

NOTES ON ORCHIDS OF BHUTAN—I

EPIGENEIUM GAGNEP. AND KATHERINEA HAWKES

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ABSTRACT

Nomenclature and delimitation of the genera *Epigeneium* Gagnep. and *Katherinea* Hawkes are discussed. *Epigeneium fargesii* (Finet) Gagnep., so far known only from China, is reported for the first time from Bhutan with description and illustrations. A new species, *Katherinea navicularis* and two other known species of *Katherinea* are described and illustrated.

INTRODUCTION

The orchids of Bhutan are very little known. Apart from the early collections of Griffith cited and described by J. D. Hooker in Flora of British India, there is no other account of this group of fascinating plants from Bhutan, although those of the neighbouring state Sikkim are well known (King and Pantling, 1898).

Recent exploration trips to Bhutan yielded among other plants, large collections of orchids, both living and herbarium specimens. Most of the living orchids which are under cultivation in the 'National Orchidarium, Botanical Survey of India, Shillong,' have flowered, thus enabling critical studies, illustrations and detailed descriptions which are often lacking in literature. In a series of notes, the present authors intend to describe and illustrate all of them which would ultimately form the basis for a comprehensive account of these plants in Bhutan.

EPIGENEIUM Gagnep.

Certain interesting points, on the delimitation and nomenclature of this genus were noticed during the study of *Epigeneium fargesii* (Finet) Gagnep. This species was first described under *Dendrobium* by Finet (1903) based on specimens collected by R. P. Farges from China. Kraenzlin (1910) transferred it to *Desmotrichum* Blume. In 1932, Gagnepain erected the genus *Epigeneium*, for this species as it differed from the above genera in its uninodal monophyllous pseudobulbs, emphatic mentum and petals adnate to the column sides. He added three new species from China and Indo-China. Tang and Wang (1951) reduced this genus to *Sarcopodium* Lindl. assuming that they were congeneric. However Hawkes (1956), presumably unaware of the papers by Tang and Wang, established a new name *Katherinea* for *Sarcopodium* Lindl., on the fact that the later name is pre-

occupied in Fungi and transferred all species of *Sarcopodium* as circumscribed by Kraenzlin (1910) to *Katherinea*. Summerhayes (1957) considered *Epigeneium*, *Sarcopodium* and *Katherinea* as congeneric and revived the genus *Epigeneium* and transferred all names under *Sarcopodium* to *Epigeneium*. The present authors had the opportunity to study live plants in flower and Types of the type species of *Epigeneium* and *Sarcopodium*. As a result it is found that *Epigeneium* differs from *Katherinea* (*Sarcopodium*) in the small monophyllous aggregate pseudobulbs, the petals adnate to the column sides and the exaggerated foot of column forming a prominent mentum with lateral sepals. These differences clearly indicate that the two genera are deserving independent generic ranks.

Epigeneium Gagnepain in Bull. Mus. Nat. Hist. Natur. sér. 2, 4: 592, 1932; Summerhayes in Kew Bull. 1957: 259, p. p.; Seidenfaden & Smitinand, Orch. Thail. 2(2): 282, 1960.

Epiphytic. *Rhizome* elongate with numerous uninodal, monophyllous aggregate pseudobulbs. *Leaves* solitary, coriaceous, terminal. *Inflorescence* solitary, uniflorous, subterminal on pseudobulb. *Scape* long, erect, slender, with a spatulate bract at base. *Floral bract* solitary, linear-lanceate. *Flowers* large with respect to the rest of the plant. *Sepals* subequal, spreading; dorsal sepal adnate to the back of column; lateral sepals larger, attached laterally to the foot forming a large obtuse, saccate mentum. *Petals* narrower, adnate at base to the sides of the column and the apices in level with the apex of dorsal sepal. *Lip* fiddle-shaped, oblong-oblancheate; base cuneate, attached to the tip of the foot; trilobed, side lobes erect, obtuse, midlobe obovate, obtuse or emarginate; disc with 2-4 longitudinal lamellae. *Column* short; foot long, broad. *Pollinia* 4, coherent in 2 pairs, without any appendages.

Type species: *Epigeneium fargesii* (Finet) Gagnep.

Distribution: China, Indo-China, Thailand and Bhutan.

Epigeneium fargesii (Finet) Gagnep. l. c. 595, 1932; Summerhayes l. c. 262, 1957; *Dendrobium fargesii* Finet in Bull. Soc. Bot. Fr. 50: 374, t. 7 ff. 11-18, 1903; Mansfeld in Fedde, Repert. 27: 295, 1930. *Desmotrichum fargesii* (Finet) Kraenzlin in Engler, Pflanzenr. 45: 358, t. 28, ff. A-D, 1910. *Sarcopodium fargesii* (Finet) Tang & Wang in Acta Phytotax. Sin. 1: 83, 1951.

Rhizome ± 2 mm thick, creeping, branched. *Pseudobulbs* closely arranged, obliquely overlapping each other, elliptic, fusiform, slightly upcurved, 1.4-1.7 cm long, 5-7 mm in diameter, brownish-green and smooth when young, turning yellowish and rugulose when old; young terminal pseudobulbs covered with 2 or more pale brown, scarios, many-nerved, ovate, acute sheaths. *Leaves* coriaceous, thick, rigid, obovate-oblong, cuneate at base, broadly obtuse, subequally bilobed, with a short narrow sinus at apex, 1-nerved, grooved on midrib above 2.0-2.5 cm long, 8-10 mm broad, dark green above, pale yellowish-green beneath; petiole short, 3-5 mm long, yellowish-green. *Scape* obliquely inserted on the pseudobulb, ± 1 cm long, with one or two bracts at base. *Bracts* scarios, brownish, ± 4 mm long, ochraceous, tubular, acute. *Floral bract* solitary, hyaline, membranous, 3-nerved, ovate, acute, ± 5 mm long. *Flower* solitary, ± 2.5 cm wide vertically and ± 2 cm wide horizontally, dark purplish-brown; pedicel with ovary slender, ± 1.5 cm long, pale greenish-brown. *Dorsal sepal* triangular, hastate at base, acute at apex, ± 8 mm long, ± 7 mm broad, 5-nerved. *Lateral sepals* falcate, lanceate, acute, twice as long as dorsal sepal, ± 2 cm long, ± 1 cm broad, dark purplish-brown, 9-nerved, adnate to the column foot forming a saccate mentum and elegantly recurved at middle. *Petals* erect, linear-lanceate, adnate to the sides of column, ± 9 mm long, ± 2 mm broad, dark purplish-brown, 3-nerved, apices in level with apex of dorsal sepal, elegantly curved side-wards. *Lip* pale brownish-purple, paler than sepals, ± 2 cm long, ± 1 cm broad, attached to the apex of foot, more or less mobile, unguiculately cuneate at base, then expanding and trilobed, consisting of two parts; the basal part with 3 up-turned obtuse lateral lobes; the distal part projecting, more or less diamond-shaped, sinuate-emarginate at apex, hyaline at margin; disc with 2 fleshy lamellae at the middle arising from the base of lip where they

are narrow and ending abruptly at the base of mid-lobe where they are broader and obtuse at apex.

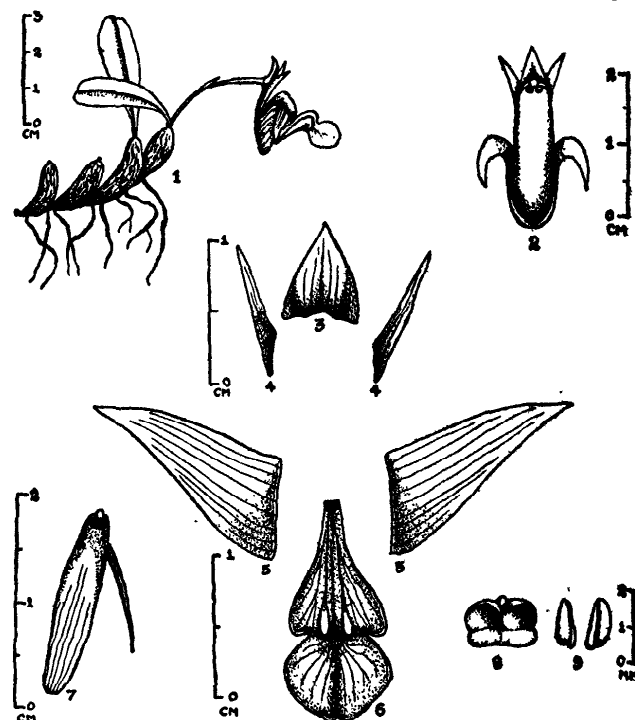


Plate I. *Epigeneium fargesii* (Finet) Gagnep.

Figs. 1-9: 1. Habit. 2. Front view of flower with lip removed. 3. Dorsal sepal. 4. Petal. 5. Lateral sepals. 6. Lip. 7. Column. 8. Operculum. 9. Pollinia. (All drawn from Balakrishnan 43013; National Orchidarium Plant no. BHT 2489).

Column erect, ± 4 mm long, ± 4 mm broad, dark purplish-brown, broad and thin; foot ± 2 cm long, ± 5 mm broad, paler brownish-purple, thin and flat, with 7 or more slender parallel nerves; operculum hemispherical, pale yellow, ± 2 mm broad, ± 1 mm long. *Pollinia* ovoid-oblong, fusiform, less than 1 mm long (Plate I).

Flowering: September (at Shillong); June (at type locality).

Type: Ta-han-ky, Tchen-Keou-Tin District, Szechuen Province, China, alt. 1200 m, 4 June 1900, R. P. Farges 1506 (CAL): "Fleurs rouges labelle blanc."

EASTERN BHUTAN: Narfong ($91^{\circ}25'E.$ & $27^{\circ}6'N$), alt. 1775 m, 5 March 1965, collected in vegetative condition, flowered at Shillong on 24 September 1965, Balakrishnan 43013 (ASSAM); National Orchidarium Plant no. BHT 2489.

Distribution: China, Indo-China, Thailand and Bhutan.

KATHERINEA, A. D. Hawkes

Katherinea Hawkes in Lloydia 19(2): 94-98, 1956. *Sarcopodium* Lindl. & Paxt. in Flow. Gard. 1: 136, 1853 (non Ehrenb. ex Brongniart, Dict. Sci.

Nat.-33:546, 1824); Kraenzlin in Engler, Pflanzenr. 45:319, 1910. *Bulbophyllum* sect. *Sarcopodium* (Lindl.) Reichb. f. in Walp. Ann. 6:243, 1861. *Dendrobium* sect. *Sarcopodium* (Lindl.) Benth. & Hook. f. Gen. Pl. 3: 499, 1883; Pfitz. in Engler & Prantl, Pflanzenfam. 2(6):175, 1888; Hook. f. Fl. Brit. Ind. 5:710, 1890; King & Pantl. in Ann. R. Bot. Gard. Calc. 8:41, 62-63, 1898. *Epigeneium* (non Gagnepain, 1932) Summerhayes in Kew Bull. 1957: 259, p. p.

Epiphytic. Rhizome creeping, woody, branching, covered with imbricating sheaths. *Pseudobulbs* uninodal, ovoid, erect, distantly placed on rhizome, covered when young with large overlapping brownish sheaths. *Leaves* two, rarely three, terminal on pseudobulb, persistent, coriaceous. *Inflorescence* solitary, terminal, arising from between leaves, bearing one or more flowers which last many days. *Floral bracts* small, persistent. *Sepals* subequal, narrowly elliptic-lanceate, spreading, many nerved. *Petals* similar but narrower. *Lip* more or less mobile, attached to the apex of column foot, trilobed; side lobes erect; midlobe oblong, ovate, acute or obtuse; disc bearing three unequal or equal fleshy lamellae. *Column* erect, long, with a long or short foot to which the lateral sepals are attached forming an obtuse mentum. *Pollinia* 4, equal or subequal, coherent in pairs, oblong-ovoid, pyriform.

Type species: *Katherinea ampla* (Lindl.) Hawkes

Distribution: Nepal, Sikkim, Bhutan, Assam, East Pakistan, Burma and Malaysia.

KEY TO SPECIES IN BHUTAN

1. Pseudobulbs 15-22 mm thick; leaves 10-14 cm long, 3-4 cm broad; flowers 7-8 cm in diameter; midlobe of lip thick, longitudinally sulcate ... *K. ampla*
1. Pseudobulbs 5-15 mm thick; leaves 5.5-8.5 cm long, 1.5-2.5 cm broad; flowers 4.0-4.5 cm in diameter; midlobe of lip thin, not longitudinally sulcate ...
2. Side lobes of lip not touching the column; column with foot narrow, flat ... *K. fuscescens*
2. Side lobes of lip touching and overlapping above the column; column with foot broad, boat-shaped with raised, erect rim-like edges ...
3. Pedicel with ovary more than 2.5 cm long; petals linear-lanceate; lip with 3 lamellae of equal length; midlobe of lip ovate, acute. Flowers in September ... *K. navicularis*
3. Pedicel with ovary less than 2 cm long; petals broadly lanceate; lip with 3 lamellae of unequal length, the middle lamella much shorter; midlobe of lip orbicular, subreniform. Flowers in April ... *K. rotundata*

1. *Katherinea ampla* (Lindl.) Hawkes. l. c. 95. *Dendrobium amplum* Lindl. Gen. Sp. Orch. 74, 1830; Wall. Pl. As. Rar. 1:25, t. 29, 1830; Paxt. in Mag. Bot. t. 121, 1836; Griff. Notul. 3:307, 1851 et Icon. Pl. As. 3: t. 304, 1851; Hook. f. Fl. Brit. Ind. 5:711, 1890; King & Pantl. l. c. 63, t. 89, 1898. *Sarcopodium amplum* (Lindl.) Lindl. & Paxt. l. c. 1: 155, 1853; Kraenzlin, l. c. 324, 1910. *Bulbophyllum amplum* (Lindl.) Reichb. f. l. c. 244, 1861. *Epigeneium amplum* (Lindl.) Summerhayes, l. c. 260, 1957.

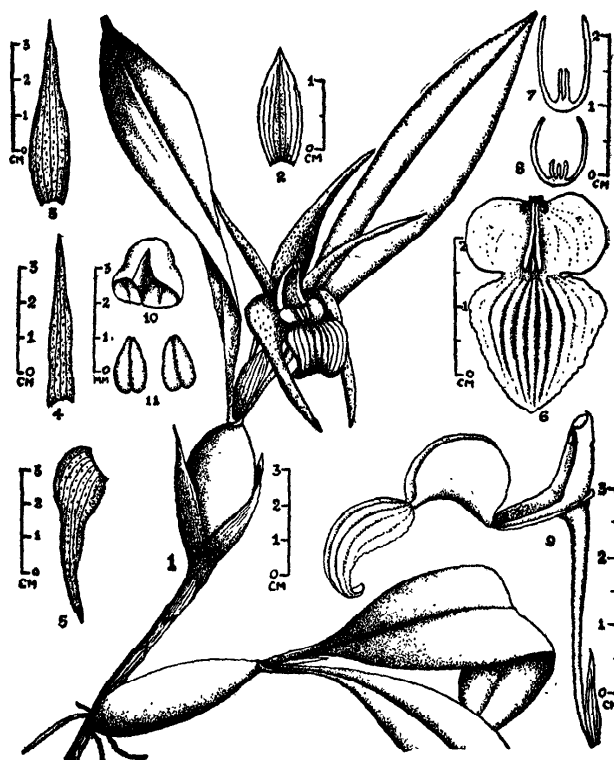


Plate II. *Katherinea ampla* (Lindl.) Hawkes

Figs. 1-11: 1. Habit. 2. Floral bract. 3. Dorsal sepal. 4. Petal. 5. Lateral sepal. 6. Lip. 7. T.S. of lip at base. 8. T.S. of lip at middle. 9. Column with lip. 10. Operculum. 11. Pollinia. (All drawn from Balakrishnan 44266; National Orchidarium Plant no. BHT 3610).

Lithophytic on moss-covered rock boulders or epiphytic on trunks of *Quercus* and *Rhododendron* species. Rhizome wide-creeping, much branched, woody, 4-5 mm thick, swollen and rooting at nodes, covered with imbricate scarios brown sheaths. *Pseudobulbs* at intervals of 8-12 cm on rhizome, 3.5-5.0 cm long, 1.5-2.2 cm in diam., oblong-ellipsoid, yellow, smooth when young, slightly wrinkled when old, covered by 3 broad, ovate-apiculate, many-nerved, scarios, brown bracts, the upper one of which often extends upto the petioles. *Leaves* elliptic-oblong, narrowed at base, subacute and notched at apex, 10-14 cm long, 3.0-4.2 cm broad, coriaceous, many-nerved; petiole grooved above, \pm 2.5 cm long.

Inflorescence solitary, single-flowered, at the apex of pseudobulb. *Scape* 3.0-3.5 cm long, covered with 2 oblong-elliptic, mucronate, brownish, scarious sheaths, slightly longer than the scape. *Floral bracts* 1.5-1.8 cm long, 6-8 mm broad, ovate-oblong, acute, scarious, dull yellowish-brown. *Flowers* showy, 7-8 cm in diam., greenish-brown, spotted purple with dark purplish-red lip; pedicel with ovary 3.5-4.0 cm long. *Sepals* subequal, greenish-brown, spotted purple, obscurely 5-9-nerved, margins recurved at the upper half; dorsal sepal 4.5-4.8 cm long, 1.0-1.2 cm broad, ovate-lanceolate, acute at apex; lateral sepals 4.2-4.5 cm long, 1.4-1.6 cm broad, lanceolate, subfalcate, acute at apex, base broad, adnate to the sides of column-foot forming a broad, obtuse mentum. *Petals* 4.5-4.8 cm long, 6-8 mm broad, linear-lanceolate, acuminate, margins recurved at the upper half; brownish-green with purple spots, obscurely 3-nerved. *Lip* ± 3 cm long, ± 2 cm broad, dark purplish-red ventrally, pale greenish-yellow with purple spots dorsally; side lobes ± 1 cm long, ± 8 mm broad, subrotund, erect, conduplicate, 4-5-nerved; midlobe ± 2 cm long, ± 2 cm broad, rhomboid-ovate, subacute and recurved at apex, crisped and revolute at margins, thick, with 3 main parallel medial ridges and 4-5 faint crisped ridges on either side; disc between the basal lobes with 3 erect purple spotted lamellae, vertically ± 3 mm broad; the side ones ± 1 cm long, arising from the base of lip to the base of midlobe; the mid-one short, ± 2 mm long, between the side ones towards the distal end at the base of midlobe; base of lip with 2 blunt teeth on either side of the lamellae. *Column* straight, ± 1.2 cm long with a broad base, white with purple spots inside, narrowly winged on sides, mucronate at apex, foot ± 1.25 cm long, almost at right angles to the column, narrowly winged, purple-spotted inside; operculum white, ± 1.5 mm long, ± 2 mm broad. *Pollinia* 4, ovoid-ellipsoid, coherent in pairs (Plate II).

Flowering: October.

Type: Wallich 2001 (CAL).

EASTERN BHUTAN: Near Tashiyangtsi ($91^{\circ} 28' E$ & $27^{\circ} 35' N$), alt. 1900 m, 23 October 1965, Balakrishnan 44266 (ASSAM); National Orchidarium Plant no. BHT 3610.

Distribution: Himalaya from Nepal eastwards and Khasi Hills.

2. *Katherinea fuscescens* (Griff.) Hawkes, l. c. 96, 1956. *Dendrobium fuscescens* Griff. Notul. 3: 308, 1851 et Icon. Pl. As. 3: t. 309, 1851; Hook. f. l. c. 712, 1890; King & Pantl. l. c. 62, t. 88, 1898. *Sarcopodium fuscescens* (Griff.) Lindl.

Fol. Orch. Sarcop. 2, 1853; Kraenzlin, l. c. 321, 1910. *Bulbophyllum fuscescens* (Griff.) Reichb. f. l. c. 244, 1861. *Epigeneium fuscescens* (Griff.) Summerhayes, l. c. 262, 1957.

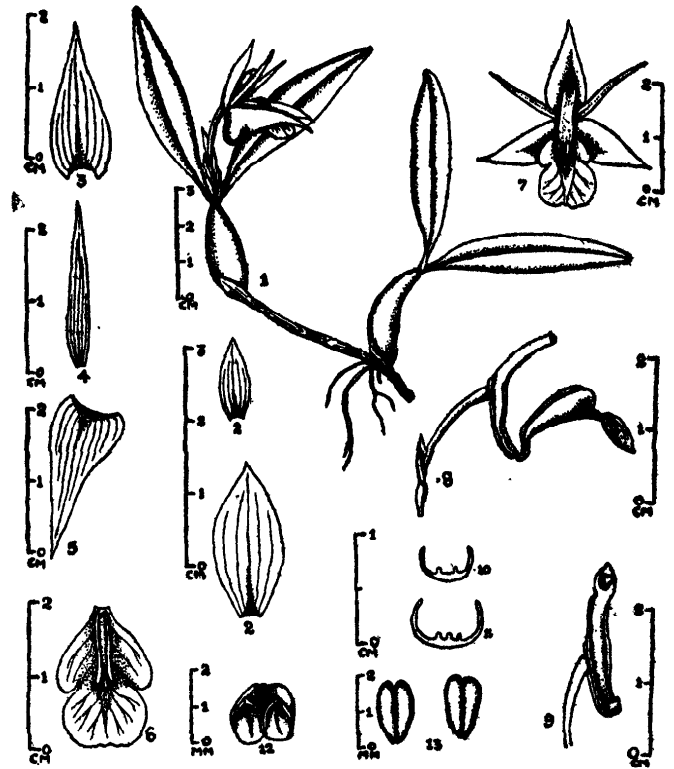


Plate III. *Katherinea fuscescens* (Griff.) Hawkes

Figs. 1-13: 1. Habit. 2. Bracts. 3. Dorsal sepal. 4. Petal. 5. Lateral sepal. 6. Lip. 7. Flower. 8. Column with lip. 9. Column. 10. T. S. of lip at base. 11. T. S. of lip at middle. 12. Operculum. 13. Pollinia. (All drawn from Balakrishnan 43015; National Orchidarium Plant no. BHT 2510).

Rhizome wide-creeping, ± 3 mm thick, often branching, covered with tubular, imbricate, brownish, scarious sheathing bracts. *Pseudobulbs* arranged at intervals of 5.5-9.5 cm apart on rhizome, narrowly oblong-ovoid, 2.2-4.0 cm long, 5-7 mm in diam., smooth and pale green when young, wrinkled and yellowish-brown when old, covered at base with a few sheathing bracts. *Leaves* narrowly elliptic-lanceolate, tapering to either end, coriaceous, sessile or subsessile; petiole 2-3 mm long. *Inflorescence* solitary, at the apex of pseudobulb between leaves, single-flowered. *Scape* 3-6 mm long, ensheathed by two or more scarious, brown, ovate-lanceolate bracts, varying in length and size, the largest ± 2 cm long. *Floral bracts* pale brown, ± 8 mm long, ± 3 mm broad, many-nerved, ovate-lanceolate, acute. *Flowers* 4.0-4.5 cm in diam., pale brownish-purple; pedicel with ovary pale green, 1.5-1.8 cm long. *Sepals* spreading, subequal, pale brownish-purple, 7-9-nerved; dorsal sepal ± 2 cm long, ± 8 mm broad at base, ovate-lanceolate, acute;

lateral sepals ± 2.1 cm long, ± 1 cm broad, ovate-lanceate, subfalcate, adnate to the sides of column-foot forming a short mentum. *Petals* spreading, linear-lanceate, pale brownish-purple, 5-nerved, ± 2 cm long, ± 3 mm broad. *Lip* mobile, ± 2 cm long, ± 1.3 cm broad, ovate-oblong in outline, dull brownish-red, side lobes narrowly oblong, obtuse, 2-3-nerved, erect; midlobe suborbicular, curved downwards, undulate at margin, emarginate or minutely mucronate at apex, dull brownish-red, many-nerved; disc between side lobes with 3 lamellae of unequal length; lamellae ± 1 mm thick, purplish-brown, stretching from the base of lip to the base of midlobe; the middle lamella short, ± 2 mm long at the base of midlobe between the side lamellae. *Column* ± 1 cm long, ± 3 mm broad, very narrowly winged at base, white with pale brownish tinge inside; foot ± 9 mm long, bent forwards, pale yellowish with brownish-purple tinge inside; operculum obtuse, ± 1.5 mm long, ± 2 mm broad. *Pollinia* 4, coherent in pairs, oblong-ellipsoid. *Fruit* ± 2.5 cm long, ± 7 mm in diam., with 6 narrow ridges; stalk ± 1 cm long (Plate III).

Flowering: October.

Type: East Bengal, Griffith 5157 (CAL).

EASTERN BHUTAN: Near Gumdritang, north of Tashiyangtsi, ($91^{\circ}25'$ E & $27^{\circ}38'$ N), alt. 2000 m, 16 March 1965, in fruit, Balakrishnan 41407 (ASSAM); Near Narfong, on the road to Tashigang ($91^{\circ}25'$ E & $27^{\circ}6'$ N), alt. 1750 m, 5 March 1965, collected in vegetative condition, flowered under cultivation at Shillong on 30 September 1965, Balakrishnan 43015 (ASSAM); National Orchidarium Plant no. BHT 2510; Bepa, on the track between Tashiyangtsi and Dongala ($91^{\circ}24'$ E & $27^{\circ}35'$ N), alt. 2200 m, 26 October 1965, Balakrishnan 44341 (ASSAM).

Distribution: Nepal, Sikkim, Bhutan, NEFA, Khasi Hills and East Pakistan.

3. *Katherinea navicularis* Balak. & Chowdhury sp. nov.

Affinis *Katherineae rotundatae* (Lindl.) Hawkes, a qua tamen differt petalis multo angustioribus, lineari-lanceatis, labio ornato lamellis tribus aequalibus decurrentibus a basi labii ad basin lobi medii, sulcis fusce purpureo-brunneis, lobo medio labii ovato acuminato, uniformiter membranaceo, absque crassitudine triangulari carnosae, fusce purpureo-brunneo, disco inter lobos laterales insignito pluribus maculis purpurascens.

Planta epiphytica. *Rhizoma* 3-4 mm crassum, valide ramosum, opertum vaginis pluribus imbricatis scariosis tubularibus; vaginae luteo-virides vel

pallide brunneae, siccae griseo-brunneae. *Pseudobulbi* uninodales di-rareo triphylli, 2.0-6.5 cm inter se distantes, anguste ellipsoideo-oblongi, teretes, leves, nitentes, pallide luteo-virides, 3.5-4.0 cm longi, 1.0-1.5 cm crassi, operti bracteis 3-4 arcuato-imbricantibus, scariosis; bractee viridi-luteae vel brunneo-luteae, saepe plicatae, quarum suprema attingit apicem pseudobulbi, raro basin folii. *Folia* opposita ex apice pseudobulbi persistentia elliptico-oblonga, ad basin angusta, subobtusae, emarginatae ad apicem, lobis obtusis subaequalibus, graciliter coriacea, uninervia, 3.5-8.5 cm longa, 1.5-2.5 cm lata; petiolo 5-7 mm longo, canaliculato, pallide luteo-viridi. *Racemi* solitarii, terminales, ex apice pseudobulbi, pedunculo ± 1 cm longo; bractea elliptico-ovata, subacuta, scariosa, pallide viridi-lutea, multinervia, breviter tubulari ad basin, ± 2.2 cm longa, ± 1 cm lata. *Pedicelli* cum ovario ± 2.7 cm longi, pallide luteo-virides, bractea florali lineari-lanceata, acuminata, pallide viridi, ± 9 mm longa, ± 2 mm lata, scariosa, uninervi. *Flores* solitarii, obscurate purpureo-brunnei, ± 4 cm longi, ± 4.5 cm diam. *Sepalum dorsale* ovato-lanceatum, acuminatum, ± 2.8 cm longum, ± 1 cm latum, sursum curvatum, obscurate purpureo-brunneum extus, pallide viridi-brunneum intus, 5-nervium. *Sepala lateralia* fixa pedi brevi columnae, falcato-lanceata, acuminata, ad basin latiora, ± 2.7 cm longa, ± 1 cm lata ad basin, obscurate purpureo-brunnea extus, pallide viridi-brunnea intus, tenuiter 9-nervia, apice decurvato patentia. *Petala* lineari-lanceata, subulata, acuminata, patentia, ± 2.9 cm longa, ± 2 mm lata, eiusdem coloris ac sepala, tenuiter 3-nervia. *Labium* ovato-acutum ambitu, distincte trilobum, latissimum ad lobos laterales, ± 1.8 cm longum, ± 1.7 cm latum; lobi laterales incurvi et marginibus superioribus utriusque tangentibus et efformantibus tubum qui columnam includit, ± 1 cm longi, ± 6 mm lati, luteolo-albi, marginibus anterioribus purpureo-brunneis; lobus medius acuminatus, ad basin angustus, ± 1.3 cm longus, ± 1 cm latus, fusce purpureo-brunneus, pallidior ad marginem; discus inter lobos laterales purpureo-brunneus, tribus jugis contiguis longitudinalibus e basi labii ad basin lobi medii decurrentibus, albus, fusce purpureo-brunneus in sulcis; mentum ± 1 cm longum, obtusum, rotundum album. *Columna* ± 1.8 cm longa, ± 3 mm lata, late alata, pede brevi et apice brevi mucronato; margines sursum curvati, erecti, ± 3 mm lati; efformantes cavitatem haud altam navicularem continuam et latissimam ad pedem, album, duplici macula lutea ad medium et una macula lata ad apicem pedis intus. *Operculum* latius quam longum, viridi-luteum, ± 2 mm longum, ± 3 mm latum. *Pollinia* 4, ob-

longo-pyriformia, bina et bina, absque appendicibus.

Holotypus, *Balakrishnan* 43014 A, lectus in Bhutania orientali ad 1560 m alt., die 29 martii 1965 et positus in CAL. Isotypi, *Balakrishnan* 43014 B-C, positi in Herbario Kanjilal in Assamia, ad Shillong (ASSAM).

Epiphyte. Rhizome 3-4 mm thick, much branched, covered with many imbricate scarious tubular sheaths. Sheaths dull yellowish-green to pale brown, drying to greyish-brown. Pseudobulbs uninodal, diphyllous, 2.0-6.5 cm apart, narrowly ellipsoid-oblong, terete, smooth, glossy, pale yellowish-green,

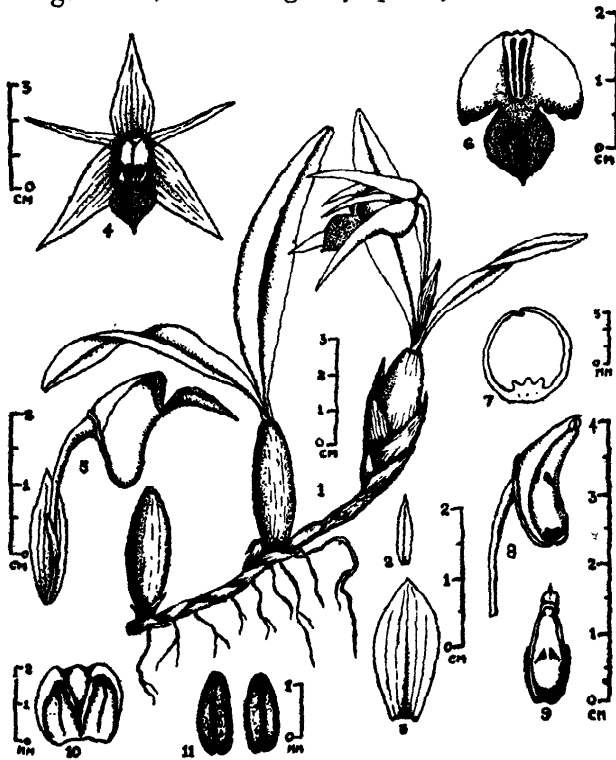


Plate IV. *Katherinea navicularis* Balak. & Chowdhury sp. nov. Figs. 1-11: 1. Habit. 2 & 3. Bracts. 4. Flower. 5. Flower with sepals and petals removed. 6. Lip. 7. T.S. of lip. 8. Column—side view. 9. Column—front view. 10. Operculum. 11. Pollinia. (All drawn from *Balakrishnan* 43014A; National Orchidarium Plant no. BHT 2513).

3.5-4.0 cm long, 1.0-1.5 cm thick; covered with 3-4 tightly imbricating, scarious bracts. Bracts greenish-yellow to brownish-yellow, often plicate, the uppermost reaching the apex of the pseudobulb, rarely to the base of leaf-blade. Leaves, opposite, at the apex of pseudobulb, persistent, elliptic-oblong, narrowed at base, subobtuse, emarginate at apex with subequal obtuse lobes, thinly coriaceous, 1-nerved, 3.5-8.5 cm long, 1.5-2.5 cm broad; petiole 5-7 mm long, grooved, pale yellowish-green. Raceme solitary, terminal, arising from the apex of pseudobulb; peduncle ± 1 cm long. Bract elliptic-ovate, subacute, scarious, pale greenish-yellow, many-nerved, shortly

tubular at base, ± 2.2 cm long, ± 1 cm broad. Pedicel with ovary ± 2.7 cm long, pale yellowish-green. Floral bract linear-lanceate, acuminate, pale green, ± 9 mm long, ± 2 mm broad, scarious, 1-nerved. Flower solitary, dull purplish-brown, ± 4 cm long, ± 4.5 cm in diam. Dorsal sepal ovate-lanceate, acuminate, ± 2.8 cm long, ± 1 cm broad, upcurved, dull purplish-brown outside, pale greenish-brown inside, 5-nerved. Lateral sepals attached to the foot of column, falcate-lanceate, acuminate, broader at base, ± 2.7 cm long, ± 1 cm broad at base, dull purplish-brown outside, pale greenish-brown inside, faintly 9-nerved, apex decurved, spreading. Petals linear-lanceate, subulate, acuminate, spreading, ± 2.9 cm long, ± 2 mm broad, dull yellowish-brown outside, pale yellowish-green inside, faintly 3-nerved. Lip ovate-acute in outline, distinctly trilobed, broadest at the lateral lobes, ± 1.8 cm long, ± 1.7 cm broad; side lobes incurved with overlapping upper margins touching each other forming a tube enclosing the column, ± 1 cm long, ± 6 mm broad, pale yellowish-white with dark purplish-brown at anterior margins; midlobe ovate, acuminate, narrowed at base, ± 1.3 cm long, ± 1 cm broad, dark purplish-brown; disc with 3 contiguous longitudinal parallel ridges running from base of lip to the base of midlobe, white, dark purplish-brown in grooves; mentum ± 1 cm long, obtuse, rounded, white. Column ± 1.8 cm long, ± 3 mm broad, broadly winged with a short foot and a short mucronate apex; margins upturned, erect, ± 2 mm broad, forming a shallow concave boat-shaped cavity, continuous and broadest at the foot, white with 2 deep yellow spots at the middle and a broad yellow spot at the apex of foot inside. Operculum broader than long, greenish-yellow, ± 2 mm long, ± 3 mm broad. Pollinia 4, oblong-pyriform, in pairs without any appendages (Plate IV).

Flowering: September-October.

Type: Near Narfong, on the road to Tashigang ($91^{\circ}26'E$ & $27^{\circ}7'N$), alt. 1560 m, 29 March 1965, collected in vegetative condition, flowered under cultivation at Shillong on 24 September 1965, *Balakrishnan* 43014 A (Holotype in CAL); *Balakrishnan* 43014 B-G (Isotypes in ASSAM); National Orchidarium Plant no. BHT 2513.

4. *Katherinea rotundata* (Lindl.) Hawkes, l. c. 87, 1956. *Sarcopodium rotundatum* Lindl. Fol. Orch. Sarcop. 2, 1853; Kraenzlin, l. c. 325, 1910. *Bulbophyllum rotundatum* (Lindl.) Reichb. f. l. c. 244, 1861. *Dendrobium rotundatum* (Lindl.) Benth. &

Hook. f. Gen. Pl. 3(2): 499, 1883; Hook. f. Fl. Brit. Ind. 5: 712, 1890; King & Pantl. l. c. 62, t. 87. 1898. *Epigeneium rotundatum* (Lindl.) Summerh. l. c. 264. 1957.

Though this species has not been collected by the present authors from Bhutan, it is quite probable that this may be found in Bhutan, as it has been already collected and reported from the adjoining Himalayan regions of Sikkim and Kameng F. D.

Type: Griffith 5160 (CAL).

Distribution: Sikkim, NEFA, Naga Hills and China.

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