps them apart and refers the Deccan plants to *G. purpureum*.

Cooke, following Prain, calls our Bombay plants *G. dilatatum* Br.,

since it is under this name that the lip is referred to as obtuse and 2-fid at the apex and not acute. He further adds : ' In his " Flora Indica, " v. 3 (1832) p. 469, Roxburgh again describes the lip of *Limodorum nutans* as acute and cites Rheedee (Hort. Mal. v. 11, t. 35), who however in his figure of *Bela-Pola* shows the lip as subpandurate, obtuse and 2-fid at the apex. The lip as figured by Rheedee corresponds exactly with the lip of *G. dilatatum*'. Therefore it seems that Roxburgh himself was not very sure of the species. Further Cooke adds : ' After spending much time over drawings and descriptions, I have come to the conclusion indicated by Sir J. Hooker (Trimen's Fl. Ceyl. v. 4, p. 179) that *G. dilatatum* and *G. purpureum* are both forms of one species, and as Brown's description of *G. dilatatum* fits the plant better than his description of *G. purpureum*, the former name has been adopted '.

It may be pointed that all the authors describing this species under the name of *G. purpureum* R. Br., including King & Pantling, J. J. Smith, and Holttum, give the lip as obtuse, emarginate or 2-fid at the apex, not sharp-pointed or acute. It does seem probable that the true form described and figured by Roxburgh as *Limodorum nutans* (= *G. purpureum* R. Br.) with a sharp-pointed or acute lip has not been met with after Roxburgh ; its very existence seems to be questionable.

26. CYMBIDIUM SW.

Cymbidium Sw. in Nov. Act. Sc. Upsal. 6 : 70, 1799 ; Endl. Gen. Pl. 199, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 536, 1883 ; Pfitz. in Engl. & Prantl. Pflanzenf. 2(6) : 184, 1889 ; Hook. f. Fl. Brit. India 6 : 8, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 184, 1898 ; Duthie, *ibid.* 9(2) : 133, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 475, 1905 ; Hook. f. Fl. Brit. India 6 : 8, 1890 ; Schltr. Orchid. 354, 1927 ; Holttum, Rev. Fl. Malaya 1 : 513, 1953.

The generic name *Cymbidium* is derived from the Greek *kyme*=boat, in allusion to the hollowed boat-shaped base of the lip in many of the species.

This genus consists of about 50 species, found in Madagascar, in Asia from Ceylon and India to Japan, and through Malaysia to Australia.

Cymbidium aloifolium Sw. in Nov. Act. Sc. Upsal. 6 : 73, 1799 ; Roxb. Fl. Ind. 3 : 458, 1832 ; Graham, Cat. Bomb. Pl. 203, 1839 ; Wight, Icon. 5 (1) : 11, tt. 1687-8, 1851 ; Dalz. & Gibs. Bomb. Fl. 266, 1861 ; Hook. f. 10 (partim) ; King & Pantl. 189, t. 252 ; Duthie 136, et Fl. Upp. Gang. Pl. 3 : 206, 1920 ; J. J. Smith 482, f. 367 ; Cooke, Fl. Pres. Bomb. 2 : 696, 1907 ; Gammie in J. Bombay nat. Hist. Soc. 18 : 586, t. 5, 1808 ; Blatt. & McC. *ibid.* 35 : 487, 1931 ; Brühl, Guide Orch. Sikk. 115, 1926 ; Fischer, Fl. Pres. Madr. 1436, 1928. *C. bicolor*

Hook. f. Fl. Brit. India 6 : 11, 1890 ; Alston, Kandy Fl. 75, f. 400, 1938 (an Lindl. 1833 ?).

Robust *epiphytes*, the roots forming a dense, thick matting over the support. *Pseudobulbs* 4-6 cm long, ovoid, sheathed by the leaf bases. *Leaves* 20-55 × 1-3 cm, coriaceous, oblong, entire with a prominent midnerve, tapering at the base into a petiole 4-10 cm long, which is marked by a transverse deep green line ; apex notched, with 2 unequal, rounded, lobes. *Inflorescence* 25-45 cm long, peduncles erect, racemes pendulous, sheathed at the base. *Flowers* bracteate, pedicellate. *Bracts* minute, persistent, ovate to triangular, acute, 2-5 mm long. *Pedicel* with *ovary* 20-25 mm long, greenish below, purplish above. *Sepals* 24-27 × 3-4 mm spreading, vinaceous purple, lanceolate or oblong-lanceolate, entire, acute, 1-nerved ; the lateral ones somewhat falcate. *Petals* 20-22 × 4-5 mm, yellowish, vinaceous in the centre, oblong, acute, often subfalcate, entire, 1-nerved. *Lip* 16-20 mm long, somewhat saccate at base, 3-lobed ; lateral lobes 7 × 2-3 mm, oblong-obtuse, entire, mottled with brown-purple ; midlobe 8-10 × 6-8 mm, broadly ovate, acute, sub-entire, much recurved, yellow with broad purple stripes. The throat of the lip with 2 yellow calli. *Column* about 12 mm long, clavate, vinaceous-brown all along inside, except near top. *Anther* 3 × 2 mm, 2-celled, broadly oblong ; pollinia 2, waxy, yellow, obliquely oblong with a small gland which tapers at the ends. *Capsule* 6.5 × 2.5 cm ovoid, elliptic, deep green longitudinally and shallowly grooved ; pedicels 10-12 mm long.

This description is after detailed field observations of H. Santapau.

Flowering : May. *Fruiting* : June onwards.

Occurrence : KONKAN : *Stocks* ; *Law* ; S. Konkan, *Dalzell* ; Ghats and the hilly parts of the Konkan, *Graham* ; Alibag, *Dalzell & Gibson* ; ? Salsette, *Dalzell & Gibson*. N. KANARA : Tamboli, near Sawantwadi, *F. X. Miranda* ; Sirsi, *Woodrow* ; Santapau 18662-18664 ; *Hallberg & McCann* 35196 ; Chandwar, *Ritchie* ; Kalanadi, *Ritchie* ; Gundh, *J. Fernandez* 1522 ; *Kapadia* 1722-1724 ; Siddhapur, *Kapadia* 2372-2374 ; Dandeli, *Kapadia* 1676.

Distribution : *India* : Sikkim, Bengal, Assam, Andaman Islands, Konkan, N. Kanara, and all the hilly tracts of South Peninsular India. *World* : India, Ceylon, Burma, S. China, and southwards to Sumatra and Java.

Notes : Dalzell & Gibson give Salsette as one of the localities for this species. No subsequent worker has been successful in re-locating it in this area ; the species seems to be more or less restricted to the districts of N. Kanara.

C. aloifolium Sw. has often been confused with *C. pendulum* Sw., *C. bicolor* Lindl. and *C. simulans* Rolfe.

King & Pantling have clearly shown the differences between *C.*

aloifolium Sw. and *C. pendulum* Sw.; these two species were founded on figures and not on actual plants; the first was based on Rheede's plate (*Hort. Mal.* 12 : t. 8), which was named *Epidendrum aloifolium* by Linne (*Sp. Pl.* 953, 1753). *C. pendulum* was based on *Epidendrum pendulum* Roxb. (*Pl. Cor.* 1 : t. 44).

Hooker f. united the 2 species after a study of the herbarium material, which has little to distinguish them. But King & Pantling having had an opportunity to observe them in nature kept them apart, putting down the differences as follows: 'The plants as they grow, which they do side by side in Sikkim, appear so different that we have kept up both as a species. The sepals and petals of *C. aloifolium*, as we have figured, are yellowish, each having a broad mesial purple strip. Upper surface of the lip is purple, with darker lines of the same colour and a patch of whitish at the base of the apical lobe. The outer surface is yellowish and striped only on the apical lobe. It has broader, blunter, more coriaceous leaves than *C. pendulum* and their apices are notched; the peduncle of the raceme being erect while the raceme itself is decurved; whereas in *C. pendulum* the peduncle is decurved from its origin from the stem'.

From a careful study of the literature, *C. bicolor* Lindl. does not seem to be a distinct species. Hooker f., though maintaining the 2 species as different, finds difficulty in keeping them apart and says: 'I am much puzzled with this (*C. aloifolium* Sw.) and the following species, (*C. bicolor* Sw.), which appear to differ in so far as my copious materials show, only in the comparative length of the epichile and hypochil of their lips, and in their geographical ranges, *aloifolium* being strictly northern and eastern, and *bicolor* as strictly western. These characters would be absolute were it not that Rheede's figures of the Malabar plant has the lip of *aloifolium*'. As noted by Hooker f. himself, *C. aloifolium* Sw. is a very variable species. It should, therefore, include the slight variations in the comparative lengths of the hypochil and epichile.

Lindley under his *C. bicolor* cites the Javanese *C. aloifolium* Bl. (*Bijdr.* t. 19); the latter has been partly included under *C. pubescens* Lindl. by J. J. Smith.

From these considerations it seems very doubtful if *C. bicolor* Lindl. can be considered an independent species, the Indian and Ceylon plants being probably equal to *C. aloifolium* Sw., and the Javanese ones, to *C. pubescens* Lindl.

Holtum has fused *C. simulans* with *C. aloifolium*. Edward Cooper (in *Dist. Gard.* 2 : 610, 1951) has the following note under *C. aloifolium*: 'Distinct from *C. simulans* by spikes erect, midlobe of lip long, acute... Probably not in cultivation. *C. aloifolium* of gardens is a synonym of *C. simulans*'.

H. Santapau has noted this plant as very common and remarkably abundant on roadside trees in the neighbourhood of Haliyal in North Kanara ; most trees at the main fork of their branches held a clump over 1 m in diameter ; due to their position along the road, most plants were densely covered with dust. Lately the sap of the leaves has been shown to have highly valuable styptic properties ; this seems to have caused the disappearance of the plant from some of its former areas.

27. *CHILOSCHISTA* LINDL.

CHILOSCHISTA Lindl. in Bot. Reg. sub. t. 1522, 1832, nom. nud. et Gen. Sp. Orch. 219, 1833, cum descr.; Endl. Gen. Pl. 204, 1837 ; Pftz. in Engl. & Prantl, Pflanzenf. 2 (6) ; 216, 1889 ; J. J. Smith, Fl. Buitenz. 6 : 533, 1905. *Sarcochilus* sect. *Chiloschista* Benth. & Hook. f. Gen. Pl. 3 : 575, 1883 ; Hook. f. Fl. Brit. India 6 : 37, 1890.

The generic name *Chiloschista* seems to be derived from the Greek words *cheilos*=lip, and *cheista* shaped like the Greek letter X, in allusion to the shape of the lip.

A very small genus with but a few species (probably 2 or 3) found in India, Nepal, Ceylon and Java.

King & Pantling (in *Ann. R. Bot. Gard. Calcutta* 8 : 206, 1898) have included this genus under *Sarcochilus* R. Br. with the following note: '...has the characters of the genus as we believe Robert Brown originally constituted it, and which occur in the only species which he described, viz. *S. falcatus*. These characters are the presence in the lip of two very large side lobes and of a very short anterior lobe, together with the total absence of a spur'. They further add under *Sarcochilus luniferus* Benth. ex Hook. f.: 'in the structure of its flowers this exactly agrees with *Sarcochilus falcatus* R. Brown, as figured by Fitzgerald in his *Orchids of Australia*, part 5. Brown's generic description is a very brief one, and contains nothing that does not fit this plant, which without hesitation we refer to *Sarcochilus*, as Brown defined it'.

Schlechter (in *Die Orchid.* 533, 1927) has also united *Chiloschista* Lindl. with *Sarcochilus* R. Br.

We have followed Pfitzer, J. J. Smith and others in the recognition of *Chiloschista* Lindl. as an independent genus. Pfitzer considers the leafless habit sufficient for keeping the genus distinct. J. J. Smith distinguishes *Chiloschista* Lindl. from *Sarcochilus* R. Br. by the lateral sepals, petals and lip of the former being inserted on the column-foot, whereas in the latter genus only the lip is inserted on the foot of the column.

Type species : *C. usneoides* Lindl.

Chiloschista lunifera J. J. Smith, Fl. Buitenz. 6 : 553, 1905 & f. 169,

1912. *Sarcochilus luniferus* Hook f. in Bot. Mag. t. 7044, 1889 et Fl. Brit. India 6 : 37, 1890 ; Grant, Orch. Burma 302, 1895 ; King & Pantl in Ann. R. Bot. Gard. Calcutta 8 : 207, 1898. *Chiloschista glandulosa* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 488, 1932 (*Chiloschista*).

Small, leafless *epiphytes*. *Roots* greyish-green, up to 2 mm thick, ± radiating in all directions ; in the absence of leaves the roots seem to have taken up the function of photosynthesis. *Stem* 0. *Scape* 2-4 cm long, from the centre of the roots cluster, thin at base, gradually thickening upwards, jointed, bracteate, the lower portion glabrous, the upper glandular-pubescent, hairs white, minute, conical. *Flowers* minute, 2-4, bracteate, almost sessile. *Bracts* 2.5 × 2 mm ovate in outline, subentire, gland-dotted, strongly 1-nerved, with a small apiculum. *Sepals* unequal, entire, 5-nerved ; dorsal sepal 5 × 2 mm obovate-oblong, obtuse ; lateral ones 3.5 × 2.5 mm broadly oblong, subacute. *Petals* slightly longer than the lateral sepals, broadly truncate, rarely with a minute mucro at the apex. *Lip* superior, inflexed on the foot of the column, 3-lobed ; lateral lobes more than twice as long as the midlobe, curving upwards and inwards ; on spreading the lip has a small pouch-like depression just at the base of the midlobe. Midlobe of lip 1.5 × 1.3 mm, broadly obovate, truncate, slightly emarginate ; the 2 lobules woolly-white. *Column* very short, with a foot which is incurved, stout, 2 mm long. *Anther* broad, obovate, mucronate, 2-celled ; pollinia 2, obovate, slightly compressed, deeply grooved with short extensible caudicles. *Ovary* pale brown 7 mm long, glandular-pubescent. *Capsules* 13 × 3 mm purplish-brown, curved, tapering at base, somewhat 4-angled at apex, with minute, erect, conical, white, hairs.

The colour details of the flowers given by Blatter & McCann are as follows : sepals and petals yellow spotted and blotched irregularly and often densely with brown-red ; column white, with foot purple-blotched ; anther yellowish.

Flowering : January to March. *Fruiting* : March to June.

Occurrence : N. KANARA : Karwar, *Bell* ; Dandeli, *Bell* ; Yellapur, *Bell* ; Kapadia 2869 ; Joida-Dandeli, *Kapadia* 2767.

Distribution : *India* : Sikkim, N. Kanara. *World* : India, Burma and Java.

Notes : Our specimens of *Chiloschista glandulosa* Blatt. & McC. exactly agree with the description and figures of *C. lunifera* J. S. Sm. as given by I. J. Smith and King & Pantling. The only difference seems to lie in the fact that the scape of the N. Kanara plants never reaches the large size of 20 cm or more as found in Sikkim and Java-nese plants.

There seems to be very little difference between this species and

C. usneoides Lindl., as has been pointed by Hooker f., who however, keeps them apart merely on the basis of colour difference in flowers. J. J. Smith is of opinion that the two species may be identical.

28. *RHYNCHOSTYLIS* BL.

RHYNCHOSTYLIS Bl. Bijdr. 285, 1825 (*Rhynchostylis*); Benth. & Hook. f. Gen. Pl. 3 : 574, 1883 ; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 218, 1889 ; Hook. f. Fl. Brit. India 6 : 32, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 213, 1898 ; Duthie, *ibid.* 9 (2) : 143, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 628, 1905 ; Schltr. Orchid. 546, 1927 ; Holttum, Rev. Fl. Malaya 1 : 697, 1953.

The generic name *Rhynchostylis* is derived from the Greek *rhynchos*=beak, and *stylos*=column or pillar, in allusion to the column which is beak-like.

This is a small genus of about 4 or 6 species, distributed from India to Malaya, Java and Philippines.

The closer allies of this genus are *Saccolabium* Bl. and *Aerides* Lour. *Rhynchostylis* can be distinguished thus : (1) the lip is scarcely lobed ; (2) the lip is not sharply distinguished from the column-foot ; (3) the spur is backward-pointing and laterally compressed ; and (4) the rostellum is strongly beaked. Holttum has pointed out that when not in flower, the pale lines on the leaves serve to distinguish the plants of this genus. We have, however, observed that dry specimens of *Vanda testacea* Reichb. f. and *V. tessellata* Hook. ex G. Don show pale longitudinal lines on the leaves.

When the genus *Rhynchostylis* was erected by Blume, he included 2 species, *R. retusa* and *R. praemorsa*, under it. The two species are now considered to be synonymous. Consequently *R. retusa* Bl. can be taken as the type species of the genus.

Type species : *R. retusa* Bl.

Rhynchostylis retusa (L.) Bl. Bijdr. 286, t. 49, 1825 ; Hook. f. 32 ; Grant, Orch. Burma 290, 1895 ; King & Pantl. 213, t. 284 ; Duthie 143, et Fl. Upp. Gang. Pl. 3 : 209, 1920 ; Prain, Beng. Pl. 1020, 1903 ; J. J. Smith 629, f. 471 ; Cooke, Fl. Pres. Bomb. 2 : 698, 1907 ; Gammie in J. Bombay nat. Hist. Soc. 18 : 833, t. 7, 1908 ; Blatt. & McC. *ibid.* 35 : 490, 1932 ; Haines, Bot. Bih. & Or. 1178, 1924 ; Brühl, Guide Orch. Sikk. 128, 1926 ; Fischer, Fl. Pres. Madr. 1440, 1928 ; Santapau in Rec. bot. Surv. India 16 (1) : 302, 1953 ; Holttum 697. *Epidendrum retusum* L. Sp. Pl. 953, 1753. *Aerides retusum* Sw. in Schrad. Journ. 2 : 233, 1799 ; Willd. Sp. Pl. 4 : 130, 1805 ; Graham, Cat. Bom. Pl. 204, 1839. *A. guttatum* Roxb. Fl. Ind. 3 : 471, 1832. *Saccolabium guttatum* Lindl. [in Wall. Cat. 7308, 1832, nom. nud. et] Gen. Sp. Orch. 220, 1833, cum descr., et Journ. Linn. Soc. 3 : 32, 1858 ; Wight, Icon. 5 (1) : 19, tt.

1745-1746, 1851; Dalz. & Gibs. Bomb. Fl. 263, 1861. *Gastrochilus retusus* (L.) O. Kuntze, Rev. Gen. Pl. 2 : 661, 1891.

Epiphytes. Stem sheathed, stout, about 7 mm thick. Leaves coriaceous, channelled, up to 30 × 2 cm, with a sharply-pointed praemorse apex. Racemes dense, cylindric, drooping, up to 30 cm long; peduncles about 6 cm long, and 2-3 mm thick, terete, with a few membranous, brown, sheathing bracts. Flowers pale pink with deeper-coloured spots, pedicellate, bracteate. Bracts 3-4 × 2 mm persistent, membranous, oblong-lanceolate, acute, entire, glabrous. Ovary whitish or pale pink, spotted with deeper-coloured spots. Dorsal sepal 7 × 5 mm ovate-oblong, obtuse, entire, glabrous, faintly many-nerved; lateral sepals 8 × 7 mm obliquely and broadly oblong, somewhat decumbent on the column-foot, acute. Petals 7 × 3 mm, of same colour as sepals, oblong, tapered at apex and base, entire, glabrous. Lip pink-purple, whitish at base, curved upwards and forwards, about 9 mm long, 2-2.5 mm broad at the base, the lower half oblong, widening upwards to 7 mm, apex emarginate. Spur 6-7 × 2 mm laterally compressed, pinkish, ± oblong and at right angles to ovary. Anther small, pink. Capsules 1.5-2 × 0.7-1 cm, obovoid-oblong, winged; pedicels 12-15 mm long, subclavate; capsules usually reflexed.

Flowering : May to June. *Fruiting* : July onwards.

Occurrence : KONKAN : Stocks : Salsette, Dalzell & Gibson; Thana, Ryan; Bhiwandi, Santapau 233.2; Chandal-Karjat, Blatter & Hallberg; Karjat, Kapadia 1953-1955; Malad, Shah 4625-4627, 4630; Kasara, Kapadia 900. DECCAN : Lanze on Kolhapur-Ratnagiri Road, Bhide. N. KANARA : W. of Dharwar, Mrs. Wilkinson 4018; Kalanadi, Ritchie; Yellapur, Santapau 18705.

Distribution : India : Tropical Himalaya from Punjab eastwards to Sikkim upto about 1200 m, Assam, Khasia Hills, Chota Nagpur, Konkan, Kanara, W. Ghats, Deccan, Malabar. World : India, Nepal, Bhutan, Ceylon, Burma, Malay Peninsula, Siam, Java, Philippines.

Notes : This species is commonly known as the 'Fox-tail orchid'. Considerable variations in the colour and shape of the floral parts have been recorded; such variations seem to be more or less local and have often been made the basis of specific or varietal distinctions.

29. *LUISIA* GAUD.

LUISIA Gaud. Freyc. Voy. Bot. 426, 1826; Benth. & Hook. f. Gen. Pl. 3 : 571, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6) : 210, 1889; Hook. f. Fl. Brit. India 6 : 22, 1890; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 201, 1898; Duthie, ibid. 9 (2) : 139, 1906; J. J. Smith, Fl. Buitenz. 6 : 544, 1905; Schltr. Orchid. 549, 1927; Holttum, Rev. Fl. Malaya 1 : 689, 1953. *Birchea* A. Rich. in Ann. Sc. Nat., Ser. 2, 15 : 66, 1841.

The generic name *Luisia* commemorates Don Luis de Torres, a Spanish botanist.

The genus consists of about 25 species, native in India through SE. Asia to Japan. The genus is best represented in Burma.

Type species : *L. teretifolia* Gaud.

KEY TO THE SPECIES OF *LUISIA*

1. Leaf-apex acute, obtuse or slightly apiculate ;
inflorescence 2-4-flowered ; flowers ± 7
mm long ; petals equalling or slightly
longer than sepals *teretifolia*
1. Leaf-apex obtuse, apiculate or caudate ; in-
florescence 1-flowered ; flowers $\pm 18-25$
mm long ; petals $1\frac{1}{2}$ to $2\frac{1}{2}$ times as long
as sepals :
 2. Leaf-apex with a jointed tail ; flowers
about 18 mm long ; lip somewhat
pandurate in outline *tenuifolia*
var. *evangelinae*
 2. Leaf-apex obtuse, often with a conical
apiculum on outer side ; flowers
about 25 mm long ; lip oblong in
outline *macrantha*

1. *Luisia teretifolia* Gaud. Bot. Freyc. Voy. 427, t. 37, 1826 ; Hook. f. 22 ; Grant, Orch. Burma 236, 1895 ; King & Pantl. 202, t. 271 ; Prain, Beng. Pl. 1018, 1903 ; Cooke, Fl. Pres. Bomb. 2 : 701, 1907 ; Gammie in J. Bombay nat. Hist. Soc. 18 : 588, 1908 ; Blatt. & McC. *ibid.* 35 : 491, 1932 ; Brühl, Guide Orch. Sikk. 123, 1926 ; Fischer, Fl. Pres. Madr. 1948, 1928 ; Alston, Kandy Fl. 75, f. 401, 1938. *Cymbidium triste* Roxb. Hort. Beng. 63, 1814, nom. nud. ; Bot. Mag. t. 3648, 1838 ; Wight, Icon. 3 : 11, 1844-1845 (descr. tantum) ; (non Willd. 1805). *C. tenuifolium* Wight, Icon. 5 : t. 1689, 1851. *Luisia truncata* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 491, t. 9, 1932.

Erect epiphytes. Stems upto 40 cm long, about 2-5 mm thick, brown or ash-grey. Leaves 2.5-12 cm long, 3-5 mm thick, uniformly thick throughout, falcate, green mottled with purple, the apex rounded or somewhat acute, purple, often the young leaves completely purple. Inflorescence 2- to 4-flowered, extra-axillary ; peduncles stout, about 3-7 mm long. Flowers 3-4 mm across, drooping, fleshy, shortly pedicellate, bracteate. Bracts 1.25×1 mm persistent, subscabrid, 1-nerved, oblong or quadrately-oblong, obtuse or subacute, minutely irregularly serrulate. Sepals $3-5 \times 2-3$ mm fleshy, pale green, tinged with reddish-brown more

so towards apex, acute, entire, glabrous, faintly 3-nerved; dorsal sepal ovate, the apex slightly incurved; lateral ones subconcave, somewhat keeled below, ovate, boat-shaped. *Petals* 3-5 × 2 mm, narrowly oblong, obtuse, entire, faintly 3-nerved, pale green, tinged or rarely spotted with purple. *Lip* 3-5 × 2-3 mm, panduriform in outline; hypochil quadrate, subconcave, green, broadly margined with purple and with a broad purple patch at the base; epichile somewhat deflexed, rhomboid or obscurely 3-lobed truncate or obtuse at the apex, pale green margined and faintly streaked with purple. *Column* 2 mm long, stout, oblong, deep purple. *Anther* pale yellow with 2 central reddish lines and a truncate, reddish anterior lip; pollinia 2, yellow, ovoid-orbicular, attached to a stout caudicle with a broad-oblong gland. *Stigmatic surface* large, oblong-orbicular, pale yellow. *Ovary* with *pedicel* 5 mm long, curved, green, pale brownish at base. *Capsules* 18-20 × 3-5 mm, narrowly spindle-shaped, tapering towards the base, strongly ribbed.

Flowering: The general time of flowering is May. But our specimens, collected in December, flowered in January, probably as a result of constant watering.

Occurrence: KONKAN: Vettora, Sabnis. N. KANARA: Devicop, Sedgwick 5786; Usheli, Ritchie; Wadchukli, Bell; Yellapur, Bell; Kapadia 1972; Gundh, Bole 1502; Kapadia 1731-1734; Castle Rock, Bell; Santapau 17825; Samphkand, Hallberg & McCann 34195.

Distribution: India: Sikkim, Bengal, Khasia Hills, Andamans, Konkan, N. Kanara, W. Ghats, Vizagapatam Hills. World: Ceylon, India, Burma, Java, China.

Notes: This species shows a considerable amount of variation in the size of the leaves, flowers and fruits. King & Pantling remark that Blume's figures show much larger flowers than those of the Indian plants. We have observed that in specimens from Andhra (S. K. Wagh 2815, 2935 and Santapau 20764, 20857), the flowers are considerably larger; the capsules are up to 30 × 5 mm.

Blatter & McCann have described their *L. truncata* from illustrations of Miss E. Bell and manuscript notes of Mr. T. R. Bell; they do not cite any specimens examined by them. After a careful examination of their description and plenty of fresh material from the N. Kanara area, we have come to the conclusion that *L. truncata* Blatt. & McC. is identical with *L. teretifolia* Gaud.

Blume referred *Epidendrum triste* Forst. to *Luisia teretifolia* Gaud. O. Kuntze followed him, and made the combination *L. tristis*. Hooker f. keeps *Epidendrum triste* Forst. apart from *L. teretifolia* Gaud., stating that the petals and lip are different; he makes *Epidendrum triste* Forst. the basionym for his *L. tristis*.

2. *Luisia tenuifolia* Bl. var. *evangelinae* (Blatt. & McC.) Sant. &

Kapadia, in J. Bombay nat. Hist. Soc. 59 : 829, 1922. *L. evangelinae* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 493, t. 11, 1932. *L. tenuifolia* Hook. f. Fl. Brit. India 6 : 24, 1890 (partim) ; Cooke 702 ; Gammie 589 ; Blatt. & McC. 492 (?).

Slender *epiphytes*. *Stems* brownish-green ; internodes about 15 mm long, 3-5 mm thick, longitudinally striated. *Leaves* up to 25 × 0.2 cm terete, dark green, usually straight, caudate at apex ; the cauda 0.2-3 cm. long, ± jointed to the leaf and at an angle to it. *Peduncles* very short, stout, sheathed, dark-brown. *Flowers* opening one at a time, fleshy, pedicellate, bracteate. *Bracts* minute, brown, somewhat woody, *Pedicel* with *ovary* 12-14 mm long, twisted, greenish and straight, but curved at apex. *Sepals* subequal, narrowly ovate-oblong, acute, mucronate on the back a little behind the apex, entire, glabrous ; dorsal sepal 8-10 × 3-4 mm, slightly keeled on the back, the sides somewhat connivent, giving it a linear-oblong appearance ; lateral ones 8-12 × 3-5 mm boat-shaped, very much keeled on the back. *Petals* 15-20 × 2-3 mm, narrowly linear-oblong, somewhat falcate, obtuse, entire, faintly 1 nerved, glabrous, green in the upper half, purplish below. *Lip* 10-13 mm long, somewhat pandurate or obovate-oblong, more or less square at the base with 2 small rounded lobes, much constricted towards the apex, ending in 2 divergent, upturned, oblong-orbicular lobes ; hypochil smooth, separated from the epichile by its purple markings and by the origin of the 3-callate disc of the latter ; central callus thick, triangular in transverse section, highest in the middle, ending in a mucronulate apex in between the apical lobes of the epichile, the lateral calli of uniform height, slightly diverging from the origin, shorter than the middle one. The general colour of the lip is white, often tinged with green, the hypochil has a central quadrate-oblong, deep purple spot which continues into the basal lobes partly or completely ; the central larger callus of the epichile often has a V-shaped purple marking, the hollow side facing inwards, which may be reduced to a spot. *Column* 5 × 3 mm semiterete, broader on top ; the large oblong-orbicular stigmatic surface dark purple. *Anther* 3.5 × 2.5 mm, nearly white, quadrately-oblong, the lip truncate ; pollinia about 1.5 mm in diam., somewhat diverging on a large caudicle and slightly infolded gland. *Capsules* 3 × 0.5 cm purplish, fusiform ; pedicles 1 cm long.

Flowering : March to April. *Fruiting* : April onwards.

Occurrence : DECCAN : Koina Valley, *Kapadia* 2912-2915, N. KANARA : *Bell* 5397 ; Astoli, *Bell* ; Chandwadi, *Bell* ; Castle Rock, *Bhide* ; *Kapadia* 2777-2780, 2803-2812 ; Anmod, *Kapadia* 1888-1891.

Distribution : Deccan, N. Kanara.

Notes : Blatter & McCann have described their species from T. R. Bell's manuscript notes and a painting by Miss Evangeline Bell, no specimens having been examined by them. According to Art. 7

(Note 3), a *neotype* for the taxon must be selected ; in the absence of the original plate, which was never published, we choose *Kapadia* 1891 as the *neotype* for this variety.

Blatter & McCann differentiate their 2 species, *L. pseudotenuifolia* and *L. evangelinae*, from *L. tenuifolia* Blume ; but no reference is made to the similarities between the 2 species themselves, which in reality are considerable. After a very careful comparison of the original descriptions of *L. pseudotenuifolia* Blatt. & McC. and *L. evangelinae* Blatt. & McC., we have come to the conclusion that they are identical. The only apparent differences between the 2 species, from the original descriptions, may be put down thus :

L. pseudotenuifolia

Leaves forming a knee 2 or 3 cm from the apex and becoming much thinner and ending in a very sharp point.

Dorsal sepal linear rounded.

L. evangelinae

Leaves long-tailed at the apex; tail about 2 cm long and more or less jointed to the rest of the leaf, and projecting in a different plane.

Dorsal sepal obtuse.

From this comparison it appears that the characteristic shape of the leaf-apex is identical in both the species, although the descriptions have been worded differently. The linear shape of the dorsal sepal can be accounted for by the fact that it is deeply concave with its margins more or less erect, giving it apparently a linear-oblong appearance ; but actually when it is properly spread out the sepal is found to be clearly ovate-oblong, and not linear.

We have selected *evangelinae* as the epithet for the taxon in preference to *pseudotenuifolia* because the former taxon is figured and is more fully described than the latter.

The only difference between *L. evangelinae* Blatt. & McC. and *L. tenuifolia* Bl. lies in the caudate and more or less jointed leaf-apex in the former species ; the flowers being identical. In the literature available to us, there is no mention of a caudate and jointed leaf-apex in *L. tenuifolia* Bl. In fact Cooke mentions the leaf-apex to be obtuse. Wight (under *Cymbidium triste* in *Ic. t. 911, 1844-1845*) and A. Richard (under *Birchea teretifolia* in *Ann. Sc. nat., ser. 2, 15 : 66, t. 10, 1841*) illustrate the leaf-apex as obtuse or subacute. Santapau's photograph of Law & Stocks's sheet of *L. tenuifolia* Bl. from the Konkan (preserved in Kew Herbarium), shows the leaf-apices to be distinctly caudate as in *L. evangelinae* Blatt. & McC.; the photograph of *Bourne* 5979 from the Nilgiris shows the leaf-apices acute or obtuse, not tailed. It appears, then, that 2 distinct types of leaf-apices are met with in *L. tenuifolia* Bl. However, we have no means of checking them, since we have had no access to either the type specimen or the original description of the species.

For these reasons we have reduced *L. evangelinae* Blatt. & McC. to a variety of *L. tenuifolia* Bl.

It is doubtful whether the true *L. tenuifolia* Bl. with the rounded or acute leaf-apex occurs in Bombay State. Law & Stocks's specimen from Konkan has a caudate leaf-apex. Neither Blatter & McCann nor their assistants have collected it. Under *L. tenuifolia* Bl. they cite 'Locality : Add : *W. Ghats* : Castle Rock (Bhide !)'. We have examined the specimens of Bhide in the Herbarium of the Bot. Surv. of India (West. Circ.), Poona ; these have caudate and jointed leaf-apices, characteristic of the variety. We have collected only the variety, from several places in Bombay State. Cooke seems to be the only person to mention the obtuse leaf-apex for our Bombay specimens.

3. *Luisia macrantha* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 492, t. 10, 1932.

Stout epiphytes. Stems up to 50 cm in length ; internodes 2.5-3.5 cm long, about 5 mm thick, scabrid, dark greenish-brown. Leaves 10-20×0.3-0.5 cm ascending, straight or flexuose, dusty green, terete the apex bluntly rounded, often with a short conical apiculum on the outer side. Inflorescence short, extra-axillary, arising from a short woody cylindrical axis, which is covered by small membranous, closely appressed, brownish-grey sheaths. Buds deep purple, oblong in outline, strongly 2-angled, convex on the dorsal side, subconcave on the ventral, the apex truncate-emarginate. Flowers facing downwards, bracteate, shortly pedicellate, variable in size, the basic apple-green colour of the freshly opened flower changing to deep brown-yellow with age. Sepals 17-22×10-13 mm subequal, apple-green or yellow, blotched and speckled with dark maroon, more so towards the base, glabrous, entire ; dorsal sepal subconcave, obovate-elliptic ; lateral ones boat-shaped, oblong-elliptic subemarginate-mucronate, the midnerve strongly keeled below. Petals 25-35×2-3 mm apple-green or yellow, blotched with dark maroon patches at the base, spreading, strap-shaped, subclavate, obtuse. Lip 22-28×7-9 mm, oblong, broadest a little before the middle ; hypochil somewhat square, 4-6 mm broad at the base with 2 small rounded, ear-like lobes at the corners ; epichile oblong, slightly raised upwards ending in 2 processes which are rhomboid-orbicular, obtuse, 6×5 mm. Calli on the epichile 3, the middle one triangular, 2-3 mm high ending in a small, blunt, yellow mucro, in between the apical processes ; lateral ones much smaller, rounded. The basic colour of the lip is apple-green or yellow ; lower surface with a broad purple patch ; hypochil deep purple except for the margin ; epichile apple-green or yellow, the calli deeper. Column 4-5×2-3 mm, white, oblong, subclavate above. Anther white suffused with purple, somewhat square, the anterior lip truncate ; pollinia 1×0.75 mm ovoid, foveolate on the back, the caudicle 2×2 mm, oblong,

broadly tapering to the narrow, transversely-oblong, gland. *Stigmatic surface* white. *Ovary* with short *pedicel* 19-22×2-3 mm, narrowly oblong, brownish-yellow. *Capsules* 7×0.5 mm, narrowly spindle-shaped, tapering at the base, strongly ribbed; pedicels about 0.8 cm long, twisted.

Flowering: This species seems to flower practically throughout the year. We have collected the flowers in November, December, March and also in June.

Occurrence: N. KANARA: Yellapur, Bell; Pirson; Kapadia 1764-1766, 1989-1990, 2353; Anmod, Sedgwick; Kapadia 1865-1867, 1880-1882, 1905; Siddhapur, Kapadia 2351; Dandeli, Kapadia 1678; Devimane, Hallberg & McCann 34567.

Distribution: This species seems to be wide-spread in N. Kanara, apparently endemic. It may also be found further south.

Notes: The type of this species is Bell 5397.

30. VANDA R. BR.

VANDA R. BR. in Bot. Reg. t. 506, 1820; Endl. Gen. Pl. 204, 1837; Benth. & Hook. f. Gen. Pl. 3: 578, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2(6): 214, 1889; Hook. f. Fl. Brit. India 6: 49, 1890; King & Pantl, in Ann. R. Bot. Gard. Calcutta 8: 214, 1898; Duthie, *ibid.* 9(2): 144, 1906; J. J. Smith, Fl. Buitenz. 6: 590, 1905; Schltr. Orchid. 550, 1927; Holttum, Rev. Fl. Malaya 1: 709, 1953.

The generic name *Vanda* has been derived from the Sanskrit name of the first species described, *V. roxburghii*.

This genus consists of about 30-40 species, which are native in India, Ceylon, E. Indies, Malaya, Borneo, Philippines, Java and Tropical Australia.

Vanda can be principally distinguished from its close ally *Angraecum* by its fleshy, 3-lobed lip; on the other hand *Ascocentrum* is merely a much reduced *Vanda*. As a rule most of the Vandas have fairly long and wide, flat leaves with the midnerve depressed above; but *V. hookeriana* Reichb. f. and its hybrid offspring *Vanda Miss Joaquim* and a few others form a special group with terete leaves and long-climbing habit. For this latter group Schlechter has proposed a new generic name, *Papilionanthe*. According to Holttum, however, a careful examination of the longitudinal section of the flowers and of their pollinia shows no essential differences from the other Vandas.

The genus *Vanda* lends itself very well to the creation of inter-specific and inter-generic hybrids, as has been well discussed by Holttum. Many hybrids have been produced between the terete and the non-terete-leaved groups of *Vanda*. These have leaves intermediate between the two types—i.e. they are narrow and deeply channelled, and are often called *semi-terete*. The plants are also intermediate in habit, with longer internodes

than the usual non-terete *Vanda*, but do not have quite the climbing habit of the true terete-leaved species. Among the inter-generic hybrids may be mentioned *Vandaenopsis* (*Vanda* × *Phalaenopsis*) and *Aranda* (*Vanda* × *Arachnis*)

Sect. *Anota* (containing *V. densiflora* Lindl. and *V. violacea* Lindl.) of Bentham & Hooker f. and Hooker f. was made an independent genus by Schlechter. J. J. Smith and Holttum consider *V. violacea* Lindl. to be a *Rhynchostylis*; the other species (*V. densiflora* Lindl.) has often been referred to the genus *Saccolabium*.

Our 2 Bombay species belong to sect. *Euvanda* of Lindley, the name of which must be changed to *Vanda* sect. *Vanda* in accordance with Art. 22 of the Code, since it contains the type species of the genus, *V. tessellata* Hook. ex G. Don (= *V. roxburghii* R. Br.)

Type species : *V. tessellata* Hook. ex G. Don.

KEY TO THE SPECIES OF *VANDA*

- Sepals and petals pale yellow, about 8 mm long; capsule with pedicel 4-5 cm long *testacea*
- Sepals and petals about 23-25 mm long, greenish-yellow somewhat brown tessellated on the upper surface, the lower one being pure white; capsule with pedicel 12-13 cm long *tessellata*

1. *Vanda testacea* (Lindl.) Reichb. f. in Gard. Chron. II, 166, 1877; Alst. Kandy Fl. 75, f. 402, 1938. *Aërides testaceum* Lindl. Gen. Sp. Orch. 238, 1833. *A. wightianum* Lindl. [in Wall. Cat. 7320, 1832, nom. nud. et] Gen. Sp. Orch. 238, 1833, et in Journ. Linn. Soc. 3 : 40, 1858; Wight, Icon. 5 (1) : 8, 1851; Dalz. & Gibs. Bomb. Fl. 265, 1861; Thwaites, Enum. Pl. Zeyl. 305, 1864. *Vanda spathulata* Graham, Cat. Bomb. Pl. 204, 1839 (non Spreng. 1826). *V. parviflora* Lindl. in Bot. Reg. 30 : Misc. 45, 1844; Wight, Icon. t. 1669, 1851; Hook. f. 50; Grant, Orch. Burma 256, 1895; King & Pantl. 215, t. 286; Duthie 144, et Fl. Upp. Gang. Pl. 3 : 210, 1920; Prain, Beng. Pl. 1021, 1903; Cooke, Fl. Pres. Bomb. 2 : 703, 1907; Gammie in J. Bombay nat. Hist. Soc. 19 : 624, 1909; Blatt. & McC. *ibid.* 35 : 494, 1932; Haines, Bot. Bih. & Or. 1181, 1924; Brühl, Guide Orch. Sikk. 129, 1926; Fischer, Fl. Pres. Madr. 1444, 1928.

Epiphytes. Stem 1-1.5 cm thick, sheathed. Leaves spreading, 3-15 × 0.4-0.7 cm, channelled, coriaceous, oblong or linear-oblong, irregularly 2- or 3-toothed at apex. Racemes 3-17 cm long, erect; peduncles 1-3 mm thick, terete, brown with a few, 2-4 mm long, oblong-acute, sheaths. Peduncles are persistent and often 9 or more old ones may be seen on the same plant. Flowers pale yellow, long-pedicelled, bracteate, generally

produced at the apical region of peduncle. *Bracts* 2.5 × 2.5 mm, ovate or ovate-oblong, acute, scabrid, brown, irregularly serrulate or subentire, 3-nerved. *Sepals* subequal, 8 × 5 mm, obovate-oblong, obtuse, pale-yellow, the lateral ones slightly broader and subacute. *Petals* 8 × 4 mm, broadly obovate-oblong, somewhat clawed, obtuse, rarely slightly retuse, entire, glabrous, 1-nerved, pale yellow. *Lip* 3-lobed; lateral lobes adnate to foot of column, arising from the sides of the mouth of the spur, oblong, obtuse; midlobe 6 × 4 mm, decurved, oblong or cuneate-oblong, the apex dilated, somewhat 3-lobed or perfectly semicircular, obtuse or retuse, subentire or irregularly crenulate, the portion below the apex with 2 blue-lilac caruncled ridges and a central channel in between. *Spur* 2.5 mm long, conical, obtuse, yellow, formed by the direct continuation of the lateral lobes of lip. *Column* small, pale yellow, with a short foot. *Anther* 2.5 × 2 mm, oblong-orbicular, apex emarginate; pollinia 2, cleft, globose, with a short caudicle and a small transversely-oblong gland. *Ovary* with *pedicel* 8 mm long, shallowly grooved, pale yellowish-green, *Capsules* 2-2.5 × 0.7 cm, fusiform or oblong-elliptic; *pedicels* 1-1.5 cm long.

Flowering: May to June. *Fruiting*: July onwards.

Occurrence: DANGS: Waghai, *Kapadia* 1163-1164. KONKAN: Stocks; Law; Gibson; Woodrow; S. Konkan, *Dalzell & Gibson*; Thana, *Santapau* 10970; *Kapadia* 1166. W. GHATS: Kasara, *Kapadia* 901. DECCAN: Mawal, *Woodrow*; hills round Mahableshwar, *Cooke*; Koinanagar, *Kapadia* 2899; Belgaum-Kolhapur, *Ritchie*. N. KANARA: Devicop, *Sedgwick* 5927; Yellapur, *Sedgwick*; Wadehukli, *T. R. Bell*; Gundh, *Kapadia* 1739; Kumbelli Mines, *Kapadia* 2689.

Distribution: India: Kumaon, Sikkim, Assam, Chota Nagpur, Dangs, Konkan, W. Ghats, N. Kanara, southern peninsular India in the hilly tracts from 300 to 1200 m. *World*: India, Nepal, Burma and Ceylon.

Notes: Hooker f. distinguishes two varieties under *Vanda parviflora* Lindl.: var. *testacea*, with brown sepals and petals from Ceylon; and var. *albiflora*, with white sepals and petals, the lip white with red speckled ridges and broader spur, from Moulmein. In our opinion these colour variations do not warrant even varietal rank. Therefore, we have united *Vanda testacea* Reichb. f. (= *Aerides testaceum* Lindl.) with *Aerides wightianum* Lindl. following Lindley himself (in *Journ. Linn. Soc.* 3: 40, 1858). Moreover, Alston describes the Ceylon plants with cream-coloured flowers; which further goes to prove that the slight variations in flower-colour should be included within the same species. The earliest valid specific epithet is *testaceum* of Lindley, and the correct binominal is *Vanda testacea* Reichb. f.

2. *Vanda tessellata* (Roxb.) Hook. ex G. Don in Loud. Hort. Brit.

372, 1830 ; Haines 1181 ; Blatt. & McC. 494 ; Fischer 1445. *Epidendrum tessellatum* Roxb. Pl. Corom. 1 : 34, t. 42, 1795. *Cymbidium tessellatum* Sw. in Nov. Act. Upsal. 6 : 75, 1799 ; Roxb. Fl. Ind. 3 : 463, 1832. *C. tesselloides* Roxb. Fl. Ind. 3 : 463, 1832. *Vanda roxburghii* R. Br. in Bot. Reg. 6 : t. 506, 1820 ; Graham 204 ; Wight, Icon. 3 (2) : 10, t. 916, 1844-1845 ; Thwaites 303 ; Hook. f. 52 ; Grant 257 ; Prain 1021 ; Duthie t. 116, et Fl. Upp. Gang. Pl. 3 : 210, 1920 ; Cooke 704 ; Gammie 625, t. 9. *V. roxburghii* R. Br. var. *spooneri* Gammie in J. Bombay nat. Hist. Soc. 19 : 625, 1909. (See Plate LI)

Epiphytes. *Stem* 0.5-1.2 cm thick, sheathed. *Leaves* spreading, recurved, coriaceous, 5-25 × 0.4-1.2 cm, linear-oblong, strap-shaped, entire, the apex irregularly praemorse with usually 2 unequal rounded lobes and an acute one in between. *Racemes* usually longer than the leaves, 2-to 10-flowered ; peduncle 6-14 cm long, terete, erect or subpendulous, about 2-3 mm thick, with bracts, which are 2-3 mm long, ovate, acute, scabrid, sheathing. *Flowers* about 5 cm across, bracteate, pedicellate. *Bracts* small, scabrid, persistent. *Sepals* subequal, the inner surface greenish-yellow tessellated with brown, pure white on the outer surface, 2.5 × 1.5 cm, obovate-oblong, the dorsal sepal with a longish claw, obtuse, margins irregularly waved and crisped. *Petals* 2.3 × 1.5 cm, clawed, similar to sepals. *Lip* 3-lobed ; lateral lobes 1 × 0.3 cm white, erect, parallel, obliquely elliptic, subfalcate, acute ; midlobe 1.6 × 1 cm, ± panduriform, thick, fleshy, sides deflexed ; apex dilated, 2-lobed with a wide retuse sinus in between ; upper surface of midlobe ribbed, varying in colour from purplish-blue to red, with white streaks or white with yellow streaks. *Spur* 7 × 4 mm, conical, obtuse-pubescent within. *Column*, 8 × 5 mm, oblong, clavate, white ; foot short, centrally grooved, with 2 yellow patches on either side. *Anther* 4 × 2 mm, oblong-obovate, base truncate, apex mucronate, white ; pollinia 2, waxy, yellow, globular, with a broad oblong caudicle and a small transversely-oblong gland which is folded upwards. *Stigmatic surface* cordate-oblong, white. *Ovary* with *pedicel* 5 cm long, twisted, white, ribbed. *Capsules* 8 × 1.5 cm, oblong, sharply winged, the wings 3 mm broad ; pedicels 4 cm long.

Flowering : March to June. *Fruiting* : April onwards.

Occurrence : GUJARAT : Chikli, Gibson. DANGS : Waghai, Kapadia 1160 ; Pimpri, Kapadia 1583. KONKAN : Woodrow. N. KANARA : Bell 5398 ; Kalanaddi, Ritchie ; Astoli, Bell ; Anmod, Kapadia ; Castle Rock, Kapadia 2830-2832.

Distribution : India : Dehra Dun, Sub-Himalayan tracts of Rohilkhand and N. Oudh, Bengal, Bihar, Chota Nagpur, Madhya Pradesh, Gujarat, Dangs, Konkan, N. Kanara, Southern Peninsular India from sea-level to about 600 m. *World* : India, Ceylon.

Notes : The colour of the flowers of this species varies considerably ; some plants show an over-all greenish-blue tint in sepals and petals with

a bluish-purple midlobe of lip; others have reddish sepals and petals with pale pink midlobe. In our plants from Castle Rock sepals and petals were dull yellowish-brown, the lip pure white with a central orange-yellow spot in between the lateral lobes. Such variations in the colour may be noted even on one and the same plant; some of our plants, when collected in the Dangs forest, showed a bluish lip; under cultivation in Bombay, the flowers of the next season had pale pink lips.

It is clear, then, that such variations in colour, as noted by Gammie for his var. *spooneri*, cannot be made the basis of a variety, in a species which is noted for its colour variations.

31. *COTTONIA* WIGHT

COTTONIA Wight, Icon. 5(1) : 22, 1851; Benth. & Hook. f. Gen. Pl. 3 : 572, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 211, 1889; Hook. f. Fl. Brit. India 6 : 26, 1890; Schltr. Orchid. 569, 1927.

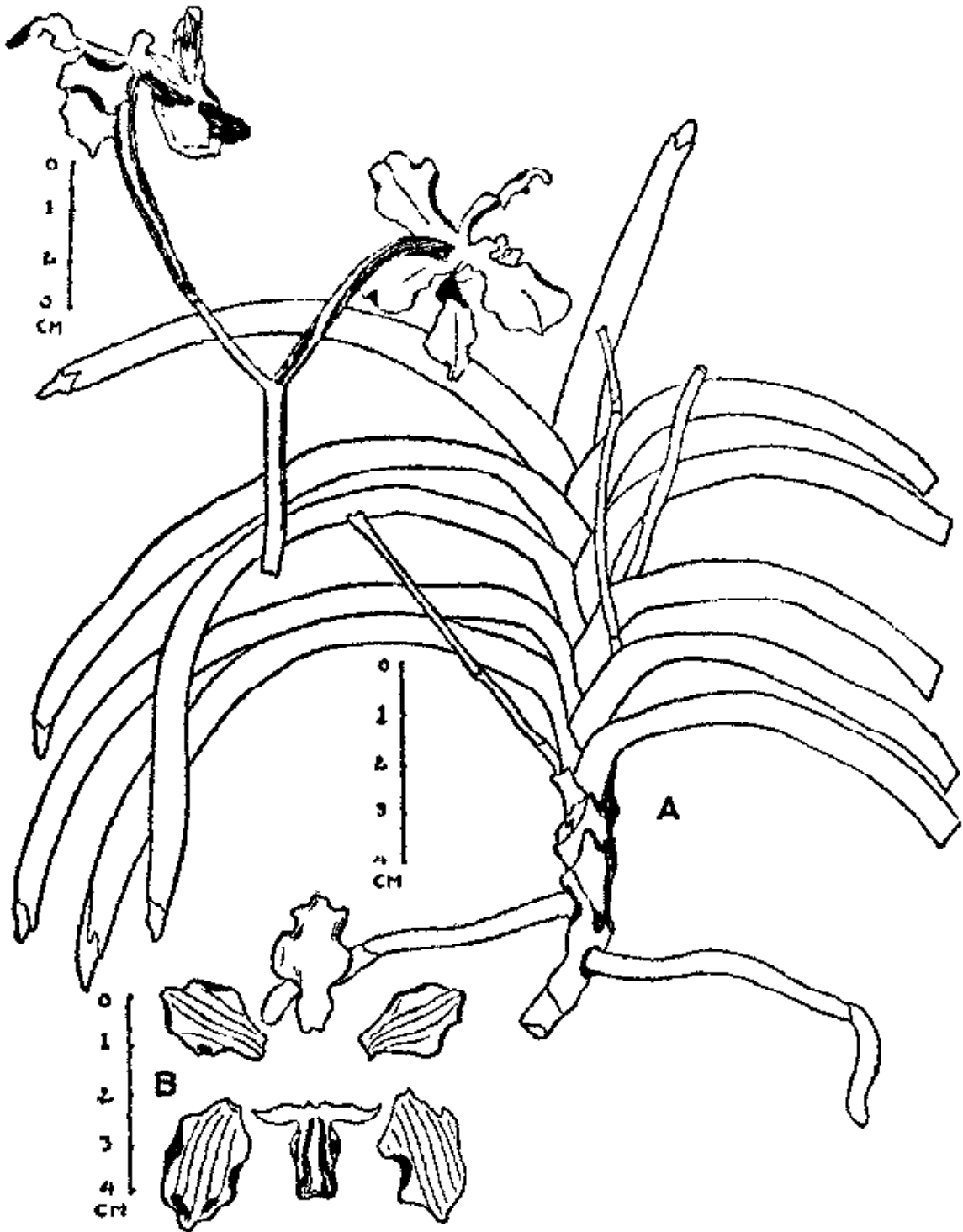
The generic name *Cottonia* was given in honour of Maj.-Gen. Cotton of the Madras Engineers, collector and cultivator of orchids, who found *Cottonia macrostachya* for the first time in Malabar.

This genus consists of a single species *C. peduncularis* Reichb. f. (= *C. macrostachya* Wt.), native in the south-western parts of India and of Ceylon.

Type species : *C. peduncularis* Reichb. f.

Cottonia peduncularis (Lindl.) Reichb. f. in Cat. Orchid. Schiller 52, 1857; Thwaites, Enum. Pl. Zeyl. 303, 1864. *Vanda peduncularis* Lindl. Gen. Sp. Orch. 216, 1833. *Cottonia macrostachya* Wight, Icon. 5 (1) : 21, t. 1755, 1851; Lindl. in Journ. Linn. Soc. 3 : 39, 1858; Dalz. & Gibs. Bomb. Fl. 263, 1861; Bot. Mag. t. 7099, 1890; Hook. f. 26; Cooke, Fl. Pres. Bomb. 2 : 702, 1907; Gammie in J. Bombay nat. Hist. Soc. 18 : 589, t. 6, 1908; Blatt. & McC. ibid. 35 : 494, 1932; Fischer, Fl. Pres. Madr. 1439, 1928.

Epiphytes. Stem 0.7-1 cm thick, closely sheathed. Leaves 5-17 × 1-2 cm, lorate, spreading, straight or recurved, sessile, narrowly elliptic-oblong, entire, coriaceous, keeled on the underside and abruptly ending in 2 unequal rounded lobes with a broad acute sinus in between. Peduncles 9-80 cm, greyish-green mottled with purple, bracteate at the nodes, with a few branches usually near the apex. Flowers few in a raceme at the very apex of the branches of peduncle, bracteate, pedicellate, usually opening one at a time. Bracts minute, cupular, brown. Pedicel with ovary about 1.2 cm long, slightly curved, greenish-brown. Sepals and petals recurved backwards ± along the ovary, brownish-yellow with 4-6 reddish-brown longitudinal streaks; dorsal sepal 9 × 4 mm, obovate-oblong, concave in the upper half, acute; lateral sepals 8 × 4.5 mm, ovate-oblong, subobtusate, 5-nerved; petals 8-9 × 3 mm,



Vanda tessellata Hook.

narrowly obovate-oblong, obtuse-truncate, 5-nerved. *Lip* 1.4 × 0.8 cm, fleshy purple with a central brownish-yellow streak about 0.6 cm long, and a golden-yellow villous margin; lateral lobes ear-like, small; mid-lobe panduriform with an abruptly acute apex. *Column* 5 × 4 mm, puberulous, footless, yellowish-brown; from the sides of the column just above the stigmatic surface 2 projections are given out which meet in the centre to form a ledge, on which the gland of the pollinia rests. *Anther* 2-celled, subpandurate, broadly retuse at apex; the underside reddish-brown with a central blue-black streak on the upper half, and yellow on the lower half; pollinia 2, yellow, waxy, ovoid; caudicle 1 mm long, with a small, somewhat square gland. *Stigmatic surface* U-shaped, yellow with a red margin and 2 red longitudinal streaks in the centre. *Capsules* 5-6 × 0.5-0.7 cm, oblong-fusiform, strongly ribbed, pedicels 2 cm long.

Flowering : March to May. *Fruiting* : May onwards.

Occurrence : KONKAN : *Stocks*; *Dalzell*; Thana, *Kapadia* 1167. W. GHATS : Khandala, *Santapau*. N. KANARA : Supa, *Ritchie*; Kumbelli Mines, *Kapadia* 2557; Poutelli Ghat, *Kapadia*; Yellapur, *Sedgwick*; *Kapadia* 1981-1982, 2864-2865; Astoli, *Bell*; Sirsi-Siddhapur, *Hallberg & McCann* 34580; Sirsi, *Santapau* 18697; Londa, *Santapau* 10815-10818, 10867; Anmod, *Kapadia* 1910-1911; Castle Rock, *Kapadia* 1815; Dandeli, *Kapadia*; Gundh, *Kapadia* 1721.

Distribution : India : Konkan W. Ghats, N. Kanara, Anaimalais, Travancore. *World* : India, Ceylon.

Notes : We have noted this species on a large number of trees and shrubs; it is usually found in open deciduous forests and is very easy to locate on account of its long erect branching peduncles.

The earliest valid specific epithet for this species is *Peduncularis* of Lindley which, therefore, must be reinstated. *Index Kewensis* credits the binominal *Cottonia peduncularis* to Thwaites; Pfitzer gives Reichenbach f. as the author; Hooker f. follows Pfitzer.

32. GASTROCHILUS D. DON

GASTROCHILUS D. Don, Prodr. Fl. Nep. 32, 1825; O. Kuntze, Rev. Gen. Pl. 2 : 660, 1891 (partim); Schltr. Orchid. 573, 1927; Holttum, Rev. Fl. Malaya 1 : 656, 1953; (non Wall. 1832). *Sarcochilus* Spreng. Syst. Veg. 3 : 721, 1826 (partim). *Saccolabium* Endl. Gen. Pl. 205, 1837; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 217, 1898; Duthie, ibid. 9 (2) : 146, 1906; (partim, non Blume 1825). *Micropera* Dalz. in Hook. Kew Journ. Bot. 3 : 282, 1851 (non Lindl. 1832). *Sarcochilus* sect. *Micropera* (Dalz.) Benth. & Hook. f. Gen. Pl. 3 : 575, 1883. *Saccolabium* sect. *Longilabellatae* Benth. & Hook. f. Gen. Pl. 3 : 579, 1883; Pfitz. in Engl. & Prantl, Pflanzenf. 2 (6) : 213, 1889. *Saccolabium* sect. *Calceolaria* Hook. f. Fl. Brit. India 6 : 60, 1890. *Saccolabium* sect. *Platy-*

rhizon Hook. f. *ibid.* 6 : 63, 1890. *Saccolabium* sect. *Gastrochilus* (D. Don) J. J. Smith, *Fl. Buitenz.* 6 : 632, 1905.

The generic name *Gastrochilus* is derived from the Greek words *gaster*=belly, *cheilos*=lip, in allusion to the inflated, ventricose hypochil of the lip in the species.

This genus contains about 15 species distributed from India and Ceylon through Malaya to Java and northwards to Japan.

In 1825, D. Don erected the genus *Gastrochilus* with a single species *G. calceolaris*, based on the manuscript name *Epidendrum calceolare* of Hamilton. Lindley (*Gen. Sp. Orch.* 223, 1833) reduced this to *Saccolabium* Bl. Subsequent authors, including Endlicher, Bentham & Hooker f., Hooker f., Pfitzer, King & Pantling, etc., follow Lindley in fusing *Gastrochilus* with *Saccolabium* or at the most keeping it as section under various names.

J. J. Smith in 1905 put *Gastrochilus* as a section of *Saccolabium*; but in 1927 raised it to generic rank. Several modern orchidologists, including Schlechter, Hayata, Ames & Quisumbing, and Holttum, have recognized the generic status of *Gastrochilus*.

Gastrochilus D. Don can be differentiated from its close allies *Sarcochilus* R. Br. and *Saccolabium* Bl. by the following characters: (1) Flowers fleshy, wide-opening, lasting for several days. (2) Lip not movable, with a cup-shaped saccate base and the midlobe, which is flat semicircular, brim-like, wider than the cup, often hairy and fringed. (3) Column very short, footless. (4) Pollinia shorter than the narrow caudicle.

The generic name *Gastrochilus* D. Don (Feb. 1825) is listed as a rejected name in favour of the later conserved *Saccolabium* Bl. (Dec. 1825), in the list of Conserved generic names in App. 3 of the International Code of Botanical Nomenclature (1956 edit.). But Art. 14 (Note 4) states: 'When a name has been conserved against an earlier synonym, the latter is to be restored, subject to Art. 11, if it is considered the name of a genus distinct from that of the *nomen conservandum*. We do consider *Gastrochilus* D. Don as distinct from *Saccolabium* Bl.

Two of the Bombay species, described by Dalzell under *Micropera*, *M. viridiflora* and *M. maculata*, clearly belong to the genus *Gastrochilus*. *Gen. Plant.* and *Fl. Brit. India* include them under *Saccolabium*. Cooke puts them under *Sarcochilus*.

Type species: *G. calceolaris* D. Don.

KEY TO THE SPECIES OF *GASTROCHILUS*

1. Midlobe of lip fringed or fimbriate *dasyogon*
1. Midlobe of lip neither fringed nor fimbriate :
 2. Inflorescence usually longer than the leaves, racemose; flowers yellow with

- or without a reddish spot *maculatus*
 2. Inflorescence shorter than the leaves in a
 cluster at the apex of the rachis ;
 flowers greenish-white *dalzellianus*

1. *Gastrochilus dasypogon* (Sm. ex Rees) O. Kuntze, Rev. Gen. Pl. 2 : 661, 1891. *Aërides dasypogon* Smith in Rees, Cycl. 39 : n. 10, 1818. *Saccolabium dasypogon* Lindl. Gen. Sp. Orch. 222, 1833 ; Hook. f. 66 ; King & Pantl. 224, t. 299. *Saccolabium flabelliforme* Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 722, f. 1, 1931.

Epiphytes. Stems very short, stout, about 1 cm thick. Leaves 2-5, each 4-14 × 1-2.5 cm, narrowly oblong or linear-oblong, rarely narrowly oblong-elliptic, coriaceous ; apex shallowly, unequally 2-lobed, the lobes rounded. Inflorescence about 2-2.6 cm long, somewhat corymbose, few-to several-flowered. Flowers pedicellate, bracteate. Bracts 3 × 2 mm, persistent, scabrid, ovate-oblong, acute or subobtuse. Pedicel with ovary 7-9 mm long, slightly curved or straight. Sepals and petals 7-8 × 2 mm, somewhat obovate-oblong, spreading, fleshy, obtuse or rarely subretuse, entire, glabrous ; petals slightly shorter and narrower. Lip with minute, erect lateral lobes ; sac (hypochil) about 3-4 mm in diam., nearly hemispherical, slightly laterally compressed ; midlobe (epichile) about 3 mm long, 6-8 mm wide, slightly deflexed, almost semicircular, outer edge minutely fimbriate. Column very short, about 2 mm long, footless. Anther convex, oval ; pollinia 2, minute, globular with the slender caudicle as long as the diam. of both together.

The colour of floral parts, according to Blatter & McCann, is the following : sepals and petals apple-green sometimes with a rose-coloured spot ; spur greenish, often sparsely pale-purple-spotted ; midlobe of lip white with a central fleshy yellow triangle, which is bordered with rose-coloured dots and short lines ; column white, usually strongly suffused with deep rose ; anther yellow ; pollinia orange-yellow.

Flowering : September to October.

Occurrence : N. KANARA : Bell 5424 ; Devinane Ghat, Gammie ; Sedgwick & Bell ; Hallberg & McCann 34568, 34464 ; Sirsi, Sedgwick ; Sirsi-Siddhapur, Hallberg & McCann 34381 ; Kapadia 2442-2443 ; Yellapur, Bell ; Kapadia.

Distribution : India : Sikkim, Assam, and southwards to N. Kanara. *World* : India and Nepal.

Notes : The specimens of *Saccolabium flabelliforme* Blatt. & McC. in Blatter Herbarium clearly agree with *Saccolabium dasypogon* Lindl. as figured and described by King & Pantling. The latter authors give the following note under *Saccolabium dasypogon* Lindl. : '... This is closely allied to *S. calceolare* Lindl. with which for many years it has been confused. The two plants, although much alike, are not really difficult

of separation. In the first place they live at different elevations and flower at different seasons. *S. calceolare* is found between 4,000 and 6,000 feet, and flowers during March and April; while *S. dasypogon* is found at or below 1,000 feet and is in flower during November and December. The leaves of *S. dasypogon* are broader, and the apical notch is less than is the case in the leaves of *S. calceolare*, and the stem of *S. dasypogon* is shorter. The colouration of the flowers of *S. calceolare* is constant; but in that of *S. dasypogon* the perianth may be pale or deep yellow, and either without spots or with numerous spots. Finally the lips of the two differ. In *S. calceolare* the sac is smaller; the apical lobe is papillose-hairy; while in *S. dasypogon* the apical lobe has deeply lacinate edges and its upper surface is perfectly smooth.

O. Kuntze in making the transfer of *Saccolabium dasypogon* Lindl. to *Gastrochilus* gives '(Sw.) Lindl.' as the authors from whom the specific epithet is derived. The original author of the specific epithet is however, Smith and not Swartz.

2. *Gastrochilus maculatus* (Dalz.) O. Kuntze, Rev. Gen. Pl. 2 : 661, 1891. *Micropera maculata* Dalz. in Hook. Journ. Bot. 3 : 282, 1851; Lindl. in Journ. Linn. Soc. 3 : 38, 1858; Dalz. & Gibs. Bomb. Fl. 263, 1861. *Sarcochilus maculatus* Pfitz. Vergl. Morph. Orch. 15, 1881; Cooke, Fl. Pres. Bomb. 2 : 698, 1907; Blatt. & McC. 488. *Saccolabium maculatum* (Dalz.) Hook. f. Fl. Brit. India 6 : 64, 1890; Gammie in J. Bombay nat. Hist. Soc. 20 : 127, 1910.

Stem about 1 cm long. *Leaves* 2-3, coriaceous, sheathing at the base, 4.8 × 1.7-2.3 cm, narrowly oblong, dark greyish-green often mottled with purple, tapering at the \perp plicate base, entire, emarginate with unequal lobes, 1-nerved. *Inflorescence* up to about twice as long as the leaves, several-flowered, arising from the base of the leaves somewhat horizontally; often 2 or more per plant. *Peduncles* 1-2 mm thick, subterete, purplish. *Flowers* about 8 × 10 mm almost sessile, bracteate. *Bracts* 1.5-2.5 × 2 mm, broadly oblong-ovate, persistent, coriaceous, brown. *Ovary* with short *pedicel* 3 mm long, stout, erect. *Sepals* and *petals* subequal, yellow with a purple spot, or pure yellow, free, obovate-oblong, rounded, entire, glabrous, faintly 1-nerved; dorsal sepal 6 × 3.5 mm, concave and hooded in the upper half, slightly narrowed to the base; lateral sepals 5 × 3 mm tapered towards the rounded submucronulate apex; petals 5 × 3 mm, \pm incurved in apical half and somewhat connivent over column. *Lip* fleshy, white flushed with pink, 3-lobed; lateral lobes 2.5 mm long, erect, nearly meeting at the base just above the mid-lobe, about 3 mm apart at the narrow, subacute apex, anterior margins pink; midlobe (epichile) 2 × 4.5 mm, obscurely 3-lobed, entire, rounded, forming a sort of brim to hypochil, somewhat like a side-saddle. *Spur* broadly conical, 5 mm long below the midlobe. *Column* 2 mm long,

stout, footless, semiterete; rostellum divided, pointing downwards. *Anther* 1.25 × 1.75 mm, opercular, conical, anterior lip obtuse; pollinia 2, 0.75 mm in diam., caudicle 1-1.25 mm long, narrow; gland small, thin.

Flowering : May.

Occurrence : W. GHATS : *Dalzell*; Phunda Ghat, *Ritchie*. N. KANARA : Idigangi, *Bell*; Yellapur, *Sedgwick*; Anmod, *Kapadia* 1883-1884; Jog, *Kapadia* 1850.

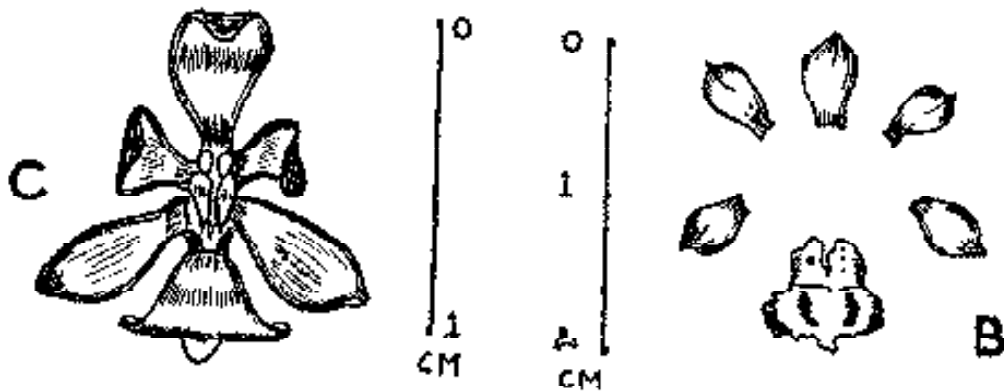
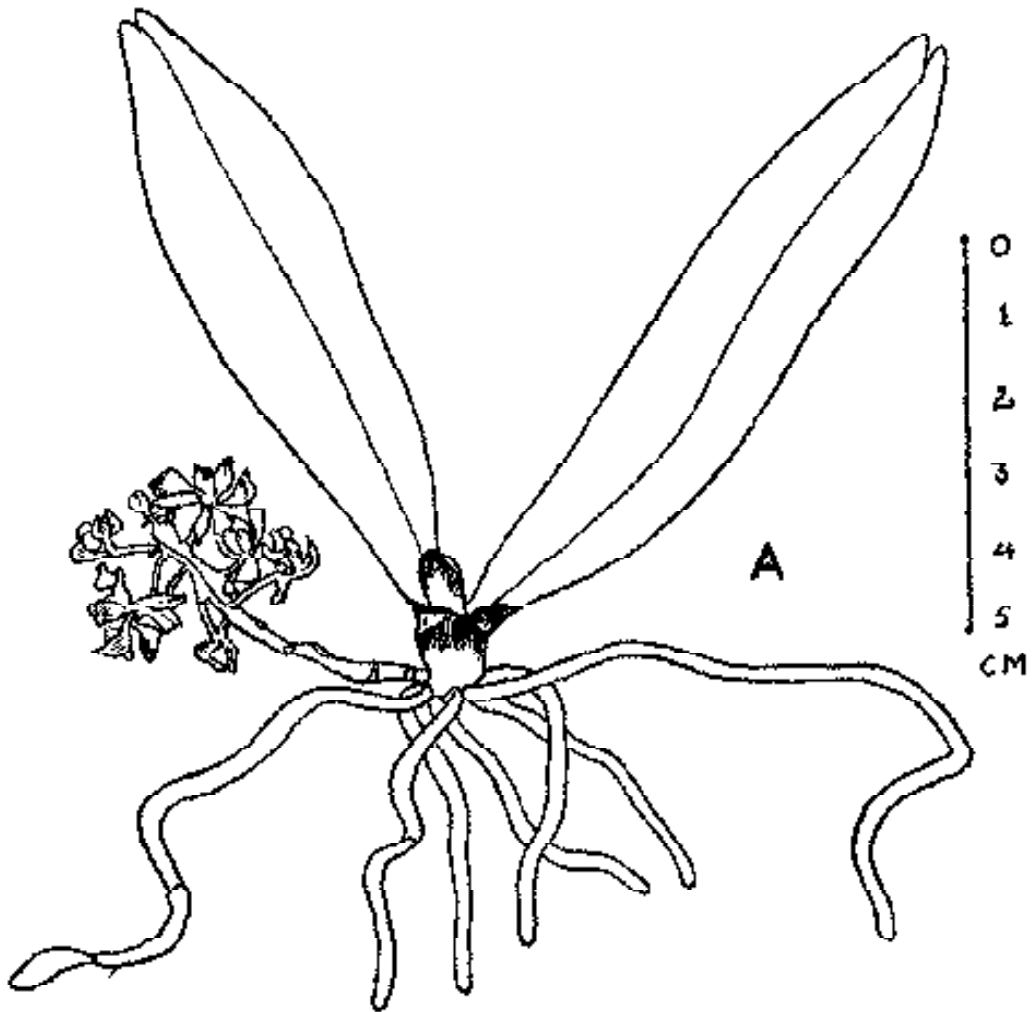
Distribution : Apparently endemic in N. Kanara.

3. *Gastrochilus dalzellianus* (Sant.) Sant. & Kapadia, in J. Bombay nat. Hist. Soc. 59 : 842, 1962. *Sarcochilus dalzellianus* Santapau in Kew Bull. 1948 : 498, 1949 et in Rec. bot. Surv. India 16 (1) : 302, 1953. *Micropera viridiflora* Dalz. in Hook. Journ. Bot. 3 : 282, 1851. *Saccolabium viridiflorum* Lindl. in Journ. Linn. Soc. 3 : 36, 1858; Dalz. & Gibs. 263; Hook. f. 63. *Sarcochilus viridiflorus* (Dalz.) T. Cooke, Fl. Pres. Bomb. 2 : 697, 1907; Blatt. & McC. 488; (non Hook. f. 1890). (See Plate LII)

Epiphytes. *Stem* very short, sheathed. *Leaves* usually 2 with a small one in between, 3-9 × 1.5-2 cm, elliptic-lanceolate, tapering at base, entire, unequally bilobed at apex, lobes entire. *Racemes* corymbose-umbellate, at apex of peduncle; peduncles suberect, about 1-2 mm thick, 3-5 cm long, terete, bracteate; bracts 1.5-2 × 1.2 mm, lower ones completely ensheathing the peduncle upper ones not so, broadly ovate-oblong, entire, subobtuse to acute. *Flowers* greenish-white, pedicellate, bracteate. *Pedicel* with ovary 7 mm long, brownish-green. *Sepals* subequal, broadly obovate and tapering at base, entire, rounded or mucronulate, pale green; dorsal sepal 7 × 3-3.5 mm, often with a few yellowish-red spots at base; lateral sepals 6 × 3-3.5 mm. *Petals* 6-7 × 3.5-4 mm, pale green, obovate and tapering at base, entire, obtuse, slightly falcate, with somewhat incurved apices. *Lip* fleshy, white; lateral lobes erect, about 1 mm long, acute, their anterior margins red-streaked; midlobe (epichile) semicircular, 2.5-3 × 5-7 mm, apiculate; spur 3.5 mm long, fleshy, conical, rounded, white with a crimson patch at back inside corresponding to the red streaks of lateral lobes of lip. *Column* about 2 mm long, stout, semiterete, footless; clinandrium green with dark reddish-brown patches on top and sides. *Anther* pale yellow, 1.5 × 1.25 mm, broadly obpyriform with a truncate apiculum; pollinia 2, deeply grooved, 0.5 mm in diam.; caudicle 1.5 mm long, narrow; gland narrow, linear, erect, 0.5 mm long. *Capsules* 3-5 cm long, narrowly fusiform, ribbed, purplish-brown.

Flowering : May to June. *Fruiting* : June to March.

Occurrence : KONKAN : *Dalzell*. W. GHATS : Mahabaleshwar, *Cooke*; Khandala, *Santapau* 487, 1352, 4521, 9077; *Kapadia* 1939-1940; Lonavla, *Kapadia* 1121, 1171; Amboli Ghat, *Gammie*,



Gastrochilus dalzellianus Sant. & Kapad.

A. Whole plant ; B. Sepals and petals dissected ; C. Front view of flower.

DECCAN : Koina Valley, *Bote* 1179 ; *Kapadia* 2904-2905, 2908-2909 ; *Amba, Bhide* ; *Acland* 1178. N. KANARA : *Ushelli, Ritchie* ; Chandwar, *Ritchie* ; Tinai Ghat, *Bhide* ; Castle Rock, *Acland* 177 ; *Kapadia* 2774, 2798 ; Dandeli, *Santapau* 18794.

Distribution : Apparently endemic to Bombay State.

Notes : This is an inconspicuous plant, often seen epiphytic on various species of *Ficus*.

The earlier specific epithet *viridiflorus* Dalz. cannot be used here on account of *Gastrochilus viridiflorus* (Lindl.) O. Kuntze.

33. *SARCANTHUS* LINDL.

SARCANTHUS Lindl. Coll. Bot. t. 39 B, 1825, et Gen. Sp. Orch. 233, 1833 ; Endl. Gen. Pl. 206, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 580, 1883 ; Pfitz. in Engl. & Prantl. Pflanzenf. 2 (6) : 212, 1889 ; Hook. f. Fl. Brit. India 6 : 66, 1890 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 239, 1898 ; Duthie, *ibid.* 9 (2) : 149, 1906 ; J. J. Smith, Fl. Buitenz. 6 : 595, 1905 ; Schltr. Orchid. 577, 1927, Holttum, Rev. Fl. Malaya 1 : 645, 1953.

The generic name *Sarcanthus* is derived from the Greek words *sarks* = flesh, *anthos* = flower, referring to the very fleshy flowers in most of the species.

This genus contains over 70 species, occurring in Ceylon, India, Burma, Malaya, Sumatra, Java, S. China and New Guinea.

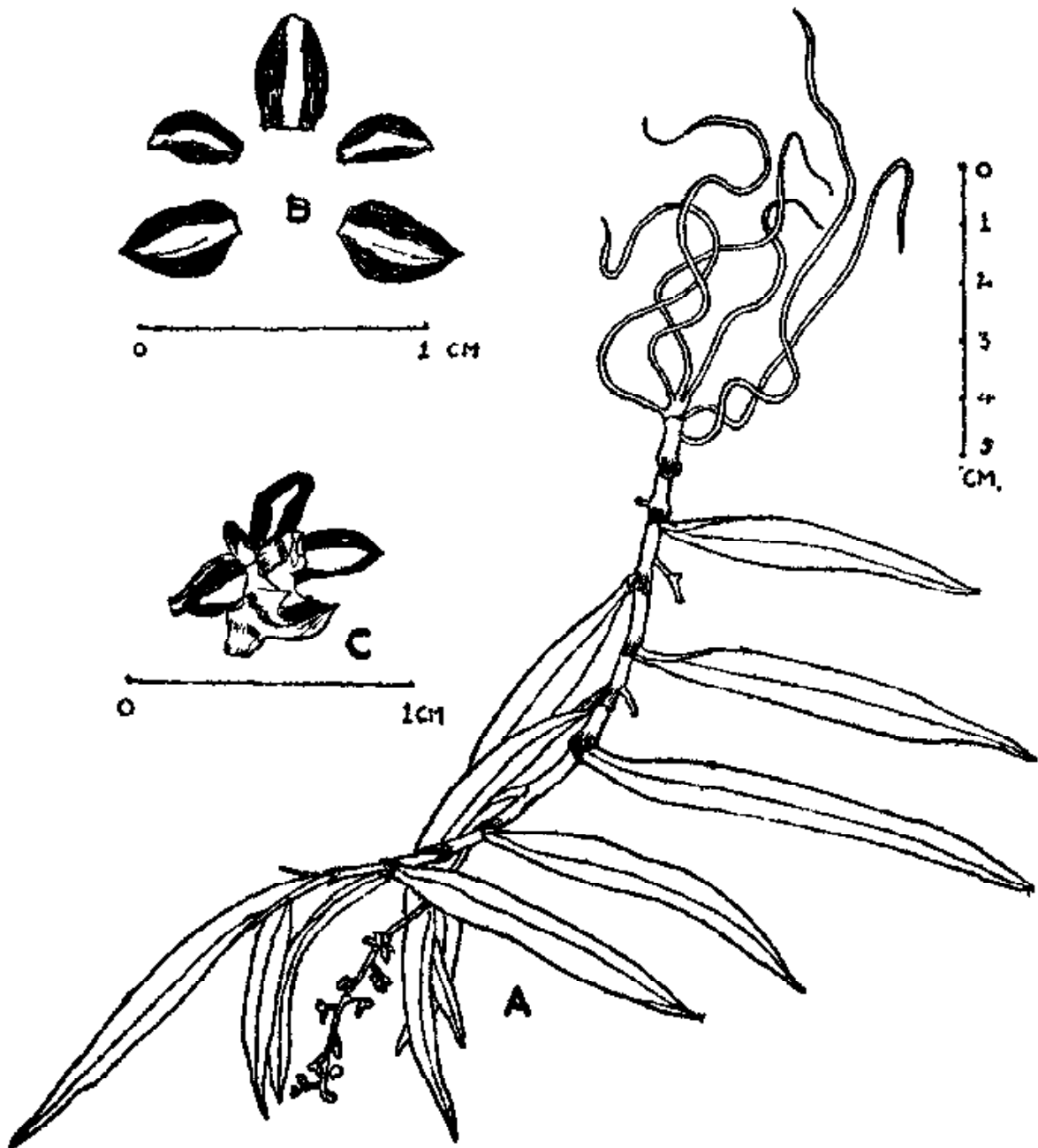
The date for *Sarcanthus* is usually given as 1821. But according to van Steenis (in *Fl. Males.* 1, 4 (5) : CXCVII, 1954) the part of Lindley's *Coll. Bot.* containing *Sarcanthus* was not published before 1825.

The only species described by Lindley, when he erected the genus *Sarcanthus* in 1825, was *S. rostratus* ; this, therefore, must be considered to be the type species.

Type species : *S. rostratus* Lindl.

Sarcanthus peninsularis Dalz. in Hook. Kew Journ. Bot. 3 : 343, 1851 ; Lindl. in Journ. Linn. Soc. 3 : 39, 1858 ; Dalz. & Gibs. Bomb. Fl. 264, 1861 ; Hook. f. 67 ; Cooke, Fl. Praes. Bomb. 2 : 706, 1907 ; Gamble in J. Bombay nat. Hist. Soc. 20 : 128, 1910 ; Blatt. & McC. *ibid.* 35 : 495, 1932 ; Fischer, Fl. Pres. Madr. 1447, 1928. *Sarcanthus pauciflorus* Wight, Icon. 5(1) : 20, t. 1747, 1851. (See Plate LIII)

Pendulous epiphytes. Stem pendulous, dirty-green ; internodes about 1 cm long, 3-5 mm thick. Leaves 6-14 × 0.7-1 cm, thick, coriaceous, narrowly linear-oblong, somewhat acuminate, ± constricted about 1.5-2 cm, from the sharp apex. Racemes pointing downwards, usually arising opposite a leaf, simple, about 2-8 cm long. Flowers about 7 × 7 mm, reddish-yellow, bracteate, shortly pedicellate. Pedicel with ovary about 2-3 mm long, pale yellowish. Bracts 1.5 × 1 mm, minute, scarious, persistent, oblong, subacuminate. Sepals 4 × 2.5 mm,



Sarcanthus peninsularis Dalz.

A. Whole plant ; B. Sepals and petals dissected ; C. Side view of flower.

spreading, very fleshy, yellow with 2 broad brown-red bands along the margins, broadly oblong, entire, glabrous; dorsal sepal obtuse; lateral ones somewhat oblique, acute. *Petals* $3 \times 1.5-1.75$ mm, of the same colour as the sepals, very fleshy, oblong, subfalcate, acute, entire, glabrous. *Lip* 2.5×2 mm, 3-lobed, produced backwards and downwards into the spur; lateral lobes erect, triangular, acute, minute, pale violet; midlobe somewhat incurved, subacute, fleshy, arrow-head-like, with 2 yellow rounded calli in between the lateral lobes. *Spur* 2.5×1.5 mm conical, obtuse, yellow, with a longitudinal septum from the mouth of the spur, ending in a rounded central callus in between the lateral calli of the midlobe. *Column* about 1.5 mm long, stout, pale yellowish. *Anther* 2×1.5 mm oblong with the anterior lip truncate and somewhat extended; pollinia 4, in pairs, globular with a narrow caudicle and a small gland. *Capsules* $17-19 \times 6-8$ mm narrowly oblong, almost sessile, strongly ribbed.

Flowering : June. *Fruiting* : November.

Occurrence : KONKAN : *Stocks* ; Wari Country, *Dalzell*. N. KANARA : Kalanaddi, *Ritchie* ; Arbail Ghat, *Sedgwick* ; Anshi, *Bell* ; Yellapur, *Bell* 7870 ; *Blatt. Herb.* 233.17 (coll. *Bell*) ; *Kapadia* 1974-1979 ; Sirsi, *Santapau* 18640 ; Siddhapur, *Kapadia* 2365-2369 ; Jog, *Kapadia* 1775, 1777 (coll. *Bole*)

Distribution : India : Konkan, N. Kanara, W. Ghats of South India, Travancore. *World* : India, Ceylon.

34. ACAMPE LINDL.

ACAMPE Lindl. *Fol. Orch.* 1853 ; Benth. & Hook. f. *Gen. Pl.* 3 : 579, 1883 ; Pfitz. in Engl. & Prantl, *Pflanzenf.* 2 (6) : 213, 1889 ; Schltr. *Orchid.* 578, 1927 ; Holttum, *Rev. Fl. Malaya* 1 : 620, 1953. *Saccolabium* sect. *Acampe* Hook. f. *Fl. Brit. India* 6 : 62, 1890. *Saccolabium* King & Pantl. in *Ann. R. Bot. Gard. Calcutta* 8 : 217, 1898 ; Duthie *ibid.* 9 (2) : 136, 1906 ; (partim, non Blume 1825).

The generic name *Acampe* is derived from the Greek *akampes* = rigid, alluding to the brittle, rigid flowers of the species.

A small genus with but a few species, distributed mostly from India, Burma, to Southern China ; it is also represented in Africa and Madagascar.

According to Lindley, this genus is distinguished from *Vanda* R. Br. by its small, brittle, inflexible flowers ; by the lip, which is adnate to the edges of the column ; and by their slender caudicles with a very small gland ; it forms a very natural group. Holttum, however, has pointed out that the genus *Acampe* Lindl. has not been dealt with by those who have rearranged the orchids of the *Sarcanthus* group in recent years, and that the limits of the genus are not yet certain.

KEY TO THE SPECIES OF *ACAMPE*

- Inflorescence much shorter than the leaves,
up to 8 cm long, in dense corymbose
racemes ; spur a small conical sac *praemorsa*
- Inflorescence much longer than the leaves,
up to 20 cm or more long, laxly paniced ;
spur about 3-4 cm long, oblong *ochracea*

Acampe praemorsa (Roxb.) Blatt. & McC. in J. Bombay nat. Hist. Soc. 35 : 495, 1932. *Epidendrum praemorsum* Roxb. Pl. Corom. 1 : 34, t. 43, 1795. *Cymbidium praemorsum* Swartz in Nov. Act. Upsal. 6 : 75, 1799 ; Roxb. Fl. Ind. 3 : 465, 1832 ; *Aerides praemorsum* Graham, Cat. Bomb. Pl. 204, 1839, (non Willd. 1805). *Saccolabium papillosum* Dalz. & Gibs. Bomb. Fl. 264, 1861 (non Lindl. 1832 nec. Bot. Reg. t. 1552). *S. praemorsum* (Roxb.) Hook. f. Fl. Brit. India 6 : 62, 1890 ; Prain, Beng. Pl. 1022, 1903 ; Haines, Bot. Bih. & Or. 1180, 1924. *Acampe wightiana* Lindl. Fol. Orch. *Acampe* 2, 1853 ; Cooke, Fl. Pres. Bomb. 2 : 705, 1907 ; Fischer, Fl. Pres. Madr. 1447, 1928 ; Thwaites, Enum. Pl. Zeyl. 303, 1864. *Vanda wightiana* Lindl. ex Wight, Icon. 5(1) : 9, t. 1670, 1851. *Saccolabium wightianum* Hook. f. Fl. Brit. India 6 : 62, 1890 ; Grant, Orch. Burma 286, 1895 ; Gammie in J. Bombay nat. Hist. Soc. 20 : 126, t. 10, 1910. (See plate LIV)

Epiphytes. *Stem* about 1-1.5 cm thick, sheathed ; sheaths brown, woody, longitudinally striated. *Leaves* thick, coriaceous, channelled, 12-30 × 1.5-3 cm, oblong, entire, emarginate with 2 unequal rounded lobes. *Peduncle* 1.5-6 cm long, rarely branched ; racemes compact, corymbose. *Flowers* clustered at the apex of the peduncle pedicellate, bracteate. *Bracts* minute, ovate-oblong, acute, persistent, brown. *Sepals* 8 × 5 mm similar, coriaceous, entire, creamy-yellow with dark brownish-red irregular transverse bands ; lateral sepals ovate, obtuse, rarely subretuse ; dorsal sepal obovate-oblong, obtuse, mucronulate. *Lip* 7.5 mm long, 5 mm broad when spread out, creamy-yellow with 3-4 small narrow, red lines arranged in the form of a cross on the broad midlobe ; fleshy, saccate at the base, obscurely 3-lobed ; lateral lobes small, erect, subentire ; midlobe dilated beyond the lateral lobes, deflexed, obovate-suborbicular, acute or mucronulate, margin irregularly waved. *Column* 3 × 3 mm short, stout, with 2 erect, minute horns produced on top from the sides of the column ; broadly margined with deep brownish-red. *Anther* 2 × 2 mm triangular-conical ; pollinia 2, waxy, yellow, globose, with a narrow, linear-oblong, translucent caudicle and a small, oblong gland. *Stigmatic surface* broadly oblong, large, margined with brownish-red. *Ovary* with *pedicel* 1 × 0.4 cm yellow, twisted. *Capsules* 6-7 × 0.6-0.8 cm cigar-shaped, longitudinally ribbed.

Flowering : April to August. *Fruiting* : May onwards.

Occurrence : KONKAN : Kanheri, *Gammie* ; Thana, *Ryan* ; Bhandup, *Blatter* ; *Kapadia* 1504 ; Kondita (Salsette), *Blatter* ; Sion, *Blatter* ; Indapur, *Graham* ; Vehar, *Santapau* 11197 ; *Kapadia* 489 ; Andheri, *Santapau* 10015-10018 ; Borivli, *R. Fernandez* 77 ; *Herbert* 1615 ; Ghodbunder, *Kapadia* 1111, 1119-1120 ; Bassein, *Santapau* 10077 ; Mumbra, *Shenoy* 2437, 3490 ; Badlapur, *Kapadia* 1945. N. KANARA : Belgaum, *Ritchie* ; Devicop, *Sedgwick* ; Dandeli, *Sedgwick* 2546 ; *Kapadia* 2036 ; Ankola-Belikeri, *Kapadia* 2175 ; Kumbelli Mines, *Kapadia*.

Distribution : India : Bengal, Chota Nagpur, Konkan, W. Chats of Bombay and South Peninsular India, Godavari District. N. Kanara. *World* : India, Burma and Ceylon.

Notes : This is one of the commonest and most abundant orchids in Bombay State. It is usually found in masses epiphytic on *Mangifera indica* L., *Syzygium* sp., *Terminalia* sp.

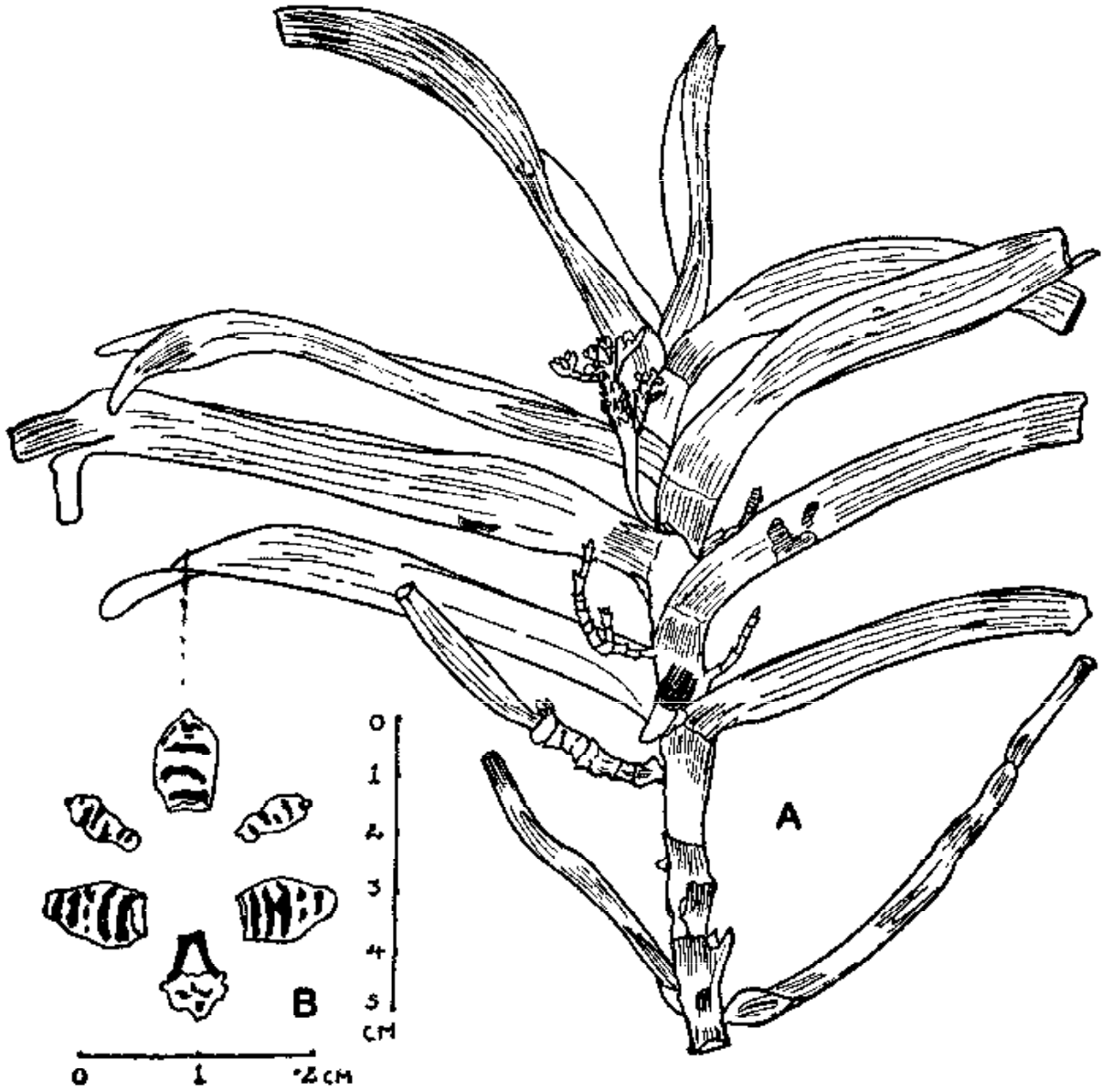
Acampe ochracea (Lindl.) Hochr. in Bull. N. Y. Bot. Gard. 6 : 270, 1910. *Saccolabium ochraceum* Lindl. in Bot. Reg. misc. 2, 1842 ; Hook. f. 62 ; Grant 285 ; Brühl, Guide Orch. Sikk. 131. *S. lineolatum* Thwaites, Enum. Pl. Zeyl. 304, 1864. *Acampe wightiana* Lindl. var. *longepedunculata* Thwaites, Enum. Pl. Zeyl. 303, 1864.

Erect or pendulous *epiphytes*. *Leaves* coriaceous, sheathing at the base, 8.5-20×0.6-2 cm, narrowly oblong, entire, shallowly and unequally 2-lobulate at the apex. *Inflorescence* 8-20 cm long ; panicles lax, branching, longer or shorter than the leaves ; peduncles terete, bracteate at the nodes. *Flowers* pedicelled, bracteate. *Bracts* minute, scarious, brown. *Sepals* and *petals* 6×2 mm, similar, yellow with pale red transverse markings, fleshy, obovate-oblong, obtuse, the lateral sepals subacute, entire, faintly 3-nerved. *Lip* 3.5×3 mm, 3-lobed, pale pinkish-white ; lateral lobes erect, small, 2 mm broad, irregularly toothed ; midlobe obovate-triangular, irregularly serrulate, acute. *Spur* 3-4 mm long, oblong, subclavate, obtuse, parallel to the ovary, with 2 longitudinal septa within. *Column* small, with 2 erect, anterior horns ; clinandrium with a central elevated boss. *Anther* 1×1.5 mm, transversely oblong-orbicular ; pollinia 2-cleft, globular with a caudicle 1 mm long and narrow linear, and a gland minute and transversely oblong. *Stigmatic surface* deeply seated within, below the projecting bosses of the rostellum. *Ovary* with *pedicel* 7.5 mm long, oblong columnar, faintly ribbed. *Capsules* with stalk 3.5×0.7 cm, linear-oblong, faintly ribbed.

Flowering : December. *Fruiting* : May.

Occurrence : N. KANARA : Yellapur, *Kapadia* 1770, 2862 ; Sirisi-Siddhapur, *Kapadia* 2445.

Distribution : India : Sikkim, Chasia Hills, N. Kanara. *World* : India, Burma and Ceylon.



Acampe praemorsa Blatt. & McC.

A. Whole plant ; B. Sepals and petals dissected.

Notes : This species has not been found previously in Bombay State. It constitutes a new record for this area.

35. *DIPLOCENTRUM* LINDL.

DIPLOCENTRUM Lindl. in Bot. Reg. sub. t. 1522, 1832, et Gen. Sp. Orch. 218, 1833; Endl. Gen. Pl. 204, 1837; Benth. & Hook. f. Gen. Pl. 3 : 582, 1883; Pfitz. in Engl. & Prantl. Pflanzenf. 2(6) : 209, 1889; Hook. f. Fl. Brit. India 6 : 78, 1890; Schltr. Orchid. 580, 1927.

The generic name *Diplocentrum* is derived from the Greek words *diplos*—double, and *kentron*—a sharp point, a spur, in allusion to the 2 collateral spurs found in the species.

This genus contains 2 species restricted to South Peninsular India. Type species : *D. recurvum* Lindl.

Diplocentrum congestum Wight, Icon. 5(1) : 10, t. 1688, 1851; Hook. f. 78; Rolfe in Hook. Icon. Pl. 27 : t. 2687, 1901; Cooke, Fl. Pres. Bomb. 2 : 704, 1907; Gammie in J. Bombay nat. Hist. Soc. 20 : 129, 1910; Blatt. & McC. *ibid.* 35 : 497, 1932; Fischer, Fl. Pres. Madr. 1449, 1928.

Small *epiphytes*. Stem very short, sheathed. Leaves 2-4, coriaceous, somewhat channelled, recurved, 2-7×0.5-0.8 cm, narrowly linear-oblong, unequally and obtusely bilobed at the apex, green mottled with purple. Racemes up to 9 cm long, arising from much below the leaves just a little above the roots, few- to many-flowered; peduncle 1-1.5 mm thick, greenish, bracteate. Flowers about 5-7 mm across, bracteate, very shortly pedicellate. Ovary with pedicel about 3 mm long, greenish-brown, slightly curved in the apical part. Bracts minute, apiculate, pale brown. Sepals and petals pale green or pinkish-brown with a central deep pink streak, spreading, subobtusely entire, glabrous; dorsal sepal 3×1 mm, narrowly elliptic-oblong. Lip 4-5 mm long, white, pale pink, or pink-mauve, fleshy, somewhat reflexed and truncate at the apex, broader and produced at the base into 2 spurs which are shortly diverging, about 1 mm long, somewhat tubercled and pale pinkish or greenish-brown. Column very short, white with 2 parallel, pink, somewhat kidney-shaped streaks on the sides. Anther 1×1 mm oblong-obovoid, pale greenish-yellow or yellow, anterior lip truncate; pollinia 2, bipartite; caudicle 1.5 mm long, apiculate, basal half ovate-oblong, about 1 mm broad, glandular. Capsule 18×3-4 mm, broadly ovoid, slightly curved, ribbed, with a 2 mm long pedicel.

Flowering : May. *Fruiting* : May onwards.

Occurrence : N. KANARA : Sirsi—Kumpta, Woodrow; Castle Rock, Blatt. Herb. 31030 (coll. T. R. Bell); Kapadia 2817-2818; Yellapur, Kapadia 2870-2871.

Distribution : N. Kanara, W. Ghats of Bombay State and South

India, Travancore.

Notes : We have found this species epiphytic on *Syzygium* sp. in open deciduous forest.

36. *EPIPOGIUM* R. BR.

EPIPOGIUM R. Br. Prodr. 330, 1810 ; Santapau in Proc. nat. Inst. Sci. India 24 B : 138. *Epipogum* Gmelin, Fl. Sibir. 1 : 11, t. 2, f. 2, 1747 ; Endl. Gen. Pl. 212, 1837 ; Benth. & Hook. f. Gen. Pl. 3 : 617 ; Pfitz. in Engl. & Prantl. Pflanzenf. 2(6) : 111 ; Hook. f. Fl. Brit. India 6 : 124 ; King & Pantl. in Ann. R. Bot. Gard. Calcutta 8 : 252 ; Duthie, *ibid.* 9 (2) : 150 ; J. J. Smith, Fl. Buitenz. 6 : 61 ; Schltr. Orchid. 100 ; Holttum, Rev. Fl. Malaya 1 : 106. *Ceratopsis* Lindl. Gen. Sp. Orchid. 383, 1835. *Podanthera* Wt. Icon. 5 (1) : 22, t. 1759, 1851.

The name *Epipogium* is derived from the Greek, *epi*=upon, and *pogon*=beard, probably with reference to the glandular hairs on the lip.

Species about 5, very widely distributed in the temperate regions of Europe and Asia.

On the spelling of the generic name, see Santapau, *loc. cit.*

Epipogium roseum (D. Don) Lindl. in Journ. Linn. Soc. 1 : 177, 1857 ; Holttum 106 ; Santapau *loc. cit.* 139. *Limodorum roseum* D. Don, Prodr. Fl. Nep. 30, Febr. 1825. *Galera rosea* Bl. Bijdr. 416, f. 3, Dec. 1825. *Epipogum nutans* Reichb. f. in Bonpland. 5 : 36, 1836 ; Lindl. 177 ; Hook. f. 124 ; King & Pantl. 252, t. 335 ; J.J. Smith 61, f. 39 ; Brühl, Guide Orch. Sikk. 148 ; Fischer 1460 ; Blatt. & McC. 35 ; 729. *Podanthera pallida* Wt. Icon. 5 (1) : 22, t. 1759, 1851.

Rhizome an ovoid horizontal tuber, about 5×3.5 cm, with few short internodes. Scapes leafless, 10-40 cm high, hollow, fleshy, about 1 cm thick at base, gradually narrowing upwards, sparsely sheathed in the basal region, yellowish. Flowers drooping, white, pedicellate, bracteate ; pedicels about 3 mm long, curved. Bracts 7-9×3-4 mm, shorter than the ovary. Sepals and petals 8-11×2-4 mm, not much spreading, narrowly linear, acute, entire, 3-nerved. Lip about equalling sepals and petals, concave, obovate-oblong in outline, irregularly crenulate, with the sides raised at the base, with a small blunt apiculum or without it ; upper surface minutely warted in 2 rows ; colour white with a few reddish brown spots. Spur short, somewhat bulbous, pointing backwards below the ovary, obtuse. Column very short. Anther larger than the column. Stigmatic surface at the base of the column, prominent. Ovary broadly ovoid, drooping, pale yellow, 8×4 mm.

Flowering : May.

Occurrence : N. KANARA ; Yellapur, Bell 4068.

Distribution : Tropical Himalayas, Sikkim in hot valleys up to 1300

m, Khasia Hills up to 2000 m, southwards to N. Kanara, Coorg, Bolampati Hills at 1400 m, Anaimalais, Pulneys at 1600 m, Wynaad.
World : W. Africa, India, Nepal, Ceylon, Malaya, Java, Australia.

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**LIST OF AGENTS FOR THE SALE OF
GOVERNMENT OF INDIA PUBLICATIONS**
(as on 17 February 1964)

AGARTALA—Laxmi Bhudat Books and Scientific Sales (Rest).

AGRA—

1. National Book House, Jami Masjid (Reg).
2. Wadhwa & Co., 45, Civil Lines (Reg).
3. Banwari Lal Jain, Publishers, Moti Kutra (Rest).
4. English Book Depot, Sadar Bazar, Agra Cantt. (Rest).

AHMADNAGAR—V.T. Jorakar, Prop. Nana General Stores, Navi Path (Rest).

AHMEDABAD—

1. Balgovind Kuber Dasa & Co., Gandhi Road (Reg).
2. Chandra Kant Chohan Lal Vora, Gandhi Road (Reg).
3. New Order Book Co., Bims Bridge (Reg).
4. Muhajan Bros., Opp. Khadi Police Gate (Rest).
5. Hastu Kitab Ghar, Near Relief Talkies, Patthar Kava, Relief Road (Reg).

AJMER—

1. Book Land, 643, Madar Gate (Reg).
2. Rajputana Book House, Station Road (Reg).
3. Law Book House, 271, Nishi Bhist (Reg).
4. Vijay Bros, Kutchery Road (Rest).
5. Krishna Bros., Kutchery Road (Rest).

ALIGARH—Friends' Book House, Muslim University Market (Reg).

ALLAHABAD—

1. Superintendent, Printing & Stationery, U.P.
2. Kitabistan, 17-A, Kania Nehru Road (Reg).
3. Law Book Co., Sardar Patel Marg, P. Box 4 (Reg).
4. Ram Narain Lal Beni Modho, 2-A, Kaira Road (Reg).
5. Universal Book Co., 20, M.G. Road (Reg).
6. Wadhwa & Co., 28, M.G. Marg (Rest).
7. The University Book Agency (of Lahore), Bijn Road (Reg).
8. Bharat Law House, 16, Mahatma Gandhi Marg (Rest).
9. Ram Narain Lal Beni Prasad, 2-A, Kaira Road (Rest).

AMBALA—

1. English Book Depot, Ambala Cantt. (Reg).
2. Seth Law House, 8710, Railway Road, Ambala Cantt. (Rest).

AMRITSAR—

1. The Law Book Agency, G.T. Road, Palsgarh (Reg).
2. S. Gupta, Agent, Govt. Publications, Near P.O. Majith Mandi (Reg).
3. Amar Nath & Sons, Near P.O. Majith Mandi (Reg).

ANAND—

1. Vijaya Stores, Station Road (Rest).
2. Charito Book Stall, Tulai Badan, Stn. Road (Rest).

ANANASOL—C. N. Roy & B. K. Roy, Book-sellers, Atwal Building (Rest).

BANGALORE—

1. The Bangalore Legal Practitioner Co-op. Society Ltd., The Associated Building (Reg).
2. S.S. Book Emporium, 115, Mount Joy Road (Reg).
3. The Bangalore Press, Lake View, Mysore Road, P.O. Box 597 (Reg).
4. The Standard Book Depot, Avenue Road (Reg).
5. Vichara Sahitya Private Ltd., Balepet (Reg).
6. Makkala Prastaka Press, Balaramdike, Gandhinagar (Reg).
7. Maruthi Book Depot, Avenue Road (Rest).
8. International Book House P. Ltd., 4-F, Mahatma Gandhi Road (Reg).
9. Navakurastaka Pubns. Private Ltd., Majestic Circle (Rest).

BAREILLY—Agarwal Brothers, Bera Bazar (Reg).

BALODA—

1. Shri Chandrakant Mohan Lal Shah, Raupura (Rest).
2. Good Companions, Booksellers, Publishers, and Sub-Agent (Rest).
3. New Medical Book House, 540, Madan Zampa Road (Rest).

BEAWAR—The Secretary, S.D. College, Co-operative Stores, Ltd. (Rest).

BELGHARIA—Grantbook Antiquarian Book-sellers and Publishers (24-Parganas), 5/1, Aditya Mukherjee Road (Reg).

BHAGALPUR—Paper Stationery Stores, D.N. Singh Road (Reg).

BHOPAL—

1. Superintendent, State Government Press.
2. Lyall Book Depot, Mohd. Din Bldg., Sultanis Road (Reg).
3. Delhi Books, Opp. Bhopal Talkies (Rest).

BHUVANESWAR—Bharata Vidyabhan, Eastern Tower Room No. 3 (Rest).

BHUPAL—Shri D. V. Deshpande, Recognised Law Booksellers, Prop. Vinod Book Depot, Near Shriroshetti Chowk (Rest).

BIKANER—Bhandani Bros. (Rest).

BILASPUR—Sharma Book Stall, Sadar Bazar (Rest).

BOMBAY—

1. Supdt., Printing and Stationery, Queen's Road.
2. Charles Lambert & Co., 101, Mahatma Gandhi Road (Reg).
3. Co-operator's Book Depot, 5/92, Ahmed Sallor Bldg., Dastar (Reg).
4. Current Book House, Maruti Lane, Raghunath Dadaji St. (Reg).
5. Current Technical Literature Co., P. Ltd., India House, 1st floor (Reg).
6. International Book House Ltd., 9, Ash Lane, M. G. Road (Reg).
7. Lakshmi Book Depot, Girgaon (Reg).
8. Rigveda Agencies, 24, Bhongwadi, Kalbadra (Reg).
9. P.P.H. Book Stall, 190-B, Khetwadi Main Road (Reg).
10. New Book Co., 183-190, Dr. Dadabhai Naoroji Road (Reg).

BOMBAY—contd.

11. Popular Book Depot, Larnington Road (Reg).
12. Sunder Das Gian Chadd, 801, Girgaum Road, Near Princess Street (Reg).
13. D. B. Taraporewala Sons and Co. (P) Ltd., 210, Dr. Dadabhai Naoroji Road (Reg).
14. Thacker and Co., Rampart Row (Reg).
15. N. M. Tripathi Private Ltd., Princess Street (Reg).
16. The Kothari Book Depot, King Edward Road (Reg).
17. P. H. Rama Krishna and Sons, 147, Rajaram Bhuvan, Shivaji Park Road No. 5 (Rest).
18. C. Jambadas & Co., Booksellers, 146-C, Princess St. (Reg).
19. Indo Nath & Co., A-6, Daulat Nagar, Borivli (Reg).
20. Minerva Book Shop, Shop No. 1/80, N. Subhas Road (Reg).
21. Academic Book Co., Association Building, Girgaum Road (Rest).
22. Dominion Publishers, 23, Bell Building, Sir P.M. Road (Rest).
23. Bombay National History Society, 91, Walkeshwar Road (Rest).
24. Downmadco and Co., 18, Naziria Building, Ballard Estate (Rest).
25. Asian Trading Co., 310, the Miraball, P.D. 1905 (Rest).

CALCUTTA—

1. Chatterjee and Co., 3/1, Bacharam Chatterjee Lane (Reg).
2. Das Gupta and Co., Ltd., 54/3, College Street (Reg).
3. Hindu Library, 69-A, Bolaram De Street (Reg).
4. S. K. Lahiri and Co. Private Ltd., College Street (Reg).
5. M. C. Sarkar and Sons, P. Ltd., 14, Bankim Chatterjee Street (Reg).
6. W. Newman & Co., Ltd., 3, Old Court House Street (Reg).
7. Oxford Book & Stationery Co., 17, Park Street (Reg).
8. R. Chambray & Co. Ltd., Kent House, P. 33, Mission Road Extension (Reg).
9. S. C. Sarkar & Sons Private Ltd., 1/C, College Square (Reg).
10. Thacker Spink & Co. (1933) P. Ltd., 3, Esplanade East (Reg).
11. Firma K. L. Mukhopadhyaya, 6/1A, Banchoa Ram Akzra Lane (Reg).
12. K.K. Roy, P. Box No. 10210, Calcutta-19 (Rest).
13. Sm. P.D. Upadhyay, 77, Muktarani Babu Street (Rest).
14. Universal Book Dist., 3/2, Hastings Street (Rest).
15. Modern Book Depot, 9, Chowringhee Centre (Rest).
16. Sood and Co., 125, Canning Street (Reg).
17. S. Bhattacharjee, 49, Dharamtala Street (Rest).
18. Mukherjee Library, 16, Sarba Khan Road (Reg).
19. Current Literature Co., 208, Mahatma Gandhi Road (Reg).
20. The Book Depository, 4/1, Madan Street (1st Floor) (Rest).
21. Scientific Book Agency, Netaji Subhas Road (Rest).
22. Reliance Trading Co., 17/1, Banku Bihari Ghose Lane, District Howrah (Rest).
23. Indian Book Dist. Co., 6312, Mahatma Gandhi Road (Rest).

CALCUTTA—Touring Book Stall (Rest).

CHANDIGARH—

1. Supdt., Govt. Printing and Stationery, Punjab.
2. Jain Law Agency, Flat No. 5, Sector No. 22 (Reg).

CHANDIGARH—contd.

3. Rama News Agency, Bookseller, Sector No. 22 (Reg).
4. Universal Book Store, Booth 25, Sector 22-D (Reg).
5. English Book Shop, 34, Sector 22-D (Rest).
6. Mehta Bros., 15-Z, Sector 22-B (Rest).
7. Tandan Book Depot, Shopping Centre, Sector 18 (Rest).
8. Kallash Law Publishers, Sector 22-B (Rest).

CHHINDWARA—The Verma Book Depot (Rest).

COCHIN—Saraswat Corporation Ltd., Palliarakav Road (Reg).

CUTTACK—

1. Press Officer, Orissa Sectt.
2. Cuttack Law Times.
3. Prabhat K. Mahapatra, Mangalabag, P.B. 35 (Reg).
4. D. P. Sur & Sons, Mangalabag (Rest).
5. Utkal Stores, Balu Basar (Rest).

DEHRA DUN—

1. Jugal Kishore & Co., Rajpur Road (Reg).
2. National News Agency, Faltan Basar (Reg).
3. Bishan Singh and Mahendra Pal Singh, 318, Chukhuwala (Reg).
4. Utam Pustak Bhandar, Faltan Basar (Rest).

DELHI—

1. J. M. Jain & Brothers, Mori Gate (Reg).
2. Atlas Ram & Sons, Kashmere Gate (Reg).
3. Federal Law Book Depot, Kashmere Gate (Reg).
4. Bahri Bros., 199, Lalpur Bai Market (Reg).
5. Bawa Harkishan Dasa Bodi (Vijaya General Agencies), P. B. 2027, Abata Kedara, Chamalian Road (Reg).
6. Book Well, 4, Sant Narankari Colony, P. B. 1565 (Reg).
7. Imperial Publishing Co., 3, Faiz Bazar, Daryaganj (Reg).
8. Metropolitan Book Co., 1, Faiz Bazar (Reg).
9. Publication Centre, Subzmandi (Reg).
10. Youngman & Co., Nai Sarak (Reg).
11. Indian Army Book Depot, 3, Daryaganj (Reg).
12. All India Educational Supply Co., Shri Ram Building, Jawahar Nagar (Rest).
13. Dhanwat Medical & Law Book House, 1532, Lalpur Bai Market (Rest).
14. University Book House, 15, U. B. Bangalore Road, Jawahar Nagar (Rest).
15. Law Literature House, 2646, Ballmaran (Rest).
16. Sumner Brothers, P. O. Birla Lines (Rest).
17. Universal Book & Stationery Co., 16, Netaji Subhas Marg (Reg).
18. B. Nath & Bros. 3808, Charkhawali (Chowri Bazar) (Rest).
19. Rajkamal Prakashan P. Ltd., 8, Faiz Bazar (Reg).
20. Premier Book Co., Printers, Publishers & Booksellers, Nai Sarak (Rest).
21. Universal Book Traders, 80, Gokhale Market (Reg).
22. Tech. & Commercial Book Coy., 75, Gokhale Market (Rest).
23. Saini Law Publishing Co., 1416, Chabaganj, Kashmere Gate (Rest).
24. G. M. Ahuja, Booksellers & Stationers, 809, Nehru Bazar (Rest).
25. Sat Narain & Sons, 3141, Mohd. Ali Bazar, Mori Gate (Reg).
26. Kitab Mahal (Wholesale Div.) P. Ltd., 25, Faiz Bazar (Reg).
27. Hindu Sahitya Bazar, Nai Sarak (Rest).

- DELHI—contd.**
28. Munshi Ram Manohar Lal, Oriental Booksellers & Publishers, P. B. 1166, Nai Sarak (Rest).
 29. K. L. Seth, Suppliers of Law, Commercial Tech. Books, Shanti Nagar, Ganeshpura (Rest).
 30. Adarsh Publishing Service, 5-A/10, Ansari Road (Rest).
- DIHANBAD—**
1. Ismag Co-operative Stores Ltd., P. O. Indian School of Mines (Reg).
 2. New Sketch Press, Post Box. 26 (Rest).
- DHARWAR—**
1. The Agricultural College Consumers Co-op. Society (Rest).
 2. Ramchraya Book Depot, Subhas Road (Rest).
 3. Karnatakaya Sahitya Mandira of Publishers and Booksellers.
- MENAKULAM—**
1. Pai & Co., Cloth Bazar Road (Rest).
 2. South India Traders Co. Constitutional Journal (Reg).
- FEROZEPUR—**English Book Depot, 78, Jhoke Road (Reg).
- GAUHATI—**Mokshada Pustakalaya (Reg).
- GAYA—**Sahitya Sadan, Gautam Budha Marg (Reg).
- GHAZIABAD—**Jayana Book Agency (Rest).
- GORAKHPUR—**Vishwa Vidyalaya Prakashan, Nalwa Road (Reg).
- GUDUR—**The General Manager, The N. D. C. Publishing & Ptg. Society Ltd. (Rest).
- GUNTUR—**Book Lovers Private Ltd., Kadri-guda, Chowrasta (Reg).
- GWALIOR—**
1. Supdt. Printing & Stationery, M. B.
 2. Loyal Book Depot, Patankar Bazar, Lashkar (Reg).
 3. M. C. Daffari, Prop. M. B. Jain & Bros., Booksellers, Surata Lashkar (Rest).
- HUBLI—**Pervaj's Book House, Koppikar Road (Reg).
- HYDERABAD—**
1. Director, Govt. Press.
 2. The Swaraj Book Depot, Lakdikapul (Reg).
 3. Book Lovers Private Ltd. (Rest).
 4. Labour Law Publications, 573, Sultan Bazar (Rest).
- IMPHAL—**Tikendra & Sons, Bookseller (Rest).
- INDORE—**
1. Wadhwa & Co., 56, M. G. Road (Reg).
 2. Swarup Brothers, Khajuri Bazar (Rest).
 3. Madhya Pradesh Book Centre, 41, Ahilya Pura (Rest).
 4. Modern Book House, Shiv Vilas Palace (Rest).
 5. Navyug Sahitya Sadan, Publishers & Booksellers, 10, Khajuri Bazar (Rest).
- JABALPUR—**
1. Modern Book House, 236, Jawaharganj (Reg).
 2. National Book House, 136, Jai Prakash Narain Marg (R).
- JALPUR—**
1. Government Printing & Stationery Deptt., Rajasthan.
- JALPUR—contd.**
2. Bharat Law House, Booksellers & Publishers, Opp. Prem Prakash Cinema (Reg).
 3. Garg Book Co., Tripolia Bazar (Reg).
 4. Vani Mandir, Sawal Mansingh Highway (Reg).
 5. Kalyan Mal & Sons, Tripolia Bazar (Rest).
 6. Popular Book Depot, Chaura Rasta (Reg).
 7. Krishna Book Depot, Chaura Rasta (Rest).
 8. Dominion Law Depot, Shahi Building, P. B. No. 23 (Rest).
- JAMNAGAR—**Swedeshi Vastu Bhandar (Reg).
- JAMSHEDPUR—**
1. Anar Kitab Ghar, Diagonal Road, P. B. 78 (Reg).
 2. Gupta Stores, Dhatkidih (Reg).
 3. Sanjal Bros., Booksellers & News Agents, Bistapur Market (Rest).
- JAWALPUR—**Sahyog Book Depot (Rest).
- JHUNJHUNU—**
1. Shashi Kumar Sarat Chand (Rest).
 2. Kupram Prakashan Prasaran, 1/00, Nandha Niwas, Azad Marg (R).
- JHODPUR—**
1. Dwarka Das Rathil, Wholesale Books and News Agents (Reg).
 2. Kitab-Ghar, Sojati Gate (Reg).
 3. Choppra Brothers, Tripolia Bazar (Reg).
- JULLUNDUR—**
1. Hazoori Bros., Mai Hiran Gate (Rest).
 2. Jain General House, Bazar Bansunwala (Reg).
 3. University Publishers, Railway Road (Rest).
- KANPUR—**
1. Advani & Co., P. Box 100, The Mall (Reg).
 2. Sahitya Niketan, Shradhanand Park (Reg).
 3. The Universal Book Stall, The Mall (Reg).
 4. Raj Corporation, Rau House, P. B. 200, Chowk (Rest).
- KARUR—**Shri V. Nagaraja Rao, 26, Sriivanapuram (Rest).
- KODARMA—**The Bhagwati Press, P. O. Jhumri Tilaiya, Dt. Hazaribagh (Reg).
- KOLHAPUR—**Maharashtra Granth Bhandar, Mahadwar Road (Rest).
- KOTA—**Kota Book Depot (Rest).
- KUMTA—**S.V. Kamat, Booksellers & Stationers (N. Kanara) (Reg).
- LUCKNOW—**
1. Soochma Sahitya Depot (State Book Depot).
 2. Bakrishna Book Co. Ltd., Hazratganj (Reg).
 3. British Book Depot, 84, Hazratganj (Reg).
 4. Ram Advani, Hazratganj, P. B. 164 (Reg).
 5. Universal Publishers (P) Ltd., Hazratganj (Reg).
 6. Eastern Book Co., Lalbagh Road (Reg).
 7. Civil & Military Educational Stores, 106/B, Sadar Bazar (Rest).
 8. Acquaintance Supply Co., 213, Falzabad Road (Rest).
 9. Law Book Mart, Amin-Ud-Daula Park (Rest).

- LUDHIANA—**
1. Lyall Book Depot, Chaura Bazar (Reg).
 2. Mohindra Brothers, Kalcheri Road (Rest).
 3. Nanda Stationery Bhandar, Pustak Bazar (Rest).
 4. The Pharmacy News, Pindi Street (Rest).
- MADRAS—**
1. Supdt., Govt. Press, Mount Road.
 2. Account Test Institute, P. O. 760, Emgore (Reg).
 3. C. Subbiah Chetty & Co., Triplicane (Reg).
 4. K. Krishnamurti, Post Box 384 (Reg).
 5. Presidency Book Supplies, 8, Pycrofts Road, Triplicane (Reg).
 6. P. Vardachary & Co., 8, Linghi Chetty Street (Reg).
 7. Palani Parthuram, 3, Pycrofts Road, Triplicane (Reg).
 8. NCBH Private Ltd., 199, Mount Road (Rest).
 9. V. Sadanand, The Personal Bookshop, 19, Congress Building, 111, Mount Road (Rest).
- MADURAI—**
1. Oriental Book House, 258, West Main Street (Reg).
 2. Vivekananda Press, 49, West Main Street (Reg).
- MADHYA SUGAR TOWN—**K. N. Narimhe Gowda & Sons (Rest).
- MANGALORE—**U.R. Shenoy Sons, Car Street, P. Box 128 (Reg).
- MANJHESWAR—**Makenda Krishna Nayak (Rest).
- MATHURA—**Bath & Co., Tilohi Building, Bengali Ghat (Rest).
- MERRUT—**
1. Prakash Educational Stores, Subhas Bazar (Reg).
 2. Hind Chitra Press, West Kutchery Road (Reg).
 3. Loyal Book Depot, Chhippi Tank (Reg).
 4. Bharat Educational Stores, Chhippi Tank (Rest).
 5. Universal Book Depot, Booksellers & News Agents (Rest).
- MONGHYR—**Anusandhan Minerva Press Building (Rest).
- MUSSORIE—**
1. Cambridge Book Depot, The Mall (Rest).
 2. Hind Traders (Rest).
- MUZAFFARNAGAR—**
1. Mittal & Co., 85-C, New Mandi (Rest).
 2. B. S. Jain & Co., 71, Abupura (Rest).
- MUZAFFARPUR—**
1. Scientific & Education Supply Syndicate (Reg).
 2. Legal Corner, Tikmanio House, Angola Road (Rest).
 3. Tirhut Book Depot (Rest).
- MYSORE—**
1. H. Venkataramiah & Sons, New Statue Circle (Reg).
 2. Peoples Book House, Opp. Jagan Mohan Palace (Reg).
 3. Geeta Book House, Booksellers & Publishers Krishna-murthipuram (Rest).
 4. News Paper House, Landsdowne Building (Rest).
 5. Indian Mercantile Corporation, Toy Palace, Ramavilas (Rest).
- NADIA—**R. S. Desay, Station Road (Rest).
- NAGPUE—**
1. Supdt., Govt. Press & Book Depot.
 2. Western Book Depot, Residency Road (Reg).
 3. The Asstt. Secretary, Mineral Industry Association, Mineral House (Rest).
- NAINITAL—**Coural Book Depot, Bars Bazar (Rest).
- NANDED—**
1. Book Centre, College Law General Books, Station Road (Rest).
 2. Hindusthan General Stores, Paper & Stationery Merchants, P. B. No. 51 (Rest).
 3. Sanjoy Book Agency, Vazirabad (Rest).
- NEW DELHI—**
1. Amrit Book Co., Connaught Circus (Reg).
 2. Bhawani & Sons, 8-F, Connaught Place (Reg).
 3. Central News Agency, 23/90, Connaught Circus (Reg).
 4. Empire Book Depot, 278, Aliganj (Reg).
 5. English Book Stores, 7-1, Connaught Circus, P. O. B. 328 (Reg).
 6. Faqir Chand & Sons, 15-A, Khan Market (Reg).
 7. Jain Book Agency, 0-9, Prem House, Connaught Place (Reg).
 8. Oxford Book & Stationery Co., Seindia House (Reg).
 9. Ram Krishna & Sons (of Lahore) 18/B, Connaught Place (Reg).
 10. Sikh Publishing House, 7-C, Connaught Place (Reg).
 11. Suneja Book Centre, 24/99, Connaught Circus (Reg).
 12. United Book Agency, 31, Municipal Market, Connaught Circus (Reg).
 13. Jayana Book Depot, Chhaparwala Kuan, Karol Bagh (Reg).
 14. Navayug Traders, Desh Bandhu Gupta Road, New Nagar (Reg).
 15. Saraswati Book Depot, 15, Lady Hardinge Road (Reg).
 16. The Secretary, Indian Met. Society, Lodi Road (Reg).
 17. New Book Depot, Latest Books, Periodicals, Sty. & Novels, P. B. 98, Connaught Place (Reg).
 18. Mehra Brothers, 50-G, Kalkaji (Reg).
 19. Luxmi Book Stores, 42, Jaupath (Rest).
 20. Hindi Book House, 82, Jaupath (Rest).
 21. People Publishing House (P) Ltd., Rani Jhansi Road (Reg).
 22. Sharma Bros, 17, New Market, Moti Nagar (Reg).
 23. B. K. Publishers, 23, Beadon Pura, Karol Bagh (Rest).
 24. Asplki Dukan, 5/5777, Dev Nagar (Reg).
 25. Sarvodaya Service, 66A-1, Rohtak Road, P. B. 2521 (Rest).
 26. H. Chandson, P. B. No. 3034 (Rest).
 27. The Secretary, Federation of Association of Small Industry of India, 23-B/2, Rohtak Road (Rest).
 28. Standard Booksellers & Stationers, Palam Enclave (Rest).
 29. Lakshmi Book Depot, 57, Begarpura (Rest).
 30. Sant Ram Booksellers, 16, New Municipal Market, Lody Colony (Rest).
- PANJIM—**
1. Singhal's Book House, P. O. B. 70, Near the Church (Rest).
 2. Sagoon Gaydev Dhoud, Booksellers, 6-7 Rua, 3 Ido Jameria (Rest).
- PATNAKOT—**The Krishna Book Depot, Main Bazar (Rest).
- PATIALA—**
1. Supdt., Bhopendra State Press.
 2. Jain & Co., 17, Shah Nashin Bazar (Reg).

PATNA—

1. Suptd. Govt. Printing (Bihar).
2. J. N. P. Agarwal & Co., Padri-Ki-Haveli, Baghbanath Bhawan (Reg).
3. Luxmi Trading Co., Padri-Ki-Haveli, (Reg).
4. Moti Lal Banarsi Dass, Bankipore (Reg).
5. Bengal Law House, Chuwahata (Rest).

PITHORGAHAR—Mandain Punetha & Sons (Rest).**PONDICHERRY—**M/s. Honesty Book House, 8 Rue Dupuis (R).**POONA—**

1. Deccan Book Stall, Deccan Gymkhana (Reg).
2. Imperial Book Depot, 286, M. G. Road (Reg).
3. International Book Service, Deccan Gymkhana (Reg).
4. Raka Book Agency, Opp. Nair's Chawal, Near Appa Bhaiwant Chowk (Reg).
5. Utility Book Depot, 1892, Shivaji Nagar (Rest).

PUDKOTTAL—Shri P. N. Swaminathan Sivam & Co., East Main Road (Rest).**RAJKOT—**Mohan Lal Dossabhai Bhai, Book-Sellers and Whr. Agents (Reg).**RANCHI—**

1. Crown Book Depot, Upper Bazar (Reg).
2. Pustak Mahal, Upper Bazar (Rest).

RAWA—Suptd., Govt. State Emporium, V. P.**ROURKELA—**The Baurkela Review (Rest).**SAHARANPUR—**Chandra Bherata Pustak Bhandar, Court Road (Rest).**SECUNDERABAD—**Hindunathan Diary Publisher, Market Street (Reg).**SILCHAR—**Shri Nishit Sen, Nazirpatti (Rest).**SIMLA—**

1. Suptd., Himachal Pradesh Govt.
2. Minerva Book Shop, The Mall (Reg).
3. The New Book Depot, 79, The Mall (Reg).

SINJAR—Shri N. N. Jakhadi, Agent, Times of India, Sinjar (Nasik) (Rest).**SHILLONG—**

1. The Officer-in-Charge, Assam Govt. B.D.
2. Chapala Bookstall, P. B. No. 1 (Rest).

SONEPAT—United Book Agency (Reg).**SREINAGAR—**The Kashmir Bookshop, Rest-ecancy Road (Reg).**SURAT—**Shri Gajanan Postakalaya, Tower Road (Reg).**TIRUCHIRAPALLI—**

1. Kalpana Publishers, Wosiu (Reg).
2. S. Krishnaswami & Co., 35, Subhush Chander Bose Road (Reg).
3. Palaniappa Bros (Rest).

TRIVANDRUM—

1. International Book Depot, Main Road (Reg).
2. Reddear Press & Book Depot, P. B. No. 4 (Rest).

TUTICORIN—Shri K. Thiragarajan, 10-C, French Chapel Road (Rest).**UDAIPUR—**

1. Jagadish & Co., Inside Buraajpole (Rest).

UDAIPUR—contd.

2. Book Centre, Maharana, Bhopal Con-serviers' Co-op. Society Ltd. (Rest).

UJJAIN—Manak Chand Book Depot, Hall Gate (Rest).**VARANASI—**

1. Students Friends & Co., Lanka (Rest).
2. Chowkharaba Sanskrit Series OH.co, Gopal Mandir Road, P. B. S. (Reg).
3. Club Book Centre (Rest).
4. Robinson Stores, University Road, Lanka (Reg).
5. B. H. U. Book Depot (Rest).

VELLORE—A. Venkatesubbian, Law Book-Sellers (Reg).**VIJAYAWADA—**The Book & Review Centre, Eluru Road, Government (Rest).**VISAKHAPATNAM—**

1. Gupta Brothers, Vizia Building (Reg).
2. Book Centre, 11/97, Main Road (Reg).
3. The Secy., Andhra University, General Co-op. Stores Ltd. (Rest).

VIZIANAGARAM—Baria & Co. (Rest).**WARDHA—**Swarajya Bhandar, Bhoori Market (Reg).**FOR LOCAL SALE—**

1. Govt. of India Kitab Mahal, Janpath, Opp. India Coffee House, New Delhi.
2. Govt. of India Book Depot, 8, Hastings Street, Calcutta.
3. High Commissioner for India in London, India House, London, W. O. 2.

RAILWAY BOOKSTALL HOLDERS—

1. S/S. A. H. Wheeler & Co., 13, Elgin Road, Allahabad.
2. Ganot Bros., E. E. M. Road, Bikaner.
3. Hingubothanna & Co., Ltd., Mount Road, Madras.
4. M. Gulab Singh & Sons Private Ltd., Mathura Road, New Delhi.

FOREIGN—

1. S/S. Education Enterprise Private Ltd., Kathmandu (Nepal).
2. S/S. Akhe Bologat, C. E. Fritztes Kongl., Novobokhandel, Fredsgation-2, Box 1866, Stockholm-16 (Sweden).
3. Reise-und Verkehrsverlag Stuttgart, Post 730, Gutenbergstr. 21, Stuttgart No. 11945, Stuttgart den (Germany West).
4. Shri Swar Sahramanyam 452, Riverside Dr. Apt. 6, New York 27, N.Y.
5. The Proprietor, Book Centre, Lakshmi Mansions, 49, The Mall, Lahore (Pakistan).

ON S. AND B. BASIS—

1. The Head Clerk, Govt. Book Depot, Ahmedabad.
2. The Asstt. Director, Extension Centre, Kapilswar Road, Belgann.
3. The Employment Officer, Employment Exchange, Dhar.
4. The Asstt. Director, Bookwear Extension Centre, Polo Ground No. 1, Jodhpur.
5. The O. I/C, Extension Centre, Club Road, Muzaffarpur.
6. The Director, Indian Bureau of Mines, Govt. of India, Ministry of Mines & Fuel, Nagpur.
7. The Asstt. Director, Industrial Extension Centre, Nadiad (Gujarat).
8. The Head Clerk, Photodupographic Press, 6, Finance Road, Poona.
9. Govt. Printing & Stationery, Rajkot.
10. The O. I/C, Extension Centre, Industrial Estate, Kolar, Ranchi.
11. The Director, B.I.S.I. Industrial Extension Centre, Udhna, Surat.

ON S. AND R. BASIS—*contd.*

12. The Registrar of Companies, Narayani Building, 27, Brabourne Road, Calcutta-1.
13. The Registrar of Companies, Kerala, 50, Feet Road, Ernakulam.
14. The Registrar of Companies, H. No. 2-5-88, Hyderguda, Hyderabad.
15. Registrar of Companies, Assam, Manipur and Tripura, Shillong.
16. Registrar of Companies, Sunlight Insurance Building, Ajmeri Gate Extension, New Delhi.
17. Registrar of Companies, Punjab and Himachal Pradesh, Link Road, Jalandhar City.
18. Registrar of Companies, Bihar, Jama Road, Patna-1.
19. Registrar of Companies, Raj. and Ajmer, Shri Kamta Prasad House, 1st Floor, 'C' Scheme, Ashok Marg, Jaipur.
20. The Registrar of Companies, Andhra Bank Building, 0, Langhi Chetty Street, F. B. 1550, Madras.
21. The Registrar of Companies, Mahatma Gandhi Road, West Cott. Bldg., P. B. 334, Kanpur.
22. The Registrar of Companies, Everest 100, Marine Drive, Bombay.
23. The Registrar of Companies, 162, Brigade Road, Bangalore.
24. The Registrar of Companies, Gwalior.
25. Asstt. Director, Extension Centre, Bhuli Road, Dhanbad.
26. Registrar of Companies, Orissa, Cuttack Chandl, Cuttack.

ON S. AND R. BASIS—*concl'd.*

27. The Registrar of Companies, Gujarat State, Gujarat Samahkar Building, Ahmedabad.
28. Publication Division, Sale Depot, North Block, New Delhi.
29. The Development Commissioner, Small Scale Industries, New Delhi.
30. The O. I/C, University Employment Bureau, Lucknow.
31. O. I/C, S. I. S. I. Extension Centre, Madla.
32. O. I/C, S. I. S. I. Extension Centre, Habra, Tebatiura, 24-Parganas.
33. O. I/C, S. I. S. I. Model Carpentry Workshop, Piyali Nagar, P. O. Burnipur.
34. O. I/C, S. I. S. I. Chronotanning Extension Centre, Tangra, 83, North Topsia Road, Calcutta-46.
35. O. I/C, S. I. S. I. Extension Centre (Footwear), Calcutta.
36. Asstt. Director, Extension Centre, Hyderabad.
37. Asstt. Director, Extension Centre, Krishna Distt. (A. P.)
38. Employment Officer, Employment Exchange, Jabua.
39. Dy. Director Incharge, S. I. S. I., C/o. Chief Civil Admn., Goa, Panjim.
40. The Registrar of Trade Unions, Kanpur.
41. The Employment Officer, Employment Exchange, Gopal Bhavan, Morina.
42. The O. I/C, State Information Centre, Hyderabad.
43. The Registrar of Companies, Pondicherry.
44. The Asstt. Director of Publicity and Information, Vidhana Sabha (P. B. 271), Bangalore.