

Taxonomic account on the family Gesneriaceae in Northeast India

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उत्तर-पूर्वी भारत में जेसनेरिएसी कुल का वर्गिकी अध्ययन

बी. के. सिन्हा एवं सुदेशना दत्ता

सारांश

यह शोध पत्र उत्तर-पूर्वी भारत में जेसनेरिएसी कुल के वर्गिकी अध्ययन को प्रस्तुत करता है। जिसमें 4 ट्राईब, 22 वंश एवं 80 जातियाँ सम्मिलित हैं। विवरण में जातियों को वर्णमाला क्रम में उनके सही स्वीकृत नामों के साथ संक्षिप्त वर्णन, फ्लोरादि की एवं वितरण भी दिया गया है। जातियों के सटीक निर्धारण के लिये बाह्यकारिकी लक्षणों, वंशागत वर्गिकी कुंजी एवं जातिय वर्गिकी कुंजी दी गई है। हेमिबोइया सबकैपिटटा सी. बी. क्लार्क, लेटोबोइया ग्लैब्रा सी. बी. क्लार्क, लेटोबोइया मल्टिफ्लोरा (सी. बी. क्लार्क) बेंथ. एक्स गैम्बल एवं डायडिमोकार्पस पोटोकार्पस सी. बी. क्लार्क के चार लेक्टोटाईप का भी निर्धारण इस शोध पत्र में किया गया है।

ABSTRACT

The paper deals with the taxonomic account of the family Gesneriaceae of Northeast India, which includes 4 tribes, 22 genera and 80 species. Species are arranged alphabetically by their correct accepted names followed by a brief description, notes of phelology and distribution. Based on the morphological characters, key to the genera and key to the species are provided for easy identification. Lectotypes of four species i.e. *Hemiboea subcapitata* C.B. Clarke, *Leptoboea glabra* C.B. Clarke, *L. multiflora* (C.B. Clarke) Benth. ex Gamble and *Didymocarpus podocarpus* C.B. Clarke is designated here.

Keywords: Gesneriaceae, Lectotype, North-East India, Taxonomy.

INTRODUCTION

The family Gesneriaceae with 147 genera and about 3000 species mainly distributed in the tropical to temperate regions of the world (Webber, 2004; Mabberley, 2008). Members of the family exhibit a varied range of habits including herbs, shrubs, small trees or even climbers. Interestingly, the family constitutes about 20% of epiphytic

species and ranks amongst the top ten families in terms of an absolute number of epiphytic taxa (Madison, 1977). This wide variation of habits has led to a greater diversity in morphology as well as adaptive features (Wiehler, 1983; Roalson & al., 2003). A recent study on the physiological characteristics shows that many members of the family show adaption and great competence to survive periodical desiccation. Therefore, though during dry periods

the plants shrivel, but on the occurrence of favourable conditions, the plants recover fully; there by rightly called as “resurrection plants”.

The earliest account of the family in Indian context made by C.B. Clarke in his book, *Commelynaceae et Cyrtandraceae Bengalenses* (1874) followed by his second contribution in Alphonse and Casimir de Candolle edited *Monographiae Phanerogamarum Prodrumi* (1883), *Gesneriaceae* (1884) and *Hemiboea*, (1888). Burt & Davidson (1955), Burt (1963) and Burt & Wiehler (1995), Fischer (1928), Burt & al., (1988), Wang & al., (1998); Hilliard, 2001; Hilliard & Burt (1995) studied the family Gesneriaceae of the old world. Skog & Boggan (2007) published a checklist of Gesneriaceae of the world. Hilliard & Burt (1995) published few genera of Old World Gesneriaceae. Moller & al., (2011) published some genera of Chinese Gesneriaceae. Later, Hara (1966) published a report on the occurrence of various Gesneriaceae members in eastern Himalayan regions. Although the report does not provide a detailed account and there has been a further addition to the family in later years. A critical study of literature reveals that taxonomic accounts of the regions are scanty and only referred in some floras (Kanjilal & al., 1939; Deb, 1983; Balakrishnan, 1983). More recently, Chauhan, (1996), Giri & al., (2008) and Sinha (2012) enumerated the members of the Gesneriaceae from Manipur, Arunachal Pradesh and Mizoram. Bhattacharyya & Goel (2014) gives a detailed account of the genus *Aeschynanthus*. Apart from these there has been a few papers confirming the occurrence of different members of Gesneriaceae in NE India (Chatterjee, 1947; Rao & Joseph 1967; Sinha & Odyuo, 2009; Datta & Sinha, 2015; Datta & al., 2013) and stray papers on lectotypification (Datta & al., 2012, 2014a,b,c; Datta & al., 2015). Keeping in view of the high diversity of gesneriaceae members, a comprehensive study of the family Gesneriaceae of NE India is need of an hour. Therefore, in the present paper, an attempt was made to present a consolidated taxonomic account of the family Gesneriaceae of North Eastern India. In the present communication, species are arranged alphabetically with their correct accepted names followed by a brief description, notes of phelology and distribution. Based on the morphological characters, the key to the genera is provided in the beginning and key to the species is provided in each genus. Photographs of some selected species are also provided to showcase the diversity of gesneroids in Northeast India.

The Northeastern part of India comprises of seven states viz. Arunachal Pradesh, Assam, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and Sikkim. A great variety of climatic and altitudinal variations coupled with varied ecological habitats have contributed immensely to the rich floristic diversity. As a result, all types of vegetations from tropical, subtropical, temperate and alpine, vegetation are found in the region. In the present context, the whole region of the Northeast has taken into consideration except Arunachal Pradesh and the Darjeeling and Jalpaiguri districts of West Bengal is also included in the study due to their great affinity of flora with NE region.

TAXONOMIC CLASSIFICATION

Based on the character of cotyledons after germination, the family Gesneriaceae is classified (Fritsch, 1893–1894; Burt, 1963) in the two subfamilies such as Gesnerioideae (with uniform enlargement of cotyledons) and Cyrtandroideae (with uneven enlargement). The other diagnostic characters used to delimit the subfamilies are the presence (Gesnerioideae) or absence (Cyrtandroideae) of endosperm in the seed, the position of the ovary, superior (Cyrtandroideae) or inferior (Gesnerioideae). The two sub-families have been further divided into 9–17 tribes (Fritsch, 1893–1894; Burt, 1963; Wiehler, 1983; Burt & Wiehler, 1995). Most recently, Webber (2004), compiled Gesneriaceae has put forward an informal classification for this family. Later, Webber & al., (2011) published a systematics and remodeling of *Chirita* and associated genera of Gesneriaceae.

Based on the classification proposed by Burt & Wiehler (1995), in the present taxonomic account on the family Gesneriaceae, 2 subfamilies, 4 tribes, 22 genera and 80 species from north-east India

TAXONOMIC ACCOUNT

Gesneriaceae Rich. & Juss. In DC., *Essai Propr. Me'd. Pl.*, ed. 2: 192. 1816.

Type: Gesneria L.

Belloniaceae Martinov, *Tekno-Bot. Slovar*: 67. 1820; Didymocarpaceae D. Don, *Edinburgh Phil. J.* 7: 83. 1822; Cyrtandraceae Jack, *Trans. Linn. Soc.* 14(1): 24. 1823; Besleriaceae Raf., *Sylva Tellur.*: 70. 1838; Ramondaceae Godr., in Grenier & Godron, *Fl. France* 2: 506. 1850.

Herbs, shrubs or rarely trees. Leaves opposite or alternate, basal, rosette forming; equal or unequal; exstipulate; usually simple, rarely shallowly to deeply lobed, pinnately. Inflorescence usually cymes, rarely racemes, axillary, often near the apex and appearing terminal. Flowers perfect. Calyx usually 5-divided. Corolla gamopetalous; usually 2-lipped. Fertile stamens 2 or 4, then often didynamous, rarely 5, epipetalous; anthers free or coherent, thecae 2, parallel, divergent, or divaricate; staminodes 1–3 or absent. Disc ringlike to opular, rarely absent. Ovary superior in all Old World taxa 1-loculed; gynophore seldom present; placentas (1 or 2), parietal, rarely 2-loculed, placenta 1 per locule and axile; ovules numerous, anatropous. Style 1; stigmas 1 or 2. Fruit usually capsular, loculicidal, septicidal, or circumscissile, rarely a berry, indehiscent. Seeds numerous, ellipsoid or ovoid, minute, sometimes with appendages at 1 or both ends, with or without endosperm; embryo straight, cotyledons equal or unequal after germination.

Note: Gesneriaceae in India is mainly represented by the subfamily Cyrtandroideae, the only representative of the subfamily Gesnerioideae is *Achimenes longiflora* which is a horticultural plant.

KEY TO GENERA

- | | | | |
|--|---------------------------|---|-------------------------|
| 1a. Ovary inferior; seedlings iso-cotylar. | 1. ACHIMENES | 9a. Fertile stamens -4. | 10 |
| 1b. Ovary superior; seedling aniso-cotylar. | 2 | 9b. Fertile stamens -2. | 15 |
| 2a. Fruits indehiscent . | 20. RHYNCHOTECHUM | 10a. Plants with short contracted stem. | 11 |
| 2b. Fruits dehiscent . | 3 | 10b. Stems distinctly caulescent with distinct internodes. | 13 |
| 3a. Seeds with at least 1 hair like appendage at each end | 4 | 11a. Anthers free. | 16. OREOCHARIS |
| 3b. Seeds unappendaged. | 6 | 11b. Anthers cohering together or in pairs. | 12 |
| 4a. Fertile stamens 4. | 5 | 12a. Anthers cohering in pairs. | 7. CORALLODISCUS |
| 4b. Fertile stamens 2. | 14. LYSIONOTUS | 12b. Anthers all cohering together. | 3. BECCARINDA |
| 5a. Corolla bright red. | 2. AESCHYNANTHUS | 13a. Corolla with short tube, usually less conspicuous than the limb, not spotted, non rhizomatous. | 14 |
| 5b. Corolla white with yellow spots within. | 13. LOXOSTIGMA | 13b. Corolla with long, ventricose tube, spotted, rhizomatous. | |
| 6a. Flowers pseudo-racemose or subcapitate, ovary ovoid. | 7 | | 6. BRIGGSIA |
| 6b. Flowers cymose, ovary conical to linear. | 9 | 14a. Leaves opposite. | 12. LEPTOBOEA |
| 7a. Calyx plicate between lobes; corolla campanulate, spurred or saccate at base; stamens 4. | 21. STAURANTHERA | 14b. Leaves alternate. | 5. BOEICIA |
| 7b. Calyx not plicate; corolla tube tubular; fertile stamens 2 or 4. | 8 | 15a. Fruits spirally twisted when ripe | 16 |
| 8a. Leaves alternate; stamens 2 or 4; capsule loculicidal. | | 15b. Fruits not spirally twisted. | 17 |
| | 19. RHYNCHOGLOSSUM | 16a. Upper surface glabrescent, lower surface of leaf arachnoid tomentose to pannose. | 17. PARABOEA |
| 8b. Lowest leaves unpaired, opposite near apex; fertile stamens 2; capsule circumscissile. | 9. EPITHEMA | 16b. Upper surface of leaf hirsute, lower surface strigose. | 4. BOEA |
| | | 17a. Corolla with spreading limb and short tube. | |
| | | | 18. PETROCOSMEA |
| | | 17b. Corolla with well developed tube. | 18 |
| | | 18a. Placentae half fertile. | 10. HEMIBOEA |
| | | 18b. Placentae fully fertile. | 19 |
| | | 19a. Plants unifoliate. | 11. HENCKELIA |
| | | 19b. Plants with more than one leaf. | 20 |
| | | 20a. Corolla tube short and broad. | 22. TETRAPHYLLUM |
| | | 20b. Corolla tube cylindric or infundibuloform. | 21 |
| | | 21a. Stigma capitate. | 8. DIDYMOCARPUS |
| | | 21b. Stigma oblique or bilobed. | 24 |
| | | 22a. Anthers fused by projections on connectives. | |
| | | | 15. MICROCHIRITA |
| | | 22b. Anthers not fused by projections on connectives. | |
| | | | 11. HENCKELIA |

1. **ACHIMENES** Pers., Syn. Pl. 2: 164. 1806.

Type: *Achimenes coccinea* (Scop.) Pers.

About 25 species, distributed tropical and subtropical countries. Mostly ornamental.

***Achimenes longiflora* DC., Prodr. 7(2): 536. 1839.**

Perennial herbs with scaly rhizomes. Stem erect. Leaves opposite, subequal, 1.5 – 3.5 × 2 – 2.5 cm, elliptic to ovate, base cuneate to rounded, margin serrate, apex acute;

upper surface villous, lower surface pinkish, pubescent; lateral nerves 4 – 6 on either side of mid rib. Petiole 6 – 10 mm long, puberulent. Cyme 2 – 5 flowered, axillary. Pedicel 1 – 2 cm long, puberulous. Calyx 10 – 15 × 3 – 4 mm, 5-sect from near base, segments narrowly lanceolate, outside puberulous, inside glabrous. Corolla purple to dark pink, obliquely funneliform, puberulent, tube 1.5 – 3 cm long, tubular; limb subequal, 1 – 2 cm long, lower lobes 3, large, upper lobes 2, small, lobes broad, entire to rarely fringed. Filaments 3 – 4 mm long, slender, adnate to corolla base; anthers 1 – 2 mm long, apically coherent. Ovary inferior, c. 1 cm long, conical; style c. 7 mm long, curved, puberulous; stigma bilobed. Capsule 2 valved, dry, ovoid.

Flowering and Fruiting: June–December.

Habitat: On soft soil, on forest floor, on walls, in moist and shady places.

Distribution: India (Meghalaya, Sikkim), America.

Specimens examined: Sikkim, Bhanu path, 1750 m, 26 Sept. 1998, *P. Singh* 19296 (BSHC herb. acc. no. 18993); Sikkim, Singtam, 10 July 1980, *P.K. Hajra* 255 (BSHC herb. acc. no. 002175); Meghalaya, Shillong, Rajbhowan, 24 June 1964, *G.K. Deka* 32383 (ASSAM herb. acc. no. 54367).

2. AESCHYNANTHUS Jack, Trans. Linn. Soc. London 14: 42. 1823 (1825), nom. cons.; B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 28:219.

Type: *Aeschynanthus volubilis* Jack

About 140 species in Asia, Pacific Islands; 16 in NE India.

KEY TO THE SPECIES

- 1a. All four stamens attached to each other at their apices, corolla pale yellow to whitish. 4. *A. chiritoides*
- 1b. Stamens attached at their apices in 2 pairs, corolla red to orange. 2
- 2a. Inflorescence distinctly pedunculate. 3
- 2b. Inflorescence without a distinct peduncle. 6
- 3a. Inflorescence subtended by large bracts, > 15 mm long, lanceolate to ovate; corolla 30 – 85 mm long. 4
- 3b. Inflorescence with small bracts, 5 – 10 mm long, suborbicular; corolla 12 – 22 mm long. 1. *A. acuminatus*
- 4a. Cymes 5 – 15-flowered; peduncles 1 – 3 cm long; bracts 40 – 55 mm long; corolla 55 – 85 mm long; ovary 35 – 50 mm long. 3. *A. superbis*

- 4b. Cymes 1 – 7-flowered; peduncles 2 – 7 cm long; bracts 10 – 30 mm long; corolla 30 – 42 mm long; ovary 16 – 24 mm long. 5
- 5a. Leaves broadly lanceolate to obovate; corolla glabrous; ovary 22 – 24 mm long, glandular puberulent; capsules 7 – 20 cm long. 3. *A. bracteatus*
- 5b. Leaves oblanceolate; corolla sparsely glandular puberulent inside; ovary 16 – 18 mm long, glabrous; capsules 5 – 10 cm long. 7. *A. linearifolius*
- 6a. Leaf blade puberulent to pubescent at least on one surface, often glabrescent. 7
- 6b. Leaf blade glabrous. 10
- 7a. Plants herbaceous; stem hispid; leaves on lower surface puberulent to glabrescent, upper surface puberulent; corolla inside glabrous 5. *A. gracilis*
- 7b. Plants woody; stem puberulent; leaves glabrous at least on one surface. 8
- 8a. Leaves opposite, closely placed, upper surface glabrous when mature, lower surface villous along nerves; calyx 3.5 – 5 mm long; corolla 17 – 27 mm long. 8. *A. mannii*
- 8b. Leaves opposite, rarely ternate, glabrous or strigose; calyx 5 – 7 mm long; corolla 12 – 32 mm long. 9
- 9a. Epiphyte; Leaves opposite or rarely ternate, glabrous on both surfaces; 1 – 3-flowered; pedicels 4 – 7 mm long, sericeous; corolla 12 – 25 mm long. 9. *A. masonii*
- 9b. Creeping on rocks; leaves opposite, glabrous above, strigose hairy on lower surface; single flowered; pedicels 12 – 14 mm long, pilose; corolla 30 – 32 mm long. 16. *A. tirapensis*
- 10a. Calyx 5-sect from base, without tube. 11
- 10b. Calyx 5-sect from above base, with tube. 14
- 11a. Pedicel sparsely puberulent. 13
- 11b. Pedicel glabrous. 12
- 12a. Pedicel 10 – 22 mm long; calyx glabrous outside, hispid inside. 2. *A. angustoblomus*
- 12b. Pedicel 3 – 4 mm long; calyx glabrous. 11. *A. philippinensis*
- 13a. Leaves elliptic to elliptic lanceolate or obovate; pedicel 6 – 12 mm long; calyx outside sparsely glandular puberulent, inside glabrous. 10. *A. micranthus*
- 13b. Leaves orbicular; pedicels 10 – 15 mm long; calyx outside puberulent, inside sparsely puberulent. 11. *A. monetarius*
- 14a. Calyx red-purple or tinged red-purple; corolla 2 – 3 cm long. 15
- 14b. Calyx green; corolla 4 – 5.5 cm long. 6. *A. parasiticus*

15a. Bracts 3 – 5 mm long; pedicel glabrous or minutely papillose.

Calyx tube 2 – 4 mm long; outside glabrous or with few small stiff glandular or eglandular hairs. 13. *A. parviflorus*

15b. Bracts 5 – 9 long; green; pedicels 1 – 1.5 cm long, glabrous.

Calyx tube 10 – 14 mm long, glabrous.

6. *A. hookeri*

1. *Aeschynanthus acuminatus* Wall. ex A.DC., Prodr. 9: 263. 1845; C.B. Clarke, Commelyn. Cyrtandr. Bengal t.45. 1874 & in A.DC. & C.DC., Monogr. Phan. 5: 30. 1883; & in Hook.f., Fl. Brit. India 4: 341. 1884; Kanjilal & al., Fl. Assam 3: 391. 1939; A.S. Chauhan in Hajra, Contrib. Fl. Namdhapa 223. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 233. 2008; Wang & al., Fl. China 18: 377. 1998; Hilliard, Fl. Bhutan 2(3): 1300. 2001; Bhattacharyya & Goel, Phytotaxonomy 14: 5. 2014.

Type: Bangladesh, Sylhet, Wall. Cat. Num. List no. 6397 (G, photo!)

Epiphytes. Stems glabrous. Leaves opposite, 4 – 12 × 1.5 – 5 cm, lanceolate to elliptic or narrowly oblanceolate, base cuneate to narrowly cuneate, margin entire to shallowly crenulate, apex acuminate; glabrous, upper surface sparsely punctuate; mid vein finely channelled above, raised beneath, lateral veins indistinct. Petioles (2) 5 – 10 mm long. Cymes axillary or pseudoterminal, 1 – 4 flowered. Primary peduncles 1 – 4 cm long, glabrous; secondary peduncles 10 – 20 mm long, glabrous. Bracts persistent, reddish, suborbicular, 5 – 10 × 4 – 8 mm. Pedicel 7 – 12 (18) mm long, glabrous. Calyx red, 5-sect from base, segments ovate to obovate, 2.5 – 6 × 2 – 3 mm, glabrous. Corolla red, rarely greenish, 1.2 – 2.2 cm long, outside glabrous, inside puberulent near base, mouth strongly oblique; limb distinctly 2-lipped; lower lip erect, c. 4.5 mm long; upper lip reflexed, c. 5 mm long. Filaments 1 – 2 cm long, glabrous; anthers, 1.5 – 2 mm long; staminodes c. 2 mm long. Ovary 1.5 – 2 cm long, glabrous; style c. 4 mm long, glabrous. Capsules 7 – 14 cm long. Seeds with 1 hairlike appendage at each end, appendages 1.5 – 4 mm long.

Flowering and Fruiting: October–May.

Habitat: In evergreen forest, 100 – 1820 m.

Distribution: India (Sikkim, Assam, Arunachal Pradesh, Meghalaya, Mizoram), China, Thailand, Bangladesh, Vietnam.

Specimens examined: Arunachal Pradesh, Kameng, Baha hills, 10 May 1958, G. Panigrahi 15318 (ASSAM herb. acc. no. 16178); Arunachal Pradesh, Namdhapa, near Deban, 22 Aug. 1984, M.S. Swaminathan 84902

(ASSAM herb. acc. no. 51743); Assam, Pynursulla, 4 Nov. 1938, R.N. De 17867 (ASSAM herb. acc. no. 20751); Mizoram, Lushai hills, Aijal, 762 m, 17 Feb. 1952, G.K. Deka 233587 (ASSAM herb. acc. no. 20747); Arunachal Pradesh, Mehao, 18 Nov. 2000, D.K. Singh 97593 (ASSAM herb. acc. no. 78118); Meghalaya, Dawki, 2 Mar. 1938, G. Panigrahi 16353 (ASSAM herb. acc. no. 20754).

2. *Aeschynanthus angustoblomus* W.T. Wang, Acta Phytotax. Sin. 13: 64. 1975; Wang & al., Fl. China 18: 381. 1998.

Type: Yunnan, Gongshan Xian, 1,500 m, 25th Sept. 1938, T.T. Yü 20424 (PE, photo !)

Epiphytes. Stems glabrous. Leaves simple, opposite, narrowly elliptic to narrowly oblong-lanceolate, 3 – 6 × 0.5 – 1 cm, papery, glabrous, base attenuate, margin entire, apex attenuate; lateral veins indistinct. Petiole 2 – 5 (7) mm long, glabrous. Cymes axillary, 1-flowered. Peduncles absent. Bracts linear to ovate, deciduous. Pedicels 1 – 2.2 cm long, glabrous. Calyx green, 5-sect from base; segments narrowly lanceolate, 6.5 – 8 × 1 – 1.5 mm, outside glabrous, inside hispid, apex acute, margin entire. Corolla red, 2 – 3.2 cm long, outside hispid, inside glabrous, mouth not oblique; limb indistinctly 2-lipped, lips equal, c. 5 × 2 mm. Filaments 1.5 – 2 cm long, finely hispid; anthers basifixed, coherent in pairs at apex, theca parallel, 1.5 – 3 mm long. Ovary glabrous, c. 5 cm long; style c. 2 cm long, with a few short hairs; stigma simple, terminal, capitate. Fruits and seeds not seen.

Fl.: June–July.

Habitat: In dense forest, 200–1,500 m.

Distribution: India (Arunachal Pradesh, Nagaland), China.

Specimens examined: Arunachal Pradesh, Changlang, Tirap, 27th June 1961, D.B. Deb 26181 (CAL); Nagaland, Kohima, July 1886, Dr. D. Prain s.n. (CAL herb. acc. no. 331119).

Note: Bhattacharyya & Goel (2014) reported *Aeschynanthus fulgens* Wall. from Nagaland based on a single collection by Watt, since no other collections were further recorded this species is avoided in this treatment.

3. *Aeschynanthus bracteatus* Wall. ex A.DC., Prodr. 9: 261. 1845; C.B. Clarke, Commelyn. Cyrtandr. Bengal t.43. 1874 & in A.DC. & C.DC., Monogr. Phan. 5: 31. 1883; & in Hook.f., Fl. Brit. India 4: 342. 1884; A.S. Chauhan in Hajra, Contrib. Fl. Namdhapa 234. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 224. 2008; Wang & al., Fl. China 18: 378. 1998; Bhattacharyya & Goel, Phytotaxonomy 14: 6. 2014.

Type: India, Pundua, Wall. Cat. Num. List no. 794 (G, photo!)

Epiphytes. Stems glabrous. Leaves opposite, 4.4 – 13 × 1.5 – 6.1 cm, broadly lanceolate to elliptic, ovate to obovate, base cuneate to rounded, at times subcordate, margin entire rarely shallowly dentate, frequently undulate, apex caudate to acuminate; leathery to papery, glabrous, adaxially drying wrinkled or smooth, abaxially few punctate, lateral veins indistinct. Petioles 5 – 20 mm long. Cymes axillary or pseudoterminal, 2 – 7 flowered. Peduncle 3 – 7 cm long, glabrous. Bracts persistent, red to purple, lanceolate to ovate, 1.5 – 3 × 0.6 – 1.4 cm. Pedicels 6 – 12(–20) mm long, glabrous. Calyx red, 5-sect from base, segments 1.5 – 2 cm × 2 – 4 mm, linear to lanceolate, outside glabrous. Corolla red to pink or purple, 3.5 – 4.2 cm long, glabrous, mouth strongly oblique; limb indistinctly 2-lipped, lobes subequal, upper lip erect, lower lip reflexed, 6 – 8 mm long. Filaments 2.5 – 3 cm long, glabrous; anthers 2 – 2.3 mm long, glabrous. Ovary 22 – 24 mm long, glandular puberulent; style 4 – 6 mm long, glandular puberulent. Capsules 7 – 20 cm long. Seeds with 1 hairlike appendage at each end, appendages 1.5 – 3 mm long.

Flowering and Fruiting: June–October.

Habitat: In forests on moist cliffs, 200 – 3200 m.

Distribution: India (Arunachal Pradesh, Meghalaya, Nagaland, Assam), Bhutan, Myanmar, Vietnam.

Specimens examined: Nagaland, Kohima, Naga hills, 213.36 m, 29 Aug. 1937, *N.L. Bor* 16256 (ASSAM herb. acc. no. 20771); Arunachal Pradesh, Kameng, Sahari forest, 2000 m, 15 Sept. 1964, *J. Joseph* 39991 (ASSAM); Assam, Khasia-Jantia hills, Sorarium, 17 Oct. 1967, *A.S. Rao* 37785 (ASSAM herb. acc. no. 44642); Assam, Pynursula, 25 Nov. 1956, *G. Panigrahi* 4612 (ASSAM herb. acc. no. 16182); Meghalaya, Khasi-Jantia hills, Mamloo, 13 Sept. 1931, *P.C. Kanjilal* 9423 (ASSAM herb. acc. no. 20766).

4. *Aeschynanthus chiritoides* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 28. 1883 & in Hook.f., Fl. Brit. India 4: 341. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 224. 2008; Hilliard, Fl. Bhutan 2 (3): 1300. 2001; Bhat-tacharyya & Goel, Phytotaxonomy 14: 7. 2014

Type: India, Arunachal Pradesh, *Booth* in herb. *Nuttall* s.n. (K, photo!)

Epiphytes. Stems rust brown tomentose. Leaves opposite, rarely in whorls of 3, narrowly elliptic to oblanceolate, (0.7) 1.2 – 2 × (0.2) 0.4 – 0.7 cm, papery, lower surface nearly glabrous, upper surface rust brown pubescent, base cuneate, margin entire, apex acute to subacute; mid

vein obscure above raised beneath, lateral veins invisible. Petioles 1.2 – 3 mm long, tomentose. Cyme axillary, 1 flowered. Bracts 1 – 2 mm long. Pedicels 3.5 – 6 mm long, sparsely tomentose. Calyx green, deeply 5-lobed, lobes triangular lanceolate, subequal, (2) 4 – 7 × c. 1 mm, outside densely puberulent with glandular hairs, inside glabrous, apex acute, margin entire. Corolla, white with pink to dark purple lines along the tube, outside puberulent, inside glabrous; limb indistinctly 2-lipped, 4 – 5 × 1 – 1.5 mm; tube c. 2.4 cm long. Stamens included; filaments 8 – 10 mm long, glabrous with few hairs near apex; anthers 1.5 – 2 mm long, all coherent towards apex. Ovary 1.5 – 2 cm long, glandular puberulent; style 1 – 1.5 cm long, glandular puberulent, stigma globose, glandular. Capsules 6 – 16.5 cm long, glabrous. Seeds 1 – 2 mm long, 1 hyaline appendage at each end, appendage 6 – 7 mm long.

Flowering and Fruiting: December–May.

Distribution: India (Meghalaya, Arunachal Pradesh), China, Laos, Vietnam, Myanmar.

Habitat: In mossy forest, 610 – 200 m.

Specimen examined: Meghalaya, 9 Dec. 1969, *Joseph* 48519 (CAL).

5. *Aeschynanthus gracilis* Parish ex C. B. Clarke, Com-melyn. Cyrtandr. Bengal. t. 48. 1874, in A.DC. & C.DC., Monogr. Phan. 5(1): 27. 1883 & in Hook.f., Fl. Brit. India 4: 340. 1884; Kanjilal & al., Fl. Assam 3: 390. 1939; A.S. Chauhan in Hajra, Contrib. Fl. Namdhapa 235. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 224. 2008; Wang & al., Fl. China 18: 382. 1998; Hilliard, Fl. Bhutan 2(3): 1299. 2001.

Type: Burma, Moulmein, *Parish* s.n. (K, photo!)

Epiphytes. Stems puberulent or spreading short hispid. Leaves opposite, 1 – 2 × 0.5 – 1.5 cm, elliptic to narrowly obovate, base cuneate to rounded, margin entire, apex acute to rounded; leathery, lower surface puberulent to glabrescent, upper surface puberulent; mid vein prominent on both surfaces, lateral veins invisible. Petioles 1.5 – 2 mm. Cymes axillary, 1-flowered. Peduncles absent. Bracts deciduous. Pedicels 6 – 8 mm long, puberulent. Calyx green, 5-sect from base, c. 4 × 1 mm, segments narrowly triangular to linear lanceolate, outside puberulent, margin entire, apex acute. Corolla red, central upper lobe yellow spotted, 2.5 – 3 cm long, outside puberulent, inside glabrous, mouth strongly oblique; limb distinctly 2-lipped, lower lip reflexed, 4 – 10 × 1 – 4 mm, oblong, apex rounded, upper lip 5 – 8 × 3 – 4 mm, central lobe oblong, lateral lobes broadly triangular. Filaments 1.4 – 1.8 cm long, minutely hairy; anthers 1.5 – 2 mm long.

Ovary 15 – 17 mm long, glabrescent; style 10 – 13 mm long, puberulent; stigma glandular. Capsules 9 – 12 cm long. Seeds c. 1 mm long, rugose, with 1 hairlike appendage at each end, appendages 15 – 22 mm long.

Flowering and Fruiting: October–April.

Habitat: A common epiphyte, in outer forests, 1000 – 1300m.

Distribution: India (Assam, Arunachal Pradesh, Meghalaya), Myanmar.

Specimens examined: Assam, Jaintia Hills, May 1899, Dr. Prain's collector s.n. (CAL herb. acc. no. 331163); Arunachal Pradesh, Rotung, 1300 m, 17 Jan. 1912, I.H. Burkill 36089 (CAL herb. acc. no. 31179); Assam, Makum forest, March 1883, G. Mann s.n. (CAL herb. acc. no. 331177); Arunachal Pradesh, Nunai, Bhutan Road, 22 Apr. 1958, B.K. Nath 13227 (ASSAM herb. acc. no. 16169); Arunachal Pradesh, Kopill cathment, R.S. Bahadur 114155 (ASSAM herb. acc. no. 073890).

6. *Aeschynanthus hookeri* C. B. Clarke in A.D.C. & C. DC., Monogr. Phan. 5: 21. 1883 & in Hook.f., Fl. Brit. India 4: 338. 1884; Bhattacharyya & Goel, Phytotaxonomy 14: 9. 2014.

Type: India, Sikkim, 4–5,000 ft., J.D. Hooker s. n. (K, photo!)

Epiphytes. Stems glabrous. Leaves opposite, leathery, 7 – 9 × 2.3 – 4 cm, narrowly elliptic to oblong, base broadly cuneate, margin entire, apex acuminate; glabrous, lower surface smooth or wrinkled on drying; mid vein raised beneath, lateral veins indistinct. Petioles 6 – 10 mm long. Cymes pseudoterminal, 4 – 10-flowered. Peduncles absent. Bracts green, 5 – 9 × 1.5 – 3 mm, triangular to lanceolate, glabrous. Pedicels 1 – 1.5 cm long, glabrous. Calyx red or purple, 5-lobed from above to near middle, lobes broadly triangular, 3 – 7 × 2 – 3.5 mm, margin entire, apex acute to obtuse, tube 10 – 14 mm long, glabrous. Corolla scarlet to orange-scarlet, 2.5 – 3 cm long, outside puberulent, inside glabrous, mouth slightly oblique; limb indistinctly 2-lipped, lips nearly equal, c. 4.5 mm long. Filaments 2.5 – 3 cm long; anthers 2.5 – 3 mm long; staminode c. 1 mm long. Ovary c. 2 cm long, glabrous; style c. 1 cm long, puberulent. Capsules 27 – 30 cm long. Seeds with 2 hairlike appendages at one end 13 – 15 mm long, opposite end with 1 hairlike appendage 5 – 7 mm long.

Flowering and Fruiting: July–December.

Habitat: In forest scrub, 2,000 – 3,000 m.

Distribution: India (Sikkim, Meghalaya, Manipur, Arunachal Pradesh, Nagaland). Endemic.

Specimens examined: Meghalaya, Khasia-Jaintia hills, near Umuhlaw (?), 31 May 1965, N.P. Balakrishnan 42257 (ASSAM herb. acc. no. 37586); Manipur, Senapati, above Liye village, 2460 m, 2 June 2005, A.A. Mao 109095 (ASSAM herb. acc. no. 73358); Arunachal Pradesh, Nongkhlow, 1219 m, 23 Mar. 1963, G.V.S. Rao 28171 (ASSAM herb. acc. no. 31219); Arunachal Pradesh, Nongpoh, 13 Mar. 1932, R. Sharma 9934 (ASSAM herb. acc. no. 20714); Meghalaya, Cherrapunji, 27 Aug. 1956, G. Panigrahi 3557 (ASSAM herb. acc. no. 16150); Nagaland, Banraw forest, 342 m, 7 Feb. 1999, A.A. Mao 101982 (ASSAM herb. acc. no. 60898).

7. *Aeschynanthus linearifolius* C.E.C. Fischer, Bull. Misc. Inform. Kew 1935: 321. 1935; Giri & al., Mat. Fl. Arunachal Pradesh 225. 2008 Bhattacharyya & Goel, Phytotaxonomy 14: 10. 2014.

Type: India, Arunachal Pradesh, Delai valley, 8,000 ft., 20 July 1928, Father Kingdon Ward 8470 (K, photo!)

Epiphytes. Stems glabrous. Leaves opposite, 4 – 9 × 0.5 – 3 cm, narrowly to broadly oblanceolate or rarely lanceolate, base cuneate to attenuate, margin entire to nearly entire, apex acuminate to subcaudate; leathery, glabrous, lower surface drying wrinkled; mid vein channelled above, raised beneath, lateral veins indistinct. Petiole 3 – 8 mm long. Cymes axillary, 1 – 4 flowered. Peduncles 2 – 5 cm long, glabrous. Bracts persistent, 1 – 2 cm × 4 – 5 mm, lanceolate, red. Pedicels 3 – 10 mm long, glabrous. Calyx red, 5-sect from base; segments 1 – 1.3 cm × 3 – 4 mm, lanceolate to elliptic, glabrous. Corolla red, 3 – 3.5 cm long, outside glabrous, inside sparsely glandular puberulent near limb, mouth slightly oblique; limb indistinctly 2-lipped, lip 4 – 5 mm long. Filaments 1.5 – 2 cm long, glabrous; anthers, c. 2 mm long. Ovary 16 – 18 mm long, glabrous; style c. 2.5 mm long, puberulent. Capsules 5 – 10 cm long. Seeds with 1 hairlike appendage at each end, appendages c. 1.5 mm long.

Flowering and Fruiting: July–October.

Habitat: On trees, in dense forest.

Distribution: India (Arunachal Pradesh), Myanmar, China.

Specimens examined: Arunachal Pradesh, Noglo, Tirap, 29 June 1961, D.B. Deb 26346 (ASSAM herb. acc. no. 27750); Meghalaya, Cherrapunji, 12 Aug. 1960, G. Panigrahi 21947 (ASSAM herb. acc. no. 24602).

8. *Aeschynanthus mannii* Kurz ex C.B. Clarke in A.D.C. & C.D.C., Monogr. Phan. 5: 29. 1883 & in Hook.f., Fl. Brit. India 4: 341. 1884; Bhattacharyya & Goel, Phytotaxonomy 14: 10. 2014.



a. *Achimenes longiflora* DC.; b. *Aeschynanthus bracteatus* Wall. ex DC.; c. *Aeschynanthus hookeri* C.B. Clarke; d. *Aeschynanthus parasiticus* (Roxb.) Wall.; e. *Aeschynanthus parviflorus* (D. Don) Spreng; f. *Aeschynanthus superbus* C.B. Clarke; g. *Henckelia pumila* (D. Don) A. Dietr; h. *Henckelia urticifolia* (D. Don.) A. Dietr; i. *Didymocarpus pedicellatus* R.Br.; j. *Didymocarpus punduana* Wall. ex R.Br.; k. *Henckelia anachoreta* (Hance) D.J. Middleton & Mich. Möller; l. *Lysionotus serratus* D. Don; m. *Paraboea multiflora* (R. Br.) B.L. Burtt; n. *Rhynchoglossum obliquum* Blume; o. *Stauranthera grandiflora* Benth.

Type: India, Naga, Patkoye, *Griffith* 3816 (K, photo!)

Epiphytes. Stem thick, short, puberulent. Leaves opposite, closely placed, 20 – 30 × 7 – 12 mm, narrowly elliptic to lanceolate, base cuneate, margin entire, apex acute to subacute; coriaceous, villous when young, upper surface glabrous when mature, lower surface villous along nerves; midrib prominent on both surfaces, raised beneath, lateral nerves obscure. Petioles 1 – 3 mm long, strongly puberulent. Pedicels (1) 4 – 8 mm long, axillary, pilose. Calyx 5-partite from base, segments linear lanceolate, 3.5 – 5 × 0.7 – 1 mm, margin entire, apex acute, villous, glabrescent when mature, finely veined. Corolla narrow, infundibuliform, curved upwards, inflated near mouth, 17 – 27 mm long, obscurely 2 lipped, lobes subequal, 1.5 – 2.5 × 1.5 – 2 mm, obtuse; minutely glandular puberulent outside, glabrous inside, with tufts of hairs inside near base. Filaments didynamous, larger filament 25 – 27 mm long, smaller filament 17 – 19 mm long, glandular hairy; anthers 1.5 – 2 mm long, glabrous. Ovary glabrous, 5 – 7 mm long; style glandular puberulent 14 – 16 mm long; stigma capitate glandular. Fruit not seen.

Fl.: February.

Distribution: India (Assam), Myanmar.

Habitat: In moist dense forest, on trees.

Specimen examined: Assam, Garo Hills, Apr. 1876, *Mann* 99 (ASSAM).

9. *Aeschynanthus masoniae* Kurz ex C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 29. 1883 & in Hook.f., Fl. Brit. India 4: 341. 1884.

Type: Burma, *Mason s.n.* (K, photo!)

Epiphytes. Stem terete, thick, pubescent upwards, later glabrescent; barks peeling off along internodes. Leaves opposite or rarely ternate, 2 – 2.5 × 1.2 – 1.5 cm, ovate to elliptic, base cuneate, margin entire, apex acute; glabrous on both surfaces; mid rib prominent beneath. Petiole 1 – 2 mm, hairy, becoming glabrous. Flowers axillary, 1 – 3 flowered. Pedicels 4 – 7 mm long, sericeous, few hairs gland tipped. Calyx 5 – 7 mm long, 5-sect from below near base, segments narrowly triangular, margin entire, apex acute, puberulous with few gland tipped hairs outside, inside glabrous. Corolla red, 12 – 25 mm long, curved, mouth narrow, 2-lipped; lobes ovate to suborbicular, apex rounded, upper lobes 3, 3 – 4 × 1 – 1.5 mm, lower lobes 2, 2 – 3 × 1 – 1.5 mm; scabrid outside, inside glabrous. Filaments strongly didynamous, larger filaments 30 – 35 mm long, smaller filaments 27 – 30 mm long, glandular hairy; anthers 1 – 2 mm long, oblong, glabrous. Ovary 1

– 1.75 mm long, glabrous or with few minute hairs; style 1 – 1.75 mm long, glandular puberulent; stigma globose, or slightly notched. Capsules linear, loculicidally 2-valved. Seeds with one hair, 3 – 5 mm long.

Flowering and Fruiting: June–September.

Habitat: Epiphyte in moist dense forest.

Distribution: India (Assam, Mizoram), Myanmar.

Specimens examined: Assam, Sialsuk, Lushai hills, 1432 m, 15 Jan. 1963, *D.B. Deb* 30776 (ASSAM 42595, 42596).

10. *Aeschynanthus micranthus* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 27. 1883 & in Hook.f., Fl. Brit. India 4: 340. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 225. 2008; Hilliard, Fl. Bhutan 2 (3): 1300. 2001; Bhat-tacharyya & Goel, Phytotaxonomy 14: 12. 2014.

Type: India, Meghalaya, Khasia, Cherrapunjee, *J.D. Hooker* 879 (K, photo!)

Epiphytes. Stem pendant, glabrous, at times rooting at nodes. Leaves opposite, (1.8) 3 – 6.5 (7.7) × 1.2 – 2.5 cm, elliptic to elliptic lanceolate or obovate, base cuneate to attenuate, margin entire, apex acute to acuminate; mid vein prominent on lower surface, lateral veins 3 – 6 on either side of mid vein. Petioles 3.5 – 7 (10) mm long, glabrous. Cyme 2 – 4 flowered. Peduncles absent. Bracts 3 – 5 mm long, triangular, glabrous. Pedicels 6 – 12 mm long, sparsely puberulent to glabrous. Calyx 5-sect from near base, segments subequal, 5 – 8 × (1.5) 2.5 – 3.5 mm, lanceolate, margin entire, apex acute, sparsely glandular puberulent outside, inside glabrous. Corolla red, curved, glandular pilose outside, inside glabrous; tube 15 – 17 mm long; limb distinctly 2-lipped, lips rounded, upper lips 3 lobed, 3 – 4 × 2 – 2.5 mm, lower lip 2 lobed, 1.5 – 2 × 1.5 – 2 mm. Filaments didynamous, longer pair 16 – 18 mm long, smaller pair 13 – 14 mm long, both puberulent with gland tipped and eglandular hair; anthers 1 – 1.5 mm long, glabrous. Ovary c. 2 cm long, glabrescent; style c. 10 mm long, puberulent with both glands tipped and eglandular hairs; stigma glandular, capitate or depressed globose. Capsules (11) 16 – 23 cm long. Seeds elliptic, 0.5 – 0.7 mm long, rough, single appendage at both ends, appendage hyaline, 7 – 14 mm long with hook like structures.

Flowering and Fruiting: June–November.

Habitat: In moist forest, 800 – 4500 ft.

Distribution: India (Sikkim, Arunachal Pradesh, Assam), Bhutan, Myanmar, China, Vietnam.

Specimens examined: Sikkim, 609 m, 8 June 1874, *G. King* 808 (CAL); Sikkim, 762 m, 18 June 1870, *G. King*

4889 (CAL herb. acc. no. 331095); Sikkim, 244 m, 24 June 1876, *G. King s.n.* (CAL herb. acc. no. 331094); Assam, Haflong, N. Cachar hills, 1371 m, 22 Aug. 1908, *Craib* 372 (CAL); Assam, Kadum, 12 Mar. 1962, *G. Panigrahi* 27784 (CAL).

11. *Aeschynanthus monetarius* Dunn, Bull. Misc. Inform. Kew 1920: 135. 1920; Burkill, Rec. Bot. Surv. India 10: 328. 1925; Giri & al., Mat. Fl. Arunachal Pradesh 225. 2008; Bhattacharyya & Goel, Phytotaxonomy 14: 12. 2014.

Type: India, Arunachal Pradesh, Rotung, 1,300 ft., 17 January 1912, *I.H. Burkill* 36088 (K, photo!)

Epiphytes. Woody branched, rooting at nodes, younger parts puberulous, glabrous when mature. Leaves opposite, orbicular, base cuneate to rounded, margin entire, apex rounded, mid vein finely channelled above, raised beneath, glabrous, wrinkled on both surfaces when dry, 1 – 1.5 × 0.9 – 1.2 cm. Petiole glabrous, 1.5 – 2.5 mm long. Flowers axillary, 1 flowered cyme. Peduncles absent. Bracts deciduous. Pedicels 1 – 1.5 cm long, puberulous. Calyx 5 sect from near base, 4 – 6 × 1 – 1.7 mm, segments narrowly lanceolate, apex acute, margin entire, outside puberulent, inside sparsely puberulent. Corolla scarlet, outside pubescent, inside glabrous; tube 2 – 3.5 × 0.7 – 1 cm, limb distinctly 2-labiate, lower lobes c. 3 × 2 mm, upper lobes c. 5 × 3 mm. Filaments strongly didynamous, pubescent, larger pair 4 – 4.5 cm long, smaller pair 1.8 – 2 cm long; anthers 2.5 – 3 mm long, minutely pubescent. Ovary oblong, finely hirsute, 2 – 3 cm long; style pubescent, 1.8 – 2.2 cm long; stigma capitate, glandular. Fruits not seen.

Flowering and Fruiting: December–January.

Habitat: In dense forest on trees, 300 – 800 m.

Distribution: India (Arunachal Pradesh). Rare and endemic.

Specimen examined: Arunachal Pradesh, Abor, Janakmukh, 16 Dec. 1911, *I.H. Burkill* 37186 (CAL herb. acc. no. 331375).

12. *Aeschynanthus parasiticus* (Roxb.) Wall., Num. List 796. 1829; B.L. Burtt & Davidson, Notes Roy. Bot. Gard. Edinburgh 21: 231. 1955; Giri & al., Mat. Fl. Arunachal Pradesh 225. 2008; Hilliard, Fl. Bhutan 2 (3): 1302. 2001. *Incarvillea parasitica* Roxb., Pl. Corom. 3: 88. 1820; Bhattacharyya & Goel, Phytotaxonomy 14: 145. 2014.

Type: Plate of *Incarvillea parasitica* in Pl. Corom. 3: 88, t. 291. 1820.

Epiphytes. Stems glabrous. Leaves opposite, 5 – 18 × 1.2 – 4.5 cm, narrowly elliptic to broadly ovate or obovate, leathery, fleshy, base attenuate or cuneate to rounded,

margin entire, apex acuminate; glabrous, lower surface may be wrinkled on drying; lateral veins indistinct, mid vein raised beneath. Petiole 5 – 12 mm long, glabrous. Cymes pseudoterminal, 2 – 10 flowered. Peduncles absent. Bracts persistent, 2 – 10 × 0.5 – 1.5 mm, green, linear lanceolate. Pedicels 10 – 15 mm, glabrous. Calyx green, shallowly 5-lobed; tube 8 – 15 mm long; lobes narrowly triangular, 3 – 5 × 1.2 – 2 mm, outside glabrous. Corolla orange-red, 4 – 5.5 cm long, outside glabrescent to puberulent near apex, inside puberulent below middle, mouth slightly oblique; limb indistinctly 2-lipped, lips subequal, 5 – 6 mm long. Filaments 2.5 – 3.5 cm long, glabrescent; anthers 3 – 4 mm long. Ovary 4 – 4.5 cm long, glabrous; style 1 – 1.8 cm long, puberulent near apex. Capsules 15 – 26 cm long. Seeds with 2 hairlike appendages at one end, appendages 1 – 1.5 cm long, opposite end with 1 hairlike appendage 1 – 1.5 mm long.

Flowering and Fruiting: July–November.

Habitat: In forest or scrub, 200 – 2420 m.

Distribution: India (Sikkim, Meghalaya, Assam, Arunachal Pradesh, Mizoram, Nagaland), Nepal, Myanmar, Vietnam, China.

Specimens examined: Meghalaya, Kynshi to Markasa, 17 June 1958, *G. Panigrahi* 16355 (ASSAM herb. acc. no. 16158); Meghalaya, Mosmai, 1219 m, 11 May 1958, *A.S. Rao* 36727 (ASSAM herb. acc. no. 79291); Meghalaya, Nongpoh, Balaibalilla, 17 Sept. 1965, *Joseph* 40609 (ASSAM herb. acc. no. 43011); Nagaland, Naga hills, June 1987, *N.L. Bor* 21247 (ASSAM herb. acc. no. 20722); Mizoram, Mizo hills, Sial Sun, 15 Jan. 1963, *D.B. Deb* 30367 (ASSAM herb. acc. no. 42593); Arunachal Pradesh, Tirap, Kothong, 24 June 1961, *D.B. Deb* 26028 (ASSAM herb. acc. no. 27743).

13. *Aeschynanthus parviflorus* (D. Don) Spreng., Syst. Veg. 4(2): 238. 1827; A.DC., Prodr. 9: 261. 1845; Giri & al., Mat. Fl. Arunachal Pradesh 226. 2008; Hilliard, Fl. Bhutan 2 (3): 1303. 2001. *Trichosporum parviflorum* D. Don, Edinburgh Philos. J. 7: 85. 1822.

Type: Nepal, Wall. Cat. Num. List no. 799 (K, photo!)

Epiphytes. Stems, glabrous. Leaves opposite, 4 – 12.5 × 1 – 4 cm, obovate or oblong, broadly lanceolate to elliptic, base attenuate or cuneate, margin entire, apex acuminate to caudate; leathery, glabrous, at times wrinkled when dry; mid vein raised beneath, lateral veins invisible. Petiole (2) 6 – 12 mm long, glabrous. Cymes axillary or pseudoterminal, 2 – 12 flowered. Peduncle absent. Bracts persistent, 3 – 5 × 1 – 2 mm, lanceolate, green. Pedicel 5 – 12 mm long, glabrous or minutely papillose. Calyx green tinged

to orange-yellow; tube 2 – 4 mm long; 5-lobed from above middle, lobes triangular to lanceolate, 2.5 – 4 × 1 – 2.2 mm, outside glabrous or with few small stiff glandular or eglandular hairs. Corolla red-orange, 2 – 3 cm long, glandular pubescent outside, glabrous or with few glandular hairs inside; mouth not or slightly oblique; limb indistinctly 2-lipped, 2 – 4 × 2 – 6 mm lips, nearly equal, ovate to oblong. Filaments 14 – 35 mm long, glabrous or with glandular hairs; anthers 2–3 mm long. Ovary 15 – 22 mm long, glabrous or with sessile glands; style 10 – 25 mm long, glandular puberulent; stigma capitate, glandular. Capsule 10 – 25 cm long. Seeds with 2 hairlike appendages at one end, appendages c. 1.5 cm long, opposite end with 1 hairlike appendage c. 1.5 cm long.

Flowering and Fruiting: July–November.

Habitat: Common epiphyte in evergreen forest.

Distribution: India (Mizoram, Sikkim, Meghalaya, Arunachal Pradesh), Nepal.

Specimens examined: Mizoram, Mizo hills, North Vernlaiphaij, 21 Jan. 1963, *D.B. Deb* 31113 (ASSAM herb. acc. no. 42597); Arunachal Pradesh, Kameng, Sissini Camp, 25 Mar. 1957, *G. Panigrahi* 6034 (ASSAM herb. acc. no. 16161).

14. *Aeschynanthus philippinensis* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 39. 1883; Giri & al., Mat. Fl. Arunachal Pradesh 226. 2008.

Type: Philippines, *Cuming* 318 (K, photo!)

Epiphytes. Plants glabrous. Leaves elliptic lanceolate, apex acuminate, base cuneate, 4 – 7 × 1.75 – 2 cm. Petiole 3 – 5 mm long, glabrous. Peduncle is spreading, 1 – 2 mm long, glabrous, 2 flowered. Bracts deciduous. Pedicel 3 – 4 mm long, glabrous. Calyx 5-sect from base, segments 6 – 7 mm long, narrowly lanceolate, glabrous, margin entire, apex acute. Corolla 25 – 35 mm long, glabrous, tube narrow, mouth oblique, 2-lipped, upper lobes 3, ovate, 3 – 5 × 2 – 4 mm, lower lobes 2, rounded, 2 – 3 × 1 – 2 mm. Filaments subequal, 28 – 37 mm long, glabrous; anthers 1.5 – 2 mm long. Capsules c. 6 cm long, glabrous.

Flowering and Fruiting: June–September.

Habitat: In dense forests, 200 – 2260 m.

Distribution: India (Arunachal Pradesh), Philippines.

Specimens examined: Arunachal Pradesh (CAL herb. acc. no. 331429); Arunachal Pradesh, Tirap, Raho to Vokanoska, 26 Aug. 1958, *G. Panigrahi* 16835 (CAL herb. acc. no. 16194).

15. *Aeschynanthus superbus* C. B. Clarke, Commelyn. Cyrtandr. Bengal. t. 6. 1874, in A.DC. & C.DC., Monogr.

Phan. 5: 32. 1883; & in Hook.f., Fl. Brit. India 4: 342. 1884; Kanjilal & al., Fl. Assam 3: 391. 1939; A.S. Chauhan in Hajra, Contrib. Fl. Namdhapa 235. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 227. 2008; Wang & al., Fl. China 18: 379. 1998; Hilliard, Fl. Bhutan 2 (3): 1301. 2001; Bhat-tacharyya & Goel, Phytotaxonomy 14: 17. 2014.

Type: Pundua, Wall. Cat. Num. List no. 795 (BM, n.v.)

Epiphytes. Stems gla

brous. Leaves opposite, 10 – 20 × 4.4 – 10.5 cm, leaf blade elliptic to obovate, lanceolate or oblong, base cuneate to rounded, margin entire, apex abruptly acuminate to acuminate or acute; glabrous, upper surface sparsely punctuate; mid vein raised beneath, lateral veins indistinct. Petioles 5 – 15 mm long. Cymes axillary, 5 – 15 flowered. Peduncles 1 – 3 cm long. Bracts persistent, red, 4 – 5.5 × 2–3 cm, elliptic to ovate. Pedicels 1 – 1.5 cm long, glabrous. Calyx orange-red, 5-sect from base; segments 2 – 3 cm × 3.5 – 7 mm, linear to lanceolate, glabrous. Corolla orange-red to dark red with darker stripes, 5.5 – 8.5 cm long, outside glabrous, inside sparsely puberulent, mouth oblique; limb indistinctly 2-lipped, lobes subequal, upper lip erect, lower lip reflexed, 1 – 1.5 cm long. Filaments 3 – 3.5 cm long; anthers 3 – 4 mm long. Ovary 35 – 50 mm long, with a few short hairs; style 6 – 8 mm long, sparsely puberulent. Capsules 32 – 52 cm long. Seeds with 1 hair-like appendage at each end, appendages 4 – 8 mm long.

Flowering and Fruiting: August–November.

Habitat: In evergreen forests, 480 – 2120 m.

Distribution: India (Meghalaya, Arunachal Pradesh, Nagaland), Myanmar, Bhutan, China, Laos, Vietnam.

Specimens examined: Nagaland, Tseminyu-Zumphah Road, 5 Oct. 1977, *C.L. Malhotra* 75057 (ASSAM); Nagaland, Naga hills, June 1936, *N.L. Bor* 20879 (ASSAM herb. acc. no. 20797); Arunachal Pradesh, Mamloo forest, 9 Nov. 1930, *P.C. Kanjilal* 8879 (ASSAM herb. acc. no. 20759); Meghalaya, Pontung, 11 Nov. 1936, *G.K. Deka* 15011 (ASSAM herb. acc. no. 20795); Assam, 31 Oct. 1917, *P.C. Kanjilal* 7285 (ASSAM herb. acc. no. 20796); Arunachal Pradesh, Waka, 29 Aug. 1958, *G. Panigrahi* 14491 (ASSAM herb. acc. no. 16190); Arunachal Pradesh, Kameng, Sessa, 1050 m, 12 Sept. 1964, *J. Joseph* 39845 (ASSAM herb. acc. no. 39980).

16. *Aeschynanthus tirapensis* U.C. Bhattach., Bull. Bot. Surv. India 35: 131. 1993 (1997); Bhattacharyya & Goel, Phytotaxonomy 14: 17. 2014.

Type: India, Arunachal Pradesh, Tirap frontier division, Sept. 8, 1958, *G. Panigrahi* 17015 B (ASSAM !)

Epiphytes. Rooting from slightly swollen nodes, subwoody. Barks flaking off from internodes. Leaves opposite, 1 – 3 × 0.6 – 1 cm, ovate to elliptic, leathery, base cuneate, margin entire, apex acute; glabrous above, adpressed strigose beneath; mid vein prominent on both surfaces, lateral nerves obscure. Petiole 1.5 – 2.5 mm long, sparsely hairy when young, glabrous when mature. Flowers solitary, axillary, red. Pedicels 1.1 – 1.5 cm long, pilose with few glandular hairs. Calyx 5-partite from base, segments linear-lanceolate, apex acute, margin entire, 6 – 8 mm long, pilose outside, glabrous inside. Corolla 2.8 – 3.2 cm long, broadly narrowed below, abruptly curved upwards; lobes 1.8 – 2 mm long, with a dark red streak, subequal; tube 10 – 12 mm long; pilose outside, glabrous inside. Stamens didynamous, longer filament 2.8 – 3.2 cm long, smaller filaments 2.5 – 2.8 cm long, glandular hairy above, glabrescent below; anthers 1.8 – 3 mm long, dorsifixed, glabrous, coherent in pairs. Ovary *c.* 2.5 cm long, glabrous; style *c.* 1.5 cm long, glandular puberulent, stigma slightly notched, glabrous.

Fl. : September.

Habitat: Creepers on rocky surface, rare and endemic.

Distribution: India (Arunachal Pradesh). Rare and endemic.

Specimen examined: Arunachal Pradesh, Tirap, Rusa to Bimalpur, 9 Sept. 1958, *G. Panigrahi* 17015 (ASSAM herb. acc. no. 16175).

3. *BECCARINDA* Kuntze, Revis. Gen. Pl. 2: 470. 1891.

Type: *Beccarinda griffithii* Kuntze.

About 7 species in China, Myanmar, Vietnam; only 1 species in NE India.

Beccarinda cordifolia (J. Anthony) B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 22: 63. 1955; Giri & al., Mat. Fl. Arunachal Pradesh 2: 227. 2008. *Petrodora cordifolia* J. Anthony, Notes Roy. Bot. Gard. Edinburgh 18: 204. 1934.

Type: Burma, north of Htawgaw, 2133 m, Jun. 1924, *G. Forrest* 24549 (K, photo!).

Herbs, perennial, rhizomatous. Leaves basal, 4 – 7 × 2.5 – 5 cm, ovate, base cordate, margin crenate to serrate, apex ovate to acute; upper surface white appressed pilose, lower surface pilose, strigose along veins; lateral veins 5 – 8 on either side of mid vein, obscure above, raised beneath. Petiole 5 – 10 cm long, red pilose. Cyme axillary, 3 – 6 flowered. Peduncle 2 – 4, 6 – 10 cm long, dense red pilose near base, glabrescent above. Bracts orbicular, 3 – 4.5 mm in diam., pilose, ciliate along margin. Pedicel 7 – 10 mm long, glabrescent. Calyx segments subequal,

4 – 6 × 1.5 – 2 mm, elliptic-lanceolate, many nerved, glabrescent, margin ciliate, apex acute. Corolla creamy yellow, tube ampliate towards mouth, lower lip lobes orbicular, *c.* 6 mm long, upper lip shortly 2-fid, truncate, *c.* 2 mm long. Stamens 4, filaments subequal, 2.5 – 3 mm long, anthers ovate-cordate, *c.* 1.5 mm long. Ovary ovoid, glabrous, *c.* 2 mm long; style *c.* 1.5 mm long, glabrescent; stigma obscurely bifid. Capsule linear-oblong, 1.5 – 2 cm long, style persistent.

Flowering and Fruiting: June–November

Habitat: On moist damp walls.

Distribution: NE India (Arunachal Pradesh, Assam), Myanmar.

Specimens examined: Arunachal Pradesh, Siang, 19 Nov. 1958, *S. Rao* 17882 (ASSAM herb. acc. no. 16310); Assam, Subansiri, 10 June 1961, *S. Rao* 24938 (ASSAM herb. acc. no. 42133).

4. *BOEA* Commerson ex Lam., Encyl. Méth., Bot. 1: 401. 1785.

Type: *Boea magellanica* Lam.

About 20 species in Australia, China, Malaysia, Myanmar, Philippines, Vietnam; 1 species in NE India

Boea wallichii R. Br. in Benn., Pl. Jav. Rar. 120. 1840; C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 140. 1883; B. L. Burtt in Edinburgh J. Bot. 41 (3): 419. 1984.

Type: Upper Burma, Taongdong, Wall. Cat. num. list no.789 (K, photo!).

Herbs. Stems short, puberulous. Leaves closely placed, 1 – 7 cm × 0.5 – 5 cm, elliptic to subovate, base narrowly obtuse to attenuate, apex rounded to obtuse, crenulate, thick, black brown when dried, upper surface sparsely villous to hirsute, lower surface densely strigose; lateral veins 3 – 9 on either side of mid vein. Sessile to shortly petiolate, *c.* 1 mm long. Inflorescence 2 – 5 flowered. Peduncles many, 5 – 9 (12) cm long, sparsely pilose. Bracts 0.7 – 3 mm long, linear puberulent. Pedicel 5 – 15 mm long. Calyx 5 partite, segments 2 mm long, narrowly lanceolate, apex acute, puberulent outside, glandular puberulent inside. Corolla blue to bluish white, campanulate, inside puberulent to glabrous; tube 4.2 – 5.3 mm long, limb distinctly 2-lipped; upper lip 2-lobed, 3.7 – 4 mm long; lower lip 3-lobed, 5 – 6 mm long, equal or subequal, apex rounded. Filaments *c.* 1 mm long, puberulent; anthers 0.5 – 0.7 mm long. Ovary *c.* 0.7 – 1.5 mm long, pubescent; style glabrous. Capsule 18 – 22 mm long, twisted, pilose.

Flowering and Fruiting: July–October.

Distribution: India (Assam, Mizoram), Myanmar.

Specimens examined: Mizoram, Lushai hills, Chumpai, 1500 m, 1 July 1926, Parry 14 (K, photo!); Orissa, Bhatipathar, 1 Nov. 1959, *G. Panigrahi* 20697 (ASSAM herb. acc. no. 16223, 16224).

5. BOEICA C.B. Clarke, Commelyn. Cyrtandr. Bengal. 118. 1874. *Type: Boeica filiformis* C.B. Clarke

Note: This genus derives its name as a variation of the genus *Boea*, but differs from both *Boea* and *Paraboea* in having 4 fertile stamens.

About 12 species in Bhutan, China, Myanmar, Vietnam; 4 species in NE India.

KEY TO THE SPECIES

- 1a. Anthers dehiscent porocidally. 4. *B. porosa*
- 1b. Anthers dehiscent longitudinally. 2
- 2a. Plant glabrous or glabrescent, peduncles filiform. 1. *B. filiformis*
- 2b. Plant pubescent, peduncles not filiform. 3
- 3a. Peduncle 5 – 10 cm, hirsute, stem hirsute, hairs arise from tubercles. 3. *B. hirsuta*
- 3b. Peduncle 10 – 15 cm, tomentose, stem villous, tubercles absent. 2. *B. fulva*

1. Boeica filiformis C.B. Clarke, Commelyn. Cyrtandr. Bengal. t. 87. 1874, & in A.DC. & C.DC., Monogr. Phan. 5: 134. 1883; & in Hook.f., Fl. Brit. India 4: 362. 1883; Kanjilal & al., Fl. Assam 3: 398. 1939; A. S. Chauhan in P. K. Hajra (ed.) A. Contrib. Fl. Namdhapa Arunachal Pradesh 235. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 2: 227. 2008.

Type: India, Assam, Griffith s.n. (K, photo !)

Undershrub or shrub. Stem nearly glabrous. Leaves lanceolate or oblanceolate to obovate, acuminate at apex, attenuate at base, shallowly denticulate or subentire along margin, upper surface glabrous when mature; veins obscure above above, raised beneath, Petiole 7 – 22 mm long. Flowers in axillary cyme, purple. Both peduncle and pedicel slender, filiform, glabrous. Bracts 2 – 5 mm long, narrow, initially villous to sericeous later glabrous. Calyx 5-partite from middle to near base, 1 – 3 × 0.5 mm, segments triangular, acute at apex, entire along margin, with a single prominent vein, puberulous. Corolla deeply 5-fid, obscurely bilabiate, glabrous; lobes 3 – 5 × 2 – 2.5 cm, elliptic, subequal, rounded at apex; tube 1 – 1.5 mm long, slightly gibbous. Filaments 1 – 2 mm long, glabrous;

anthers minutely glandular at apex, basifixed, thecae 2, c. 2 mm long; Ovary c. 2 × 1 mm long, oblong, sparsely puberulent to glabrous when mature; style 2 – 3 mm long, glabrous; stigma punctiform. Capsules linear-oblong, glabrous, beak 2 – 5 mm long.

Key to the varieties

- 1a. Leaves glabrous on both surfaces, lateral veins 9 – 13 on either side of mid-vein. 1.1. var. *filiformis*
- 1b. Leaves glabrous above, yellow sericeous along veins beneath, lateral veins 14 – 16 on either side of mid-vein. 1.2. var. *griffithii*

1.1. Boeica filiformis C.B. Clarke var. filiformis

Leaves 10 – 17 × 2.5 – 5 cm, glabrous on both surfaces, lateral veins 9 – 13 on either side of mid-vein. Peduncles 4 – 10 cm long. Capsules 6 – 15 mm long.

Flowering and Fruiting: February–October.

Distribution: India (Arunachal Pradesh, Assam), Bhutan.

Specimens examined: Naga Hills, banks of the Dekko river, 1891, Masters 44 (CAL, herb. acc. no. 33197); Assam, upper Dehing Forest, Mar. 1880, *G. Manns.n.* (CAL, herb. acc. no. 33193); Assam, Lakhimpore, Makum, 91.44 m, 12 Apr. 1885, *C.B. Clarke* 37815C (CAL, herb. acc. no. 333192); Assam, Wallich's.n. (CAL, herb. acc. no. 333194); Assam, Berjan, upper Dehing reserve forest, 8 July 1959, *G. Panigrahi*, 18725 (CAL); Baligan, near Naga hills, Nov. 1878, *Prain's collector* 489 (CAL, herb. acc. no. 333187); Balek, near Naga hills, 18 Nov. 1912, *I.H. Burkill*, 36438 (CAL, herb. acc. no. 333196); Tirap, Chenglang to Khela, 19 Aug. 1958, *G. Panigrahi*, 14439 (CAL); Tirap, Gadua to Beferacca (?), 12 July 1961, *D.B. Deb*, 26681 (CAL); Lohit, Nanam, beyond Jungtu, about 6 miles from Nam-sai, 10 Sept. 1969, *A.S. Rao*, 47784 (CAL); Tirap, Chenglong to Khela, 20 Aug. 1958, *G. Panigrahi*, 14439 (CAL).

1.2. Boeica filiformis C.B. Clarke var. griffithii Su. Datta & al., J. Econ. Taxon. Bot. 38 (2): 240. 2014.

Type: India: Assam, Goalpara, 19 Aug. 1808, Wall. List no. 9079, *Buch.-Ham. s.n.* (K, photo !)

Leaves 14 – 22 × 4 – 6 cm, glabrous above, yellow sericeous along veins beneath, lateral veins 14 – 16 on either side of midvein. Peduncles 4 – 15 cm long. Fruits 5 – 7 mm long.

Specimens examined: Khasi hills and Brahmaputra plains, *S. Kurz s.n.* (CAL, herb. acc. nos. 333203, 333204).

2. *Boeica fulva* C.B. Clarke, Commelyn. Cyrtandr. Bengal. 119. 1874, in A.DC. & C.DC., Monogr. Phan. 5: 135. 1883 & in Hook.f., Fl. Brit. India 4: 362. 1883; Kanjilal & al., Fl. Assam 3: 398. 1939; A. S. Chauhan in Hajra (ed.), Contrib. Fl. Namdhapa 236: 1996; Giri & al., Mat. Fl. Arunachal Pradesh 2: 228. 2008; Wang & al., in Fl. China 18: 288. 1998; M. Hillard in Grierson & Long, Fl. Bhutan 2(3): 1324. 2001.

Type: India, Assam, *Masters s.n.* (CAL !)

Undershrub. Stem decumbent at base, young parts yellow villous, glabrescent. Leaf 9 – 20 (25) × (2) 4 – 5 (7) cm, opposite, elliptic to oblanceolate, apex acute to acuminate, base narrowly cuneate to rounded, denticulate; upper surface yellow villous, later glabrescent, lower surface densely yellow villous, specially along nerves; veins prominent on both surfaces, lateral veins 11 – 16 on each side of midrib. Petiole 1 – 2 cm long, villous. Cymes many flowered. Peduncles 10 – 15 cm long, axillary, yellow flocculose, later glabrescent. Pedicel (0.4) 0.7 – 1 (2) cm, villous or flocculose tomentose. Bracts 2, opposite linear, 5 – 7 × 1 – 2 mm, yellow tomentose. Calyx 5-partite, 2 – 4 mm long, segments narrowly triangular to linear-lanceolate, outside puberulent to villous, apex acute, entire. Corolla pink to purple, outside tomentose, inside glabrous; deeply 5-fid, obscurely bilabiate, 1 – 2 × 0.5 – 1.5 mm, lobes subequal, apex rounded; tube 3 – 4 mm long. Filaments c. 1 – 1.5 mm long, glabrous; anthers c. 1 mm long, thecae 2, glandular at apex. Ovary conical to oblong, 1.5 – 2 mm long, puberulent; style 1 – 2 mm long, glabrous; stigma punctiform. Capsule (4) 7 – 10 mm long, beak 5 mm long, puberulent.

Flowering and Fruiting: June–November.

Distribution: India (Arunachal Pradesh, Assam), Bhutan, China.

Specimens examined: Assam, above Balek, 1158 m, 4 Jan. 1912, *I.H. Burkill* 37665 (CAL herb. acc. no. 333201); Assam, Subansiri, 25 Sept. 1959, *G. Panigrahi* 19400 (ASSAM herb. acc. no. 16265).

3. *Boeica hirsuta* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 136. 1883; & in Hook.f., Fl. Brit. India 4: 362. 1884.

Type: Assam, Sundra bank, 1875, *s. coll.* (K, photo !)

Undershrub. Stem stout, yellow hirsute, hair 4 – 8 mm long. Leaves alternate, 16 – 19 × 6 – 7 cm, broadly lanceolate, apex acuminate, base attenuate, denticulate; upper surface dense yellow hirsute, hair 4 – 8 mm long, tubercled, lower surface soft villose. Petiole 1 – 2 cm long. Cyme umbellate, yellow hirsute. Peduncle 5 – 10 cm long, yellow hirsute. Bracts 1 cm, elliptic to oblong, yellow

hirsute. Pedicel 5 – 10 mm long, yellow hirsute. Calyx 5-partite upto near base, 3 mm long, segments linear-lanceolate, hirsute. Capsules 5 – 7 mm long, minutely hairy.

Flowering and Fruiting: June–July.

Distribution: India (Assam). Endemic.

Specimens examined: Assam, Subansiri, Kimin to Khunipahar, 24 Sept. 1959, *G. Panigrahi* 19325 (ASSAM herb. acc. nos. 24672, 25210).

4. *Boeica porosa* C. B. Clarke in A.DC. & C. DC., Monogr. Phan. 5: 136. 1883; Wang & al., in Fl. China 18: 287. 1998.

Type: Griffith KD 3848 (K, photo !)

Sub-shrubs. Stems 10 – 30 cm long, brown hirsute. Leaves elliptic to oblanceolate, 13 – 16 × 4 – 5 cm, acute at apex, cuneate at base, crenate to serrated along margins, upper surface glandular hirsute, densely pubescent along midrib, lower surface densely yellow hirsute along veins; lateral veins 8 – 11 on either side of midrib. Petiole 2 – 4 cm long, sparsely hirsute. Cymes many-flowered, axillary. Peduncle 4.5 – 6.5 cm long, densely hirsute. Bracts 2, opposite, 4 – 6 mm long, calyx-like, linear-lanceolate, entire, hirsute. Pedicel 5 – 8 mm long, hirsute. Calyx 5-partite from near the base, 4 – 5 × c. 3 mm, segments linear-lanceolate, entire or sometimes dentate, outside densely hirsute. Corolla white to pinkish, 5 – 7 mm long, glabrescent outside; lobes 3 – 5 × 2 – 3 mm, subequal, suborbicular, rounded at apex, shortly connate at base; tube not swollen, 1 – 1.5 mm long. Filaments 1 – 1.5 mm long, glabrous; anthers 1-celled, dehiscing poricidally (single pore); suborbicular, basifixed, 1.5 – 2 mm long. Disc ringlike. Ovary 1 – 2 mm long, conical to oblong, minutely hirsute; style 2 – 3 mm long, terminal, glabrous towards apex; stigma terminal, glandular. Capsules 2 – 2.8 cm long, finely hairy.

Flowering and Fruiting: April–August.

Distribution: India (Assam, doubtful in Arunachal Pradesh), Myanmar, China, Vietnam.

Specimens Examined: Assam, Lakhimpur dist., Makum, 61 m, 12 April 1885, *C.B. Clarke* 37807 D (CAL, herb. acc. no. 33210); *ibid.*, Jeypore, 18 July 1935, *G.K. Deka* 13151 (ASSAM, herb. acc. nos. 20956, 20957).

6. *BRIGGSIA* Craib, Notes Roy. Bot. Gard. Edinburgh 11: 236. 1919.

Type: *Briggsia longifolia* Craib.

About 22 species in Bhutan, China, Myanmar, Vietnam; only 1 species in NE India.

Briggsia kurzii (C.B. Clarke) W. E. Evans, Notes Roy. Bot. Gard. Edinburgh 16: 133. 1928; Wang & al., Fl. China 18: 275. 1998; O. M. Hillard in Grierson and D.G. Long,

Fl. Bhutan 2(3): 1308. 2001. *Didymocarpus kurzii* C.B. Clarke, Commelyn. Cyrtandr. Bengal. t. 66. 1874.

Type: India, West Bengal, Kurseong, 5-6,000 ped. S. Kurz.

Herbs; stems 18 – 30 (50) cm, sparsely tomentose. Leaves mostly opposite at stem apex, basal leaf usually small, 4 – 17 × 2 – 7 cm, equal to subequal in a pair, elliptic to oblanceolate, base sometimes oblique, narrowly cuneate, margin irregularly serrate, apex acuminate to obtuse; upper surface glabrous, lower surface sparsely adpressed pubescent along veins; lateral veins 8 – 11 on each side of midrib, conspicuous and raised beneath. Petioles absent to 1 – 5 cm long, sparsely tomentose. Cymes 1 to 4 flowered. Peduncles 4 – 8 cm long, sparsely glandular tomentose. Bracts 2, 2 – 5 × 1 – 2 mm, lanceolate to linear, outside sparsely tomentose, inside glabrous, margin entire. Pedicels 4 – 15 mm long, sparsely glandular tomentose. Calyx segments 1 – 1.8 cm × 2 – 3 mm, lanceolate to narrowly triangular, outside sparsely tomentose, inside glabrous, margin entire to sparsely denticulate, veins indistinct. Corolla yellow to orange, rarely white, inside lower lip purple to brown spotted, 3 – 5 cm long, outside very sparsely pubescent, inside glabrous; tube 2.8 – 3.8 × 1.5 – 2 cm; upper lip 4 – 6 × 5 – 8 mm, lobes semiorbicular, apex rounded; lower lip 3 – 10 × 4 – 8 mm, lobes semiorbicular, apex obtuse to rounded. Filaments 2 – 3 cm long, glabrous; anthers globose, thecae confluent; staminodes c. 2. Ovary 10 – 13 mm long, pubescent; style 7 – 12 mm long, sparsely pubescent. Capsules 3.5 – 4.5 cm, glabrescent; calyx 1.5 – 2 × 0.5 – 0.7 cm. Seeds c. 0.5 mm long, acute at both ends.

Flowering and Fruiting: June–October.

Habitat: Rocks of grassy slopes, epiphytic in montane forests.

Distribution: India (Arunachal Pradesh, Sikkim, West Bengal, Mizoram), Bhutan, Myanmar, China.

Specimens examined: West Bengal, Tonglu ridge, 2438 m, 16 Oct. 1904, I.H. Burkill 25127 (CAL); Mizoram, Dampa Tiger Reserve, 25 Sept. 2006, 900m, B.K. Sinha & M. Odyuo 112941 (ASSAM herb. acc. no. 71169); Sikkim, Tedong, Damthang forest, 2133 m, 26 June 2003, A.K. Sahoo 26571 (BSHC herb. acc. no. 38491).

Note: *B. kurzii*, have stems and herbaceous leaves as in *Loxostigma*, and only the lack of seed appendages supports their placement in *Briggsia*.

7. CORALLODISCUS Batalin, Mélanges Biol. Bull. Phys.-Math. Acad. Imp. Sci. Saint-Pétersbourg. 12: 176. 1888.

Type: *Corallodiscus conchifolius* Batalin.

3 species in Bhutan, China, India, Nepal, Thailand; 1 species in NE India.

Corallodiscus lanuginosus (Wall. ex R.Br.) B. L. Burtt, Gard. Chron., ser. 3, 122: 212. 1947; Kanjilal, Fl. Assam 3: 395. 1939; Bernardi, Candollea 18: 265. 1963; Hara, Rep. Fl. East. Himal. 1: 298. 1966; Wang & al., in Fl. China 18: 284. 1998; M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1322. 2001. *Didymocarpus lanuginosus* Wall. ex R. Br., Cyrtandreae 118. 1839.

Type: Tibet, Gossain Than, Wall. Cat. 791 (K photo !)

Rhizomatous herbs, aculescent. Leaves in basal rosette, broadly rhomboid to elliptic, (1.5) 3 – 5(–8) × 1 – 3.2 (5) cm, obtuse at apex, subentire to crenulate along the margin, cuneate at base; flat to plicate, upper surface tomentose, lower surface densely villous to pan-nose; lateral veins 3 – 5 on each side of midrib, impressed above, prominent and raised beneath. Petiole to 1.5 – 3.5 cm long, sparsely tomentose; younger leaves subsessile. Cymes axillary, 1–15 flowered. Peduncles (5) 7.5 – 10.5 (17) cm long, glabrescent to tomentose. Pedicel 5 – 10 mm long, tomentose. Calyx (2) 3.5 – 7 (10) mm long, outside glabrous to pubescent, finely veined. Corolla blue or purple, inside with or without spots 6 – 15 (1.9) cm long, outside glabrous to glabrescent; tube 5 – 10 mm long, inside tomentose; upper lip lobes 1–2 mm long, lower lip lobes 2 – 4 mm long, lobes round. Filaments 2 – 3 mm long, glabrous, other pair 4 – 6 mm long; anthers 0.5 – 1 mm long, peltate, glabrous; staminodes 0.5 – 1 mm long. Ovary 2 – 5 mm long, glabrous; style 2 – 5 (8) mm long, terminal, simple, rarely minutely pilose; stigma obscurely bilobed. Capsules narrowly oblong, (0.5) 1 – 2.5 cm, glabrous, acute at apex, splitting longitudinally. Seeds small ellipsoid, acute at both ends, c. 1 mm long.

Flowering and Fruiting: June–December.

Distribution: India (Assam, Sikkim, Meghalaya), Bhutan, Thailand, Nepal.

Habitat: Rocky slopes, steep cliffs, forest margins, forests; 700–4300 m.

Specimens examined: Without Locality, s. loc. 635 (CAL); Without Locality, s. coll. 476 (CAL); Raman to Rimbik, Darjeeling, 2286 – 2591 m, 24 Sept. 1962, B. Safui 1831 (CAL); Jipti to Malpa, Kumaon, 2200 – 2500 m, 12 June 1960, Y.A. Rao 11790 (CAL herb. acc. no. 557173); Pandukesh, Garhwal, 2300 m, 27 Oct. 1959, M.A. Rau 10639 (CAL); Assam, Khasia, 1219 m, Aug. 1880, G. Mann s.n. (CAL); China, Kumaon, 2286 m, 14 Aug. 1913, N. Gill 717 (CAL).

Notes: From literature, it is noted that *Corallo-discus bhutanicus* (Craib) B.L. Burtt and *Corallo-discus kingianus* (Craib) B.L. Burtt are reported from NE India, but we failed to find any herbarium records at CAL or ASSAM, so these two species are not included in this study.

8. DIDYMOCARPUS Wall., Edinburgh Philos. J. 1: 378. 1819, nom. cons.

Type: *Didymocarpus primulifolius* D. Don.

About 180 species in SE Asia; 15 species in NE India.

KEY TO THE SPECIES

- | | |
|--|-------------------------------|
| 1a. Epiphytic herbs. | 5. <i>D. aureoglandulosus</i> |
| 1b. Perennial herbs. | 2 |
| 2a. Calyx 3-partite from near base, the third segment 3-lobed from above middle. | 14. <i>D. triplotrichus</i> |
| 2b. Calyx 5-partite, segments equal to subequal. | 3 |
| 3a. Calyx without a distinct tube. | 4 |
| 3b. Calyx with a distinct tube. | 6 |
| 4a. Calyx segments glandular puberulent. | 8. <i>D. mortoni</i> |
| 4b. Calyx segments glabrous. | 5 |
| 5a. Calyx segments free, up to 1 cm long. | 10. <i>D. parryorum</i> |
| 5b. Calyx segments connate near base, 3 – 4 mm long. | 15. <i>D. wengeri</i> |
| 6a. Corolla hairy. | 7 |
| 6b. Corolla glabrous. | 10 |
| 7a. Lower leaves alternate or subalternate | 6. <i>D. curvicapsa</i> |
| 7b. Leaves opposite or whorled, rarely lowermost leaves alternate. | 8 |
| 8a. Leaves all terminal. | 12. <i>D. podocarpus</i> |
| 8b. Leaves both cauline and terminal. | 9 |
| 9a. Stem and upper surface of leaves villous, peduncle pilose. | 7. <i>D. Hookeri</i> |
| 9b. Stem and leaves appressed puberulent. | 13. <i>D. punduana</i> |
| 10a. Leaves eglandular. | 4. <i>D. aurantiacus</i> |
| 10b. Leaves gland dotted. | 11 |
| 11a. Leaves puberulent. | 12 |
| 11b. Leaves pubescent. | 13 |
| 12a. Anthers bearded. | 11. <i>D. pedicillatus</i> |
| 12b. Anthers glabrous. | 3. <i>D. andersonii</i> |

13a. Anthers bearded; lower surface of leaves strigose with gland tipped hairs. 2. *D. albicalyx*

13b. Anthers glabrous. 14

14a. Stem appressed strigose with red globular glands; lateral nerves 3–5; peduncle strigose with sessile glands. 9. *D. oblongus*

14b. Stem pubescent, eglandular; lateral nerves 8–11; peduncle glabrescent. 1. *D. adenocarpus*

1. Didymocarpus adenocarpus C.E.C. Fisch., Kew Bull. 1929: 253. 1929 & Rec. Bot. Surv. India 12 (2): 118. 1938; Kanjilal & al., Fl. Assam 3: 396. 1939.

Type: India, Assam, Southern Lushai Hills, 4500 ft., Sept., Wenger 239 (K, photo !)

Herbs. Stem sparsely pubescent. Leaves opposite, 2 – 4 pairs, 9 – 15 × 5 – 8 cm, base oblique, shallowly cordate to cuneate, margin crenate to serrate, apex acute; pubescent on both sides, lower surface gland dotted; lateral veins 8 – 11 on either side of midrib. Petiole 3 – 5 cm long, pubescent. Cyme 14 – 20 flowered. Primary peduncle 4.5 – 6 cm long, glabrescent; secondary peduncle 1 – 2 cm long, glabrescent. Bracts 5 – 7 mm long, reddish brown, sub-orbicular, margin entire, apex obtuse. Pedicel 3 – 5 mm long, glabrous. Calyx reddish brown, campanulate, 8 – 10 mm long, glabrous, finely veined; lobes 5 – 8, 1.5 – 2 mm long, triangular. Corolla white, with pink ting, 1.8 – 3 cm long, glabrous; tube inflated near mouth, 1.5 – 2 cm long; mouth 2-lipped, upper lip 3 lobed, 1.8 – 2 mm long, lower lip 2-lobed 1.5 – 1.8 mm long. Filaments c. 18 mm long; anthers c. 3 mm long. Ovary 1 – 1.8 cm long, yellow glandular; style 3 – 5 mm long, sparsely puberulent; stigma peltate. Capsule 3 – 3.5 cm long; valves glandular, style persistent. Seeds minute, reddish brown.

Flowering and Fruiting: September.

Distribution: India (Assam, Mizoram).

Habitat: On rocks, 1219 – 1524 m.

Note: Description is based on the photograph of the type specimen. No specimen is found at CAL and ASSAM.

2. Didymocarpus albicalyx C.B. Clarke, in A.D.C. & C.D.C., Monogr. Phan. 5: 78. 1883.

Syntypes: India, Himalaya Centralis, Sikkim, 2000 m, Griffith 3839 (K, M, W, G); J.D. Hooker (BM, G, K, P, W)

Herbs. Stem hirsute, hairs 1.5 – 2 mm long, with gland tipped hairs. Leaves opposite, subequal, 1 – 3 pairs, 2.7 – 20 × 2.4 – 14 cm, elliptic to ovate or suborbicular, base cordate to rounded, at times oblique, margin doubly serrate, apex acute; upper surface pubescent, lower surface strigose along the veins with gland tipped hairs; lateral

veins 5 – 7 on either side of mid vein. Petiole 0.4 – 10 cm long, puberulous. Peduncle 5 – 13 cm long, pubescent with gland tipped hairs. Bracts 3 – 9 × 3 – 8 mm, pubescent, ovate to suborbicular. Calyx pale purple, campanulate, 5-sect from near base, lobes 2 – 3 mm long, oblong, apex rounded, glabrescent. Corolla white to purple, 1.4 – 2 cm long, lobes rounded. Anthers bearded. Ovary glabrous. Capsule 13 – 22 mm long.

Flowering and Fruiting: Unknown.

Distribution: India (West Bengal, Sikkim), Bhutan.

Specimens examined: Sikkim, East Sikkim, Fambonglho to Ranka side, 13 July 1998, S.K. Rai 14182 (BSHC herb. acc. nos. 28861, 28859); Sikkim, Pheoi, 18 May 1964, A. Chettri 27871 (BSHC herb. acc. nos. 33518, 33519).

Note: Since all the images of the syntypes are not available for study, lectotypification was avoided.

3. *Didymocarpus andersonii* C.B. Clarke, Commelyn. *Cyrtandr. Bengal.* 92, t. 62. 1874.

Type: India, Sikkim, Pankabare, 11 July 1862, *Anderson* 313 (CAL !)

Herbs. Stem sparsely hirsute. Leaves opposite, 1 pair with rudimentary, 2 pair, 7 – 25 × 4.2 – 15 cm, broadly ovate to suborbicular, base cordate to cuneate, unequal, margin crenate to serrate, apex obtuse; upper surface glandular hirsute, lower surface glabrous, sparsely gland dotted, villous along veins; lateral veins 5 – 7 on either side of mid rib. Petiole 1 – 12.5 cm long, spreading hirsute. Inflorescence 14 – 20 flowered. Primary peduncle 10 – 20 cm long, spreading hirsute; secondary peduncle 4 – 6 cm long, glabrescent. Bracts 5 – 7 × 4 – 5 mm, suborbicular, partly connate, margin entire, distinctly veined. Pedicel 3 – 5 mm long, glabrescent. Calyx reddish brown, campanulate, 5 – 9 mm long, glabrous, finely veined; lobes 1.3 – 2 mm long, triangular, apex obtuse. Corolla purple, 2.2 – 4 cm long, glabrous; tube inflated near mouth, 1.2 – 2.5 cm long; mouth 2-lipped, lobes rounded, upper lip 3 lobed, 3 – 5 mm long; lower lip 2-lobed 1.5 – 2.2 mm long. Filaments 7 – 9 mm long; anthers 3 – 5 mm long, glabrous. Ovary 1 – 1.8 cm long, glabrous; style 2 – 4.2 mm long, glabrescent; stigma peltate. Capsule 3 – 3.5 cm long.

Flowering and Fruiting: June–September.

Distribution: India (Sikkim, West Bengal, Himachal Pradesh).

Habitat: Rocks, cliffs in valleys; 600–1500 m.

Specimen examined: Sikkim, Machong, 7 July 1991, N.R. Mandas & P. Singh 13484 (BSHC).

4. *Didymocarpus aurantiacus* C.B. Clarke, Commelyn. *Cyrtandr. Bengal.* 90, t. 60. 1874; & in Hook.f., *Fl. Brit.*

India 4: 346. 1884; O.M. Hillard in Grierson and D.G. Long, *Fl. Bhutan* 2(3): 1310. 2001.

Type: India, Sikkim, Runjeet, 2500 ft., Darjeeling, 29. Aug. 1869, C.B. Clarke 8912C (K, photo !)

Herbs. Stem glandular pubescent to pilose. Leaves opposite, 4 – 15 × 2 – 10 cm, broadly ovate to suborbicular, base unequal, cordate to cuneate, margin crenate to serrate, apex obtuse to subacute; upper surface dense villous, lower surface villous along veins; lateral veins 4 – 6, on either side of mid vein. Petiole 1.5 – 5 cm long, puberulous. Peduncle 5 – 7 cm long, puberulous. Bracts 3 – 5 mm long, linear lanceolate to ovate oblong, villous. Pedicels 5 – 15 mm long, puberulous. Calyx campanulate-tube 2 – 4.5 mm long, lobes 1.5 – 2.5 mm long, triangular, outside glandular puberulous, inside glabrous. Corolla orange red, 3 – 4.5 cm long; tube cylindric, wide near the mouth, upper lobes 3-lipped, 6 – 8.7 mm long; lower lobes 2-lipped, 4 – 5.5 mm long, lobes broadly ovate. Filaments 1.8 – 2 cm long; anthers glabrous, 2 – 5 mm long. Ovary 2 – 3.1 cm long, glandular pubescent; style 8 – 12 mm long, sparsely white pubescent. Capsule 3 – 5 cm long, sparsely glandular puberulous.

Flowering and Fruiting: June–August.

Habitat: On moist rock crevices, 600 – 1200 m.

Distribution: India (Sikkim, West Bengal).

Specimens examined: West Bengal, Darjeeling, 914 m, 15 Aug. 1870, C.B. Clarke 12365 M (CAL herb. acc. no. 332171); West Bengal, Kalimpong, 1219 m, Aug. 1913, H.J.C. Kinghorn 15 (CAL herb. acc. no. 332153); Sikkim, without locality, Aug. 1912, D. Prain 144 (CAL).

5. *Didymocarpus aureoglandulosus* C.B. Clarke in *Repert. Spec. Nov. Regni Veg.* 4: 292. 1907.

Type: Chieng-Mai, SO-Seite des Doi-Sutep, 12. Dec. 1904. *Hosseus* 220 (K, photo !)

Epiphyte. Leaves radical, opposite, 2 – 4 pairs, 10 – 15 × 5 – 8 cm, unequal, elliptic to ovate-elliptic, base unequal, cordate to rounded, margin crenate to serrate; adpressed grey pilose above, glabrescent beneath, pilose with sparse glands along veins; lateral nerves 7 – 8 on either side of mid vein. Petiole 4 – 6 cm long, glabrescent. Cyme 3 – 5 flowered. Peduncle 10 – 15 cm long, glandular, white pubescent. Bracts 3 – 5 mm long, linear lanceolate, glandular white pubescent. Pedicels 1 – 2 cm long, glabrescent. Calyx 5-sect from near base, glandular white pubescent outside, inside glabrous, lobes 10 – 13 mm long, linear-lanceolate. Corolla pale pink, 3 – 4 cm long; tube 2.5 – 3 cm long, upper lobes 3-lipped, 5 – 8 mm long, lower lobes 2-lipped, 3 – 5 mm long, rounded.

Filaments 17 – 20 mm long, glabrous; anthers 3 – 4.5 mm long, coherent by their upper surfaces. Ovary 3 – 4 cm long, sparsely glandular pubescent; style 8 – 12 mm long, sparsely white pubescent.

Flowering and Fruiting: July – October.

Distribution: India (Mizoram, West Bengal, Sikkim).

Habitat: On trees, in dense forest, 1,500 m.

Specimens examined: Without locality, 1877, *G. King s.n.* (CAL herb. acc. no. 332166); West Bengal, Darjeeling, 21 Aug. 1875, *C.B. Clarke* 27065G (CAL herb. acc. no. 332157); Sikkim, 1219 m, 7 Aug. 1910, *Ribu s.n.* (CAL herb. acc. no. 332154).

6. *Didymocarpus curvica* Hilliard, Edinburgh J. Bot. 52: 217. 1995; O.M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1313. 2001.

Type: India, Sikkim, Lachen, 7–8000 ft., 4 Aug. 1849, *Hooker s.n.* (K, photo !)

Herbs. Stems 7 – 25 cm, appressed puberulent, with globose glands. Leaves mostly opposite, basal 2 often alternate; 2–6 × 1.5 – 5.6 cm, base broadly cuneate to subcordate, ovate to elliptic, margin dentate to serrate or crenate, apex acute to obtuse; upper surface appressed puberulent, sometimes yellow glandular, lower surface puberulent along veins, sometimes yellow glandular; lateral veins 4 or 5 on each side of midrib. Petiole 0.1–3.5 cm long, puberulent. Cymes 2–5 flowered, axillary or terminal. Peduncle 2.5 – 3.5 cm long, sparsely glandular puberulent. Bracts free, 2–5 mm long, ovate to orbicular, sparsely glandular puberulent, margin entire. Pedicel 5–11 mm long, sparsely glandular puberulent. Calyx 1.5 – 3.2 mm long, campanulate, glandular pubescent; limb indistinctly 2-lipped, 5-lobed, 1.5– 2.8 mm long, lobes subequal, triangular, outside sparsely glandular puberulent, inside glabrous, margin entire, apex acute. Corolla purple-red, 1.8 – 2.5 cm long, glabrous to glandular puberulent; tube 1.2 – 2 mm long, nearly tubular; upper lip 3 – 4 mm long, lower lip 1.8 – 2.2 mm long, ovate. Filaments 3 – 4 mm long, glabrous; anthers c. 2 mm long, bearded. Ovary 1.3 – 1.8 cm long, glabrous; style 0.5 – 0.7 cm long. Capsule 2.5–3 cm long, often curved.

Flowering and Fruiting: July–September.

Distribution: India (Sikkim, Assam), Bhutan.

Habitat: In shady moist cliffs; 1200–2600 m.

Specimens examined: Sikkim, Lanchung, 9 July 1986, *D.C.S. Raju & S. Singh* 5656 (BSHC herb. acc. no. 28869); Assam, Cherrapunji, 27 Aug. 1956, *G. Panigrahi* 3582 (ASSAM herb. acc. no. 16250).

7. *Didymocarpus hookeri* C.B. Clarke, Commelyn. Cyrtandr. Bengal. t. 54. 1874; & in Hook.f., Fl. Brit. India 4: 349. 1884.

Type: India, Meghalaya, Khasia Hills, 5000–6000 ft., *Hooker f. & Thomson* (CAL herb. acc. no. 332349 !).

Herbs. Stems densely appressed puberulent. Leaves whorled; 4 – 17 × 3 – 7 cm, ovate to broadly ovate or ovate oblong; upper surface sparsely to densely appressed puberulent, lower surface sparsely puberulent along veins, sparsely gland dotted, base oblique, cuneate to cordate, margin crenate to serrate, apex subacute to obtuse; lateral veins 5–7 on each side of midrib. Petiole 4 – 7 cm long. Cymes 7 – 20 flowered. Peduncle 2 – 5 cm long, sparsely glandular puberulent. Bracts free, 1.8 – 3 mm long, ovate, glabrescent, margin entire. Pedicel 2 – 5 mm long. Calyx 3 – 4.5 mm long; indistinctly 2-lipped; tube 2–3 mm long; lobes 1 – 2.2 mm long, subequal, triangular, glabrous to pubescent outside, margin entire, apex acute. Corolla purple, 1.8 – 3 cm long, glabrous, tube cylindric, 2 – 2.5 cm long; upper lip 3.2 – 3.8 mm long; lower lip 4.2 – 5.4 mm long. Filaments 5.5 – 7.2 mm long, glabrous; anthers 2 – 2.5 mm long, puberulent. Ovary 1.1 – 1.7 cm long, glabrous; style 0.5 – 0.8 cm long, glabrous. Capsule 2.5 – 4 cm long.

Flowering and Fruiting: July–October.

Distribution: India (Sikkim, Assam).

Habitat: Forests near waysides; 1200–2600 m.

Specimens examined: Meghalaya, Upper Shillong, Aug. 1931, *S.R. Sharma* 8611A (ASSAM herb. acc. nos. 20858, 20860); Meghalaya, 7 Oct. 1930, *P.C. Kanjilal* 8611 (ASSAM herb. acc. no. 20863); Assam, without locality, *C.B. Clarke* 416 (ASSAM, herb. acc. no. 20865); Meghalaya, Cherra road, 21 June 1937, *N.L. Bor* 15779 (ASSAM herb. acc. no. 20867).

8. *Didymocarpus mertonii* C.B. Clarke, Commelyn. Cyrtandr. Bengal. t. 65. 1874; & in Hook.f., Fl. Brit. India 4: 348. 1884; C.E.C. Fisch., Rec. Bot. Surv. India 12 (2): 118. 1938; O.M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1310. 2001.

Type: India, Darjeeling, Rungbee, 4500 ft., 1. Aug. 1869, *C.B. Clarke* 8717K (CAL !)

Herbs. Stem glandular pubescent to pilose. Leaves opposite, 4 – 15 × 2 – 10 cm, broadly ovate to suborbicular, base unequal, cordate to cuneate, margin crenate to serrate, apex obtuse to subacute; upper surface dense villous, lower surface villous along veins; lateral veins 4 – 6, on either side of mid vein. Petiole 1.5 – 5 cm long, puberulous. Peduncle 5 – 7 cm long, puberulous. Bracts 4 – 7

mm long, ovate, villous. Pedicels 5 – 15 mm long, puberulous. Calyx 5-sect from near base, lobes 4 – 7 mm long, oblong, outside glandular puberulous, inside glabrous. Corolla purple, 1.8 – 2 cm long; tube cylindric, wide near the mouth, limb oblique, lobes rounded. Filaments 1.8 – 2 cm long; anthers 2 – 5 mm long, glabrous. Ovary 0.7 – 1.3 cm long, glandular puberulous; style 2 – 5 mm long, sparsely puberulous. Capsules 2.5 – 3.2 cm long.

Flowering and Fruiting: June – August.

Distribution: India (Assam, Mizoram, Sikkim, West Bengal).

Habitat: On moist rock crevices, 914 – 1524 m.

Specimens examined: Sikkim, without locality, *G. King* (CAL herb. acc. no. 332299); Sikkim, Gangtok, 1524m, 20 Oct. 1952, *K. Biswas* 9759 (CAL); West Bengal, Darjeeling, 914 m, 27 June 1870, *C.B. Clarke* 1209 A (CAL herb. acc. no. 332288); Sikkim, without locality, Aug. 1912, *D. Prain* 144 (CAL).

9. *Didymocarpus oblongus* D. Don, Prodr. Fl. Nep. 123. 1825; C.B. Clarke in Hook.f., Fl. Brit. India 4: 346. 1884.

Type: Nepal, Wall. Cat. Num. List no. 738 (BM, n.v.)

Herbs. Stem appressed strigose with red globular glands. Leaves opposite, 2-pairs, near base, 1.5 – 12.5 × 1.2 – 4.5 cm, elliptic to elliptic lanceolate, base cuneate to rounded, margin serrate, apex rounded; upper surface appressed strigose, lower surface strigose along the veins with sessile glands on both surfaces; lateral nerves 3 – 5 on either side mid vein. Petioles 0.2 – 1.5 cm long, puberulous. Peduncle 4 – 5 cm long, strigose with sessile glands, secondary peduncle 1.8 – 2 cm long, glabrescent. Bracts 3 – 4 × 4 – 6 mm, ovate, margin subentire, apex obtuse, upper surface glabrous, lower surface puberulous. Calyx campanulate, glabrous; tube 2 – 3.5 mm long; segments 1 – 2 mm long, ovate, margin entire, apex rounded. Corolla purple, 1.2 – 1.4 cm long; tube 6 – 8 mm long, mouth oblique, lobes rounded, glabrous. Anthers glabrous. Ovary glabrous. Capsule 9 – 19 mm long.

Flowering and Fruiting: Unknown.

Distribution: India (Sikkim), Bhutan.

Habitat: On rocks crevices in moist forest.

Specimen examined: Sikkim, East Sikkim, Phodamchen, 24 Aug. 1986, *B. Krishna & B. Mitra* 6677 (BSHC herb. acc. no. 9803).

10. *Didymocarpus parryorum* C.E.C.Fisch., Kew Bull. 1928: 141. 1928 et Rec. Bot. Surv. India 12 (2): 118. 1938.

Type: India, Mizoram (previously Assam), Lushai Hills at Sairep, 1700 m, July 1926, *Parry* 7 (K, photo !)

Herbs. Stem brown hirsute. Leaves opposite, subequal in pairs, 4 – 7 × 6 – 12 cm, rotund, base cordate, margin serrate, apex apiculate; upper surface brown appressed hirsute, stellate glandular, lower surface sparsely villous, appressed hirsute along veins; lateral nerves 3 – 5 on either side of mid vein. Petiole 4 – 9 cm long, canaliculated, brown hirsute. Inflorescence 10 – 15 flowered. Peduncle glabrous, primary peduncle 6 – 12 cm long, secondary peduncle 3 – 5 cm long. Bracts c. 8 mm long, suborbicular, forked, apex rounded to acute, glabrous. Pedicels c. 5 mm long. Calyx 5-sect from base, free, c. 1 cm long, linear-oblongate, margin entire, apex subacute, conspicuously veined, yellow. Corolla orange, 1.8 – 2.7 cm long, glabrous; tube cylindric, 1.3 – 1.9 cm long; upper lobes 3, suborbicular, 5 – 8 mm long; lower lobes 2 c. 2 mm long. Filaments glabrous; staminodes 2, short, linear. Ovary linear, c. 11 mm long; stigma peltate. Capsule linear, 17 – 24 mm long. Seeds ellipsoid, glabrous.

Flowering and Fruiting: February–July.

Distribution: India (Assam, Mizoram).

Note: Description based on literature and the photograph of the type specimen. No specimen was found at CAL, BSHC and ASSAM.

11. *Didymocarpus pedicellatus* R.Br., Cyrtandreae: 118. 1839; C.B. Clarke. in Hook.f., Fl. Brit. India 4: 345. 1884; O.M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1311. 2001; Giri & al., Mat. Fl. Arunachal Pradesh 2: 231. 2008.

Type: Himalaya occidentalis, alt. 800–1700 m, a Chumla usque ad Kumaon frequens, *Royle s.n.* (K photo !)

Herbs. Stem sparsely glandular puberulent. Leaves opposite, 1 pair with rudimentary 2 pair, 5 – 25 × 3.5 – 15 cm, broadly ovate to suborbicular, base cordate to cuneate, margin crenate to serrate, apex obtuse; upper surface glandular puberulent, lower surface glabrous, sparsely gland dotted, reddish villous along veins; lateral veins 4 – 7 on either side of mid rib. Petiole 1 – 13.5 cm long, puberulent. Inflorescence 14 – 20 flowered. Primary peduncle 10 – 20 cm long, glabrescent; secondary peduncle 4 – 6 cm long, glabrescent. Bracts 5 – 7 × 4 – 5 mm, suborbicular, partly connate, margin entire, distinctly veined. Pedicel 3 – 5 mm long, glabrescent. Calyx reddish brown 6– 10 mm long, campanulate, glabrous, finely veined; lobes 1.5 – 2 mm long, triangular, apex obtuse. Corolla purple, 2 – 4 cm long, glabrous; tube inflated near mouth, 1.5 – 2 cm long; mouth 2-lipped, lobes rounded, upper lip 3 lobed, 3 – 5 mm long, lower lip 2-lobed 1.5 – 2.2 mm long. Filaments 7 – 10 mm long; anthers 3 – 5 mm long, bearded.

Ovary 1 – 1.5 cm long, glabrous; style 3 – 5 mm long, glabrescent; stigma peltate. Capsule 3 – 3.5 cm long, stipitate.

Flowering and Fruiting: June–September.

Distribution: India (Sikkim, West Bengal, Himachal Pradesh).

Habitat: Rocks, cliffs in valleys; 600–1500 m.

Specimens examined: West Bengal, Jalpaiguri, 7 Sept. 2009, A. Sarkar & T.K. Paul 109 (CAL); Without locality, King s.n. (CAL herb acc. no. 332109); Mussorie, 2 Aug. 1965, Rev. Santapau 28526 (CAL).

12. *Didymocarpus podocarpus* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5 : 76. 1883, “*podocarpa*” & in Hook.f., Fl. Brit. India 4: 347. 1884; O.M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1314. 2001.

Type: India, Sikkim; Lachen, July 1849, Hooker f. [K000820550, photo!] (Lectotype designated here)

Herbs. Stem appressed hirsute, glandular. Leaves terminal, in pseudowhorls of 4, few smaller leaves along stem, 3 – 15 × 1.5 – 2 cm, ovate to elliptic, base rounded or cuneate, margin doubly serrate, apex subacute; upper surface hirsute, hairs 0.3 – 0.6 mm long, lower surface densely villous along veins, both surface globose gland dotted, lateral veins 4 – 7 on either side of mid vein. Petiole 0.4 – 2.3 cm long, puberulent. Cyme terminal, many flowered. Primary peduncle 3 – 6 cm long; secondary peduncle 15 – 22 mm long, glabrous. Bracts 4 – 7 × 3 – 5 mm, broadly ovate to suborbicular, connate at base, outside gland dotted, inside glabrescent, margin entire. Pedicel 1 – 2 cm long, glabrous. Calyx campanulate, 2-lobed, outside gland dotted, inside glabrous; tube 1.6 – 4 mm long; lobes 1.5 – 3 mm long, triangular, apex acute to subacute. Corolla violet with white line on throat, glandular pubescent outside, inside glabrous; tube cylindric, 2.2 – 2.6 cm long; upper lip 3.5 – 4 mm long, lower lip 6.5 – 8 mm long. Filaments 6.5 – 7.2 mm long, glabrous; anthers 2 – 2.5 mm long, puberulent. Ovary 1.1 – 1.5 cm long, glabrous; style 0.7 – 1 cm long, glabrous. Capsule 2.5 – 4 cm long.

Flowering and Fruiting: June – August.

Habitat: Forests near waysides; 2285–3600 m.

Distribution: India (Sikkim, West Bengal), Bhutan.

Specimens examined: Sikkim, 14 July 1999, S.K. Basak 472 (CAL); Sikkim, 3048 m, 1891, J.S. Gamble 10 (CAL).

Note: Clarke (1883) cited the following specimens: India, Sikkim; Lachen, alt. 3400–3800 metr., Hooker f. [K]; King [CAL?]; Sinchul, at 2700 metr., Hooker f. [K]; alt. 2600 metr., Treutler 95 [K]; Tumlok, Clarke 12966 [K] in the protologue. Specimens collected by Treutler, Clarke

and King could not be traced at K or CAL. The specimen collected by Hooker, from Sinchal (K000820553) was in fruiting stage. So the collection from Lachen (K000820550) bearing flowers is designated here as the lectotype.

13. *Didymocarpus punduanus* Wall. ex R.Br., Cyrtandr. 118. 1839; C.B. Clarke in Hook.f., Fl. Brit. India 4: 349. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 2: 231. 2008.

Type: India, Meghalaya, Pundua, F.de in Wall. Cat. Num. List no.777 (K, photo !)

Herbs. Stems densely puberulent to glabrescent. Leaves opposite, 1 – 14 × 1 – 10 cm, ovate to oblong, or obovate, upper surface appressed puberulent, lower surface puberulent along veins, base oblique, broadly cuneate to cordate, margin crenate to crenulate or nearly entire, apex acute to rounded; lateral veins 5 or 6 on each side of midrib. Petiole 1.3 – 3.5 cm long, glabrous to sparsely puberulous. Cymes 2 – 12 flowered. Peduncle 1 – 10 cm long, sparsely glandular puberulent. Bracts free, 0.2 – 2 cm long, ovate to orbicular, often leaflike, glabrous to puberulent, yellow glandular, margin crenate to entire. Pedicel 4 – 15 mm long. Calyx 4 – 5 mm long; tube 2 – 4 mm long; lobes 2 – 3 mm long, subequal, triangular, outside sparsely puberulent, inside glabrous, margin entire. Corolla purple to reddish purple with darker stripes, 2.2 – 3.6 cm long, outside sparsely pubescent to glabrous, inside glabrous; tube 2 – 2.8 cm, narrowly funnelform; upper lip 3.5 – 4.2 mm long; lower lip 5 – 7 mm long. Filaments 3 – 5 mm long, glabrous; anthers 1– 2 mm long, sparsely pubescent to glabrous; staminodes 3, 1.2 – 5 mm long. Ovary 1.2 – 1.8 cm long, glabrous; style 1.1 – 1.4 cm long, glabrous. Capsule 3 – 4.2 cm long.

Flowering and Fruiting: June–October.

Distribution: India (Sikkim, Assam, Meghalaya). China.

Habitat: Rocks, cliffs in valleys; 1500–3400 m.

Specimens examined: Meghalaya, Khasia Jaintia hills, Bishop falls, 1219 m, 30 Aug. 1931, R. Sharma 9323 (ASSAM herb. acc. no. 20845); Arunachal Pradesh, Kameng, Sehani forest, 15 Sept. 1964, J. Joseph 39977 (ASSAM herb. acc. no. 39977).

Key to varieties

1a Leaves base cuneate; penduncles slender; anthers not hairy.

13.1. var. *attenuatus*

1b Leaves base unequal, cordate; penduncles stouter; anthers hairy.

13.2. var. *pulchrus*

13.1. *Didymocarpus punduanus* var. *attenuatus* C.B. Clarke in A.D.C. & C.D.C., Monogr. Phan. 5: 80. 1883, “*attenuata*”; C.B. Clarke in Hook.f., Fl. Brit. India 4: 349. 1884.

Type: India, Meghalaya, Khasia, 4000–5000 ped., Hooker & Thomson (W)

Stem puberulous; leaves cuneate; pedicel minutely hairy; calyx pilose, segments triangular; anthers glabrous.

Specimens examined: Meghalaya, Khasia hills, 1219 – 1524 m, Aug. 1885 (ASSAM herb acc. No. 20847); Meghalaya, Mawphlong, 5759 m, 26 Sept. 1962, M.R. Hakim 28674 (ASSAM herb. acc. no. 32410); Meghalaya, Khasia hills, 1676 m, 9 Oct. 1914, P.C. Kanjilal 4500 (ASSAM herb. acc no. 20843).

13.2. *Didymocarpus punduana* var. *pulchrus* (C.B. Clarke) Su. Datta & B.K. Sinha, Nelumbo 57: 31. 2015.

Didymocarpus pulchrus C.B. Clarke in A.D.C. & C.D.C., Monogr. Phan. 5(1): 79. 1883, “*pulcher*” et C.B. Clarke in Hook.f., Fl. Brit. India 4: 348. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 2: 231. 2008.

Type: India, Sikkim, Griffith KD 3841 (K, photo !)

Stem puberulous; leaves base unequal, cordate; pedicel glabrescent; calyx glandular pilose, segments triangular; anthers minutely hairy.

Specimens examined: Meghalaya, Khasia Jaintia hills, Pynursla, 6 Sept. 1941, R.N. De 20617 (ASSAM herb. acc. no. 20872); Meghalaya, Khasia Jaintia hills, Dumpep, 15 Oct. 1933, R. Sharma 10587 (ASSAM, herb acc. no. 20874).

14. *Didymocarpus triplotrichus* Hilliard, Edinburgh J. Bot. 52: 218. 1995; O.M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1311. 2001.

Type: India, Darjeeling distr., Pankhabari, 2 000 ft., VIII. 1880, J.S. Gamble 8322 (K, photo !)

Herbs. Stem short, hirsute, with sessile glands. Leaves opposite, subequal, lowermost pair radical, 6 – 18 × 4.6 – 14 cm, ovate to subrotund, base cordate, margin crenate, apex obtuse; upper surface appressed strigose, with sessile glands, lower surface puberulous, gland dotted, appressed strigose along veins; lateral nerves 6 – 8 on either side of mid vein. Petiole 1 – 8.5 cm long, appressed pubescent. Peduncle glandular pubescent. Bracts 3 – 4 × 4 – 5 mm, ovate, gland dotted, strigose, sparsely glandular. Pedicel 8 – 18 mm long, glandular pubescent. Calyx campanulate; tube 3 – 4 mm long; lobes 1.5 – 2 mm long, triangular, apex acute, margin entire, glandular pubescent with glands outside, glabrous inside. Corolla purple, 3.5 – 4.2 cm long, glabrous, tube narrowly cylindrical, inflated

near mouth; upper limb large, oblique, lobes rounded. Anthers glabrous. Ovary glabrous. Capsule 40 – 45 mm long, stipitate.

Flowering and Fruiting: July – August.

Distribution: India (West Bengal: Darjeeling, Sikkim).

Specimen examined: Sikkim, East district, Machong, Rikep, Barapathling, 7 Jul. 1991, N.R. Mondal & P. Singh 13484 (BSHC).

15. *Didymocarpus wengeri* C.E.C. Fisch., Kew Bull. 1928: 74. 1928; et Rec. Bot. Surv. India 12 (2): 118. 1938.

Type: India, Mizoram (previously Assam), South Lushai Hills, 2500 ft., Sept. 1927, Wenger (K, photo!)

Herbs. Stem hirsute. Leaves opposite, 1 – 2 pairs, 1.8 – 6 × 1.5 – 6 cm, orbicular, base unequal, cordate, margin crenate to serrate, apex rounded; upper surface villous-ciliate, lower surface puberulous, hirsute along veins, with glandular hairs; lateral veins 5 – 7 on either side of mid vein. Petiole 2 – 5 cm long, hirsute. Inflorescence 5 – 8 cm long, hirsute. Peduncle 7 – 9 cm long, glandular hirsute. Bracts 1 – 2 mm in diam., reddish brown, orbicular, sparsely hirsute on upper surface, glandular hirsute on lower surface. Pedicel 2 – 4 mm long, glandular hirsute. Calyx 5-sect from base, segments 3 – 4 mm long, linear lanceolate, glabrous. Corolla pink red, with yellow streaks, 1 – 1.7 cm long, glabrous to capitate glandular hairy, tube infundibuliform, 0.8 – 1 cm long; lobes yellow, orbicular, 4 – 5 mm wide. Stamens glabrous. Ovary linear elliptic, glabrous; style equals the length of the ovary; stigma peltate, 2-lobed. Capsules linear.

Flowering and Fruiting: August–January.

Distribution: India (Mizoram). Endemic

Note: Description based on literature and on the photograph of the type specimen. No specimen found at CAL, BSHC, ARUN and ASSAM.

9. *EPITHEMA* Blume, Bijdr. Fl. Nederl. Ind. 13: 737. 1826.

Type: *Epithema saxatile* Blume

About 10 species in SE Asia; 1 species in NE India.

Epithema carnosum Benth., Scroph. Ind. 57. 1835; C.B. Clarke, Commelyn. Cyrtandr. Bengal 129, t. 90. 1874 & in Hook.f., Fl. Brit. India 4: 369. 1884; Kanjilal & al., Fl. Assam 3: 399. 1939; Wang & al., in Fl. China 18: 401. 1998; Giri & al., Mat. Fl. Arunachal Pradesh 231. 2008; O.M. Hillard in Grierson and Long, Fl. Bhutan 2(3): 1330. 2001.

Type: Napalia, 1832, Wall. Cat. Num. List no. (K, n.v.)

Herbs. Stems 8 – 16 cm, spreading puberulent. Basal stem leaves always unpaired, upper leaves opposite, rarely

unpaired; (3) 7 – 12 (14) × 3 – 8 cm, cordate to ovate, base cordate, rarely oblique, margin serrate to create, at times wavy to subentire, or dentate near base, apex obtuse to subacute; glands present on the upper surface, mildly hirsute on both surfaces, base of the hair broad, c. 0.5 mm long; veins prominent on both surfaces, lateral nerves 7 – 12 on either side of the mid-rib. Petioles 1 – 7 (9) cm long, puberulent. Cyme dense, pseudoterminal or axillary, many-flowered. Peduncles 1 – 5 cm long, minutely puberulent. Bracts 1, covering a part of inflorescence, subspathaceous, obovate, margin coarsely toothed, truncate at apex, 5 – 10 × 6 – 10 mm, puberulent. Pedicels 2 – 4 mm long, puberulent. Flowers often cleistogamous. Bracteoles solitary, 0.1 – 0.2 mm long, linear. Calyx 5-lobed from above middle, 3.5 – 4 × 1 – 2 mm, lobes triangular, equal to subequal, apex acute, margin entire, hirsute on the outer surface, inner surface glabrous. Corolla purplish white, tube tubular, longer than limb, 3 – 4 × 2 mm, outside glandular, inside sparsely puberulent centrally; limb 2 lipped c. 2 mm long, lower lip 2-lobed, upper lip 3-lobed, lobes subequal, 5 – 6 × 2 – 3 mm long, apex notched. Filaments 2 – 3 mm long, glabrous; anthers dehiscing longitudinally, c. 1 mm long; disc annular, absent in cleistogamous flowers. Ovary ovoid to globose, puberulent toward style, 1 – 2 × c. 1 mm; style simple, 1 – 2 mm long; stigma 1, terminal, subcapitate, undivided. Capsules globose to subglobose, 2 – 3 mm in diam, enclosed within a calyx tube. Seeds oblong or ellipsoid, minute, 0.1 – 0.2 mm long, subacute at both ends, smooth.

Flowering and Fruiting: June–November.

Habitat: Crevices of rocks in shaded places, dense forests.

Distribution: India (Meghalaya, Arunachal Pradesh, West Bengal), Myanmar, Bhutan, Nepal, Sri Lanka, Borneo, Taiwan, China, Thailand.

Specimens examined: Darjeeling, Rishap, 914 m, 2nd Aug. 1870, C.B. Clarke 12300C (CAL herb. acc. no. 331817); Sikkim Himalaya, 21st July 1857, T. Thomson s.n. (CAL herb. acc. no. 331841); Sikkim, 23rd Sept. 1857, T. Thomson s.n. (CAL herb. acc. no. 331827); Sikkim Himalaya, 610 m, 8th Aug. 1872, G. King s.n. (CAL); Sikkim Himalaya, 1878, G. King s.n. (CAL herb. acc. no. 331823); Khasi, 609–914 m, Aug. 1883, G. Mann s.n. (CAL); Khasi, Jantia Hills (Syndai – Muktapur), 17th Aug. 1968, N.P. Balakrishnan 46147 (CAL); North Jaintia Hills, 609–914 m, Aug. 1883, G. Mann s.n. (ASSAM herb. acc. no. 21020).

Note: *Epithema carnosum* var. *dentatum* C.B. Clarke describes from Burma was raised to species level by B.L. Burtt. This variety was initially differentiated from the typical variety based on denticulate leaf margin and sometimes acute to subacute apex. While studying *E. carnosum* specimens it has been observed that few specimens show dentate leaf especially near base. On the basis of this observation it is felt necessary to reinstate the varietal status of *Epithema dentatum* (C.B. Clarke) B.L. Burtt to *E. carnosum* var. *dentatum*.

10. HEMIBOEIA C.B. Clarke, Hooker's Icon. Pl. 18: t. 1798. 1888. *Type:* *Hemiboeia follicularis* C.B. Clarke

23 species in China, Japan, Vietnam; Only 1 species in NE India.

Hemiboea subcapitata C. B. Clarke, Hooker's Icon. Pl. 18: sub t. 1798. 1888; Wang & al., Flora of China 18: 298. 1998.

Type: China, Ichang, Dr. Henry 4894 (K000252075, photo!). Lectotype designated here.

Herbs. Stems 15 – 30 cm long, sparsely purple-brown, glabrous to pubescent. Leaves opposite, 6 – 16 × 4 – 8 cm, elliptic to ovate, base unequal, cuneate to attenuate, margin entire to subentire, apex acute to acuminate; upper surface sparsely white pilose to glabrescent when mature, lower surface glabrous; lateral veins 4 – 6 on each side of midrib. Petioles 1 – 3 cm long, sparsely pilose to glabrescent. Cymes axillary or pseudoterminal, 2 – 5 flowered. Peduncles 1 – 6 cm long, glabrous. Bracts 1 – 1.5 cm in diam., outside glabrous. Calyx 5-sect from base, segments 5 – 10 × 2 – 3 mm, equal, lanceolate to elliptic, glabrous. Corolla outside creamy white, inside purple spotted, outside sparsely glandular puberulent, inside glabrous with a ring of hairs near the base; tube c. 27 mm long; upper lip c. 6 × 5 mm, lower lip c. 8 × 6 mm, apex acute. Filaments 7 – 9 mm long, glabrous, slender; anthers 3 – 4 mm long; staminodes 2, 3 – 4 mm long. Ovary c. 2 cm long, glabrous; style c. 1 cm long, glabrous, stigma obtuse. Capsules 1 – 2 cm long.

Flowering and Fruiting: August–December.

Habitat: On moist walls and shaded wet forests.

Distribution: NE India (Arunachal Pradesh), China, Vietnam (?).

Specimen examined: Arunachal Pradesh, Siang, Mingning to Pang, 762 m, 15 Nov. 1958, R.S. Rao 17683 (ASSAM herb. acc. no. 16306).

Note: Clarke (1888) cited two collections (4894 and 4215A), both by Dr. Henry from Ichang, China, in the

protologue. Both the collections are at K. The sheet with the collection no. 4215A (K000858077) was annotated by Clarke as *Hemiboea capitata* whereas the one with collection no. 4894 (K000252075) was annotated as *Hemiboea subcapitata*. Hence *Dr. Henry* 4894(K000252075) has been designated here as the lectotype to avoid any confusion.

11. HENCKELIA Spreng., Anleit. Kenntn. Gew., ed. 2, 2(1): 402. 1817.

Type: Henckelia incana (Vahl) Spreng.

About 140 species in Bhutan, Borneo, China, India, Indonesia, Laos, Malaysia, Myanmar, Nepal, Thailand, Vietnam; 15 species in NE India.

KEY TO THE SPECIES

- 1a. Plants usually with 2 leaves, one much smaller than the other. 3. *H. bifolia*
- 1b. Plants with several leaves. 2
- 2a. Plants stemless, or stems prostrate and rooting at nodes. 3
- 2b. Plants stemmed, stems erect. 5
- 3a. Upper surface of leaf pubescent, margin serrate. 9. *H. lachensis*
- 3b. Leaves densely villous. 4
- 4a. Petiole 2 – 3.8 cm long. 10. *H. mishmiensis*
- 4b. Petiole 4 – 15 cm long. 12. *H. primulacea*
- 5a. Stem hairy or glabrescent, leaves at least on upper surface hairy. 6
- 5b. Stem and leaves glabrous. 12
- 6a. Petiole 5 – 20 cm long, upper 2 pairs of leaves crowded near apex. 14. *H. speciosa*
- 6b. Petiole 0.6 – 6.5 cm long, leaves on stem widely placed. 7
- 7a. Leaves basal and on stem. 7. *H. grandifolia*
- 7b. Leaves all on stem. 8
- 8a. Upper surface yellow glandular, lateral veins 8 – 13 on each side of midrib. 11. *H. oblongifolia*
- 8b. Upper surface puberulent, eglandular; lateral veins 5 – 10 on either side of midrib. 9
- 9a. Plants perennial, corolla inside minutely glandular puberulent. 10
- 9b. Plants annual, corolla inside glabrous. 11

- 10a. Calyx with a distinct tube. 14
- 10b. Calyx free. 1. *H. adenocalyx*
- 11a. Upper surface of leaf sparsely glandular. 6. *H. dimidiata*
- 11b. Upper surface of leaf eglandular. 13
- 12a. Leaf margin ciliate. 4. *H. calva*
- 12b. Leaf margin not ciliate. 5. *H. dibangensis*
- 13a. Stems glabrous to sparsely pubescent or pilose apically, stigma obtrapeziform. 2. *H. anachoreta*
- 13b. Stem pubescent to pilose, stigma flabellate. 13. *H. pumila*
- 14a. Calyx tube 1–1.5 cm long. 15. *H. urticifolia*
- 14b. Calyx tube 7 – 10 mm long. 8. *H. hookeri*

1. Henckelia adenocalyx (Chatterjee) D.J. Middleton & Mich. Möller, Taxon 60: 774. 2011. *Chirita adenocalyx* Chatterjee, Kew Bull. 1948: 63. 1948; Giri & al., Mat. Fl. Arunachal Pradesh 2: 228. 2008.

Type: Burma, Kampti, Nama Uka, Marao Uka, 770 m, Dec. 1911, S.M. Toppin 4215 (K photo!).

Perennial herbs. Stems erect, yellow brown tomentose. Leaves opposite, 12 – 17 × 6 – 10 cm, elliptic to ovate, base oblique, broadly rounded, margin dentate to serrate, apex acute to acuminate; papery, upper surface puberulent, lower surface puberulent along veins; lateral veins 7 – 9 on either side of midrib, conspicuous. Petiole 2 – 7 cm long, glabrescent. Cymes 1 – 3 flowered. Peduncle 2 – 5 cm long, yellow tomentose. Bracts 2, free, 9 – 20 × 3 – 5 mm, lanceolate to ovate, nearly glabrous to pubescent, margin subentire to denticulate, apex acute. Pedicel 20 – 22 mm long, puberulent. Calyx 5, free, 1.5 – 2 cm long, equal, narrowly triangular to lanceolate, margin subentire, apex subacute; 3-veined; outside sparsely puberulent, inside white glandular. Corolla yellow to white, 4 – 5 cm long, outside sparsely puberulent to sparsely pilose, inside glabrous to minutely glandular; tube narrowly funnelform, 3.2 – 3.7 × 1.5 – 2 cm; upper lip 1.2 – 2 cm long; lower lip 1.5 – 2 cm long. Filaments 1.2 – 1.5 cm long, glabrous, curved; anthers 5 – 7 mm long, fused by entire upper surfaces, glabrous. Ovary 2.2 – 3.5 cm long, puberulent; style 5 – 11 mm long, puberulent; stigma deeply 2-lobed, lobes 0.7 – 1.2 mm long. Capsule straight, 5 – 7 cm long.

Flowering and Fruiting: June – December.

Distribution: India (Arunachal Pradesh). Myanmar.

Specimens examined: Arunachal Pradesh, Siang, Garsing to Eyo, 605 m, 22 Nov. 1958, *R.S. Rao 17938* (ASSAM herb. acc. no. 16252); West Siang, Hergo to Kaying, 600m, 19 Nov. 2010, *M. Bhaumik 25322* (ARUN herb. acc. no. 18089).

2. *Henckelia anachoreta* (Hance) D.J. Middleton & Mich. Möller in A. Weber & al., *Taxon* 60 : 774. 2011. *Chirita anachoreta* Hance, *Ann. Sci. Nat., Bot., sér. 5*. 5: 231. 1866; Wang & al., *Flora of China* 18: 343. 1998.

Type: China, 27 Jul. 1864, *G. Theophilus Sampson s.n.* (BM, photo !)

Annual herbs. Stems erect, glabrous to sparsely pubescent or pilose apically. Leaves opposite; lanceolate to ovate elliptic, 3 – 12 × 2 – 7.5 cm, broadly cuneate to cordate, margin denticulate or crenulate, apex acute to acuminate; sparsely puberulent to sparsely pilose base oblique; lateral veins 6 – 10 on each side of midrib. Petiole 0.5 – 5 cm long. Cymes 3 – 5 flowered. Peduncle 3 – 7 cm, glabrous to sparsely pubescent. Bracts 2, free, 4 – 7 mm long, lanceolate to ovate, margin entire to remotely denticulate, apex acute, puberulent. Pedicel 1 – 2 cm long, glabrous to sparsely pubescent. Calyx 5-lobed from near middle; tube 3 – 5 mm long; lobes slightly unequal, 5 – 8 mm long, narrowly triangular to triangular, outside sparsely puberulent to glabrous, inside glabrous, margin entire, apex acuminate. Corolla white to yellow with yellow or purple markings or blue-purple, 3 – 6 cm long, outside glabrous to sparsely puberulent, inside glabrous; tube tubular, 2.5 – 4 cm long; lower lip 5 – 8 mm long; upper lip 1 – 1.7 cm long. Filaments 1 – 1.2 cm long, glabrous to sparsely puberulent; anthers 2 – 3 mm long, fused by entire upper surfaces, glabrous. Ovary 1.5 – 2.5 cm long; style 5 – 7 mm long, glabrescent; stigma obtrapeziform, 2-lobed. Capsule 7.5 – 12 cm long, glabrous.

Flowering and Fruiting: July–November.

Habitat: On rocks in forests, valley streamsides; 200–2300 m.

Distribution: India (Nagaland, Arunachal Pradesh), China, Laos, Myanmar, Thailand, Vietnam.

Specimens examined: Kurung Kumey, Palin to Yanglang, *S.S. Dash 31197* (ARUN herb. acc. no. 11395).

3. *Henckelia bifolia* (D. Don) A. Dietr. *Sp. Pl.* 1: 574. 1831. *Chirita bifolia* D. Don, *Prodr. Fl. Nep.* 90. 1825; Clarke in Hook.f., *Fl. Brit. India* 4: 357. 1884; O. M. Hillard in Grierson & D.G. Long, *Fl. Bhutan* 2(3): 1320. 2001.

Type: Nepal, *Wallich 806A* (BR photo!)

Perennial, rhizomatous herbs, erect stem up to 25 cm tall. Stem puberulent with 1 – 2 rudimentary leaves near base. Leaves 2, unequal, at apex; larger leaves sessile, 5 – 10 × 5 – 9 cm, ovate to orbicular, base cordate, margin crenate to subentire, apex rounded or with an apical notch; lateral veins 3 – 5 on either side of mid vein; puberulent on both surfaces; smaller leaf ovate, 2 – 5 × 3 – 4 cm, puberulent on both surfaces; lateral veins 2 – 3 on either side of mid vein; shortly petiolate, 1 – 2.2 mm long, puberulent. Inflorescence 1 – 2 flowered. Peduncles 0.5 – 5 cm long, puberulous. Bracts 4 – 9 × 3 – 5 mm, ovate, margin subentire, apex acute, puberulent. Pedicel 1 – 2.4 cm long, puberulous. Calyx 5-sect from near base; tube 5 – 10 mm long; segments 4 – 10 mm long, lanceolate, margin subserrate, apex acute, outside stringly pubescent, inside glabrous. Corolla infundibuliform, white with yellow band inside, limb pale blue to bright purple, 3 – 5 cm long, glabrescent, inside apically 2 glandular flanges; tube 2 – 3 × 0.8 – 1.2 cm, tubular; upper lip 1 – 1.3 cm long, lower lip 6 – 9 mm long, lobes rounded, apex rounded to subacute. Filaments 5 – 7 mm long, glandular puberulent; anthers 2 – 2.5 mm long, bearded, glabrous. Ovary 1 – 1.8 cm long, puberulent; style 6 – 7 mm long, sparsely puberulent; stigma shallowly lobed. Capsule 6 – 12 cm long, glabrous.

Flowering and Fruiting: June – August.

Habitat: in shady places, on forest slopes.

Distribution: India (Arunachal Pradesh), Bhutan, Nepal.

Specimen examined: Arunachal Pradesh, Kameng, near Lumla, 23 Aug. 1976, *P.K. Hajra 68467* (ASSAM herb. acc. no. 50361).

4. *Henckelia calva* (C.B. Clarke) D.J. Middleton & Mich. Möller, *Taxon* 60: 775. 2011. *Chirita calva* C.B. Clarke in Candolle & Candolle, *Monogr. Phan.* 5(1): 116. 1883; C. B. Clarke in Hook.f., *Fl. Brit. India* 4: 358. 1884. *Chirita glabra* sensu C.B. Clarke, non Miquel, Commelyn. *Cyr-tandr. bengal. t.* 73. 1874.

Type: India, Sikkim, Lachen, 5 Aug. 1849, *J.D. Hooker s.n.* (K, Photo !)

Annual herbs. Stems erect, glabrous. Leaves opposite, unequal, larger leaf 2.5 – 10 × 2.5 – 5 cm, larger leaf 10 – 22 × 5 – 7 cm, elliptic to oblong elliptic, base oblique, broadly rounded, margin entire to subentire, apex acute to acuminate; papery, glabrous, ciliate along margin; lateral veins 7 – 9 on either side of midrib, conspicuous. Petiole 2 – 7 cm long, glabrous. Cymes 1 – 3 flowered. Peduncle 2 – 3 cm long, glabrescent. Bracts 2, free, 3 – 10

× 1–2 mm, linear to lanceolate, nearly glabrous to pubescent, margin subentire, apex acute. Pedicel 1–2 cm long, glabrous. Calyx 5-sect from below middle, equal; tube 4–11 mm long, tubular; segments narrowly triangular to lanceolate, margin subentire, apex acute; glabrous. Corolla yellow to white, limb purple; 4–6 cm long, outside sparsely puberulent to sparsely pilose, 2 glandular flanges inside on roof of the tube, glabrous; tube narrowly funnelform, 3.2–3.7 × 1.5–2 cm; upper lip 1.2–2 cm long; lower lip 1.5–2 cm long. Filaments 1.2–1.5 cm long, glandular puberulent; anthers 5–7 mm long, glabrescent. Ovary 2.2–3.5 cm long, gland dotted; style 5–11 mm long, puberulent; stigma 2-lobed. Capsule straight, 5–9 cm long.

Flowering and Fruiting: June–December.

Distribution: India (Arunachal Pradesh, Sikkim, West Bengal), Myanmar.

Specimens examined: West Bengal, Darjeeling, Aug. 1882, J.S. Gamble 10535 (CAL herb. acc. no. 332862); Sikkim, 1891, G.A. Gamble s.n. (CAL herb. acc. no. 33866); Sikkim, without locality, Kurz s.n. (CAL herb. acc. no. 332867)

5. *Henckelia dibangensis* (B.L. Burt, Srivastava & Mehrotra) D.J. Middleton & Mich. Möller in A. Weber & al., *Taxon* 60: 775. 2011. *Chirita dibangensis* B.L. Burt, Srivastava & Mehrotra, *Notes Roy. Bot. Gard. Edinburgh* 45: 469. 1988; Giri & al., *Mat. Fl. Arunachal Pradesh* 2: 229. 2008.

Type: India, Arunachal Pradesh, Hunli, Dibang valley, S.K. Srivastava 16730 (CAL !)

Annual herbs. Stems erect, glabrous. Leaves opposite, 6–12 × 4–6.5 cm, ovate to elliptic, base oblique, cuneate, margin denticulate to subentire, apex acute to acuminate; glabrous; lateral veins 5–7 on each side of midrib, conspicuous. Petiole 1–4 cm long, glabrescent. Cymes 1–2 flowered. Peduncle 1–2 cm long, glabrescent. Bracts 2, 1–2 × 1–2 mm, lanceolate to ovate, puberulent, margin minutely denticulate, apex acute. Pedicel 0.5–2 cm long, glabrous to sparsely pubescent, at times glandular puberulent. Calyx 5-lobed from near middle, tube 2–6 mm long; lobes 4–6 × 2–3 mm, subequal, narrowly triangular, outside sparsely puberulent, inside glabrous, margin entire, apex acuminate. Corolla white with 2 yellow lines on throat, 3–5 cm long, outside sparsely puberulent, inside glabrous; tube 2–3 cm long; lower lip 5–7 mm long, upper lip 7–10 mm long. Filaments 1–1.2 cm long, sparsely puberulent; anthers 1–2

mm long, fused by entire upper surfaces, glabrous. Ovary 1.5–2.5 cm long, sparsely puberulent; style 1–1.5 cm long, glabrescent; stigma obtrapeziform, 2-lobed. Fruit not seen.

Flowering and Fruiting: July–November.

Habitat: On moist grassy slopes.

Distribution: India (Arunachal Pradesh). Endemic.

Note: Description based on type, later collections not seen at CAL, ASSAM, BSHC or ARUN.

6. *Henckelia dimidiata* (Wall. ex C.B. Clarke) D.J. Middleton & Mich. Möller, *Taxon* 60: 775. 2011. *Chirita dimidiata* Wall. ex C.B. Clarke in A.DC. & C.DC., *Monogr. Phan.* 5: 115. 1883; C. B. Clarke in Hook.f., *Fl. Brit. India* 4: 357. 1884.

Syntypes: Sikkim, Assam, Bhutan, Khasi, Wallich (L, K, BM, W); Hooker & Thomson (K, BM, W)

Annual herbs. Stems erect, glabrous to sparsely pubescent. Leaves opposite, 6–12 × 2–6.5 cm, lanceolate to elliptic, base oblique, cuneate to cordate, margin denticulate, apex acute to acuminate; upper surface sparsely glandular puberulent; lateral veins 6–10 on each side of midrib, conspicuous. Petiole 1–4 cm long, glabrescent. Cymes 2–5 flowered. Peduncle 2–6 cm long, glabrescent. Bracts 2, 2–4 × 1–2 mm, lanceolate to ovate, puberulent, margin minutely denticulate, apex acute. Pedicel 0.5–2 cm long, glabrous to sparsely pubescent, at times glandular puberulent. Calyx 5-lobed from near middle, tube 2–10 mm long; lobes 4–6 × 2–3.5 mm, subequal, narrowly triangular, outside sparsely puberulent, with few glands, inside glabrous, margin entire, apex acuminate. Corolla white to yellow, 3–5 cm long, outside sparsely puberulent, inside glabrous; tube 2.5–4 cm long; lower lip 7–10 mm long, upper lip 10–12 mm long. Filaments 1–1.2 cm long, sparsely puberulent; anthers 1–2 mm long, fused by entire upper surfaces, glabrous; staminodes 2, 1–3 mm long. Ovary 1.5–2.5 cm long, sparsely puberulent; style 1–1.5 cm long, glabrescent; stigma obtrapeziform, 2-lobed. Capsule erect, 6–15 cm long.

Flowering and Fruiting: July–November.

Habitat: Rocks in forests, valley streamsides.

Distribution: India (Sikkim, Assam, Meghalaya). Laos, Myanmar, Thailand, Vietnam, China.

Specimens examined: Meghalaya, Pangtum forests, 22 Feb. 1935, R. Sharma 12197 (ASSAM herb. acc. nos. 20924, 20901).

Note: Since all the syntypes were not available for study lectotypification was avoided.

7. *Henckelia grandifolia* A. Dietr., Sp. Pl., ed. 6, 1: 576. 1831. *Chirita macrophylla* Wall., Pl. Asiat. Rar. 1: 56. 1830; C. B. Clarke in Hook.f. Fl. Brit. India 4: 358. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 2: 229. 2008. *Chirita macrophylla* var. *tirapensis* (Panigrahi) Deb & Dutta J. Bombay Nat. Hist. Soc. 68(31): 579. 1972.

Type: Nepal, 1830, Wall. Cat. Num. List no. 805 (K, photo !)

Perennial herbs. Stems erect, appressed puberulent. Basal leaves 2, stem leaves 1 – 3 pairs, opposite, unequal, 8 – 17 × 6 – 15 cm, ovate to elliptic, base oblique, cordate to rounded, margin dentate to serrate, apex abruptly acuminate to rounded; upper surface appressed puberulent, lower surface sparsely pubescent; lateral veins 5 – 7 on each side of midrib, conspicuous. Petiole 1.2 – 3.5 cm long, puberulous. Cymes 1 – 6 flowered. Peduncle 5 – 15 cm long, sparsely pubescent. Bracts 2, free, 0.4–2 cm × 1–10 mm, ovate or elliptic to suborbicular, sparsely pubescent, margin entire to dentate, apex acute to rounded at times. Pedicel 1 – 2 cm long, sparsely pubescent. Calyx 5-lobed from above to near middle; lobes 8 – 11 × 2 – 3 mm, unequal, narrowly triangular, glabrous to sparsely puberulent outside, inside glabrous, margin entire, apex acute; tube 7 – 11 mm long. Corolla white to yellow, 4.5 – 5.5 cm long, glabrous; tube 3 – 4 cm long; upper lip c. 9 mm long; lower lip c. 1.1 cm long. Filaments c. 1 cm long, glabrous; anthers 3–4 mm long, fused by entire upper surfaces, glabrous; staminodes 3, central c. 2 mm long, laterals 3.5–5.5 mm long. Ovary c. 1.5 cm long; stigma flabellate, c. 3 mm long, 2-lobed. Capsule 8 – 13 cm long.

Flowering and Fruiting: June–December.

Habitat: Rocks in forests; 1300 – 3100 m.

Distribution: India (Assam, Meghalaya, Arunachal Pradesh, Mizoram). Bhutan, Myanmar, Nepal, Thailand, China.

Specimens examined: Arunachal Pradesh, Tirap, Rahu to Wakka, 2 July 1961, D.B. Deb 26449 (ASSAM herb. acc. no. 27755); Arunachal Pradesh, Tirap, Chenglang to Khela, G.K. Murthy 12953 (ASSAM herb. acc. no. 13576); Mizoram, Mizo hills, Thalthlang, 13 July 1963, R.M. 33956 (ASSAM herb. acc. nos. 41835, 41836); Meghalaya, Khasi hills, Lailaughati, 1219 m, July 1886, G. Mann s.n. (ASSAM herb. acc. no. 20927).

8. *Henckelia hookeri* (C.B. Clarke) D.J. Middleton & Mich.Möller, Taxon 60: 775. 2011. *Chirita hookeri* C.B. Clarke, Commelyn. Cyrtandr. Bengal. 102. t. 70. 1874; C.B. Clarke in Hook.f., Fl. Brit. India 4: 359. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 2: 229. 2008.

Type: India, Mishmee hills, Griffith 3826 (K, n.v.)

Herbs to subshrubs. Stem villous. Leaves opposite, unequal, 11 – 15 × 5–7 cm, margin serrate, apex acute to acuminate, base unequal cordate to cuneate, upper surface pilose. Petiole 2 – 6 cm long, puberulous. Peduncle 1 – 6 cm long, villous. Bracts 1.7 – 2 cm long, ovate oblong, minutely pubescent. Pedicel 1 – 2 cm long, villous. Calyx 5-sect from below middle; tube 7 – 10 mm long; segments 10 – 13 mm long, triangular to lanceolate, outside puberulous, inside glabrous. Corolla pink, 5 – 6 cm long, outside sparsely puberulent to sparsely pilose, inside glabrous to minutely glandular; tube narrowly funnelform, 3 – 3.5 × 1.5 – 2 cm; lower lip 1.5 cm long; upper lip 2 cm long. Filaments c. 1.5 cm long, glabrous; anthers fused by entire upper surfaces, c. 2 mm long, glabrous. Ovary 15 – 19 mm long, glabrous; style 10 – 12 mm long, pilose; stigma bifid.

Flowering and Fruiting: September–November.

Habitat: In bushes on moist floor, 312 – 1233 m.

Distribution: NE India (Assam, Arunachal Pradesh, Nagaland).

Specimens examined: Arunachal Pradesh, Tirap, Nampong to Nansupass, 316–1233 m, 12 Oct. 1959, R.S. Rao 20079 (ASSAM herb. acc. no. 16254); Arunachal Pradesh, Tirap, Eyo to Tuting, 457–609m, 23 Nov. 1958, R.S. Rao 17980 (ASSAM herb. acc. no. 13564); Arunachal Pradesh, Lower Subansiri, hapali Pange road, 31 Oct. 1980, G.D. Pal 78365 (ARUN 2835); Nagaland, Tseminyu, 17 Nov. 1973, T.M. Hynniewta 56134 (ASSAM herb. acc. no. 59882).

9. *Henckelia lachenensis* (C.B. Clarke) D.J. Middleton & Mich.Möller, Taxon 60: 776. 2011. *Chirita lachenensis* C. B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 118. 1883.

Type: India, Sikkim, Lachen, 2500 m, Hook.f. (K, photo !)

Perennial, rhizomatous, herbs or lianas. Stems absent or prostrate and rooting at nodes, puberulent. Leaves 2 – 8, basal, sometimes alternate or opposite; 5– 14 × 3.4–9 cm, ovate to narrowly ovate or rarely oblong, base oblique, cuneate to cordate on 1 side, rounded to cordate on other, margin dentate to serrate, apex acute to obtuse or abruptly acuminate; upper surface puberulent, lower surface pubescent only along veins, lateral veins 6–8 on each side of midrib, conspicuous. Petiole 2–18 cm long. Cymes 1 – 4 flowered. Peduncle 4.5 – 17 (21) cm long, puberulent to villous. Bract 1, 1.8 – 7 × 1 – 3 mm, narrowly ovate or oblong, sparsely puberulent to villous, margin sparsely serrate to subentire, apex acute. Pedicel 2 – 4 cm long, sparsely puberulent to villous. Calyx 5-sect from near

base or near middle; tube 1.5 – 7 mm long; lobes equal, 3 – 10 mm long, lanceolate-linear to ovate, margin entire, apex subulate-acuminate to acute, outside puberulent to sparsely villous, inside glabrous. Corolla white or tinged pink to blue, 3 – 4.5 cm long, outside puberulent, inside apically sparsely puberulent; tube 2–3 × 0.8–1.2 cm, tubular; upper lip 1 – 1.3 cm long, lower lip 6 – 9 mm long, lobes rounded, apex rounded to subacute. Filaments 5 – 7 mm long, puberulent; anthers 2 – 2.5 mm long, fused by entire upper surface surfaces, glabrous; staminodes 2, c. 1.7 mm long. Ovary 1 – 1.8 cm long, puberulent; style 6 – 7 mm long, sparsely puberulent; stigma suboblate to 2-lobed. Capsule 6 – 12 cm long, glabrous.

Flowering and Fruiting: June–December.

Distribution: India (Sikkim, Assam), China, Bhutan, Myanmar.

Specimens examined: Sikkim, Dentam, 1600m, 29 Aug. 1994, *P. Singh* 16349 (BSHC herb. acc. nos. 30468, 30470); Sikkim, Shotak, 23 July 1985, *D.C.S. Raju* 3884 (BSHC herb. acc. no. 28872); Sikkim, Gangtok towards kabi, 7 Aug. 1990, *D.C.S. Raju & team* 13067 (BSHC herb. acc. no. 28870); Sikkim, Lingja to Pentong, 19 Aug. 1989, *N.R. Mondal* 11111 (BSHC herb. acc. no. 28871).

10. *Henckelia mishmiensis* (Debbarm. ex Biswas) D.J. Middleton & Mich. Möller, *Taxon* 60: 776. 2011. *Chirita mishmiensis* Debb. ex Biswas, *Assam Forest Rec.*, Bot. 1: 21, t. 9. 1934; Kanjilal & al., *Fl. Assam*, 3: 396. 1939; Chauhan & al., in Hajra (ed.), *Contrib. Fl. Namdhapa* 236. 1996.

Type: Assam, Mishmi, *Biswas s.n.* (ASSAM !)

Perennial, rhizomatous herbs. Leaves developing from the base to near base, 9.8 – 20.2 × 2.8 – 3.8 cm, elliptic oblong, base cuneate, margin crenate to serrate, apex acute; upper surface tomentose, lower surface appressed villous; lateral nerves 8 – 10 on either side of midvein. Petiole 2 – 3.8 cm long, white villous. Pedicel 0.5 – 2 cm long, villous. slender, single flowered. Calyx 5-partite from above, middle, segments 5 – 8 mm long, subequal, triangular to subulate, apex acute, glabrescent outside, puberulous inside. Corolla puberulous, yellow, 5 – 6 cm long; tube narrowly funnelform, 3.5 – 4 cm long; 5-lobed, 1.8 – 2.2 cm long, lobes subequal, rounded, purplish; Filaments 3.5 – 4 cm long, geniculate, glabrous below, barbate at apices; anthers 3 – 5 mm long. Ovary 3 – 4 cm long, finely pubescent; style 1.5 – 1.8 cm long, pubescent; stigma emarginated, smooth. Capsule 5 – 7 mm long.

Flowering and Fruiting: March–June.

Habitat: On damp rock surfaces, 600 – 1675 m.

Distribution: India (West Bengal: Darjeeling; Sikkim).

Specimens examined: Arunachal Pradesh, Lohit, Shoeeling to Paya, 625 – 300 m, 15 Nov., 1957, *R.S. Rao* 10635 (ASSAM herb. acc. nos. 25498, 24599).

11. *Henckelia oblongifolia* (Roxb.) D.J. Middleton & Mich. Möller, *Taxon* 60: 776. 2011. *Chirita oblongifolia* (Roxb.) Sinclair, *Bull. Bot. Soc. Bengal* 9: 102. 1957; Balakr., *Fl. Jowai* 2: 347. 1983; Chauhan & al. in Hajra (ed.), *Contrib. Fl. Namdhapa* 236. 1996. *Incarvillea oblongifolia* Roxb., *Fl. Ind.*, ed. 2, 3: 113. 1832.

Type: Bangladesh, Chittagong, 1810, *Roxburgh* 238 (BM, n.v.)

Perennial herbs. Stems erect, rust-brown puberulent towards apex. Leaves opposite, 8 – 18 × 5–10 cm, ovate to elliptic or oblong, base oblique, cuneate to cordate, margin denticulate, apex acuminate; densely puberulent on both surfaces, upper surface yellow glandular, lateral veins 8 – 13 on each side of midrib. Petiole 1.6 – 4 cm long. Cymes 5 – 7-flowered. Peduncle 1.8 – 3.8 cm long, densely rust-brown puberulent. Bracts 2, 3 – 4 × 2 – 3 mm, ovate, densely puberulent, margin denticulate, apex acute. Pedicel 0.5–1.5 cm long, densely rust-brown puberulent. Calyx 5-lobed from above middle; tube 7 – 9 mm long; lobes 3 – 5 mm long, equal, triangular, outside densely puberulent and glandular, inside glabrous, margin entire, apex acute to acuminate. Corolla white with yellow at throat, 4 – 4.5 cm long, outside sparsely puberulent, inside glabrous; tube funnelform, 2.7 – 3 cm long; lower lip 5 – 7 mm long, upper lip 1 – 1.2 cm long, margin entire, apex rounded to subacute. Filaments 1.3 – 1.5 cm long, glabrous; anthers 1.5 mm long, fused by entire upper surfaces, glabrous; staminodes 2, c. 6 mm long. Ovary 1.7 – 2 cm long, puberulent; style 5 – 8 mm long, puberulent; stigma peltate or 2-lobed. Capsule 5 – 8 cm long, glabrous.

Flowering and Fruiting: August–October.

Habitat: In evergreen forests, moist places on rock crevices; 800–1200 m.

Distribution: India (Assam, Meghalaya, Arunachal Pradesh). China, Myanmar, Bangladesh.

Specimens examined: Assam, Khasi hills, 1219 m, Aug. 1885, *G. Mann* (ASSAM herb. acc. nos. 20928, 20929); Meghalaya, Barapani, 14 Oct. 1930, *R. Sharma* 8680 (ASSAM herb. acc. no. 20923); Meghalaya, Daribokgr, 5 Mar. 2007, *R. Shray* 114436 (ASSAM herb. acc. no. 68214); Meghalaya, Khasia-Jaintia hills, Railiang, 23 Nov. 1969,

N.P. Balakrishnan 50149 (ASSAM herb. acc. no. 46979); Arunachal Pradesh, Subansiri, Kheel towards Khagali, 30 Oct. 1958, *G.D. Pal* 2039 (ARUN herb. acc. no. 2943).

12. *Henckelia primulacea* (C.B. Clarke) D.J. Middleton & Mich. Möller, *Taxon* 60: 776. 2011. *Chirita primulacea* C.B. Clarke, *Commelyn. Cyrtandr. Bengal.* 114, t. 82. 1874; Hook.f., *Fl. Brit. India* 4: 358. 1884; Giri & al., *Mat. Fl. Arunachal Pradesh* 2: 230. 2008.

Type: Sikkim, 14 Apr. 1857, *Hooker & T. Thomson s.n.* (K, photo !)

Perennial herbs. Stem compressed, covered with leaf bases. Leaves radical, 5 – 16 × 3 – 7 cm, oblong elliptic, base oblique, margin doubly serrate, apex acute; both surfaces densely villous; lateral nerves raised beneath, 8 – 11 on either side of mid vein. Petiole 4 – 15 cm long, villous. Peduncle 3 – 6 cm long, villous, 1 – 3 flowered. Bracts 6 – 10 mm long, triangular, apex acute, puberulous. Pedicel 1.5 – 4 cm long, puberulous. Calyx deeply 5-sect; 10.7 – 12.3 mm long, lobes triangular, apex acute, glabrescent. Corolla 4 – 5 cm long, puberulous, white; 5-lobed, 1.8 – 2.2 cm long, lobes subequal, rounded. Filaments 3.5 – 4 cm long, sessile glandular; anthers 3 – 5 mm long, bearded. Ovary 3 – 4 cm long, finely villous; style 1.5 – 1.8 cm long, pubescent; stigma emarginated, smooth.

Flowering and Fruiting: March–June.

Habitat: On damp rock surfaces.

Distribution: India (West Bengal: Darjeeling; Sikkim).

Specimen examined: Sikkim, without locality, *G. King s.n.* (CAL).

13. *Henckelia pumila* (D. Don) A. Dietr., *Sp. Pl.*, ed. 6, 1: 574. 1831. *Chirita pumila* D. Don, *Prodr. Fl. Nepal.* 90. 1825; C.B. Clarke in Hook.f., *Fl. Brit. India* 4: 357. 1884; Giri & al., *Mat. Fl. Arunachal Pradesh* 2: 230. 2008.

Type: Nepal, *Wallich 801* (K, photo !)

Annuals herbs. Stems pubescent to sparsely pilose. Leaves 4 – 8, opposite, 4 – 17 × 3 – 8 cm, lanceolate to ovate or elliptic, base oblique, cuneate to cordate, margin denticulate to serrulate, apex acute to acuminate; upper surface puberulent to pilose, lower surface puberulent specially along veins, upper surface brown spotted; lateral veins 6 – 9 on each side of midrib, conspicuous. Petiole 6 – 20 mm long, puberulent. Cymes 2 – 6 flowered. Peduncle 3 – 8 cm long, puberulent to glabrescent. Bracts 2, free, 5 – 12 × 1 – 4 cm, lanceolate to obovate, pubescent, margin entire to shallowly denticulate, apex acute. Pedicel 5 – 15 mm long, glabrous to puberulent. Calyx 1 – 2.1 cm long, 5 lobed from above middle; tube 5 – 10 mm long; lobes

5 – 11 × 1.5 – 2 mm, subequal, narrowly triangular to ovate, margin entire, apex acuminate, outside pubescent to sparsely pilose, inside glabrous. Corolla white to purple with yellow markings, 3.5 – 6 cm long, outside puberulent to pilose, inside glabrous to sparsely pubescent; tube 2.7 – 4.8 × 1 – 1.5 cm; upper lip 3 – 8 mm long; lower lip 0.5 – 1.2 cm long. Filaments 0.7 – 1.3 cm long, sparsely puberulent; anthers 2 – 4 mm long, fused by entire upper surfaces, glabrous; staminodes 2, 2.5 – 3.5 mm long, glabrous. Ovary 1.5 – 3 cm long, glabrous to sparsely puberulent; style 7 – 10 mm long, glabrescent; stigma flabellate, 2.7 – 3.2 mm long, 2-lobed. Capsule erect, 6 – 15 cm long.

Flowering and Fruiting: July – October.

Habitat: Forests, streamsides, moist rocks, cliffs, or among grassy clumps.

Distribution: India (Assam, Sikkim, Meghalaya, Arunachal Pradesh), Bhutan, Myanmar, Nepal, Thailand, Vietnam, China.

Specimens examined: Meghalaya, Mamloo forest, 6 Nov. 1983, *U.N. Kanjilal & R. Sharrma* 10579 (ASSAM herb. acc. nos. 20896, 20887); Meghalaya, Mamloo forest, 12 Sept. 1931, *U.N. Kanjilal & R. Sharma* 9548 (ASSAM herb. acc. no. 20890, 20889); Meghalaya, Khasi hills, Mairang to Nongkhlor, 22 Aug. 1978, *G.M. Bhaumik* 60352 (ASSAM herb. acc. no. 55028); Assam, near Dawki, 11 Aug. 1938, *R.N. De* 16849 (ASSAM herb. acc. no. 20885); Arunachal Pradesh, Kameng, Angling to Hova road, 17 Oct. 1973, *P.K. Hajra* 54307 (ASSAM herb. acc. no. 79072).

14. *Henckelia speciosa* (Kurz) D.J. Middleton & Mich. Möller, *Taxon* 60: 777. 2011. *Chirita speciosa* Kurz, *J. Bot.* 11: 195. 1873.

Type: Yunnan, Poneline, 5 Mar. 1868, *D.J. Anderson s.n.* (K, photo !)

Perennial herbs. Stems absent or to 5 cm, rust brown pilose. Leaves 4 – 6, basal or along the stem, alternate, 5–19 × 3.7–13 cm, ovate to suborbicular, base oblique, cordate to rounded, margin serrate or crenate, apex acuminate to rounded; upper surface sparsely white pubescent, lower surface purplish along veins, pilose along veins; lateral veins 6 – 8 on each side of midrib. Petiole 5 – 20 cm long. Cymes 1 – 6 flowered. Peduncle 3.5 – 16.5 cm long, rust-brown pubescent and villous. Bracts 2, free, 7 – 14 × 2 – 4 mm, narrowly ovate to oblong, rust-brown villous, margin entire, apex acute. Pedicel 1 – 2 cm long, rust-brown pubescent. Calyx 1 – 2.5 cm long, 5-lobed from above to near middle; tube 5–10 mm long; lobes 5 – 15 × 3 – 5 mm, subequal, narrowly triangular, outside

rust-brown pubescent, inside glabrous, margin entire, apex acuminate. Corolla blue-purple with yellow in tube, 4.5 – 6 cm, puberulent; tube narrowly tubular, 3.5 – 4.5 cm long; lower lip 0.9 – 1.2 cm long; upper lip 1.5 – 1.8 cm long. Filaments 1 – 1.5 cm long, glabrous to sparsely pubescent; anthers 4 – 5 mm long, fused by entire upper surfaces, densely puberulent; staminode 1, 2.5 – 3 mm long. Ovary 2 – 2.7 cm long, puberulent; style 7 – 14 mm long, sparsely puberulent; stigma 2-lobed, lobes 1 – 2 mm long. Capsule straight, 6 – 8.7 cm long.

Flowering and Fruiting: March – July.

Habitat: In rocks in wet valleys; 1000 – 1960 m.

Distribution: India (Nagaland), Myanmar, Thailand, Vietnam, China.

Specimen examined: Nagaland, Naga hills, 1936, *N.L. Bor* 19819 (ASSAM herb. acc. no. 20947).

15. *Henckelia urticifolia* (D. Don.) A. Dietr., *Sp. Pl.*, ed. 6, 1: 574.1831. *Chirita urticifolia* Buch.-Ham ex D. Don, *Prodr. Fl. Nepal.* 90. 1825; C.B. Clarke in Hook.f., *Fl. Brit. India* 4: 358. 1884; Giri & al., *Mat. Fl. Arunachal Pradesh* 2: 231. 2008. *Chirita grandiflora* Wall., *Pl. Asiat. Rar.* 1: 43 1830.

Type: Nepal, Wall. Cat. Num. List no. 800 (K, n.v.)

Perennial herbs. Stems erect, sparsely puberulent. Leaves unequal in a pair, 4 – 11 (17) × 2.5 – 6 (10) cm, elliptic to ovate rarely obovate, base oblique, broadly cuneate to rounded, margin dentate to serrate, apex acute to abruptly acuminate; papery, upper surface puberulent, lower surface puberulent along veins; lateral veins 5 – 10 on either side of midrib, conspicuous. Petiole 1 – 6.5 cm long, glabrescent. Cymes 1 – 2 flowered. Peduncle 1.5 – 5.5 cm long, puberulent to sparsely puberulent. Bracts 2, free, 6–16 × 3–9 mm, lanceolate to ovate, nearly glabrous to pubescent, margin subentire to denticulate, apex acute. Pedicel 0.8–2.2 cm long, puberulent or pilose to glabrous. Calyx 5-sect, outside sparsely puberulent to villous near base, inside glabrous; tube 1–1.5 cm long; lobes 1 – 2 cm long, slightly unequal, narrowly triangular to lanceolate, margin entire, apex attenuate. Corolla purple to pink, 5.5 – 6 cm long, outside sparsely puberulent to sparsely pilose, inside glabrous to minutely glandular; tube 3.5 – 4 × 1.5 – 2 cm, narrowly funnelform; lower lip 1.5 – 2 × 0.7 – 1 cm; upper lip 2.2 – 2.5 × 2 – 2.4 cm. Filaments 1.5 – 1.7 cm long, glabrous; anthers 2.8 – 3.5 mm long, fused by entire upper surfaces, glabrous; staminodes 2, 6 – 7 mm long. Ovary 18 – 20 mm long, puberulent; style 12 – 14 mm long, puberulent; stigma deeply 2-lobed, lobes 1 – 1.8 mm long. Capsule straight, 8 – 15 cm long.

Flowering and Fruiting: July–October.

Habitat: In forests, along streamside.

Distribution: India (Sikkim, Meghalaya, Mizoram, Arunachal Pradesh), Bhutan, Myanmar, Nepal, China.

Specimens examined: Without locality, *N.L. Bor* 1249 (ASSAM herb. acc. no. 20909); Meghalaya, Khasia hills, Dunnipep, *U.N. Kanjilal* 10844 (ASSAM herb. acc. no. 20911); Sikkim, without locality, 1829 m, 1934, *N.L. Bor* 18541 (ASSAM herb. acc. no. 20910).

12. *Leptoboea* Benth. in Benth. & Hook.f., *Gen. Pl.* 2: 1025. 1876. *Type: Leptoboea multiflora* (C.B. Clarke) C.B. Clarke.

About 3 species in Bhutan, China, Myanmar, Thailand; 2 species in NE India.

KEY TO THE SPECIES

1a. Plant pubescent.

2. *L. multiflora*

1b. Plant glabrous.

1. *L. glabra*

1. *Leptoboea glabra* C.B. Clarke in A.DC. & C.DC., *Monogr. Phan.* 5: 165. 1883; & in Hook.f., *Fl. Brit. India* 4: 371. 1884.

Type: India, Assam, Mishmee hills, *Griffith* KD 3843 (K000898149) (K, photo!, lectotype designated here)

Shrubs, glabrous, bark peeling off, papery. Leaves broadly elliptic, apex acuminate, margin serrate to subentire, base attenuate; glabrous on both surfaces; mid vein finely channelled above, raised beneath, lateral nerves 4 – 6 on either side of mid vein. Capsule 7 mm long. Oblong 2-valved nearly- from the first 4-valved. Petioles scarcely 4 mm long. Capsule broadly oblong, subobtuse, early dehiscent from the apex into 4 obtuse valves.

Flowering and Fruiting: June–December.

Distribution: India (Sikkim, West Bengal, Assam).

Note: Description is based on the photograph of the type specimen. No specimen was found at CAL, ASSAM and BSHC.

Note: The protologue refers to two collections by Griffith (3843 at K and 3842 at G) both from Mishmee. Since the collection 3842 could not be traced the sheet at K bearing collection no. 3843 is chosen as the lectotype.

2. *Leptoboea multiflora* (C.B. Clarke) Benth. ex Gamble, *Man. Ind. Timb.* 274. 1881; C. B. Clarke in A.DC. & C. DC., *Monogr. Phan.* 5: 165. 1883, in Hook.f., *Fl. Brit. India*

4: 371. 1884; Wang & al. in Fl. China 18: 286. 1998; O. M. Hillard in Grierson and D.G. Long, Fl. Bhutan 2(3): 1323. 2001. *Championia multiflora* C. B. Clarke, Commelyn. Cyrtandr. Bengal. 99. 1874.

Type: Plate of *Championia multiflora* C. B. Clarke, Commelyn. Cyrtandr. Bengal. t 68. 1874. (Lectotype designated here).

Shrubs, upto 3 m long, rusty tomentose, swollen at nodes, bark grey, peeling off, papery. Leaves opposite decussate, crowded at tips of short lateral branches, elliptic to ovate, (2.5)4 – 11(–17) × (1)2.6 – 9.5 cm, acute to acuminate at apex, cuneate at base, obscurely toothed or entire along margin, lateral veins 6 – 12 on each side of midvein, veins depressed above and raised beneath, upper appressed pubescent, especially along veins, lower pilose, dense along veins. Petiole 10 – 12 mm long, pubescent. Peduncle 1 – 4 cm long, puberulent. Bracts 2, 2 – 4 (6) × 0.2–1 mm, linear to subulate, puberulent. Pedicel 1 – 3 cm long, filiform, puberulent. Calyx segments 1.5 – 2 × 0.2 – 0.4 mm, linear to narrowly triangular, connate below the middle, campanulate, pubescent both inside and outside, persistent in fruits. Corolla 6 – 9 mm long, outside glabrous; tube 1 – 2 mm long; lobes subequal, suborbicular, apex round, 2 – 3 × 3.5 – 5 mm. Stamens obscurely didynamous; filaments 1.5 – 2 mm long, glabrous; anthers 1.5 mm long, divaricate. Ovary oblong, 1.8 – 3 × c. 0.5 mm, sparsely puberulent, minutely glandular; style 5.5 – 7 mm long, glabrous; stigma minutely glandular. Capsule 2 – 3.5 cm long, glabrous, acute, style persistent.

Flowering and Fruiting: July – December.

Habitat: Dense forests on slopes; 1000–1300 m.

Distribution: India (Assam, Manipur, Meghalaya, Sikkim, West Bengal, Arunachal Pradesh). Bhutan, Nepal, Myanmar, Thailand.

Specimens examined: Manipur, Mysring, Naga Hills, 1524 m, Dec. 1907, A. Meebold 7198 (CAL); Meghalaya, Khasia, 1219 – 1524 m, J.D. Hooker & T. Thomson s.n. (CAL); Assam, Saohan, Khasia, 1524 m, 30 Oct. 1867, C.B. Clarke 5537 (CAL herb. acc. no. 333242). Sikkim, Dumsong, 762 m, 29 Nov. 1908, W.G. Craib 455 (CAL); Sikkim, Rungbu, 914 m, 16 Nov. 1908, W.G. Craib 126 (CAL); Sikkim, without locality, S. Kurz s.n. (CAL herb. acc. no. 333235); Sikkim, Rinchingpong, 1067 m, 1862, T. Anderson 841 (CAL herb. acc. no. 333234); Arunachal Pradesh, Kameng, Baha hills, 10 May 1958, G. Panigrahi 15347 (ASSAM herb. acc. no. 24600); Assam, Khasia Jaintia hills, 25 Aug. 1935, G.K. Deka 13154 (ASSAM herb. acc. no. 21015).

Note: Clarke (1874) described *Championia multiflora* from Khasia and Sikkim. One of the specimens at K (K000898143) was annotated by Clarke as *Championia multiflora* but this is not from the type locality. Another specimen at CAL (herb. acc. no. 333230) was first annotated by Clarke as *Championia multiflora* and later as *Lep-toboea multiflora* on a label but it is also not from the type locality and therefore cannot be a type. Therefore, the illustration in the protologue is selected as the lectotype.

13. LOXOSTIGMA C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 59. 1883. *Type*: *Loxostigma griffithii* (Wight) C. B. Clarke

7 species in Bhutan, China, Myanmar, Nepal, Vietnam; 1 species in NE India.

Loxostigma griffithii (Wight) C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 60. 1883 & in Hook.f., Fl. Brit. India 4: 344. 1884; Kanjilal & al., Fl. Assam 3: 394. 1939; A.S. Chauhan in Hajra (ed.), Contrib. Fl. Namdhapa 237. 1996; Giri & al., Mat.Fl. Arunachal Pradesh 232. 2008; Wang & al., Fl. China 18: 373. 1998; Hilliard, Fl. Bhutan 2 (3): 1305. 2001. *Didymocarpus griffithii* Wight, Ill. Ind. Bot. 2: 182. 1841.

Type: Sikkim, Mishmee, 1–2,000 m, Griffith 3821 (K, Photo!)

Herbs or subshrubs, 1 – 1.2 m tall, pubescent, terrestrial climber, branched, stem often rooting near the base. Leaves opposite, unequal to subequal in a pair, (3) 7 – 19 × (2) 4 – 10 cm, elliptic to ovate or lanceolate to obovate, base oblique or cuneate to subcordate, margin serrate to crenate, apex acuminate to acute; upper surface glandular appressed strigose, hair 1 – 2.5 mm long, lower surface glabrescent, puberulent along veins, midvein prominent on both surfaces, raised beneath. Petioles (0.8) 1 – 2 cm long, puberulent. Cymes branched (2) 4 – 10 (12) flowered. Peduncles 6 – 15 cm, puberulent, dichotomously branched. Bracts 2, opposite, at branching point, ovate to narrowly lanceolate, puberulent, 3 – 6 (10) × 1 – 3 mm, margin irregularly dentate, glandulose serrate. Pedicels 0.5 – 3 cm, puberulent. Calyx 5-sect from near base; segments equal to subequal, outside pubescent, inside glabrous, 5 – 9 × 1.5 – 7 mm, narrowly lanceolate to broadly ovate, apex acute, margin glandulose-serrate, with a prominent vein. Corolla creamy-yellowish, purplish to pink spotted inside, 2 – 4.5 cm long, outside sparsely glandular puberulent to pubescent, inside glabrous; tube (1.5) 2 – 3 × (0.7) 1.5 – 2 cm, middle portion inflated; lower lip 5 – 7 × 3 – 5 mm, lobes semiorbicular; upper

lip 7 – 15 × 5 – 10 mm, lobes oblong to ovate. Stamens on lower lip 0.7 – 2 cm long, on upper lip 1 – 2.5 cm long, glabrous; anthers 3.5 – 5 mm long; staminode 1.5 – 3 mm long. Ovary 1 – 3 × 0.4 – 0.7 cm, glabrous; style 5 – 12 mm long, glandular; stigma glabrous. Capsule 5.5 – 11 cm long, glabrous, during fruiting peduncle and pedicel almost glabrous, calyx persistent at fruit base, puberulent. Seeds ellipsoid, c. 1 mm long, glabrous, appendages hyaline, 1 – 2 mm long.

Flowering and Fruiting: September–March.

Habitat: On trees or rocks in forests.

Distribution: India (Sikkim, Arunachal Pradesh, Meghalaya, Manipur, Assam, West Bengal). China, Bhutan.

Specimens examined: Manipur, Hartook, Mokong, 152 m, 25 Nov. 1885, C.B. Clarke 42117 (CAL herb. acc. no. 331530); Assam, without locality, N. Wallich s.n. (CAL herb. acc. no. 331533); Sikkim, without locality, 1219 m, 22 Jan. 1876, G. King s.n. (CAL herb. acc. no. 331509); West Bengal, Darjeeling, Mungpoo, 1371.6 m, 1 Oct. 1884, C.B. Clarke 36675C (CAL herb. acc. no. 331478); Assam, Khasi hills, 609.6 m, 16 Dec. 1916, P.C. Kanjilal 7110 (ASSAM herb. acc. no. 20827); Arunachal Pradesh, Tirap, Noglo to Laju, 30 June 1961, D.B. Deb 26375 (ASSAM herb. acc. no. 27757); Sikkim, North Sikkim, Dzangu, 1800 m, 18 Nov. 1995, S.K. Jana 17967 (BSHC herb. acc. no. 40235); Sikkim, South Sikkim, Rabongla, 23 Aug. 1986, A.K. Verma 6535 (BSHC herb. acc. no. 14884).

14. *LYSIONOTUS* D. Don, Edinburgh Philos. J. 7: 85. 1822. *Type: Lysionotus serratus* D. Don

About 25 species in Bhutan, China, Japan, Laos, Myanmar, Nepal, Thailand, Vietnam; 3 species in NE India.

KEY TO THE SPECIES

- | | |
|--|----------------------------|
| 1a. Anthers unappendaged. | 1. <i>L. atropurpureus</i> |
| 1b. Anthers appendaged. | 2 |
| 2a. Leaves not spinulous along margin. | 3. <i>L. serratus</i> |
| 2b. Leaves spinulous along margin. | 4. <i>L. palinensis</i> |

1. *Lysionotus atropurpureus* Hara, J. Jap. Bot. 48: 359. 1973; A.S. Chauhan in Hajra, Contrib. Fl. Namdhapa 237. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 232. 2008; Wang & al., Fl. China 18: 390. 1998; Hilliard, Fl. Bhutan 2 (3): 1305. 2001.

Type: India, West Bengal, Darjeeling, Siri Khola Rombick, 2100 – 2200 m, 5 July, 1972, Kanai & al. 723147 (TI, n.v.)

Epiphyte. Stems glabrous or sparsely puberulent near apex. Leaves opposite, rarely ternate, 4 – 15 × 2 – 5 cm, oblong-lanceolate to narrowly elliptic, papery, glabrous, base cuneate, margin denticulate, apex acuminate; lateral veins 4 – 8 on each side of midrib. Petiole (3–) 5 – 15 mm long, glabrous. Cymes 1 – 4 flowered. Peduncle 5.5 – 7.5 cm long, filiform, glabrous. Bracts linear, 2 – 4 × 0.5 – 0.8 mm. Pedicel 7 – 20 mm long, filiform, glabrous. Calyx 5-sect from base; segments 4 – 7 mm long, lanceolate, margin entire to rarely sparsely subserrate, apex acute, finely veined, glabrous. Corolla purple, 3 – 5 cm long, glabrous; tube infundibuliform, 2 – 4 cm long; lower lips 5 – 6 mm long, subequal; upper lip 8 – 10 mm long, subequal, central lobe larger. Filaments 4 – 6 mm long; anthers oblate; connective unappendaged; staminodes 1 – 2, 1 – 2 mm long. Ovary 1.2 – 1.5 cm long, glabrous; style 5 – 8 mm long, glabrous. Capsule 6 – 7.5 cm long. Seed appendages to c. 2 mm long.

Flowering and Fruiting: July – October.

Habitat: On trees in broad-leaved forests.

Distribution: India (Arunachal Pradesh, Sikkim, West Bengal). Bhutan, China.

Specimens examined: India, Sikkim, Tedong, 15 Dec. 1985, A.K. Verma 4746 (BHSC herb. acc. no. 14861); Sikkim, Rabangla, 9 June 1986, A.K. Verma 5448 (BHSC herb. acc. no. 14850); Sikkim, Kawlakhola, 17 July 1998, S.K. Rai 20857 (BSHC herb. acc. no. 28855).

2. *Lysionotus palinensis* G.D. Pal, J. Bombay Nat. Hist. Soc. 97 (1): 131. 2000; Giri & al., Mat. Fl. Arunachal Pradesh 2: 233. 2008.

Type: Arunachal Pradesh, Lower Subansiri dist., Palin c. 140 m, 9 Sept. 1983, G.D. Pal 400 (CAL !)

Subshrubs, rooting at lower nodes. Stem terete, pubescent above, later becoming glabrous. Leaves (3) 7 – 10 × (0.5) 3.5 – 5 cm, elliptic-lanceolate, base cuneate, margin spinulous, dentate to serrate, apex acuminate to acute, glabrous; upper surface rarely sparsely puberulent along nerves when young, glabrous when mature; lateral veins 4 – 6 on each side of midrib, flat to prominent. Petiole 0.2 – 0.5 cm long, pubescent. Cymes 4 – 10 flowered, axillary. Peduncle 3 – 7 cm long, glabrous to sparsely puberulent. Bracts 3 – 6 × 2 – 4 mm, ovate lanceolate, margin entire, apex acute to acuminate, finely 3-veined, glabrous. Pedicel 5 – 11 mm long, glabrous. Calyx 5-sect from base, 7 – 10 × 1 – 2 mm, segments glabrous. Corolla purplish to white, 4 – 4.5 cm long, outside sparsely puberulent, inside glabrous to sparsely glandular puberulent basally; tube

slender funnelform; lower lip 5 – 8 × 5– 6 mm; upper lip 10 – 12 × 5 – 6 mm. Filaments 7 – 10 mm long; anthers subglobose, 1 – 2 mm long, connective appendage horn-like. Ovary 3 – 5 × c. 1 mm, glabrous; style 2 – 3.5 mm long, glabrous. Capsule 10 – 12 cm long.

Flowering and Fruiting: August – November.

Habitat: In moist shaded places on humus rich soil.

Distribution: India (Arunachal Pradesh). Endemic.

Specimen examined: Arunachal Pradesh, West Siang, 27 Nov. 2011, *M. Bhaumik* 25504 (ARUN herb. acc. no. 18096).

3. *Lysionotus serratus* D. Don, Edinburgh Philos. J. 7 (13): 86. 1822; Hook.f., Bot. Mag. 107.t. 6538. 1881; C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 58. 1883 & in Hook.f., Fl. Brit. India 4: 344. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 233. 2008; Wang & al., Fl. China 18: 390. 1998; Hilliard, Fl. Bhutan 2(3): 1304. 2001.

Type: Nepal, Wall. Cat. Num. List no. (BM)

Subshrubs. Stems 10 – 100 cm long, scarcely puberulent when young, glabrous when mature. Leaves (5.5) 11 – 15 (21) × (1.7) 3.5 – 6 cm, elliptic-lanceolate to obovate, base cuneate, margin dentate to serrate, apex acuminate to acute, glabrous; upper surface rarely scarcely puberulent when young, glabrous when mature; lateral veins 5 – 10 on each side of midrib, flat to prominent. Petiole 1.8 – 2.5 cm, glabrous. Cymes 4 – 10 flowered, axillary. Peduncle 7.5 – 9 cm long, glabrous or rarely scarcely puberulent. Bracts (3.5) 5 – 8 × 3.5 – 5 mm, ovate, margin entire, apex acute, finely veined, glabrous. Pedicel (3) 7 – 11 (15) mm long, glabrous. Calyx 5-sect from base, 7 – 9 × 1 – 1.5 mm, segments glabrous. Corolla purplish to white, 2.5 – 3 (4.5) cm long, outside sparsely puberulent, inside glabrous to sparsely glandular puberulent basally; tube slender funnelform, (1.5) 2.2 – 3 × c. 1 cm; lower lip 5 – 8 × c. 5 mm; upper lip 10 – 12 × c. 5 mm. Filaments (5) 7 – 10 mm long; anthers subglobose, c. 2 mm long; connective appendage hornlike, c. 0.5 – 1 mm; staminodes 2 – 3, 2 – 6 (8) mm long. Ovary 8 – 10 × c. 2 mm, glabrous; style 2 – 3.5 mm long, glabrous. Capsule 7–11 (14) cm long. Seed 0.5 mm long, oblong, acute at both ends, rugose, appendages subulate, 0.5 – 1 mm long.

Flowering and Fruiting: July – January.

Habitat: On trees or rocks in forests, streamsides, grassy slopes, valleys; 900–2200 m.

Distribution: India (Sikkim, Nagaland, Meghalaya, Assam, Arunachal Pradesh), Bhutan, Myanmar, China, Nepal, Thailand, Vietnam.

Specimens examined: Sikkim, lower Chumbi, 2133 m, Dec. 1904, *G.L. Searight Esq.* 76 (CAL herb. acc. no. 331581); Nagaland, Naga Hills, Neechoogard, 152 m, 17 Oct. 1885, *C.B. Clarke* 40855 (CAL herb. acc. no. 331580); Bengal and Borders, *V. Narayanaswami & party* 2731 (CAL); Assam, Jantia hills, 914 – 1219 m, Aug. 1883, *G. Mann* (CAL herb. acc. no. 331590); Sikkim, Birch hill, 1857, *T. Thomson* (CAL herb. acc. no. 331611); Sikkim, Sinchal, Oct. 1868, *S. Kurz* (CAL herb. acc. no. 331616); Assam, Khasia, 1219 m, *J.D. Hooker* (CAL herb. acc. no. 331636); Sikkim, below Lachen, 2133 m, 17 Sept. 1909, *Smith & Cave* 2827 (CAL herb. acc. no. 331631).

Imperfectly known species

1. *Lysionotus confertus* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 58. 1883 & in Hook.f., Fl. Brit. India 4: 344. 1884.

Type: India, Arunachal Pradesh, Tirap, Patkoi range, 27 Feb. 1837, *Griffith* KD 3819 (K, Photo !)

Subshrubs, glabrous. Leaves coriaceous, ternate, elliptic acuminate, base cuneate to subrounded, crenate to subentire, c. 9 × 3.5 cm; veins obscure on upper surface, mid vein finely channeled, above raised beneath, lateral veins obscure, c. 6 on either side of mid vein. Petiole c. 5 mm long. Peduncle 10 cm long. Pedicel 5 mm long. Cymes compositis, many flowered. Calyx (in fruit) oblong.

Distribution: India (Assam).

Note: Description is based on the image of the type specimen. No specimen found at CAL, ASSAM and ARUN.

2. *Lysionotus kingii* (C.B. Clarke) Hilliard, Edinburgh J. Bot. 52: 219. 1995; Hilliard, Fl. Bhutan 2 (3): 1304. 2001.

Aeschynanthus kingii C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 31. 1883 & in Hook.f., Fl. Brit. India 4: 342. 1884.

Type: India, Sikkim, 6000 ft., *G. King* 2166 (CAL, Photo !)

Herbs. Leaves elongate-elliptic, c. 20 × 7 cm, margin entire, apex acute, base attenuate; lateral nerves 7 – 8 on either side of midrib. Petiole 7 – 8 mm long. Peduncle, axillary, 6 – 7 cm long, 3 – 7 flowered. Pedicel 5 – 15 mm long. Calyx green, divided from near base; segments lanceolate, 5 – 15 mm long (in fruit), apex caudate-acuminate. Corolla not seen. Fruit linear. Seeds appendaged at both ends.

Distribution: India (Sikkim, type locality). Endemic

Note: Description is based on type specimen at CAL. No specimen found at CAL, ASSAM and ARUN.

3. *Lysionotus levipes* (C.B. Clarke) B.L. Burt, Edinburgh J. Bot. 52: 220. 1995. *Aeschynanthus levipes* C.B. Clarke in A.D.C. & C.D.C., Monogr. Phan. 5: 28. 1883 & in Hook.f., Fl. Brit. India 4: 341. 1884.

Type: India, Arunachal Pradesh, Mishmee, Griffith KD 3815 (K, Photo !)

Subshrubs. Stems densely spreading puberulent. Leaves lanceolate to narrowly so, 1.2 – 1.7 cm × 2.5–4 mm, base cuneate, margin entire, apex acute; densely puberulent on both surfaces; lateral veins obscure. Petiole c. 1 mm. Cymes 1-flowered. Pedicel c. 6 mm long. Calyx 5-sect from base; segments. Corolla light purple with darker veins, c. 5 cm long, outside sparsely puberulent, inside below sparsely puberulent.

Distribution: India (Meghalaya; type locality), China.

Note: Description is based on the image of the type specimen. No specimen found at CAL, ASSAM and ARUN.

4. *Lysionotus pubescens* C. B. Clarke, J. Linn. Soc., Bot. 25: 52. 1889; Hilliard, Fl. Bhutan 2 (3): 1305. 2001. *Lysionotus gracilipes* C.E.C. Fischer, Kew Bull. 1940: 41. 1940.

Type: India, Manipur, 5500 ft., C.B. Clarke 41283 (K, Photo !)

Subshrubs. Stems apically puberulent. Leaves opposite, 1.5 – 9.2 × 0.5 – 2 cm, oblong to lanceolate, upper surface glabrous, lower surface sparsely appressed pilose, base cuneate to rounded, margin denticulate to subentire, at times serrate, apex acuminate to acute; lateral veins 4 – 6 on each side of midrib, flat. Petiole 2 – 6 mm long, glabrous. Cymes 1 – 5 flowered, axillary. Peduncle (3) 6 – 9 cm long, glabrous to sparsely puberulent. Pedicel 4 – 7 mm long, sparsely puberulent. Calyx 5-sect from base; segments 2.5 – 4.5 mm, glabrous. Corolla white to purplish, purple striate, 3.7 – 4.4 cm long, outside pilose, inside glabrous. Capsule 5.5 – 6 cm long. Seed appendages hairlike, 0.6 – 2 mm long.

Flowering and Fruiting: August–October.

Distribution: India (Manipur; type locality), Myanmar, Bhutan, China.

Note: Description is based on the image of the type specimen. No specimen found at CAL, ASSAM and ARUN.

15. *MICROCHIRITA* (C.B. Clarke) Y.Z. Wang in J. Syst. Evol. 49: 59. 2011; D.J. Middleton & Mich. Möller, Taxon 60: 778. 2011.

Type: *Microchirita hamosa* (R. Br.) Y.Z. Wang.

About 18 species in Borneo, China, Indonesia, Malaysia, Thailand, Vietnam; 1 species in NE India

Microchirita hamosa (R. Br.) Y.Z. Wang in J. Syst. Evol. 49: 60. 2011.

Type: Myanmar, Trogla in Martaban, 1827, Wallich 788 (BM, n.v.)

Annual herbs. Stems sparsely puberulent to glabrous. Leaves 1 – 4, lowermost solitary, leaves toward apex opposite; 2 – 6 × 1.7 – 4 cm, ovate, base rounded to cordate, margin entire, apex acute to obtuse; upper surface puberulent, lower surface sparsely puberulent to glabrescent, lateral veins 6 – 16 on each side of midrib, conspicuous. Petiole 1 – 3 mm long, glabrescent. Cymes 2 – 5 flowered. Peduncle inconspicuous. Bracts absent. Pedicel 3 – 14 mm long, spreading pubescent. Calyx 5-sect from near base; tube 1 – 3 mm long; outside puberulent, inside glabrous; segments unequal, 4.5 – 7 × c. 1 mm, linear to narrowly triangular, margin entire, apex acute. Corolla white, throat yellow, 1 – 2 cm long, outside sparsely puberulent, inside glabrous; tube 7 – 15 × 3 – 5 mm; upper lip 2 – 3 mm long, lower lip 1.2 – 1.7 mm long. Filaments 2 – 4 mm long, glabrous; anthers 1 – 1.8 mm long, bearded; staminodes 2, 0.8 – 1.5 mm long. Ovary 3.7 – 6 mm long, puberulent; style 7 – 8 mm long, puberulent; stigma narrowly obtrapeziform, deeply 2 lobed. Capsule erect, 1.7 – 4 cm.

Flowering: July – October; *fruiting:* July – November.

Habitat: On shaded rocks in forests, 300–1500 m.

Distribution: India (Assam, West Bengal), China, Laos, Malaysia, Myanmar, Thailand, Vietnam.

Specimen examined: Orissa, Bhatipathar, 1 Nov. 1959, G. Panigrahi 20697 (ASSAM herb. acc. no. 16224).

16. *OREOCHARIS* Benth. in Benth. & Hook.f., Gen. Pl. 2: 1021. 1876.

Type: *Oreocharis benthamii* C.B. Clarke

About 28 species in southern China, Thailand, Vietnam; 1 species in NE India.

Oreocharis muscicola (Diels) Mich., Möller & A. Weber, Phytotaxa 23: 23. 2011. *Didissandra muscicola* Diels, Notes Roy. Bot. Gard. Edinburgh 5: 225. 1912. *Briggsia muscicola* (Diels) Craib, Notes Roy. Bot. Gard. Edinburgh 11: 264 1920; Giri & al., Mat. Fl. Arunachal Pradesh 2: 228. 2008.

Type: Mekong, 7–8,000 ft., G. Forrest 5095 (E, n.v.).

Rhizomatous herbs. Plants stemless. Leaf basal, narrowly elliptic to lanceolate, (3) 5 – 10.5 cm × 1 – 2.5 cm, both surfaces densely white appressed villous, lower

surface rust-brown villous along veins, base cuneate, or oblique at times, margin serrate to serrate-crenate; lateral veins 5 – 8 on each side of midrib, conspicuous on both surfaces, raised beneath. Petiole 3 – 8 cm long, densely white villous. Cymes 2 – 6 flowered. Peduncle 6 – 15 cm long, scarcely rust-brown villous near base. Bracts 2, 0.5 – 7 × 1 – 2 mm, lanceolate, outside rust-brown villous, inside glabrous, apex acute, margin entire. Calyx segments 4 – 7 × 1 – 2 mm, lanceolate, outside sparsely white pubescent, apex acute, margin entire. Corolla yellow to orange, inside purple-red to orange or brown spotted or striate, outside sparsely puberulent, inside glandular pubescent; tube 1.5 – 2 × 1.5 – 2 cm; lower lip lobes 2 – 4 × c. 3 mm, semiorbicular, apex rounded to acute; upper lip lobes 7 – 9 × c. 5 mm, oblong, apex acute to rounded. Filaments 10 – 12 mm long, sparsely puberulent; anthers 1 – 3 mm long, reniform, thecae confluent; staminode c. 1 mm. Ovary 8 – 18 mm long, glabrous; style 2 – 10 mm long. Capsules 4 – 6.5 cm long, glabrous, style persistent.

Flowering and Fruiting: May – December.

Habitat: Forests on rocks or trees.

Distribution: NE India (Arunachal Pradesh), Bhutan, Myanmar, China.

Specimen examined: Arunachal Pradesh, Kameng, without date, *s. coll. s.n.* (ASSAM herb. acc. no. 23765).

Note: Based on recent molecular studies (Möller & al., 2011) this species is included under *Orecharis*.

17. PARABOEIA (C. B. Clarke) Ridley, J. Straits Branch Roy. Asiat. Soc. 43: 4, 63. 1905. *Type:* *Paraboeia clarkei* B.L. Burtt (*Didymocarpus paraboeia* C.B. Clarke)

About 87 species in Bhutan, China, Indonesia, Malaysia, Myanmar, Philippines, Thailand, Vietnam; 1 species in NE India.

Paraboeia multiflora (R. Br.) B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 41(3): 433. 1984; O. M. Hillard in Grierson & D.G. Long, Fl. Bhutan 2(3): 1327. 2001; Xu & al., Edinburgh J. Bot. 65(2): 278. 2008. *Boea multiflora* R. Br., Cyrtandreae 120. 1839, reprint from Benn., Pl. Jav. Rar. 120. 1840.

Type: Bangladesh, Pundua, Sylhet mt., [collected in early 19th century], *F. De Silva* in Wall. Cat. Num. List no. 793 (BM, photo !)

Herbs, rarely subshrubs. Stems to 2–12 cm long, brownish woolly. Leaves basal, rarely opposite, mostly crowded near stem apex; 5–15 (20) × 2.5–9 cm, ovate to elliptic or obovate, papery, upper surface glabrescent, lower surface rust-brown pannose, reddish-brown woolly along veins,

base often oblique, cuneate to subcordate, margin crenate, apex acute; mid vein finely channelled above, veins prominent on both surfaces, raised beneath, lateral veins 6–10 (15) on each side of midrib. Petiole 1– 5 cm long. Cymes axillary, lax, many flowered. Peduncle (3.5) 8–18 (26) cm long, rust-brown pannose, glabrescent. Bracts 2, 1–4 × c. 1 mm, elliptic, outside rust-brown woolly to pannose. Pedicel (2) 6–10 mm long, brown woolly pannose. Calyx 5-sect from base; segments 1–3 × 0.5–1 mm, lanceolate to triangular, woolly felted outside, glabrous inside. Corolla white, 4–5 (7) mm long, campanulate, white gland dotted outside, glabrous inside; tube 1– 3 mm long; lobes subequal, 1.5–2.5 × c. 3 mm. Filaments 1–3 mm long, glabrous; anthers 1–2 mm long, covered with glistening glands, mostly near the apex; staminodes absent. Ovary 2–3 mm long, covered with glistening globose glands; style 2–3 mm long, glabrous. Capsule 5–13 mm long, spirally twisted.

Flowering and Fruiting: June–November.

Habitat: Damp rocks and banks, forest floor, in shady places, 300 – 1200 m.

Distribution: India (Assam, Arunachal Pradesh, Meghalaya, Mizoram, West Bengal), Bangladesh, Bhutan, Myanmar, China, Laos, Thailand, Vietnam.

Specimens examined: Assam, Notrong forest, Assam, 10 Nov. 1938, *Dr.K. Biswas* 3841 (CAL); Pynursla, Assam, 25 Aug. 1956, *R.S. Rao* 3029 (CAL); Living Bridge, Khasia, 305 m, 10 May 1886, *C.B. Clarke* 42839 A (CAL herb. acc. no. 333140); Khasia, *G. Mann s.n.* (CAL herb. acc. nos. 333135, 333136, 333137, 333138); Dawki, Khasia-Jantia hills, Assam, 2 July 1941, *S.R. Sharma* 20634 (ASSAM herb. acc. no. 20961); Lailong Song (Changlung), Tirap, 510 m, 19 June 1961, *D.B. Deb* 25828 (ASSAM herb. acc. no. 27758); Mizoram, Dampa Tiger Reserve, Mizoram, 400 m, 30 Oct. 1907, *B.K. Sinha* 117091 (ASSAM herb. acc. nos. 71149, 71150).

18. PETROCOSMEA Oliver, Hooker's Icon. Pl. 18: t. 1716. 1887. *Type:* *Petrocosmea sinensis* Oliv.

27 species in China, Myanmar, Thailand, Vietnam; 2 species in NE India.

KEY TO THE SPECIES

- 1a. Filaments with geniculate apex; anthers, ovate to cordate, with thecae parallel, connective not projected. 2. *P. parryorum*
- 1b. Filaments apex not geniculate, simple; anthers broadly oblong, with theca marginal, connective enlarged at the apex. 1. *P. kingii*

1. *Petrocosmea kingii* (C.B. Clarke) Chatterjee, Kew Bull. 1 (2): 50. 1947. *Trisepalum kingii* C.B. Clarke in A.D.C. & C.D.C., Monogr. Phan. 5: 139. 1883.

Type: Burma, Tenasserim, Mount Moolyet, 1,800 m, *Gallatly s.n.* (K, photo !)

Herbs, perennial, short lived. Leaves large, alternate, few aggregated at the top of the stem, (5.5) 9.5 – 20 × 5.5 – 7 cm, broadly elliptic to ovate, acuminate at apex, unequal or rounded at base, minutely serrated along margin, upper surface of the leaf and mostly near the base is covered with dense tubercled hair, lower surface furfuraceous pubescent; vein prominent on both surfaces, slightly raised beneath, 5 – 7 on either side of midrib. Petiole 1 – 2.5 (4) cm long, pilose. Peduncles 1.5 – 3.5 cm long, pilose, 1 – 5 flowered, arising from the penultimate axil. Bracts minute, deciduous. Pedicel (0.7) 1 – 1.5 cm long, pilose. Calyx, bilabiate, anterior lobes more than half trifid, posterior lobes bifid, lobes c. 5-10 mm long, lanceolate, acute at apex, serrated along margin pilose outside, glabrous inside. Corolla white, glabrous; tube 4 – 5 × 2-3 cm, broadly tubular; limb obscurely bilabiate, upper lip 2, lower lip 3, lobes 2 – 3 × 2 mm, subequal, ovate, subacute at apex. Stamens 2, glabrous; filaments c. 2 mm long; anthers c. 4 mm long, broadly oblong, 2 loculed, theca marginal, longitudinal dehiscence, connective enlarged at the apex. Staminodes 2. Ovary c. 3 mm long, subsessile, ovate-lanceolate, pilose; style 6 – 8 mm long, pilose; stigma glandular. Disc annular. Fruits narrowly ovoid on long stalk, very thinly hairy.

Flowering and Fruiting: January–June.

Distribution: India (Cultivated at Royal Botanic Garden, Calcutta), Myanmar.

Specimen examined: Burma, Moulmein, 27 Mar. 1895, received from Mr. Peche, *s.n.*, cultivated at Royal Botanic Garden, Calcutta (CAL herb. acc. no. 332030).

Note: Recent collection of *Petrocosmea kingii* (C.B. Clarke) Chatterjee is not found in any of the herbaria.

2. *Petrocosmea parryorum* C.E. Fischer, Bull. Misc. Inform. Kew 1926: 438. 1926.

Type: Assam; Lushai hills, 1700 m., Muallung (Chin border), 3rd Nov. 1925, Mr. & Mrs. N.E. Parry *s.n.* (K, photo !)

Herbs, dense sericeous-hirsute when young. Stems rhizomatous, fibrous. Leaves in basal rosette, 3-7 × 3 cm, initially somewhat fleshy, later spotted or puckered, finally membranaceous, areolate when dry, sparsely white pubescent on both surfaces; orbicular to narrowly oblate or broadly elliptic, rounded or subacute at apex, rounded at

base, entire to repand or sinuate to serrated, ciliate along margin; pinnately nerved, midrib broad, papillose above, densely hirsute on lower surface near the base, lateral veins obscure above, prominent beneath. Petiole hirsute. Flowers solitary or few forming a subumbel. Peduncle pilose. Pedicel 1-2 cm long, pilose. Bracts linear to linear lanceolate, hirsute. Calyx 5-partite to base, segments 6 × 2 mm, equal, lanceolate, acute at apex, hirsute. Corolla violet, broadly campanulate, conspicuously veined, outside glabrous, inside pubescent; tube short, 1.3 – 1.5 cm in diam.; limb obscurely bilabiate, 4.5 – 6 × 4 – 5 mm, subequal, pilose outside, glabrous inside, anterior lip 3 lobed, lobes broadly rounded, posterior lip 2-lipped, narrowly blunt orbicular. Filaments 1.5 – 3 mm long, broad, apex geniculate, red villous, base glabrous; anthers 3 – 4 mm long, basifixed, ovate to cordate, coherent at apex, 2 loculed, thecae parallel, connective not projected, dehiscence longitudinal. Staminodes 2, ligulate, minute. Ovary 2 – 3 mm long, oblong, white pubescent, mature ovary upto 7 mm long; style 5 – 7 mm long, obscurely pilose near base, glabrous above, exerted. Capsules linear-lanceolate, splitting into valves, valves hard, acute, 1.3 – 2 × 4 – 6 mm. Seeds fusiform, acute at both ends, smooth, brown, c. 0.5 mm long.

Flowering and Fruiting: July – February.

Distribution: India (Assam, Meghalaya, Sikkim), China, Vietnam.

Habitat: On rocks in deep shade near waterfall.

Specimens examined: Meghalaya, Hmifang, Lushai hills, 1524 m, July 1916, Parry *s.n.* (CAL herb. acc. no. 3332551); Mesolazusui, Naga hills, 1829 m, 20 July 1935, N.L. Bor 6395 (CAL, herb. acc. no. 333250); Lushai hills, 30 July 1934, N.E. Parry 33 (CAL herb. acc. no. 332033); Sikkim, June 1934, N.L. Bor 6260 (ASSAM herb. acc. no. 21021).

Notes: The protologue states that the plant was seen to grow gregariously, associated with Begonias on moss covered rocks over which water trickles during part of the year, in winter it is subjected to frost.

19. RHYNCHOGLOSSUM Blume, Bijdr. Fl. Ned. Ind. 14: 741. 1826. *Type: Rhynchoglossum obliquum* Blume

About 12 species in SE Asia, Pacific Islands; 2 species in NE India

KEY TO THE SPECIES:

- 1a Stems puberulent; leaves glandular puberulent; fertile stamens 2 2. *R. obliquum*
- 1b Plants glabrous; leaves glabrous; fertile stamen 4 1. *R. lazulinum*

1. *Rhynchoglossum lazulinum* A.S. Rao & Joseph, Bull. Bot. Surv. India 9: 280. 1967; Giri & al., Mat. Fl. Arunachal Pradesh 233. 2008.

Type: India, Arunachal Pradesh, Kameng, 10 Sept., 1964, *Joseph* 39716 A (CAL !)

Succulent herbs, 60 cm tall. Leaves alternate or opposite, 9 – 2.4 × 3.5 – 10 cm, broadly elliptic, base oblique, subcordate to round, margin entire, apex acute to acuminate, membranous; upper surface appressed glandular, lower surface glabrous; lateral veins 12 – 30. Petiole at lower nodes 2 – 2.5 cm long, subsessile near peduncle, c. 2 mm long. Raceme 14 – 25 cm long, 7 – 10 flowered. Peduncles 6 – 20 cm long. Bracts subulate, 4 – 6 mm long. Pedicels 3 – 6 mm long. Calyx infundibuliform, c. 4 cm long, conspicuously ridged, lobes triangular, c. 11 mm long, apex acute, margin entire, glandular. Corolla blue to violet; tube c. 6 × 0.5 cm, finely puberulent outside, dilated and bends near throat, inside glabrous; lobes subequal, suborbicular, apex obovate, upper lip c. 2.5 × 5 cm, lower lip c. 2.5 × 3 cm. Stamens 4, didynamous, filaments 3 – 5 mm long, glabrous; anthers 3 – 4 mm long. Ovary 3 – 4 mm long, glabrous; style 2 – 3.5 cm long, stout, glabrous; stigma c. 3 mm in diam., lobed, undivided, minutely glandular. Capsules 8 – 11 mm long, ovoid-oblong, within accrescent calyx. Seeds 1 – 2 mm long, ovoid.

Flowering and Fruiting: September–November.

Distribution: India (Arunachal Pradesh, Assam). Endemic

Habitat: On hill slopes, in moist forests. 200 – 1500 m.

Specimens examined: Arunachal Pradesh, Aka hills, 1936, *N.L. Bor* 18179 (ASSAM); Assam, Balipara, 13 Nov. 1951, *G.K. Deka s.n.* (ASSAM herb. acc. no. 29477); Arunachal Pradesh, Subansiri district, 19 Nov. 1964, *A.R.K. Sastry* 40738 (ASSAM).

2. *Rhynchoglossum obliquum* Blume, Bijdr. Fl. Ned. Ind. 14: 741. 1826; C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 161. 1883 & in Hook.f., Fl. Brit. India 4: 367. 1884; Ridley, Fl. Mal. Pen. 2: 539. 1923; Gamble, Fl. Madras 2: 990. 1924; Kanjilal & al., Fl. Assam 3: 398. 1939; A.S. Chauhan in Hajra (ed.), Contrib. Fl. Namdhapa 237. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 233. 2008; Wang & al. in Fl. China 18: 400. 1998; O.M. Hillard in Grierson and Long, Fl. Bhutan 2(3): 1328. 2001.

Type: Indonesia, Java, Goha, Unknown collector 506 A (L, n.v.).

Stems 18 – 100 cm long, sparsely puberulent. Leaves (4) 6 – 14 × (2) 3.5 – 7.5 cm, elliptic to ovate, base oblique,

cuneate or cordate on smaller side, cordate on other, margin entire to undulate, apex acuminate, upper surface minutely glandular puberulent, lower surface glabrous; veins 9 – 16 on the larger side of the leaves, prominent on both surfaces, raised beneath. Petioles (0.5) 1.5 – 2 (3.5) cm long. Raceme (3) 6 – 24 cm long, 10 – 30 flowered. Peduncles 2 – 5.5 (8) cm long, minutely hairy. Bract 1 or absent, 0.5 – 2 mm long, subulate, minutely hairy. Pedicels 2 – 3 mm long, minutely hairy. Calyx 3 – 5 mm long, sparsely puberulent, green to blue tinged; lobes 1 – 3 mm long, apex acute, margin entire. Corolla pale to dark purple blue, 8 – 11 mm long, inside puberulent near mouth; tube 5 – 7 × 1 – 2 mm long; upper lip 1.5 – 2.5 mm long, 2 lobed; lower lip 3.5 – 5 mm, 3 lobed to undivided. Stamens 2; filaments 3 – 5 mm long, glabrous; anthers 0.7 – 1 mm long. Ovary 1 – 3 × c. 1.5 mm, glabrous; style 3.5 – 5 mm long, glabrous; stigma capitate, glandular. Capsule 3 – 5 mm long. Seed c. 0.5 mm long.

Flowering and Fruiting: February – October.

Distribution: India (Assam, Arunachal Pradesh, West Bengal, Sikkim, Mizoram), Nepal, Bhutan, China, Myanmar, Taiwan, Thailand, Peninsular Malaysia, Java, Laos, Vietnam, Cambodia, Philippines.

Specimens examined: Assam, Cachar, Damchara, 762 m, Sept. 1903, *Shaik Mokim* 160 (CAL); Arunachal Pradesh, Subansiri, Khuni Pahar, 290 m, 24 Sept. 1959, *G. Panigrahi* 19323 (CAL); East Himalaya, *Griffith K.D.* 3845/1 (CAL herb. acc. no. 331934); West Bengal, Darjeeling, Mongpu, 609.6 m, 15 Nov. 1870, *C.B. Clarke* 13772 (CAL herb. acc. no. 331996); Mizoram, Dampa Tiger Reserve, Dampa Reing Pui, 17 Sept. 2008, *B.K. Sinha & M. Odyuo* 112872 (ASSAM herb. acc. no. 71162); Sikkim, Tholung, 17 Sept. 2000, *D. Maity* 23232 (BSHC herb. acc. no. 33079).

Imperfectly known species

Rhynchoglossum ampliata (C.B. Clarke) B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 168. 1962. *Klugia ampliata* C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 160. 1883.

Type: India, Assam, Mishmee Hills, near Yen, Griffith KD 3846 (K, Photo !)

Stems 30 cm high, glabrous. Leaves alternate, appear opposite at apex, 7 – 15 × 3 – 8 cm, oblique, base rounded to attenuate, margin entire to undulate, rarely serrated near apex, apex acute to acuminate; glabrous; mid vein finely channeled above, prominent and raised beneath,

lateral veins 6 – 10 on either side of mid vein. Petiole 0.5 – 2 cm long, glabrous. Raceme 6 – 8 cm long, axillary later lateral on maturity, sparsely puberulent. Peduncles 1 – 5 cm long. Pedicels 2 – 5 mm long. Bracts 6 – 8 mm long, subulate, puberulent. Flowers 10 – 15. Fruiting calyx 10 – 15 cm long, infundibuliform, ridged; tube 5 – 10 cm long, cylindric; subequally 5-lobed, 5 – 8 cm long, lobes triangular, margin entire, apex acuminate. Corolla not seen. Capsules ovoid oblong within accrescent calyx.

Flowering and Fruiting: Not known.

Distribution: India (Assam, type locality).

Note: Description is based on literature and the photograph of the type specimen. No specimen found at CAL, BSHC and ASSAM.

20. RHYNCHOTECHUM Blume, Bijdr. Fl. Ned. Ind. 775. 1826.

Type: *Rhynchotechum parviflorum* Blume.

About 13 species in SE Asia, Pacific Islands; 7 species in NE India.

KEY TO THE SPECIES

- | | |
|---|----------------------------|
| 1a Plants sericeous to villous or glabrous, not hispid. | 2 |
| 1b Plants hispid. | 7. <i>R. vestitum</i> |
| 2a Leaves opposite. | 3 |
| 2b Leaves alternate to subopposite. | 4 |
| 3a Upper surface of leaves glabrous, rarely pubescent. | 1. <i>R. alternifolium</i> |
| 3b Upper surface of leaves villous. | 3. <i>R. gracile</i> |
| 4a Calyx segments glabrous. | 4. <i>R. calycinum</i> |
| 4b Calyx segments scabrous to sericeous. | 5 |
| 5a Corolla pink, glabrous. | 5. <i>R. hookeri</i> |
| 5b Corolla red purple, scabrous. | 6 |
| 6a Corolla with glandular hairs on outer surface. | 6. <i>R. obovatum</i> |
| 6b Corolla eglandular. | 2. <i>R. ellipticum</i> |

1. Rhynchotechum alternifolium C.B. Clarke in A.DC. & C.DC., Monogr. Phan. 5: 198. 1883; & in Hook.f., Fl. Brit. India 4: 374. 1884; B.M. Anderson & D.J. Middleton, Edinburgh J. Bot. 70 (1): 131. 2013.

Type: India, Upper Assam, by lake Brahmakoondo [Brahmakund], *Griffith* 3850 (K photo!).

Undershrubs. Stems 90 – 200 cm tall. Leaves alternate to sub-opposite, 5.8 – 24 (32.3) × (2.2) 4 – 9.7 cm, obovate,

base narrowly cuneate to cuneate, margin denticulate to sub-entire, apex caudate; mid vein raised beneath, secondary vein pairs 11 – 16 (18); upper surface glabrous to rarely white pubescent, lower surface short rusty villous along veins, glabrous in-between. Petiole 2 – 7 cm long, glabrous. Inflorescence (3) 5 – 20 cm long, 3 – 5 branched. Peduncles (1.2) 2.5 – 11.5 cm long; rusty-yellow villous. Bracts 4.5 – 11 (14) mm long, linear to triangular. Pedicels 3 – 12 mm long, rusty-yellow villous. Calyx segments 2.5 – 3 (3.5) × 1 – 1.75 (2) mm, lobes oblong, glabrous to sparsely sericeous. Corolla white, glabrous, upper lip 2 – 3.5 × 2.5 – 5 mm, apex obtuse, lower lip 3 – 5 × 3.5 – 6 mm, apex rounded to obtuse; tube 1.5 – 2 mm long. Filaments 1 – 1.75 mm long; anthers c. 2 mm in diam., puberulent; staminode c. 0.5 mm long. Ovary ovoid, 1 – 2 × 1.25 – 2 mm, slightly puberulent; style 3 – 5 mm long; stigma apex rounded to truncate. Fruits (dry) 3 – 5 × 2.5 – 4.5 mm, ovoid glabrous.

Flowering and Fruiting: February – September.

Habitat: Growing in evergreen and mixed forests.

Distribution: India (Arunachal Pradesh). Myanmar.

Specimens examined: Lohit, Paya to Nara, 305 – 460 m, 17 Nov. 1957, *R.S. Rao* 10691 (ASSAM herb. acc. no. 16304); Tirap, Rusa to Bimalpur, 7 Sept. 1958, *G. Panigrahi* 17037 (ASSAM herb. acc. no. 13546); Dibang valley, on the way to Dipunala, 3 Sept. 1990, *A. Pramanik* 5176 (ARUN herb. acc. no. 2231); Lohit, on the way to Lohitpur, 16 Sept. 1969, *A.S. Rao* 47886 (CAL).

2. Rhynchotechum ellipticum (Wall. ex D.Dietr.) A.DC. in DC., Prodr. 9: 285. 1845; C.B. Clarke, Commelyn. Cyrtandr. Bengal. 131, t. 41. 1874, & in A.DC. & C.DC., Monogr. Phan. 5: 196. 1883; *et* in Hook.f., Fl. Brit. India 4: 373. 1884; Kanjilal & al., Fl. Assam 3: 399. 1939; A.S. Chauhan in Hajra (ed.), Contrib. Fl. Namdhapa 237. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 234. 2008; Hilliard in Grierson & D.G. Long, Fl. Bhutan 2(3): 1326. 2001.

Type: Bangladesh, Mts Sylhet, *F. de Silva*, *W. Gomez* & *H. Bruce* in *Wallich* 6411 (K, Photo!).

Herbs. Stems 30 – 60 (220) cm long. Leaves opposite; 5 – 30 × 4 – 16 cm, elliptic to slightly obovate, base narrowly cuneate to cuneate, margin denticulate to serrulate, apex acute or obtuse; upper surface dark green, glabrous to sparsely puberulent; lower surface pale green, yellow villous along veins; lateral vein pairs 10 – 16 on either side of mid vein. Petiole 1 – 4 cm long, glabrous. Cymes many flowered, at the axils of fallen leaves, branched. Peduncle 7 – 10 mm long, sericeous, first branch 0.7 – 6 cm long;

second branch 5 – 14 mm long. Bracts 2.8 – 5.2 mm long, linear to triangular, glabrescent. Pedicels 1 – 7 mm long, glabrescent. Calyx pink, 3 – 5.5 mm long, lobes triangular, margin entire, apex acute to subrounded, scabrous outside, glabrous inside. Corolla red-purple, upper lip 3 – 4 × 3.5 – 4.2 mm, apices rounded; lower lip 4.8 – 8 × 5–7 mm; apices rounded; tube 1.3 – 2.2 mm long, outside scabrous. Filaments 1 – 1.3 mm long, glabrous; anthers 1–1.5 mm in diameter, sparsely puberulent; staminode c. 0.7 mm long. Ovary 1–1.75 mm in diameter, glabrous to rarely puberulent; style 5 – 7 mm long, sparsely puberulent to glabrous; stigma apex globose to truncate. Fruits 3 – 5 mm in diam., ovoid, glabrous.

Flowering and Fruiting: July–December.

Habitat: On forest floor, near stream.

Distribution: India (Assam, Arunachal Pradesh, Sikkim, Mizoram), Bhutan, Bangladesh, Nepal and Myanmar.

Specimens examined: Sikkim, without locality, July 1984, *N.L. Bor* 19888 (ASSAM herb. acc. no. 20995); Mizoram, Dampa Tiger Reserve, Teirei, 27 Oct. 2007, *B.K. Sinha & N. Odyuo* 116944 (ASSAM herb. acc. no. 71175); Mizoram, Dampa Tiger Reserve, 22 Sept. 2009, *B.K. Sinha & N. Odyuo* 112791 (ASSAM herb. acc. no. 71174); Assam, Riat Khawn, 1371 m, 29 Aug. 1913, *U.N. Kanjilal* 2664 (ASSAM herb. acc. no. 21000).

3. *Rhynchoechum gracile* B.M. Anderson, Edinburgh J. Bot. 70(1): 150. 2013.

Type: India, Assam, *Masters s.n.* (L, n.v.).

Herbs. Stems glabrous. Leaves alternate to sub-opposite, 13 – 20 × 3 – 6 mm, narrowly elliptic to narrowly obovate, base cuneate, margin slightly denticulate, upper surface white villous, lower surface yellow villous; secondary vein pairs 14 – 19. Petiole 1.5 – 3 cm long, glabrous. Inflorescence 19 – 25 cm long, 5 – 6 branched. Peduncles 11 – 13.5 cm long, villous. Bracts linear, (2) 4 – 6 mm long, minutely sericeous. Pedicels 3 – 8 mm long, minutely sericeous. Calyx lobes triangular, 1 – 1.5 × c. 0.5 mm, sub-glabrous minutely sericeous. Corolla glabrous; upper lip 2.5 – 3 × c. 3 mm; apex rounded, lower lip 4 – 5 × c. 6 mm, apex rounded; tube c. 1.5 mm long. Filaments 0.75 – 1 mm long, glabrous; anthers c. 1 mm diameter; staminode 1, c. 0.4 mm long. Ovary 1–1.5 × c. 0.5 mm, puberulent; style 2.5–4 mm long, glabrous; stigma apex rounded. Fruits not seen.

Flowering and Fruiting: Not recorded.

Distribution: India (Assam).

Note: Description is based on the image of the type specimen. No specimen found at CAL, ASSAM and ARUN.

4. *Rhynchoechum calycinum* C.B. Clarke in A.D.C. & C.D.C., Monogr. Phan. 5: 199. 1883 & in Hook.f., Fl. Brit. India 4: 374. 1884; Burkill, Rec. Bot. Surv. India 10: 330. 1925; G.D. Pal & Thoth., Bull. Bot. Surv. India 30: 173. 1988; Giri & al., Mat. Fl. Arunachal Pradesh 234. 2008; B.M. Anderson & D.J. Middleton, Edinburgh J. Bot. 70 (1): 136. 2013.

Type: India, Upper Assam, on the banks of the river Soondra, unknown s.n. (K, Photo!).

Herbs. Stems 80 – 125 cm long. Leaves opposite, 24 × 8.5 cm, elliptic, base narrowly cuneate, margin entire to slightly denticulate, apex acuminate; glabrous on both surfaces; secondary vein pairs 14 – 15. Petiole 5 – 6.5 cm long, glabrous. Inflorescence 4 – 5 cm long, branched. Peduncles 1.5 – 2.5 cm long, sparsely yellow villous to glabrous. Bracts 7 – 9 × 1 – 1.5 mm, triangular to linear. Pedicels 1 – 6 mm long, glabrescent. Calyx segments 5 – 7 × 1 – 1.75 mm, lobes triangular to linear, apices acute, glabrous. Corolla white, glabrous; lobes subequal, upper lip 5.5 – 6.5 mm long; apex rounded, lower lip 6 – 6.5 mm long, apices rounded; tube 4 – 4.5 mm long. Filaments 1 – 2 mm long, glabrous; anthers c. 0.5 mm in diameter, puberulent; staminode c. 0.25 mm long. Ovary 2 – 2.5 × c. 2 mm, glabrous; style c. 3 mm long; stigma apex globose. Fruits ellipsoid, 2 – 2.75 × c. 2 mm, glabrous.

Flowering and Fruiting: October–June.

Habitat: Growing on the margins of primary forest, often in moist and shady conditions, along streams.

Distribution: India (Assam, Arunachal Pradesh). Endemic.

Specimens examined: Assam, Abor, Jankamukh, 20 Dec. 1911, *I.H. Burkill* 37282 (CAL herb. acc. no. 331759); Arunachal Pradesh, West Siang, Lirmoba to Ligo, 700 m, 15 Sept. 2011, *M. Bhaumik* 27433 (ARUN herb. acc. no. 18114, 18116).

5. *Rhynchoechum hookeri* (C.B. Clarke) B.M. Anderson, Edinburgh J. Bot. 70(1): 152. 2013.

Type: East Bengal, Chittagong, on Seetakoondo hill, Hooker & Thomson 481 (K photo!)

Herbs. Stems glabrous. Leaves opposite, 15.5 – 25 × 4.4 – 8.2 cm, narrowly elliptic to oblong, base cuneate, margin denticulate to entire, apex acuminate, upper surface glabrous to sparsely white pubescent; lower surface sericeous, especially along veins; secondary vein pairs 15 – 21. Petiole 1.5 – 4 cm long; glabrous. Inflorescence 1 – 3 cm long, 2–4-branched. Peduncles 0.2 – 0.5 cm long, sericeous. Bracts 2.5 – 5 cm long, linear to triangular, minutely sericeous. Pedicels 3 – 11 mm long, sparsely sericeous to

glabrescent. Calyx segments $1.75 - 3 \times 0.5 - 1$ mm, lobes triangular to linear, apex acute to acuminate, sparsely sericeous. Corolla pink-lilac, glabrous to sparsely puberulent; upper lip $1.5 - 3 \times 0.75 - 1.5$ mm, apex rounded, lower lip $4 - 4.5 \times 5 - 5.5$ mm, apex rounded; tube $1 - 1.5$ mm long. Filaments $0.75 - 1$ mm long; anthers *c.* 1 mm diam., slightly glandular puberulent; staminode *c.* 0.5 mm long. Ovary $1 - 1.25 \times 0.75 - 1$ mm, glabrous to slightly puberulent; style $3.5 - 4$ mm long; glabrescent; stigma apex rounded. Fruits $2 - 3 \times 2 - 2.5$ mm, ovoid, glabrous.

Flowering and Fruiting: July – September.

Habitat: Growing in rainforest and woodland.

Distribution: India (Arunachal Pradesh), Bangladesh, Myanmar.

Specimen examined: India orientalis, *Hooker & Thomson s.n.* (CAL herb. acc. no. 331717).

6. *Rhynchotechum obovatum* (Griff.) B.L. Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 38. 1962; B.L. Burtt, Thai Forest Bull., Bot. 29: 107. 2001.

Type: Griff., Icon. Pl. Asiat. 4: pl. 438. 1854. *Epitype:* Mishmee, Griffith s.n. (K, Photo !).

Herbs. Stems $30 - 200$ cm tall, glabrous. Leaves opposite; $7 - 27 \times 4 - 18$ cm, elliptic to slightly obovate, base narrowly cuneate to cuneate, margin serrulate, apex acuminate, rarely acute or obtuse; upper surface glabrous to sparsely white puberulent; lower surface yellow villous, denser along veins; lateral vein pairs $11 - 20$ (25). Petiole $1 - 6$ cm long, glabrescent. Inflorescence pinkish white, $8 - 13$ cm long, $5 - 7$ branched. Peduncle $0.7 - 6$ cm long, sparsely sericeous, becoming glabrous. Bracts $2 - 7$ mm long, linear to triangular, minutely sericeous to glabrescent. Pedicels $1 - 13$ mm long, yellow villous to minutely scabrous. Calyx pale pink, $3 - 5 \times 1 - 1.5$ mm, lobes triangular to linear, apex acute, scabrous. Corolla red-purple, outside scabrous with glandular hairs to glabrescent; upper lip $3 - 4 \times 3 - 5$ mm, apex rounded, lower lip $5 - 7 \times 6 - 7.5$ mm, apex rounded; tube $1.5 - 2$ mm long. Filaments $1 - 1.25$ mm long, glabrous; anthers $1 - 1.5$ mm diameter, slightly puberulent; staminode $0.25 - 0.5$ mm long. Ovary $1 - 1.5 \times 1.25 - 1.75$ mm, glabrous to rarely puberulent; style $(5.5) 6 - 7 (7.5)$ mm long, finely scabrous to glabrous; stigma rounded to truncate. Fruits widely ovoid, $3 - 4.5$ mm in diam, glabrous.

Flowering and Fruiting: July–January.

Habitat: Growing in forests, typically in shady and moist conditions, on limestone bedrock, sometimes on steep slopes.

Distribution: India (Arunachal Pradesh, Sikkim, Assam, Meghalaya), Bhutan, Bangladesh, Nepal and Myanmar.

Specimens examined: Arunachal Pradesh, without locality, *s. coll.* 99427 (ASSAM herb. acc. no. 67350 & 67355); Assam, Aka Hills, *N.L. Bor* 15254a (ASSAM herb. acc. no. 20996); Mizoram, Dampa Tiger Reserve, Phuldurgesia to Saithal, 22 Sept. 2006, *B.K. Sinha & N. Odyuo* 112791 (ASSAM herb. acc. no. 71173); Meghalaya, Khasia-Jaintia hills, 18 Nov. 1969, *N.P. Balakrishnan* 50245 (ASSAM herb. acc. no. 46993).

7. *Rhynchotechum vestitum* (Griff.) Wall. ex C.B. Clarke, Commelyn. Cyrtandr. Bengal. 132, t. 92. 1874, in A.DC. & C.DC., Monogr. Phan. 5: 197. 1883 & in Hook.f., Fl. Brit. India 4: 373. 1884; Kanjilal & al., Fl. Assam 3: 399. 1939; A.S. Chauhan in Hajra (ed.), Contrib. Fl. Namdhapa 237. 1996; Giri & al., Mat. Fl. Arunachal Pradesh 234. 2008; W.T. Wang & al., in C.Y. Wu & P.H. Raven (eds), Fl. China 18: 395. 1998; Hilliard in Grierson & D.G. Long, Fl. Bhutan 2(3): 1326. 2001.

Type: Bhutan, Geeree nuddee, 3300 ft, *Griffith* 426 (right-hand specimen on sheet, K, Photo !).

Subshrubs. Stems $60 - 180$ cm tall, sometimes decumbent. Leaves opposite; $7 - 25 \times 4 - 10$ cm, elliptic to narrowly elliptic, base cuneate, margin denticulate to sub-entire, apex acuminate to acute; secondary vein $8 - 19$ on either side of mid rib; upper surface long rusty appressed hispid, the hairs $1 - 3$ mm long; lower surface long rusty appressed hispid, denser along veins. Petiole $2 - 7$ cm long, hispid. Inflorescence $2 - 5$ cm long, $3 - 4$ -branched. Peduncles reduced, $0.5 - 2$ cm long, axis densely yellow hispid, rarely. Bracts $5 - 16$ mm long, triangular to linear, hispid. Pedicels $5 - 14$ mm long, densely long yellow hispid. Calyx greenish white, $4 - 7 \times 1 - 2$ mm, lobes triangular, apex caudate, densely long hispid. Corolla pink to white, glabrous outside, upper lip $3 - 4 \times 4 - 6$ mm; apex rounded, lower lip $5 - 6 \times 6 - 8$ mm, apex rounded; tube $1.5 - 2$ mm long. Filaments $1 - 1.5$ mm long; anthers $1 - 1.5$ mm in diam., glandular puberulent, rarely glabrous; staminode $0.25 - 0.5$ mm long. Ovary $1 - 1.5 \times 1 - 2$ mm, slightly puberulent; style $3 - 5$ mm long; stigma apex truncate to globose. Fruits $3 - 4 \times 3 - 4$ mm, ovoid widely ovoid, glabrous to rarely slightly puberulent.

Flowering and Fruiting: July–September.

Habitat: Growing in damp and shady conditions in evergreen forest floor, sometimes in ravines, at $450 - 1820$ m.

Distribution: India (Assam, Sikkim, Meghalaya, Arunachal Pradesh), Bhutan, Bangladesh, China, Vietnam, Sumatra and Java.

Specimens examined: Sikkim, S. Kurz (CAL herb. acc. no. 331726); Meghalaya, Khasi hills, Riat Khawn, 1371 m, 29 Aug., 1913; Meghalaya, Jantia hills, on road to Shillong, 18 Nov. 1969, N.P. Balakrishnan 49978 (ASSAM herb. acc. no. 46996); Arunachal Pradesh, Siang, Koppu to Geling, 600 – 833m, 27 Mar. 1958, G.K. Murthy 13080 (ASSAM herb. acc. no. 16299); Arunachal Pradesh, Dibang valley, on the way to Tiwari gaoon, 9 Sept. 1990, A. Pramanik 5295 (ARUN herb. acc. no. 2233); Arunachal Pradesh, Kurung Kumen, Nyapin, Dec. 2008, S.S. Dash 32423 (ARUN herb. acc. no. 13441); Arunachal Pradesh, Changlang dist., Namdhapa, 29 Sept. 1994, G.D. Pal 7304 (ARUN herb. acc. no. 5299); North Sikkim, Lingthem, 13 Sept. 1986, D.C.S. Raju & S. Singh 7303 (BSHC 008840).

21. STAURANTHERA Benth., Scroph. Ind. 57.1835; G. Don, Gen. Hist. 4: 665. 1838. *Type: Stauranthera grandiflora* Benth.

Over 10 species in SE Asia, Pacific Islands; 2 species in India found in NE India.

KEY TO THE SPECIES

- 1a. Flower white, not gibbous at base. 2. *S. umbrosa*
1b. Flower blue, gibbous at base. 1. *S. grandiflora*

1. Stauranthera grandiflora Benth., Scroph. Ind. 57.1835; Dietr., Syn. Pl. 3: 582. 1834; R. Br. in Benn. Pl. Jav. Rar. 121. 1848; C.B. Clarke, Commelyn. Cyrtandr. Bengal. 127. 1874, in A.DC. & C.DC., Monogr. Phan. 5: 190. 1883 & in Hook. f., Fl. Brit. India 4: 371. 1884; Giri & al., Mat. Fl. Arunachal Pradesh 234. 2008.

Type: Malaysia, Penang, Wall. Cat. 6395 (K photo!)

Plants upto 40 cm high, brown pubescent, almost glabrous when mature. Leaves opposite, unequal, reduced leaf 5 – 7 mm long, sessile, linear, normal leaf (10.5) 17.5–23.5 × (4) 9–12 cm, broadly elliptic to ovate, base oblique or rounded, margin entire to repand or obscurely toothed, apex acuminate; mature nearly glabrate except on the nerves beneath; lateral veins (8) 12 – 16 on either side of the mid-vein, do not terminate along margin, prominent on both surfaces, raised beneath, mid-vein finely channeled above. Petioles 1.5 – 4 cm long. Cyme at the axil of small leaves, dichotomously branched. Peduncles 15 – 20 cm long, sparsely puberulent. Bracts at each level of dichotomy, linear, adaxially sparsely puberulent, 5 – 7 mm long. Pedicels 1.5 – 2 cm long, sparsely puberulent. Calyx 3 – 5 × 2 – 3 mm, 5-lobed, broadly triangular, acute at apex, entire along margin, puberulent outside, glabrous

inside. Corolla blue, c. 1.2 cm long, outside thinly puberulent to glabrous, inside glabrous, tube campanulate, gibbous at base, lower lip 2-lobed, 3.5 – 4 mm long, upper lip 3-lobed, 3.5 – 4.5 mm, apex rounded, tube c. 2.5 × 3 mm. Filaments 2.5 – 3 mm long, glabrous; anthers cordate, c. 1.5 mm long. Ovary 1.5 – 2 × c. 2.5 mm, thinly puberulent; style 1 mm long, broad, glabrous; stigma c. 1.5 mm in diam., glabrescent. Capsules 4 – 6 mm in diam., pubescent, accrescent calyx 5 – 9 mm long. Seeds c. 0.7 mm long.

Flowering and Fruiting: June–September.

Habitat: In moist shaded forests. 200 – 800 m.

Distribution: India (Assam, Arunachal Pradesh, Nagaland), Bangladesh, Myanmar, China, Vietnam, Thailand, Malaysia, Indonesia.

Specimens examined: Assam, Dekho valley, 213 m, 29 Mar. 1895, G. Watt 11022 (CAL herb. acc. no. 331301); Nagaland, Kohima, May 1895, G. Watt 11577, (CAL herb. acc. No. 331809); Nagaland, Kohima, May 1895, G. Watt 11577, (CAL herb. acc. No. 331799); Arunachal Pradesh, Tirap, Kamhari, 16 July 1961, D.B. Deb 26760 (CAL); Arunachal Pradesh, Tirap, Kamhari, 20 June 1961, D.B. Deb 25851 (CAL).

2. Stauranthera umbrosa (Griff.) C.B. Clarke, Commelyn. Cyrtandr. Bengal. t. 89. 1874, in A.DC. & C. DC., Monogr. Phan. 5: 189. 1883 & in C.B. Clarke in Hook. f., Fl. Brit. India 4: 371. 1884; Wang & al. in Fl. China 18: 396. 1998; Giri & al., Mat. Fl. Arunachal Pradesh 235. 2008.

Type: Griffith KD 3845 (K, Photo!).

Undershrubs. Stems apically rust-brown puberulent. Lower leaves alternate, upper opposite to subopposite, strongly unequal; smaller leaf reduced to linear scale like appendage, sessile, 2 – 4 mm long, normal leaves (6.5) 10 – 21 × (2.5) 6.5 – 9.5 cm, ovate-elliptic to obovate, base cuneate, or oblique rarely rounded, margin repand to distantly crenate, apex acuminate, glabrescent above or with adpressed strigose hair, glandular hairs on the lower surface, sparsely puberulent along veins; lateral veins 6 – 8 (15) on either side of mid-vein, do not terminate along margin, prominent on both surface, raised beneath, mid-vein finely channeled above. Petioles 5 – 10 mm long, glabrescent. Cyme lax, pseudoterminal or from axil of reduced leaf, few- to many-flowered. Peduncles 4 – 6 cm long, puberulent. Bracts 3 – 4 mm long, linear, adaxially puberulent. Pedicels 1 – 1.5 cm long, puberulent. Calyx c. 4 mm long, 5-lobed, broadly triangular, apex acute, margin entire, thinly puberulent

on both sides, 2 – 3 × 1.7 – 2 mm. Corolla white, c. 7 mm long, outside puberulent, inside glabrous, tube campanulate, gibbous or saccate at base, lower lip 2-lobed, c. 3 mm long, upper lip 3-lobed, c. 3.5 mm long, lobes subequal, apex rounded, tube slightly longer than limb, 3 – 4 × c. 4 mm. Filament 4 – 6 mm long, glabrous; anthers 1 – 1.5 mm long, cordate, thecae slightly divergent, confluent at apex. Ovary 2 – 3 × c. 3 mm, subglobose, densely puberulent; style 1.5 – 2 mm long, broad, thinly puberulent; stigma densely puberulent. Capsules 4 – 5 mm in diam., pubescent, accrescent calyx 4 – 6 mm long. Seeds c. 0.5 mm long.

Key to the variety

- 1a. Upper surface of leaf glabrescent. 2.1. var. *umbrosa*
 1b. Upper surface of leaf adpressed strigose hairy. 2.2. var. *upendrae*

2.1. *Stauranthera umbrosa* (Griff.) C. B. Clarke var. *umbrosa*

Upper surface of leaf glabrescent.

Flowering and Fruiting: September–February.

Habitat: Forest margins in valleys, shady places in dense forests; 200–3000 m.

Distribution: India: (Arunachal Pradesh Assam, Nagaland), Bangladesh, China, Malaysia, Myanmar, Java, Vietnam.

Specimens examined: Assam, North of Sidi river, 3048 m, 17 Jan. 1912, *I.H. Burkill* 36079 (CAL herb. acc. no. 331784); Rohing, 3048 m, 31 Dec. 1911, *I.H. Burkill* 37609 (CAL herb. acc. no. 331785); Rangging, 22 Feb. 1912, *I.H. Burkill* 36681 (CAL herb. acc. no. 331786); Baligan, near Naga Hills, Nov. 1898, *M.A. Hock (Dr. Prain's Collector)* 426 (CAL herb. acc. no. 331783); Suckimpore, Namsung, 475 m, 17 Apr. 1885, *C.B. Clarke* 37921 A (CAL herb. acc. no. 331791); Nagaland, Neechoyavd, Naga Hills, 152 m, 17 Oct. 1885, *C.B. Clarke* 40838 (CAL herb. acc. no. 331803).

2.2. *Stauranthera umbrosa* (Griff.) C.B. Clarke var. *upendrae* U.C. Bhattach.ex Su. Datta & al., *Pleione* 6(2): 384. 2012.

Type: India, Meghalaya, Tura, Garo hills, 3000' (909m), 14 Feb. 1886, *C.B. Clarke* 43076 G (CAL herb. acc. no. 331802 !).

Upper surface of leaf with adpressed strigose hair, c. 0.5 mm long.

Flowering and Fruiting: September–February.

Habitat: In dense forest, moist and damp places, 700 – 900 m.

Distribution: India (Assam). Endemic.

Specimens examined: Assam, Tura (Garo Hills), 916 m, 14 Feb. 1886, *C.B. Clarke* 43076 G (CAL herb. acc. no. 331802); without locality, Sept. 1903, *Shaik Mokim* 38 (CAL); Damchhra, 762 m, Sept. 1903, *Shaik Mokim* 22 (CAL); Tura peak (Garo Hills), 762 m, 1885, *Amber Myanu* (?) (CAL herb. acc. no. 331804).

22. *TETRAPHYLLUM* Griff. ex C.B. Clarke in A.DC. & C.DC., *Monogr. Phan.* 5: 137. 1883.

Type: *Tetraphyllum bengalense* C.B. Clarke

1 species in NE India.

Tetraphyllum bengalense C.B. Clarke in A.DC. & DC. *Monogr. Phan.* 5: 137. 1883 & in Hook.f., *Fl. Brit. India* 4: 363. 1884; Burkill in *Rec. Bot. Surv. Ind.* 10(2): 330. 1925; A. S. Chauhan in Hajra (ed.). *Contrib. Fl. Namdhapa* 238. 1996; Giri & al., *Mat. Fl. Arunachal Pradesh* 2: 235. 2008.

Type: India, Assam, Cachar, 1 June, 1873, *K.L. Keenan s.n.* (K, photo !)

Herbs, slightly woody. Stems 10 – 30 cm long, brown woolly, one pair of scale leaves along stem, 1 – 2 cm long. Leaves usually 2-pairs rarely 3, at the apex, opposite, (7) 9 – 13 (15) × 7 – 10 cm, obovate, oblique or attenuate at base, acuminate at apex, denticulate along the margin, young leaves woolly on both surfaces, mature leaves glabrous above, tomentose beneath, especially along veins; veins prominent on both surfaces, raised beneath, lateral veins 9 – 14 on either side of midrib, do not terminate along a margin. Petiole 5 – 7 mm long. Peduncle 3 – 4 mm long. Bracts c. 2 mm long. Flowers in axillary cymes, 10 – 30 flowered, blue. Pedicels 4 – 6 mm long. Calyx c. 1.5 cm long; corolla tube c. 2 cm long; limb c. 1 cm long, subacute, inside sparsely sericeous. Filaments glabrous. Ovary sericeous near apex. Capsules lanceolate, 12 – 18 × ca 3 mm, narrowed above, splitting loculicidally and septicidally into 4 valves, leaving 2 main ribs united to the persistent style base.

Flowering and Fruiting: June–February.

Distribution: India (Arunachal Pradesh, Assam, Manipur), Bangladesh.

Specimens examined: Manipur, 30 Nov. 1885, *C.B. Clarke* 42335 (CAL herb. acc. no. 332029); Assam, Rangging, 670.5 m, 25 Jan. 1912, *I.H. Burkill* 36244 (CAL herb. acc. no. 332021); Assam, Balek, 18 Jan. 1912, *I.H. Burkill* 36437 (CAL herb. acc. nos. 332028, 332022); Assam, Guahati to Jorhat, 16 May 1957, *G. Panigrahi* 9311 (CAL);

Assam, Guahati to Jorhat, 16 May 1957, *G. Panigrahi* 9311 (ASSAM herb. acc. no. 16308, 16309). Bangladesh, East Bengal, *Griffith* 3830 (CAL herb. acc. no. 332031); Chittagong, 13 Feb. 1875, *C.B. Clarke* 19814 (CAL herb. acc. no. 332032).

ACKNOWLEDGEMENTS

We express our sincere thanks to the Director, Botanical Survey of India for providing facilities and encouragement. We are also thankful to the authorities of Royal Botanic Gardens, Kew, Naturhistorisches Museum Wien and National Herbarium of the Netherlands for providing the images of type specimens on the web.

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