

The Gesneriaceae of India: Consequences of updated generic concepts and new family classification

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Abstract

For the Gesneriaceae of India the consequences of revised generic circumscriptions and the new classification based on molecular phylogenetic work are summarised and outlined. An identification key, genus descriptions and some considerations on the biogeographic distribution of the genera in India are provided. The current genus count in India is 23, with *Briggsia* Craib having disappeared and *Cyrtandromoea* Zoll. being excluded from Gesneriaceae. The Indian species formerly included in *Boea* Comm. ex Lam. and *Paraboea* (C.B. Clarke) Ridl. are now included in *Dorcoceras* Bunge and *Middletonia* C. Puglisi, respectively. *Oreocharis* Benth. is newly recorded for India due to the transfer of *Briggsia muscicola* (Diels) Craib to *Oreocharis*. The Indian genera are from both tribes of subfamily Didymocarpoideae, namely Epithemateae and Trichosporeae. The genera are represented in three out of four subtribes of tribe Epithemateae and six out of ten subtribes in tribe Trichosporeae, thus, in total the Indian genera are represented in nine out of fourteen subtribes in the subfamily Didymocarpoideae. Subtribe Jerdoniinae is endemic to India. This high level of diversity underlines the biogeographical and historical importance of India for the family Gesneriaceae.

Keywords: *Dorcoceras*, Gesneriaceae, India, Jerdoniinae, *Middletonia*, *Oreocharis*

Introduction

The present paper provides an overview of the Gesneriaceae Rich. & Juss. in India with emphasis on the new generic delineations, and the placement of the genera in the new classification for the family. Consequences of these changes include the disappearance of some generic names and the appearance of new ones. An account of the Gesneriaceae occurring in Northeast India was published recently, though it was not based on the latest classification or the revised genus boundaries (Sinha & Datta, 2016). In the following an account of the current status of the genera in India is provided.

Gesneriaceae are a medium-sized plant family of the order Lamiales (e.g. Schäferhoff *et al.*, 2010). The family comprises around 3400 species and has roughly a third of its distribution in the Neotropics and two-thirds in the Paleotropics, with some outliers in Europe and the southern hemisphere (Weber *et al.*, 2013). Recent molecular-phylogenetic work laid the basis for a new classification of the family (Möller & Clark 2013; Weber *et al.*, 2013). In this classification three major changes to the last

formal classification of Burt & Wiehler (1995) were made: (1) *Sanango* G.S. Bunting & Duke is added as a monotypic subfamily (subfam. Sanangoideae A. Weber, J.L. Clark & Mich. Möller), (2) subfam. Gesnerioideae Burnett ('New World Gesneriaceae') now also includes the southern hemispherical Coronantheroideae Wiehler and the Old World tribe Titanotricheae T. Yamaz. ex W.T. Wang, and the former tribes Gloxinieae Fritsch and Episcieae Endl. are now combined in tribe Gesnerieae Dumort. This subfamily now has 5 tribes and 12 subtribes; and (3) subfam. Didymocarpoideae Arn. (synonym: Cyrtandroideae Burnett) includes the tribes Epithemateae C.B. Clarke (synonym: Klugieae Fritsch) and Trichosporeae Nees ("Epithematoid" and "Didymocarpoid Gesneriaceae" *sensu* Weber, 2004) which also contains members of the former tribes Cyrtandreae G. Don and Didymocarpeae Endl. The two tribes are divided into 14 subtribes (Fig. 1).

Past and recent taxonomic changes

With focus on the present political boundary of India, Clarke (1884) in Hooker's Flora of British India

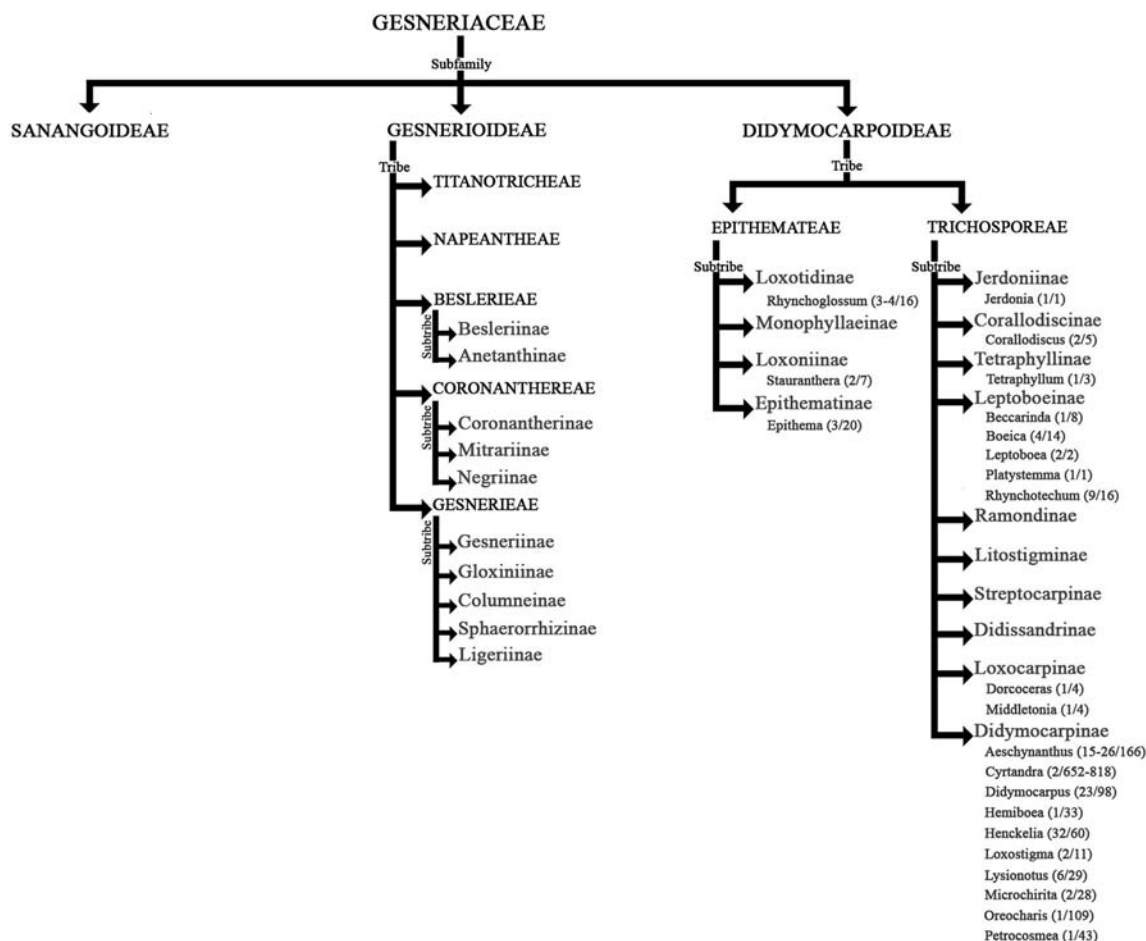


Fig. 1. Genera of Gesneriaceae of India in the new classification of Weber *et al.* (2013), with approximate number of species in India and in total given in brackets.

listed 20 genera. Since then, the circumscription of several genera changed and some were merged into others, while a few represent segregates from existing ones or were resurrected. A few genera were added subsequently from later collections (*Beccarinda* Kuntze, *Hemiboea* C.B. Clarke, *Oreocharis* Benth., *Petrocosmea* Oliv.). *Isanthera permollis* Nees was sunk into *Rhynchotechum* Blume, as *R. permolle* (Nees) B.L. Burtt (Burtt, 1962a). The genus *Klugia* Schltdl. was merged into *Rhynchoglossum* Blume (Burtt, 1962b).

The Indian species of *Didissandra* C.B. Clarke listed by Clarke (1884) were moved to *Corallodiscus* Batalin by Burtt (1947). Another *Didissandra* species (*D. muscicola* Diels) described from China by Diels (1912) and also collected in Northeast India (Sinha & Datta, 2016), was moved to *Briggsia* Craib as *B. muscicola* (Diels) Craib (Craib, 1919). This species was recently sunk into *Oreocharis* based on molecular phylogenetic data (Möller *et al.*, 2011b).

One species of *Boea* Comm. ex Lam., *B. multiflora* R. Br. was sunk into *Paraboea* (C.B. Clarke) Ridl., as *P. multiflora* (R. Br.) B.L. Burtt var. *multiflora* (Burtt, 1984), but later placed in a new genus *Middletonia* C. Puglisi (Puglisi *et al.*, 2016). *Boea wallichii* R. Br. was described from material from upper Burma (Brown, 1839), and is also collected in Northeast India (*N.E. Parry 14*, K [not barcoded]). Based on molecular phylogenetic evidence it was placed in a new genus, *Dorcoceras* Bunge, as *D. wallichii* (R. Br.) C. Puglisi (Puglisi *et al.*, 2016).

Species of *Chirita* Buch.-Ham. ex D. Don were moved to *Henckelia* Spreng. (Weber *et al.*, 2011a), one to *Microchirita* Yin Z. Wang (Wang *et al.*, 2011), and another, *C. kurzii* (C.B. Clarke) C.B. Clarke to *Briggsia*, as *B. kurzii* (C.B. Clarke) W.E. Evans (Evans, 1928). This caulescent species was later returned to *Loxostigma* C.B. Clarke [i.e. *L. kurzii* (C.B. Clarke) B.L. Burtt, 1975] for want of a better place for the moment (Möller *et al.*, 2014).

Molecular data showed that *Cyrtandromoea* Zoll. is not part of Gesneriaceae and has now been excluded from the family (Weber *et al.*, 2013). All these taxonomic changes resulted in a different set of genera to be present in India. Here, we present an account of these 23 genera as presently occurring in India, all falling in subfamily Didymocarpoideae, in 2 tribes and 9 subtribes (Fig. 1). An identification key, genus descriptions and some considerations on the biogeographic distribution of the genera in India are provided.

Key to the genera native to India

Notes: (1) For unambiguous identification of some genera both flowering and fruiting material is necessary. (2) In case that the characters given are only relevant for the species in India and not for the genus as a whole, this is explicitly stated. (3) If a genus is represented only by a single species in India, the species name is given in brackets after the genus name; in monotypic genera the specific name is preceded by “only species”. In case of most recent taxonomic changes, also the basio- or well-known synonyms are given.

1. Inflorescence a terminal, several- to many-flowered unilateral raceme; flowers in two ranks **1. Rhynchoglossum**
1. Inflorescence not a terminal raceme; flowers in axillary cymes or solitary **2**
2. Leaves of a pair strongly different in size (anisophyllous), the small leaf scale-like, the large leaf markedly asymmetrical at base; calyx plicate. **2. Stauranthera**
2. Leaves of a pair subequal or leaves alternate; calyx not plicate **3**
3. Inflorescences in terminal and axillary positions, consisting of a stalk, a single dense-flowered head (much condensed pair-flowered cyme, flowers in four rows), and a small or conspicuous cucullate subtending bract; fruit a pyxis (capsule with circumscissile dehiscence, bowl-shaped when open) **3. Epithema**
3. Inflorescence not as above, usually an axillary pair-flowered cyme or solitary flower, usually scapose in rosette plants; fruit a loculicidally or septically dehiscent capsule or indehiscent, hard or fleshy berry **4**
4. Fertile stamens 4 **5**
4. Fertile stamens 2 **15**
5. Plants with a single leaf on top of a distinct stalk; leaf heart-shaped, \pm as broad as long, margins coarsely bluntly serrate; stalk 1–2x as long as leaf; inflorescence axillary, with 1 to a few flowers; corolla saintpaulioid, violet, throat whitish; anthers yellow **10. Platystemma** (only species *P. violoides*)
5. Plants with several to many leaves **6**
6. Plants with leaves in a basal rosette or tuft . . . **7**
6. Plants with stems with distinct internodes . . . **10**
7. Filaments flattened, inserted at the middle of corolla tube; two (the shorter ones) with a marked downward appendage; corolla somewhat inflated dorsally, lilac, pencilled with red lines; placentae 4, separate from each other and arising directly from the ovary wall **4. Jerdonia** (only species *J. indica*)
7. Filaments neither flattened nor with appendages; corolla of different colouration; placentae in two lateral pairs **8**
8. Corolla campanulate or short-infundibuliform; anthers cohering all together, poricidally dehiscent; fruits plagiocarpic (held at an angle against pedicel), follicular (opening on the upper side only) . . . **7. Beccarinda** (*B. cordifolia*)
8. Corolla tubular, narrow- or broad-tubed; anthers cohering in pairs, longicidally dehiscent; fruits orthocarpic (in \pm straight continuation of pedicel), opening by 2 to 4 valves. **9**
9. Leaves rhomboid; corolla 0.8–1.5 cm long, tubular, not swollen, bearded on abaxial lip, evenly blue, purple or whitish, not spotted inside **5. Corallodiscus**
9. Leaves elliptic to lanceolate; corolla 1.7–3.5 cm long, broad-tubed, ventrally gibbous, yellow to orange, inside with red-purple to brown markings (these characters apply to the only Indian species of *Oreocharis*, *O. muscicola*, and not for the genus as a whole) . . . **22. Oreocharis** (*O. muscicola*, formerly *Briggsia muscicola*)
10. Plants epiphytic; leaves usually thick-fleshy or leathery; veins usually obscure; corolla with long or short tube, arcuate, usually bright red (more rarely pink, orange, yellow, greenish yellow, greenish or whitish); stamens didynamous, anthers connate in pairs; capsules linear, long; seeds with one or several appendages on one or both tips. **14. Aeschynanthus**
10. Plants terrestrial, if epiphytic (*Loxostigma* p.p.) characters different (the morphology and taxonomic definition of the following genera are in need of further study; seeds without or with a

- single appendage at each end as in some spp. of *Loxostigma*) **11**
11. Fruit an indehiscent, globose (or slightly 4-parted), white or bluish berry. **11. Rhynchotechum**
11. Fruit a dehiscent brownish capsule. **12**
12. Leaves in a 4-merous whorl on top of stem; flowers crowded in a terminal bunch, almost sessile **6. Tetraphyllum** (*T. bengalense*)
12. Leaves placed along stem; flowers with distinct pedicels **13**
13. Terrestrial or epiphytic herbs with underground rhizome or stem base creeping and rooting; corolla broad-tubular, ventricose; all anthers coherent or coherent in pairs . . . **19. Loxostigma**
13. Terrestrial shrubs or subshrubs; corolla campanulate; anthers free. **14**
14. Leaves opposite **9. Leptoboaea**
14. Leaves alternate **8. Boeica**
15. Fruit indehiscent, a hard (sclerocarpous) "berry" (relevant for the West Malesian species, including the two Indian species from the Great Nicobar Island). **15. Cyrtandra**
15. Fruit a dehiscent capsule. **16**
16. Capsules (in the Indian species) spirally twisted, 2-valved **17**
16. Capsules straight **18**
17. Lower leaf indumentum with glands (in the Indian species); corolla campanulate, purple; anthers coherent throughout anthesis. **12. Dorcoceras** (*D. wallichii*, formerly *Boea wallichii*)
17. Lower leaf indumentum without glands; corolla flat, white; anthers coherent only at beginning of anthesis, later free **13. Middletonia** (*M. multiflora*, formerly *Boea multiflora*/*Paraboea multiflora*)
18. Stigma chiritoid (upper stigma lobe lacking or very short, lower lobe enlarged, often emarginate or bifid) **19**
18. Stigma capitate, truncate, stomatomorphic or bilobed (with upper and lower lobe of \pm equal size) **20**
19. Plants annual or short-lived monocarpic, caulescent; inflorescence often crested; fruits bivalved. **21. Microchirita**
19. Plants usually perennial, caulescent or of rosette habit or unifoliate; inflorescence not crested; fruits bivalved or follicular **18. Henckelia**
20. Plants with leaves in basal rosettes; corolla campanulate (in the single Indian species) **23. Petrocosmea** (*P. parryorum*)
20. Plants caulescent (though stem sometimes short); corolla funnel-shaped or infundibuliform. **21**
21. Bracts 2, connate, forming a boat-shaped, semi-globose or urceolate involucre; ovary with one carpel fertile; fruit (in the Indian species) plagiocarpic, follicular (dehiscing only on upper side) **17. Hemiboea** (*H. subcapitata*)
21. Bracts 2, free; ovary with both carpels fertile; fruits orthocarpic, dehiscing on both sides . . . **22**
22. Plants usually epiphytic; corolla tubular-funnel-shaped, inflated in upper half, mouth often with two folds on lower side, white or purplish, sometimes with yellow spots at the mouth; seeds with a hair-like appendage at each end **20. Lysionotus**
22. Plants terrestrial; corolla funnel-shaped or infundibuliform, not inflated, mouth without folds on lower side, not spotted; seeds unappendaged **16. Didymocarpus**

Descriptions of the genera native to India

In the following, descriptions of genera are given in taxonomic order according to the new family classification for Gesneriaceae (Weber *et al.*, 2013), providing generic characters valid for the entire genus. Genera from elsewhere, with the one or other species naturalized in India, are not considered. The species numbers given here for the genera are taken from the World Checklist of the Smithsonian Institution (Skog & Boggan, 2007), and updated with new entries from The International Plant Names Index (2012; accessed 10 February 2017). They represent a rough guide only, since ongoing taxonomic work will likely affect these numbers in the future for some genera.

I. Tribe Epithemateae C.B. Clarke

There are no changes in this tribe at the generic level and India retains its three genera, *Rhynchoglossum* (subtribe Loxotidinae G. Don), *Stauranthera* Benth. (subtribe Loxoniinae A. DC.), and *Epithema* Blume (subtribe Epithematinae DC. ex Meisn.).

Subtribe Loxotidinae G. Don

1. Rhynchoglossum Blume (incl. *Klugia* Schltdl.)
(Fig. 2a & b)

Perennial or annual herbs, glabrous or with sparse indumentum of many-celled, often branched, eglandular hairs. Stems terete, fleshy-succulent with medullary bundles. Leaves alternate, nearly distichous, shortly petiolate, laminae obliquely ovate-cordate, base strongly asymmetrical. Inflorescences terminal, unilateral racemes with two flower rows, subtending bracts small, linear, mostly displaced onto the pedicels, a few sterile bracts often present on the flowerless side of the inflorescence axis. Sepals connate in the lower half, sometimes with wings at the lines of fusion, lobes narrowly triangular-acute. Corolla usually white (esp. tube) and azure blue (corolla lobes), rarely deep purple or evenly white, typically strongly zygomorphic; tube cylindrical, upper lip (in most species) of two short, upright or reclined lobes, lower lip a large, roundish or elongate, entire or slightly three-partite plate or tongue, rarely limb consisting of five subequal lobes. Fertile stamens 4 (the former genus *Klugia*) or 2; filaments inserted near middle of corolla, anthers coherent in pairs, thecae parallel or divaricate, apically confluent, dehiscing longicidally. Ovary unilocular. Capsules globose or ovoid, included in the calyx, dehiscing loculicidally.

Note: About 16 spp.; from N and S India and S China to New Guinea, and 1 sp. (or more?) in C America. 3 or 4 spp. in India.

Subtribe Loxoniinae A. DC.

2. Stauranthera Benth. (Fig. 2c & d)

Perennial (sometimes annual?) herbs with fleshy-succulent stems. Leaves opposite, strongly anisophyllous, large leaves obliquely elliptic or ovate, base very unequal, apex acute-acuminate or blunt; small leaves reduced to a tiny cordiform or reniform auricle. Inflorescences terminal, an alternicladic thyrse with pair- or single-flowered cymes or solitary flowers emerging from small bracts. Sepals with conspicuous plications at the sinuses. Corolla blue or white, sometimes with a yellow blotch at the palate, either rotate or widely campanulate, ecalcarate, or distinctly zygomorphic and spurred at the base. Stamens 4; filaments adnate to corolla base; anthers coherent and forming a cross-like figure, thecae slightly divergent, dehiscing longicidally. Nectary absent. Ovary unilocular. Capsules globose, breaking irregularly into pieces in the upper half.

Note: 7 spp.; from NE India and S China throughout Malesia to New Guinea. 2 spp. in India.

Subtribe Epithematinae DC. ex Meisn.

3. Epithema Blume (Fig. 2e & f)

Monocarpic herbs with succulent stems. Typical morphology (relevant also for the Indian species): Cotyledons basal, appearing at ground level, the macrocotyledon developing into a large petiolate leaf that falls off early and is usually no longer present in the flowering plant; lowermost cauline leaf solitary with distinct petiole and broadly ovate-cordate laminae; upper leaves smaller, opposite (more rarely alternate), in one or two pairs, subsessile or petiolate. Inflorescences one to many, consisting of a stalk, a single densely contracted head-like pair-flowered cyme and its subtending bract; bract of variable size and form, ranging from large, cucullate and enclosing the flower-head to a small scale. Sepals connate in lower half, lobes triangular, spreading after anthesis and the calyx forming a campanulate rain splash cup. Corolla bluish or white with blue or purple patches on the upper lobes; tube cylindrical; limb bilabiate. Nectary cup-shaped. Fertile stamens 2, the posterior pair; filaments inserted above middle of corolla tube; anthers apically coherent, thecae divaricate, apically confluent; staminodes 2, their filaments longer than those of the fertile stamens, distal parts upcurved. Ovary unilocular. Capsules globose, membranous, dehiscence circumscissile.

Note: The genus was recently revised by Bransgrove & Middleton (2015). 20 spp.; from N India and S China over SE Asia to New Guinea, 1 sp. in W Africa, and 3 spp. in India.

II. Tribe Trichosporeae Nees

In this tribe, three monogeneric subtribes were established, subtribe Jerdoniinae A. Weber & Mich. Möller to accommodate *Jerdonia* Wight, subtribe Tetraphyllinae A. Weber & Mich. Möller for *Tetraphyllum* Griff. ex C.B. Clarke and subtribe Corallodiscinae A. Weber & Mich. Möller for *Corallodiscus*. All occur in India. Subtribe Leptoboeinae C.B. Clarke includes six genera that retain their original circumscriptions. All, except *Championia* Gardner, occur in India. Subtribe Loxocarpinae A. DC., after re-circumscription of several of its genera, now includes 14 genera, with only *Dorcoceras* and *Middletonia* occurring in India. Subtribe Didymocarpinae G. Don is the largest in tribe Trichosporeae, presently comprising 32 genera (Möller et al., 2016), and species of 9 genera occur in India.

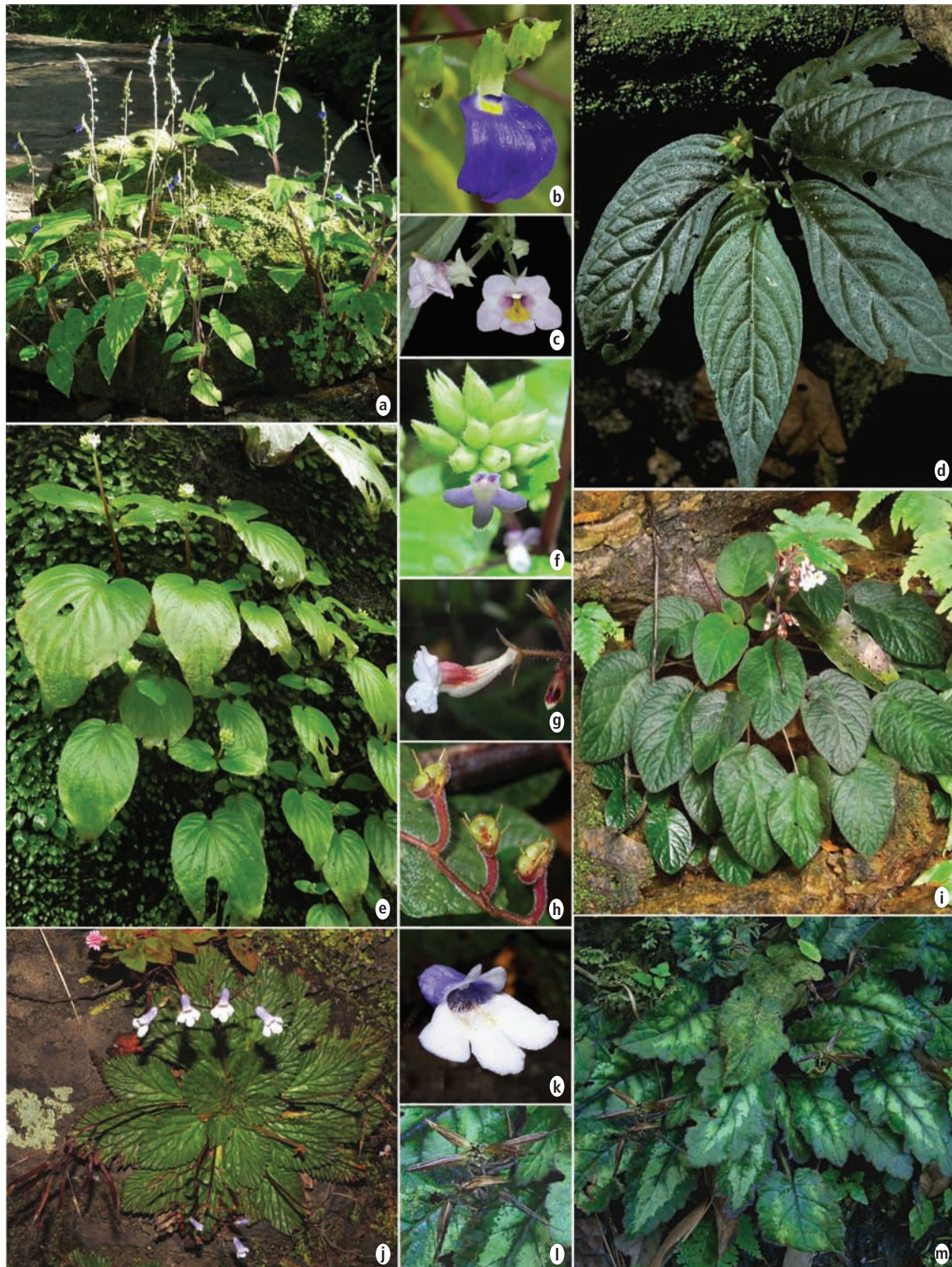


Fig. 2. Photographic images of Gesneriaceae occurring in India and adjacent areas. a, b. *Rhynchoglossum notonianum* (Wall.) B.L. Burtt: a. Habit; b. Flower; c, d. *Stauranthera grandiflora* Benth., Malaysia: c. Flowers; d. Habit; e, f. *Epithema zeylanicum* Gardner: e. Habit; f. Flower; g–i. *Jerdonia indica* Wight: g. Flower, h. Immature capsules; i. Habit; j, k. *Corallodiscus lanuginosus* (Wall. ex DC.) B.L. Burtt: j. Habit; k. Flower; l, m. *Beccarinda cordifolia* (J. Anthony) B.L. Burtt: l. Plagiocarpic fruits; m. Habit. (Images: a, e–g: A.P. Janeesha & S. Nampy, University of Calicut; c, d: A. Weber, University of Vienna; b, h, i: M. Möller, RBGE; j, k: V.S. Hareesh & P.G. Arunkumar, University of Calicut; l–m: G. Krishna, Central National Herbarium (CAL), Botanical Survey of India. All with permission).

Subtribe Jerdoniinae A. Weber & Mich. Möller

4. *Jerdonia* Wight (Fig. 2g–i)

(Sub)-rosette perennials. Leaves alternate, long-petiolate, laminae elliptic. Cymes long-pedunculate, few-flowered; bracts small. Sepals free, lanceolate. Corolla pale lilac with red lines; tube elongate, inflated above; limb oblique, bilabiate; lobes ovate, obtuse. Stamens 4; filaments short, dilated upwards, two with distinct spurs, inserted in the middle of the corolla tube; anthers connivent and coherent at the apices; thecae divergent, apically confluent. Nectary annular. Ovary ovoid, unilocular with 4 parietal placentae; style slender; stigma small, obscurely bilobed. Capsules broadly ovoid, loculicidally dehiscent. Seeds ellipsoid, testa striate-reticulate with longitudinal furrows (slightly star-shaped in cross section).

Note: In molecular phylogenies, *J. indica* Wight occupies a basal lineage in tribe Trichosporeae (Möller *et al.*, 2009) and has unusual morphological features such as apparently isocotylous seedlings, as opposed to anisocotylous seedlings of most Old World Gesneriaceae (Burt, 1963), a corolla with a prominent boss, conspicuously inflated on the adaxial side [somewhat reminiscent of the recently established genus *Tribounia* D.J. Middleton (Middleton & Möller, 2012)], flattened and appendaged filaments and unilocular ovary with four separate placentae (Wight, 1850; Weber, 1989; Janeesha & Nampy, 2014). Only one species (*J. indica* Wight) in India.

Subtribe Corallodiscinae A. Weber & Mich. Möller

5. *Corallodiscus* Batalin (Fig. 2j & k)

Perennial rosette herbs. Leaves many, glabrous to densely woolly, laminae broadly lanceolate, (ob)ovate, rhombic, elliptic or suborbicular, base broadly or narrowly cuneate; venation conspicuous. Cymes one- to many-flowered, lax or rarely subumbellate; bracteoles apparently absent. Sepals free or fused halfway. Corolla blue to purple, rarely yellow or white, tubular, limb bilabiate; upper lip shorter than lower lip; lobes subequal, rounded or obtuse; lower lip with dense beard inside of tube. Stamens 4, inserted above corolla base (rarely above middle), included or slightly exerted; anthers dorsifixed, coherent in pairs; thecae divaricate, confluent, longicidally dehiscent. Nectary annular. Ovary oblong; stigma capitate. Capsules oblong to linear, much longer than the calyx, dehiscent loculicidally, sometimes also septicidally.

Note: The genus has only a few species with mostly limited distribution in Bhutan and China, except for *C. lanuginosus* (Wall. ex DC.) B.L. Burt that has an extremely wide distribution, ranging from Beijing Municipality in NE China to S India (Wang *et al.*, 1998). Interestingly, *C. lanuginosus* was only recently recorded from the Western and Eastern Ghats in India (Kamble *et al.*, 2006; Rout *et al.*, 2008). 5 spp.; Bhutan, China, N and NE India, Nepal, Thailand. 2 spp. in India.

Subtribe Tetrphyllinae A. Weber & Mich. Möller

6. *Tetrphyllum* Griff. ex C.B. Clarke

Perennial herbs with monocarpic stem(s). Stems erect, caulescent, tawny-villose, bearing a tetramerous (pseudo)whorl or a single leaf pair at the top and pairs of scale leaves (in some species with axillary cymes) along the stem. Leaves petiolate or (sub)sessile, laminae ovate or lanceolate, partly unequal-sided. Cymes condensed, flowers nearly sessile; bracteoles small. Sepals 5, almost free to base. Corolla pink or blue, widely funnel-shaped; limb bilabiate or subregular; lobes obtuse. Stamens 4, didynamous, or 2; filaments adnate to corolla base; anthers coherent at the tips, opening by longitudinal slits. Nectary much-reduced. Ovary ovoid; stigma obscurely bilobed. Capsules splitting loculicidally and septicidally into 4 valves, leaving the two main ribs united to the persistent style base.

Note: 3 spp.; NE India, Bangladesh(?), Myanmar, Vietnam, Thailand. 1 sp. (*T. bengalense* C.B. Clarke) in India.

Subtribe Leptoboeinae C.B. Clarke

7. *Beccarinda* Kuntze (Fig. 2l & m)

Perennial herbs, rarely subshrubs. Stemless with basal leaves or with leafy unbranched stem. Indumentum of white, fawn, brown or reddish purple hairs. Leaves petiolate, laminae elliptic or ovate to ovate-orbicular, base cordate. Cymes pedunculate, umbelliform or pseudocapitate. Sepals 5, free to base. Corolla purple-blue or red, campanulate, bilabiate. Stamens 4, inserted near corolla base, included; anthers all coherent, thecae subparallel, apically confluent, dehiscent poricidally. Nectary ring-like or inconspicuous. Ovary ovoid; stigma capitate. Capsule at an angle to the pedicel, straight, ovoid to oblong, opening on the upper side.

Note: Around 8 spp.; NE India, Myanmar, S China, Laos, Vietnam (Tonkin), Indonesia (Sumatra). 1 sp. [*B. cordifolia* (Anthony) B.L. Burt] in India.

8. Boeica C.B. Clarke (Fig. 3a & b)

(Sub)shrubs or perennial rhizomatous herbs. Leaves alternate, spaced along stem, tufted at apex or forming a basal rosette, petiolate, laminae (ob)ovate to elliptical, base cuneate or attenuate, glabrous to densely woolly. Cymes lax or dense, one- to many-flowered. Sepals free or fused halfway. Corolla white to pink or blue to purple, campanulate or flat-faced, limb slightly zygomorphic; lobes (sub) equal, rounded or acute. Stamens 4, inserted near corolla base; filaments short; anthers large, free, basifixed, thecae subparallel, apically confluent; dehiscence variable. Nectary ring-like or lacking. Ovary ovoid or conical; stigma capitate. Capsules short to linear with persistent style, loculicidally and then septicidally dehiscent.

Note: 14 spp. described, but probably fewer. Bhutan, S China, N and NE India, Myanmar, N Vietnam, NW Malaya. 4 spp. in India.

9. Leptoboea Benth. (Fig. 3e & f)

Terrestrial shrubs with branched stems; branches spongy. Leaves opposite, those of a pair equal or subequal; petioles short, laminae ovate, apex acute, base broadly cuneate. Cymes with filiform peduncles and pedicels, 3–5-flowered, umbellate. Sepals free, equal. Corolla whitish with two purple spots at base of upper lobes, shallowly campanulate, tube slightly longer than limb, limb obscurely bilabiate; lobes (sub)equal, rounded. Stamens 4, inserted at corolla base, included; anthers free, basifixed, thecae subparallel, apically confluent, dehiscing poricidally. Nectary absent. Ovary ovoid; stigma capitate. Capsules linear, much longer than the calyx, dehiscence septicidal, eventually also loculicidal.

Note: 2 spp. validly described, but perhaps only 1. Bhutan, N and NE India, S China, Myanmar, Nepal, Thailand. 2 spp. in India.

10. Platystemma Wall. (Fig. 3c & d)

Small slender herbs with a horizontal rhizome (with a successive series of tuberous swellings). Aerial shoots with a single, sessile, orbicular-cordate, membranous, hairy leaf. Cymes emerging from the leaf axil; peduncle slender, bearing one to a few flowers; bracteoles very small, sublinear. Sepals free nearly to base, forming a wide, campanulate calyx. Corolla violet, tube whitish, short, limb wide, deeply bilabiate; lobes oblong, obtuse. Stamens 4; filaments short, curved; anthers apically coherent; thecae divaricate, apically confluent, dehiscing by a single short slit. Nectary annular. Ovary ovoid; style much longer than

ovary; stigma inconspicuous. Capsules ovoid-oblong, splitting loculicidally (+ septicidally?), partially enclosed in the persisting calyx.

Note: 1 sp. (*P. violoides* Wall.); Nepal, Bhutan, N India and SW China.

11. Rhynchotechum Blume (Fig. 3g & h)

Shrubs or subshrubs. Stem erect, woody, unbranched or branched. Leaves opposite or alternate, (sub)equal in a pair when they are opposite, surface woolly, hirsute or glabrescent. Cymes (few- to) many-flowered, lax. Sepals 5, free, equal. Corolla white, cream, or pink-purple to red-maroon, tubular-campanulate, limb slightly bilabiate; lobes rounded. Stamens 4, included, inserted near the base or in the middle of the corolla; anthers free, thecae parallel, apically confluent, dehiscing longicidally. Nectary ring-shaped or absent. Ovary ovoid; stigma globose. Berry ovoid or globose.

Note: The genus was revised by Anderson & Middleton (2013). 16 spp.; India, Sri Lanka, Nepal, Bangladesh, Bhutan, SW and S China, Taiwan, Japan, SE Asia to New Guinea. The genus has its main distribution in India in the NE with 7 species, but extends with 2 species, *R. permolle* and *R. parviflorum* Blume, to S India and the Nicobar Islands, respectively.

Subtribe Loxocarpinae A. DC.

12. Dorcoceras Bunge

Plants with leaves in rosette. Leaves opposite or alternate, indumentum simple on the upper surface and glandular or eglandular on the lower surface. Cymes axillary. Sepals 5, free. Corolla lilac-blue, obliquely campanulate with a ventricose tube, reflexed upper lobes and a broad throat. Stamens 2, included in the throat, erect; filaments slender. Capsules 2-valved, spirally twisted.

Note: The genus has been resurrected to accommodate four species segregated from *Boea*. The species are distinguished from *Boea* by their rosette habit (vs. caulescent), and campanulate corolla (vs. flat-faced corollas) with inserted stamens (vs. exerted stamens) (Puglisi *et al.*, 2016). 4 spp.; China, Thailand, Cambodia, Vietnam, Philippines, India and Indonesia. 1 sp. [*D. wallichii* (R. Br.) C. Puglisi, the former *Boea wallichii* R. Br.] in India.

13. Middletonia C. Puglisi (Fig. 3i–k)

Perennial herbs. Leaves opposite; laminae oblong to elliptic, base cuneate to rounded, sometimes oblique, margins crenate or serrate, apex obtuse

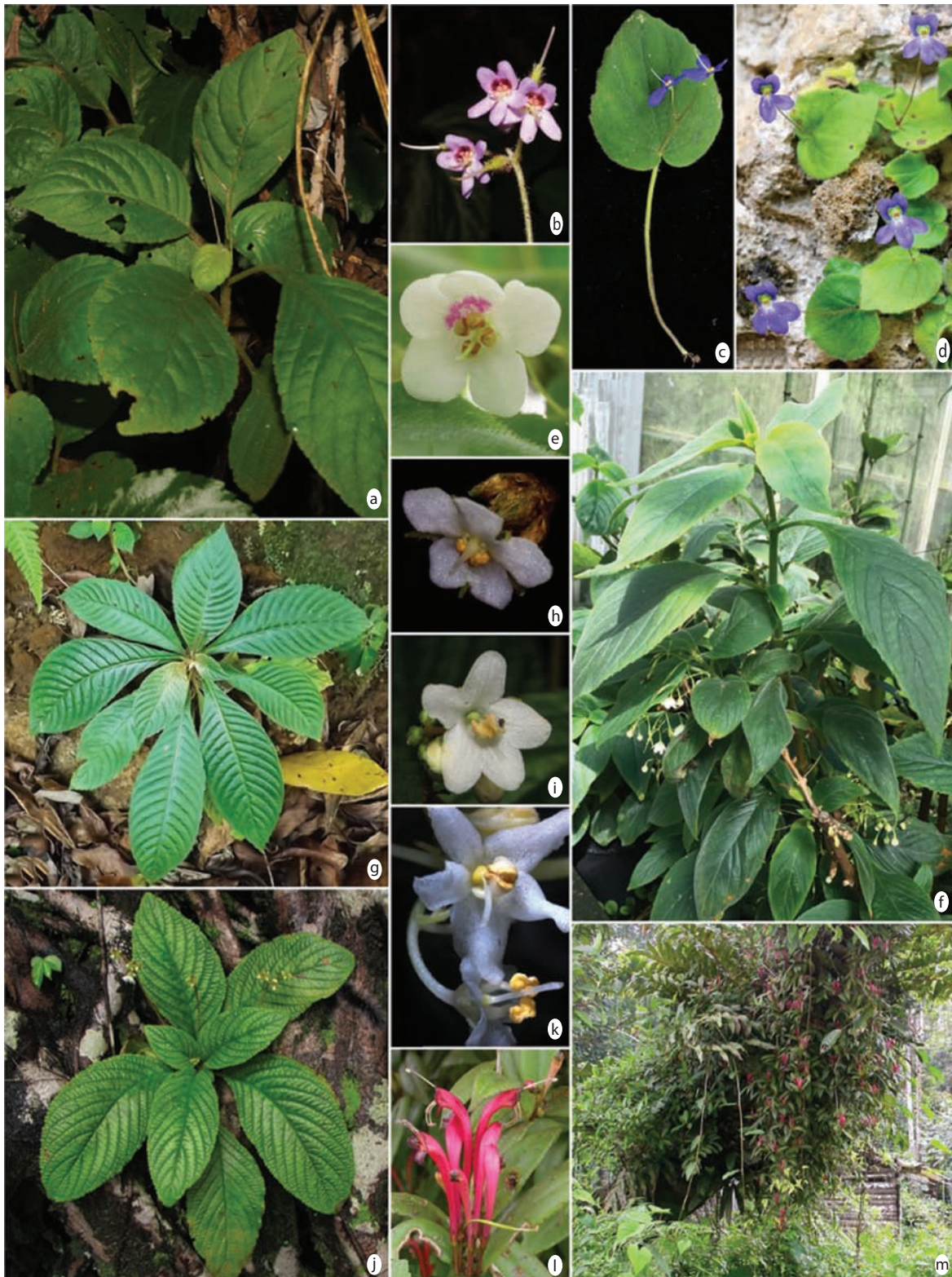


Fig. 3. Photographic images of Gesneriaceae occurring in India and adjacent areas. a, b. *Boeica* sp.: a. Habit; b. Flowers; c, d. *Platystemma violoides* Wall., Nepal; c. Individual plant; d. Habit; e, f. *Leptoboaea multiflora* (C.B. Clarke) Gamble, Thailand: e. Flower; f. Habit; g, h. *Rhynchotechum permolle* (Nees) B.L. Burtt: g. Habit; h. Flower; i, j. *Middletonia multiflora* C. Puglisi: i. Flower; j. Habit; k. *Middletonia* sp. nov., Thailand, flowers showing non-adhering anthers (lower fl.); l, m. *Aeschynanthus ceylanicus* Gardner: l. Flowers; m. Habit. (Images: a, b: Gopal Krishna, Central National Herbarium (CAL), Botanical Survey of India; c, d: Bhaskar Adhikari, RBGE; e, f, k–m: Michael Möller, RBGE; g, h: Janeesha A.P & S. Nampy, University of Calicut; i, j: Alfred Joe, Department of Botany, University of Calicut. All with permission).

to acute; upper surface glabrescent, furfuraceous or pubescent, lower surface with a matted indumentum; veins raised beneath. Cymes axillary, many-flowered, densely tomentose; bracts inconspicuous. Sepals 5, free to base; narrowly ovate, glabrous or glandular inside, \pm tomentose outside. Corolla white, violet or blue, slightly bilabiate, with or without indumentum; tube short; limb slightly 2-lipped, upper lip 2-lobed, lower lip 3-lobed, lobes spreading, flat. Stamens 2; anthers with a minute, glandular indumentum, coherent when young, later free, opening towards the top. Ovary ovoid with a farinose glandular indumentum, style glabrous; stigma capitate. Capsules straight or twisted, retaining the indumentum of the ovary.

Note: *Middletonia* was established for a few species previously belonging to *Paraboea*. *Middletonia* and *Paraboea s.str.* are similar in their matted indumentum on the abaxial side of leaves, but the former possesses a farinose glandular indumentum on the ovary. The farinose glands extend to the anther inner faces and corolla outer surfaces. *Middletonia* has been described as having free and erect anthers (Puglisi *et al.*, 2016). On closer study, however, the anthers proved coherent in early stages, but become later free and present pollen rather openly, at least in an as yet undescribed taxon growing in Edinburgh (RBGE-BG-Base acc. no.: 20121408, coll. no. *D.J. Middleton* 5559) from Thailand (M. Möller, pers. obs.). Whether this characteristic is common to all species in *Middletonia* requires further detailed field studies. 4 spp.; N India, Bangladesh, Bhutan, S China, Burma, Thailand, Laos, Cambodia, Vietnam, Malaysia. 1 sp. [*M. multiflora* (R. Br.) C. Puglisi, the former *Boea multiflora* R. Br. and *Paraboea multiflora* (R. Br.) B.L. Burt] in India.

Subtribe Didymocarpinae G. Don

14. *Aeschynanthus* Jack (Fig. 3l & m)

Epiphytic (rarely terrestrial) (sub)shrubs. Stems terete, rarely (sub)quadrangular, branched or not, erect, spreading or pendulous; clinging to the substrate by nodal roots. Leaves opposite, often arranged in a single plane, rarely whorled; petioles short, laminae (linear to) lanceolate, ovate, or cordate (to suborbicular), margins entire, rarely obscurely denticulate; fleshy or leathery or rarely herbaceous, sometimes with a water-storing hypodermis below the upper epidermis; veins usually obscure. Inflorescence a few-flowered, axillary cymes or flowers solitary, in leaf axils or emerging from scaly bracts and forming a pseudoterminal cluster; bracteoles ovate or scaly,

rarely large and coloured, usually deciduous. Sepals either free and linear, or basally fused or entirely connate to form a cup-shaped or cylindrical, often showy (coloured) calyx with small rounded lobes. Corolla usually bright red, or rarely orange, yellow, greenish yellow or greenish; tube usually long, arcuate; limb bilabiate, often with dark spots or stripes; lobes rounded. Stamens 4, didynamous, included or exerted; anthers coherent in pairs at the tips, rarely all four coherent. Nectary ring- or cup-shaped. Ovary stipitate, linear; stigma capitate or peltate. Capsules linear, in some species up to 50 cm long, loculicidally dehiscent. Seeds with a triangular appendage at both ends or a filiform appendage at the apical and one to many filiform appendages at the hilar end.

Note: >166 spp.; from India and S China throughout Malesia to New Guinea and the Solomon Islands. The genus was recently revised for Thailand (Middleton, 2007), and Cambodia, Laos and Vietnam (Middleton, 2009), and c. 15 species were recognized for India, while Bhattacharyya & Goel (2014) recognized 26 species [many species were synonymized by Middleton (2007, 2009)]. Sinha & Dutta (2016) reported 16 species from NE India, which included *A. angustiblougus* W.T. Wang and *A. philippinensis* C.B. Clarke, not mentioned by Bhattacharyya & Goel (2014). Clearly the genus requires additional work in India.

15. *Cyrtandra* J.R. Forst. & G. Forst.

Lignescent herbs, shrubs or small trees. Stems terete or angular, erect or ascending, branched or unbranched. Leaves opposite, iso- to strongly anisophyllous, petiolate; laminae ranging from narrowly lanceolate to suborbicular, margins entire or dentate; venation pinnate. Cymes short- to long-pedunculate, placed in upper or lower (leafless) part of stem, sometimes growing underground; bracteoles free or connate and forming a conspicuous cup; flowers in dense clusters or in open cymes or solitary. Calyx lobes 5, free or connate, sometimes bilabiate, persistent or caducous. Corolla variously (usually light) coloured, funnellform, campanulate or tubular; limb bilabiate, rarely (sub)-regular; lobes rounded. Stamens usually 2, rarely 4; included or (rarely) exerted; anthers free or coherent, thecae subparallel, sometimes apically confluent, dehiscing longicidally. Nectary ring- or cup-shaped. Ovary ovoid to oblong, stigma capitate or bilobed. Fruits indehiscent, oblong, ovoid or globose, hard-walled, leathery or fleshy.

Note: 652–818 spp. (Atkins *et al.*, 2013); from the Nicobar Islands, S China and S Japan throughout

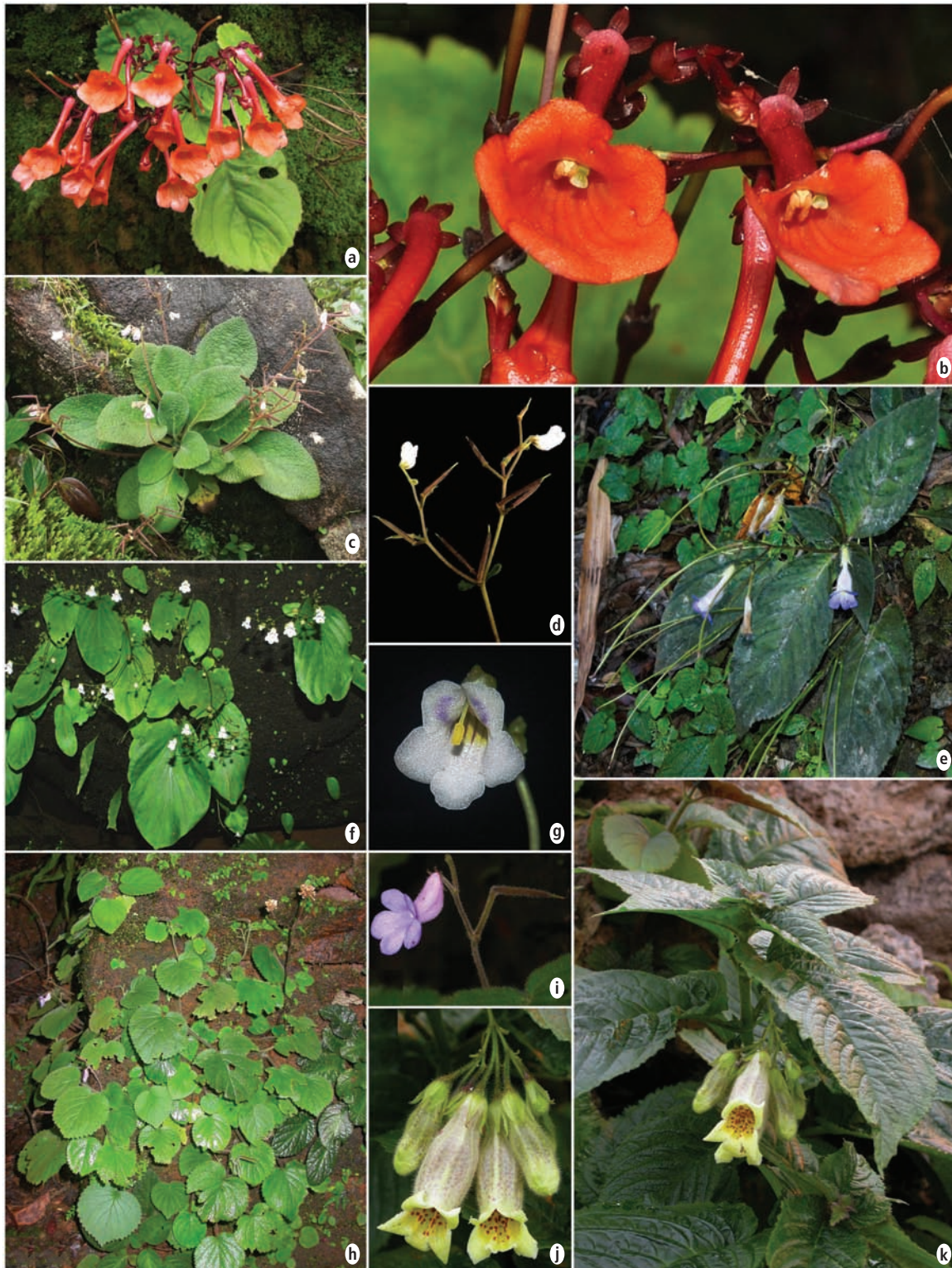


Fig. 4. Photographic images of Gesneriaceae occurring in India and adjacent areas. a, b. *Didymocarpus moellerii* A. Joe, Hareesh & M. Sabu: a. Habit and flowers; b. Flowers showing enanthiostyly; c, d. *Henckelia bracteata* Janeesha & Nampy: c. Habit; d. Flowers and immature fruits; e. *Henckelia pumila* (D. Don) A. Dietr., habit; f, g. *Henckelia pradeepiana* Nampy, Manudev & A. Weber: f. Habit; g. Flower; h, i. *Henckelia repens* (Bedd.) A. Weber & B.L. Burt: h. Habit; i. Flower; j, k. *Loxostigma griffithii* (Wight) C.B. Clarke, Nepal: j. Flowers; k. Habit. (Images: a, b: Alfred Joe, Department of Botany, University of Calicut; c, d, f, g: A.P. Janeesha & S. Nampy, University of Calicut; e: P.G. Arunkumar & A.P. Janeesha, University of Calicut; h–k: Michael Möller, RBGE. All with permission).

Malesia and the Pacific to the Hawaiian Islands. *Cyrtandra* is the largest genus of Gesneriaceae and has the widest distribution in the Old World. Centres of diversity are Borneo, New Guinea and the Pacific Islands. 2 spp. in India (Great Nicobar Island).

16. *Didymocarpus* Wall. (Fig. 4a & b)

Perennial terrestrial or saxicolous, caulescent herbs. Stems seasonal, herbaceous, erect with few nodes; renewal buds produced in the humid season, are dormant in the dry season and develop into flowering shoots in the next humid season. Leaves decussate, in few pairs on short stem, in the tropical (Malayan) species leaves in several distant pairs on long stem. Cymes pedunculate, few- to many-flowered. Bracts 2, free, opposite. Sepals free or connate halfway or more, cartilaginous, surface polished. Corolla often claret-coloured or violet, but including a wide range of colours, usually straight tubular or trumpet-shaped, widening towards the mouth; limb slightly to strongly bilabiate, rarely personate; lobes rounded. Stamens 2, included; filaments slender; anthers cohering. Nectary cup-shaped, rim sometimes lobed. Ovary cylindrical; stigma capitate. Capsules usually stipitate, bivalved, dehiscing loculicidally.

Note: The genus still requires taxonomic adjustments with some Chinese species, which are likely to be excluded on the basis of recent molecular studies (Weber & Burt, 1998; Möller *et al.*, 2011a; Li *et al.*, 2016). Around 98 spp.; N and NE India, Nepal and S China southwards to the Malay Peninsula and N Sumatra. 23 spp. in India, including the recently described *D. moellerii* A. Joe, Hareesh & M. Sabu (Joe *et al.*, 2016). These are essentially restricted to the NE, with only one, *D. lyratus* var. *protractus* C.B. Clarke occurring in the southern region which clearly belongs to *Henckelia*, though the variety was not formally transferred to that genus by Weber & Burt (1998).

17. *Hemiboea* C.B. Clarke

Perennial caulescent herbs with erect stems. Leaves opposite, petiolate; laminae ovate or lanceolate. Cymes in the axils of the uppermost leaves, several- to many-flowered; flowers enclosed by large, connate bracteoles forming a boat-shaped, semi-globose or urceolate involucre. Sepals connate in lower part, 3-veined. Corolla white, pale yellow or rose to purple coloured, funnel-shaped; limb bilabiate, upper lip 2-lobed, lower lip 3-lobed; lobes rounded. Stamens 2, inserted above base or below middle of corolla tube; filaments slender or filiform; anthers apically coherent, thecae parallel, not confluent; staminodes 2 or 3. Nectary annular.

Ovary slender, cylindrical, bilocular, only upper (adaxial) locule fertile; stigma truncate or capitate. Capsules oblique in relation to pedicel (sometimes straight?), cylindrical, somewhat curved upwards, dorsally (sometimes on both sides?) dehiscent.

Note: Based on molecular studies, the genus was expanded to include the only two described species of *Metabriggsia* W.T. Wang (Weber *et al.*, 2011b); plus a few recently described species. 33 spp.; NE India, C & S China, Taiwan, N Vietnam, Japan. 1 sp. (*H. subcapitata* C.B. Clarke) in India.

18. *Henckelia* Spreng. (Fig. 4c–i)

Perennial (rarely annual), caulescent or rosette or rarely creeping herbs. Leaves opposite, alternate or whorled, sometimes clustered at the stem apex, petiolate; lamina shape variable, sometimes pinnately lobed. Cymes axillary, 1–15-flowered; bracts paired or in whorls, free or connate at base, sometimes early caducous. Sepals 5, free or fused into a tube for part of length, triangular or narrowly triangular. Corolla colouration variable, often with yellow markings in throat, infundibuliform, more rarely tubular; tube often slightly pouched, sometimes rather constricted in throat; bilabiate with 2-lobed upper lip and 3-lobed lower lip. Stamens 2; filaments geniculate or straight; anthers fused face to face, glabrous or pubescent. Disk a simple annular ring or 5-lobed, often very small. Ovary shortly stipitate or not; stigma chiritoid, often weakly so and rarely almost truncate, lower lobe bifid or not. Capsules splitting into 2 valves or opening only along the dorsal side, stipitate or not, plagiocarpic or orthocarpic, calyx persistent or not in fruit. Growing on acidic soils and rocks, not on limestone.

Note: The amalgamation of *Henckelia* sect. *Henckelia* (*sensu* Weber & Burt, 1998), the species of *Chirita* sect. *Chirita*, and the monotypic genus *Hemiboeopsis* W.T. Wang (Weber *et al.*, 2011a) changed the morphological concept of the genus enormously and partly introduced rather unusual characters.

In India, there are basically two groups of species in *Henckelia*, corresponding to species previously belonging to *Chirita* sect. *Chirita* (predominantly with caulescent habit with internodes and leaves in whorls of 2 or 3 and orthocarpic capsules dehiscing along both upper and lower suture) in the NE (and Sri Lanka) and those of *Henckelia* sect. *Henckelia* (predominantly with leaves in a basal rosette and plagiocarpic capsules opening along the upper suture only) in S India. The latter were initially placed in *Didymocarpus* (as sect. *Orthoboea* Benth., see Weber & Burt, 1998), but can be distinguished from *Didymocarpus* s. str. by growth patterns, with

Didymocarpus showing seasonal growth with dormant buds surviving the dry season, which is absent in *Henckelia*, and the mostly capitate, or obscurely bilobed stigma and enantiostyly (the deflection of the style either to the left or right side of the floral axis) in *Didymocarpus*. Both groups of *Henckelia* have a chiritoid stigma (i.e., the absence of an upper and the usually bifid development of the lower stigma lobe) and mirror-image flowers (i.e., absence of enantiostyly). About 60 species including the recently described *H. pradeepiana* Nampy & al. (Manudev et al., 2012), *H. bracteata* Janeesha & Nampy (2015) from Kerala, and *H. sivagiriensis* (Rajakumar, Selvak., S. Murug. & Chellap.) E.S.S. Kumar from Tamil Nadu (Kumar, 2013). NE and S India, Sri Lanka, Nepal, Bhutan, S China, Northern Vietnam, N Laos, N Thailand. 32 species in India.

19. *Loxostigma* C.B. Clarke (Fig. 4j & k)

Terrestrial or epiphytic herbs with underground rhizome or the lower part of the stem creeping and rooting. Leaves usually opposite, strongly anisophyllous, membranous; internodes sometimes condensed, giving the appearance of irregular pseudo-whorls of leaves. Cymes pedunculate; flowers 1 or 2 to many. Sepals free or almost free to base. Corolla white, yellow to orange, lavender or purple, inside often red purple or brownish spotted, tubular, ventricose in the middle, spotted within. Stamens 4, slightly didynamous; filaments inserted at base or near middle of corolla tube, curved; anthers equal, cohering by their tips either in pairs or all together. Nectary cupular. Ovary sessile, elongate; stigma obliquely bilamellate. Fruits sessile, somewhat compressed laterally, dehiscent loculicidally. Seeds with or without an appendage at each end.

Note: The definition of *Loxostigma* has slightly widened with the inclusion of caulescent species of the former genus *Briggsia* into *Loxostigma*, including the resurrection of the Indian *Loxostigma kurzii* (Möller et al., 2014). Until then, the main difference between caulescent *Briggsia* species and *Loxostigma* was seen in the possession of appendaged seeds in the latter (Wang et al., 1998; although seeds are unknown for half of the species listed in the Flora of China). The inclusion of the *Briggsia* species was necessary for nomenclatural stability reasons, since the type of *Briggsia*, *B. longifolia* Craib, had been sunk in *Oreocharis* (Möller et al., 2011b). Consequently, *Loxostigma* now includes species with and without appendaged seeds. 11 spp.; NE India, Bhutan, Nepal, Myanmar, S China, Laos, N Vietnam. 2 spp. in India.

20. *Lysionotus* D. Don (Fig. 5a & b)

Epiphytic herbs or subshrubs. Stems branched, branches \pm woody, glabrous. Leaves opposite or in whorls of three, isophyllous or unequal in size, herbaceous or coriaceous; petioles short; laminae lanceolate or elliptical-acuminate, margins entire to crenate-serrate. Cymes pedunculate, few- to many-flowered; bracteoles inconspicuous. Sepals almost free, rarely fused halfway. Corolla white, yellow or purplish to reddish, infundibuliform; tube straight, inflated in upper half; limb slightly bilabiate, mouth (always?) with two yellow folds; lobes rounded. Stamens 2, included; filaments flattened and curved; anthers cohering face to face, connective sometimes with an appendage, thecae sub-parallel. Nectary annular. Ovary (sub)-stipitate, cylindrical; stigma slightly bilamellate. Capsules cylindrical, splitting loculicidally (later also septically). Seeds with a hair-like appendage at the apical end and a capillary funicle at the hilar end.

Note: 29 spp.; from N India and Nepal eastwards through S China, Taiwan, Bhutan, Laos, Myanmar, N Thailand, N Vietnam to S Japan. 6 spp. in India.

21. *Microchirita* (C.B. Clarke) Yin Z. Wang (Fig. 5c & d)

Mostly annual (more rarely longer lived in a \pm aseasonal climate or dying down to a rootstock in the dry season of more seasonal climates), caulescent, rarely creeping. Stems often fleshy or juicy. Leaves in distant pairs, except lowermost leaf solitary (macrocotyledon). Inflorescences usually two or several in a leaf axil, often displaced onto the petiole, often consisting of a short-stalked serial flower pair only, but this repeated several times (serial arrangement, "crested inflorescence"). Sepals free to base, narrowly triangular to narrowly ovate, appressed to fruit. Corolla white, bluish, blue, purple, yellow, orange or reddish, usually infundibuliform, tubular or funnel-shaped; upper lip 2-lobed, lower lip 3-lobed; lobes rounded. Stamens 2; anthers usually joined. Stigma chiritoid. Capsules elongate, straight or curved, usually splitting into 2 valves.

Note: *Microchirita*, as a previous member of *Chirita*, the erstwhile C. sect. *Microchirita* C.B. Clarke, shares the chiritoid stigma (the main character for the hitherto genus *Chirita*) with other genera previously associated with *Chirita*, such as *Damrongia* Kerr, *Liebigia* Endl., and *Primulina* Hance (see Weber et al., 2011a). *Microchirita* is well defined and readily characterised by its caulescent habit (though some species remain in a unifoliate state under adverse conditions), with decussate leaves, almost free sepals, more or less tubular corolla,



Fig. 5. Photographic images of Gesneriaceae occurring in India and adjacent areas. a, b. *Lysionotus serratus* D. Don, Thailand: a. Flower; b. Habit; c, d. *Microchirita hamosa* (C.B. Clarke) Yin Z. Wang: c. Habit; d. Flowers; e, f. *Petrocosmea parryorum* C.E.C. Fisch.: e. Habit; f. Flower (Images; a, b: Michael Möller, RBGE; d–f: RBGE archive; c: Karan Rana, University of Baroda. All with permission).

and often crested inflorescences with peduncles displaced onto the petiole (Weber, 1975). 28 spp. described, perhaps more; growing \pm exclusively growing on karst limestone rocks, either in forest or on exposed rocks in the open (sun-tolerant to some degree). From the Western Ghats and the foothills of the Himalayas of India, through continental Southeast Asia to Indonesia (Borneo, Sumatra and Java). The highest concentration of species is in Thailand. 2 spp. in India.

22. *Oreocharis* Benth.

Perennial rosette plants, indumentum variable, sometimes rufescent-lanuginose. Leaves spirally arranged, petiolate, of variable shape. Cymes pedunculate-scapose, flowers in corymbose or subumbellate arrangement, or lax, or reduced to a single flower; bracteoles small. Flowers 5-merous,

bilabiate, rarely 4- or 5-merous and actinomorphic. Sepals nearly free to base, or fused halfway. Corolla colouration variable, blue, purple, red, orange, yellow and white, extraordinarily variable in size and shape, ranging from campanulate through funnel-shaped, infundibuliform to broad-tubular, tube straight or ventricose; limb with equal lobes or bilabiate; lobes rotundate or lanceolate or almost absent. Stamens 4 or 5, of equal length or didynamous, or 2 (either the posterior or the anterior pair reduced), either included, equalling or protruding far out from the corolla; filaments inserted at corolla base or above; anthers free or connate. Nectary cylindrical. Ovary usually glabrous; stigma capitate or bilobed. Capsules bi- or four-valved, loculicidally (and septicidally) dehiscent.

Note: The genus has recently been enlarged by the inclusion of about 10 Chinese genera (Möller *et*

al., 2011b, 2014), and is morphologically difficult to circumscribe based on floral characters but the species share a basal rosette with spiral leaf arrangement and capsules dehiscing predominantly on one side (Möller et al., 2011b) and $x = 17$ chromosomes (Möller & Pullan, 2015 onwards). All rosette-forming species of *Briggsia*, including the type (*B. longifolia*), were transferred to *Oreocharis* (Möller et al., 2011b, 2014; Chen et al., 2014), including one of the two species occurring in NE India, *B. muscicola* [now *Oreocharis muscicola* (Diels) Mich. Möller & A. Weber; Middleton et al., 2013]. More than 109 spp.; N India, S China (107 spp.), Bhutan, Myanmar, N Thailand, Vietnam. 1 sp. [*O. muscicola* (Diels) Mich. Möller & A. Weber, the former *Briggsia muscicola* (Diels) Craib] in India.

23. *Petrocosmea* Oliv. (Fig. 5e & f)

Perennial herbs. Leaves few to many, in a basal rosette, petiolate or sessile (several species with both petiolate and sessile leaves), ovate to orbicular, apex acute, obtuse or rounded, base cuneate to cordate, rarely peltate. Cymes pedunculate, few- to several-flowered, lax, rarely subumbellate; bracteoles present. Calyx 3-partite; lobes equal, free or fused. Corolla white, or purple to blue shades, short-tubed, flat-faced; tube broad, shorter than the bilabiate limb; lobes rounded. Stamens 2; filaments short, inserted near corolla base; anthers basifixed, coherent at apices, thecae parallel, apically confluent or not, longicidally dehiscent. Nectary lacking. Ovary ovoid or conical; stigma capitate or globose. Capsules ovoid or oblong, dehiscing loculicidally.

Note: 43 spp.; NE India, S China (35 spp.), Myanmar, Thailand, S Vietnam. 1 sp. (*P. parryorum* C.E.C. Fisch.) in India.

Biogeographic considerations for India

It is remarkable that India harbours native Gesneriaceae members in 3 out of 4 subtribes of tribe Epithemateae and 6 out of 10 subtribes in tribe Trichosporeae, i.e., 9 out of 14 in subfamily Didymocarpoideae (Fig. 1). This high level of diversity underlines the biogeographic importance of India for the family Gesneriaceae.

A clear geographic divide is present among the Indian Gesneriaceae with 13 genera exclusively distributed in the North, and predominantly in the Northeast (*Beccarinda*, *Boeica*, *Didymocarpus*, *Dorcoceras*, *Hemiboea*, *Leptoboea*, *Loxostigma*, *Lysionotus*, *Middletonia*, *Oreocharis*, *Petrocosmea*,

Platystemma, and *Tetraphyllum*) (Fig. 6). These represent mostly westwards extensions of genera with main centre of distribution in the Himalayas (Nepal, Bhutan, Myanmar), China and Indochina.

On the Indian mainland one genus is exclusively restricted to the South, *Jerdonia*, with the narrow endemic, *J. indica* in the Western Ghats of Karnataka, Kerala and Tamil Nadu (Janeesha & Nampy, 2014). It forms the basal most lineage in tribe Trichosporeae in phylogenetic analyses (Möller et al., 2009), and is perhaps a relic from the distant past of the tribe.

Aeschynanthus, *Corallodiscus*, *Epithema*, *Henckelia*, *Microchirita*, *Rhynchoglossum* and *Rhynchotechum* have members in the North and South of India. These genera cover five subtribes in both tribes, which indicates that the Old World Gesneriaceae were more widespread in the past across this country. *Corallodiscus* is especially interesting because of the wide distribution of the one species occurring in India, *C. lanuginosus* with a distribution range from near Beijing in China to the Western Ghats (Zhou et al., 2017).

The Andaman and Nicobar Islands harbour 8 species of Gesneriaceae in 5 genera, *Aeschynanthus* (3 spp.), *Cyrtandra* (2 spp.), *Epithema* (1 sp.), *Rhynchotechum* (1 sp.), and *Stauranthera* (1 sp.). These represent three subtribes of both Old World tribes Epithemateae and Trichosporeae. *Cyrtandra* occurs only on the Great Nicobar Island. It is interesting to note that three of these have either fleshy berries (*Cyrtandra*, *Rhynchotechum*), or seed appendages (*Aeschynanthus*) aiding bird or wind dispersal, respectively (Mendum et al., 2001; Weber, 2004; Kokubugata et al., 2011), which could explain their occurrence on the Andaman and Nicobar Islands. This group of island is situated between two major biodiversity hotspots, the Indian subcontinent and the Malaysian-Indonesian region (Malesia) and consequently contains floristic elements representative of the Indian, Myanmarese, Thai, and Malesian floras. For the Nicobar Islands, the flora resembles closer that of Malesia rather than India (Balakrishnan & Ellis, 1996), which may explain the presence of Gesneriaceae genera on the islands that are essentially centred in Central and Southeast Asia.

Conclusions and summary

To date the genus count for Gesneriaceae in India is 23. Three genera are no longer found in India: *Briggsia*, *Boea* and *Paraboea*. *Dorcoceras* and *Middletonia* are new names for India. *Cyrtandromoea*

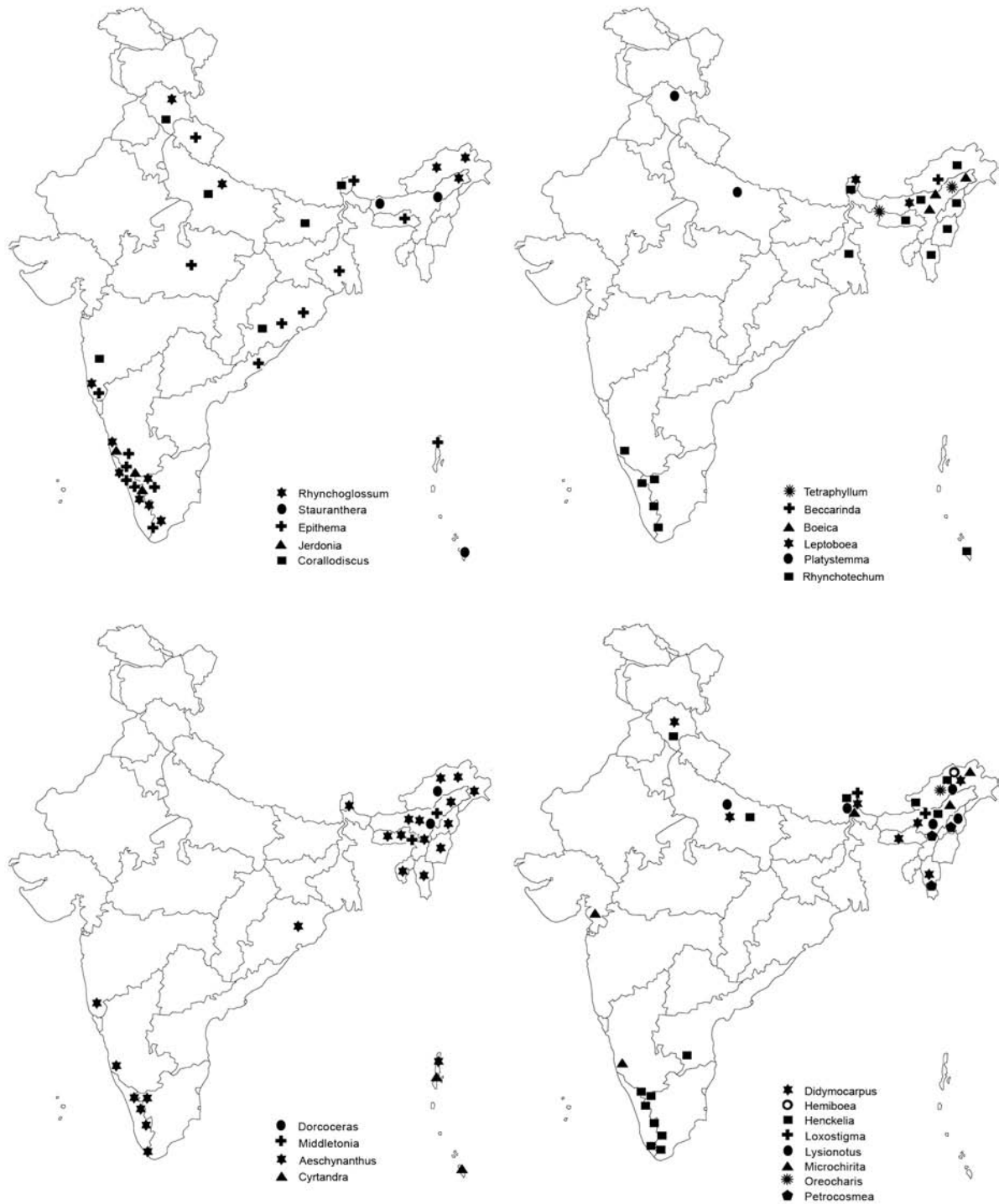


Fig. 6. Distribution maps of Gesneriaceae of India by genus. Data from field, herbarium and literature.

has been excluded from the family. The morphological definitions for a few genera have changed, widened (e.g. *Henckelia* and *Loxostigma*), narrowed for others by exclusion from larger genera and resurrection or establishment of new genera (e.g. *Dorcoceras* from *Boea* and *Middletonia*

from *Paraboea*). For some genera like *Henckelia* more work is perhaps needed to come to a final taxonomic framework.

The Indian Gesneriaceae contain important lineages such as *Jerdonia* or *Corallodiscus* the former being remarkable for its many morphological features

unusual in the family, the latter for its conserved morphology, retained across the wide biogeographic distribution range of the species in India.

Within India, a strong biogeographic break is apparent in the distribution of Gesneriaceae with the northern species having strong links to those countries neighbouring India, predominantly China. This split is particularly apparent in *Henckelia* and is manifest also in a morphological divide. With such an array of diverse aspects, the family Gesneriaceae proves an interesting plant family to study in India.

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