EDINBURGH JOURNAL OF BOTANY 70 (1): 121–176 (2013)

doi:10.1017/S0960428612000376

A REVISION OF *RHYNCHOTECHUM* BLUME (GESNERIACEAE)

B. M. Anderson & D. J. Middleton

The genus *Rhynchotechum* Blume (Gesneriaceae) is revised. It consists of 16 species, three of which are newly described here: *Rhynchotechum burmanicum* B.M.Anderson from Burma, *R. gracile* B.M.Anderson from Northeast India, and *R. vietnamense* B.M.Anderson from Vietnam. A new combination is made for *Rhynchotechum hookeri* (C.B.Clarke) B.M.Anderson. A key and descriptions of all species are provided.

Keywords. Conservation assessments, Gesneriaceae, new species, *Rhynchotechum*, taxonomic revision.

Introduction

The genus *Rhynchotechum* Blume (Gesneriaceae) comprises a group of understorey subshrubs with a range that stretches from India to China, north to the Ryukyus in Japan, south through the Philippines and the Malay Peninsula to Sumatra and east to Papua New Guinea. The plants have relatively small flowers in cymose inflorescences and the fruits are white berries. They have little economic importance but some use by indigenous peoples. Their small flowers and variable leaves make the species difficult to distinguish. The last descriptive taxonomic work on the entire genus was by Clarke in 1883, although there have been a number of more recent regional accounts (Schlechter, 1923; Hatusima, 1971; Chun, 1974; Walker, 1976; Kao & De Vol, 1978; Theobald & Grupe, 1981; Wang, 1984; Li & Kao, 1998; Wang *et al.*, 1998; Wang & Wang, 2000; Burtt, 2001; Hilliard, 2001).

The genus was erected in 1826 by Blume and included in the Cyrtandreae, a section of Bignoniaceae. It was distinguished from *Cyrtandra* J.R.Forst. & G.Forst. by its four fertile stamens with unilocular anthers and its globose fruit. It was similarly distinguished as part of Brown's (1840) Gesneriaceae in tribe Cyrtandreae and was placed close to *Cyrtandra* in Gesneriaceae by Don (1838) and Endlicher (1839, '*Rhynchothecum*'). Bentham (1876) placed *Rhynchotechum* in tribe (or subfamily) Cyrtandreae close to *Isanthera*, which had been described by Nees in 1834. Bentham differentiated between them by whether the leaves were opposite (*Rhynchotechum*) or alternate (*Isanthera*), but Clarke (1884) noted that *Rhynchotechum* could also have alternate leaves and remained doubtful about whether *Isanthera* should be kept

Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland, UK. E-mail for correspondence: banderson2914@gmail.com

distinct, stating it differed in a shorter style and marginal anther dehiscence. In 1962, Burtt united *Isanthera* and *Rhynchotechum* based on his observations that the anthers of *Isanthera discolor* Maxim. had similar valve-like dehiscence as in *Rhynchotechum* and that Nees' (1834) description was ambiguous about whether the anther dehiscence was longitudinal or medial. He was unable to find anthers of *Isanthera permollis* Nees (the type species), but Theobald & Grupe (1981) later verified that wild *Rhynchotechum permolle* (Nees) B.L.Burtt specimens show the same kind of anther dehiscence as other *Rhynchotechum* species, a conclusion with which we concur.

Classifications up to and including Burtt & Wiehler (1995) tended to place *Rhynchotechum* near *Cyrtandra*, which also has indehiscent fruit, but there were indications that the two genera are not closely related. Ivanina (1965) considered *Rhynchotechum* distinct enough, based on fruit and seed characters, to merit tribal status. Ratter (1962) identified a diploid chromosome number for *Rhynchotechum discolor* (Maxim.) B.L.Burtt as $2n = 20$ but for a *Cyrtandra* sp. he found $2n = 34$. Kiehn & Weber (1997) had a count of $2n = 18–20$ for *Rhynchotechum parviflorum* Blume and $x = 17$ for *Cyrtandra* species, and they mentioned that Burtt had doubts about the placement of *Rhynchotechum* within tribe Cyrtandreae. Later chromosome counts (Wang & Wang, 2000) corroborate $2n = 20$ for *Rhynchotechum discolor* as well as for *R. brevipedunculatum* J.C.Wang and *R. formosanum* Hatus.

In 2009, Möller *et al.* used *trnL-F*, *atpB-rbcL* and ITS sequences to construct a phylogeny of some Old World Gesneriaceae and found that *Rhynchotechum* was in a more basal position relative to most asiatic Gesneriaceae and was distant from *Cyrtandra*. They concluded that the tribe Cyrtandreae had no basis and that the morphological similarity, indehiscent fruit, was homoplastic. In the analysis, *Rhynchotechum* grouped monophyletically with *Boeica* T.Anderson ex C.B.Clarke, *Platystemma* Wall. and *Leptoboea* Benth. (Möller *et al.*, 2009), all of which have dehiscent fruits. A similar phylogeny was generated by Wei *et al.* (2010) based on *trnL-F* and ITS, and it supported *Boeica* as the closest genus to *Rhynchotechum*.

This revision aims to clarify the species delimitations within *Rhynchotechum*.

Methods

This revision is based on a traditional taxonomic approach through the adoption of a morphological species concept. Species are differentiated by differences in multiple characters derived from observations on and measurements of herbarium specimens. Floral measurements are based on rehydrated flowers. The herbarium material studied included the collections at A, AAU, ABD, B, BM, BR (images only), CMU, CMU-Pharmacy, E, GH, GXMI (images only), IBSC (image only), K, K-W, KYO, L, MICH, NY, PE (images only), QBG, S, SING, UC, US and W (images only), totalling c.1000 specimens (herbarium abbreviations from Thiers, 2012).

Measurements were taken to the nearest 1/4 of a millimetre but it should be noted that flowering material for most species is rather scarce. The botanical terminology

used is primarily based on Radford *et al.* (1976), with the descriptor 'narrowly obovate' used in lieu of 'oblanceolate' for clarity.

All specimens have been seen except where indicated by 'n.v.' for *non vidi*. Flowering and fruiting times are based on the specimens seen, so the time spans may be underestimated. Flowering was recorded even if there were buds or small ovaries without corollas, while fruiting was recorded even with immature fruits. Often specimens had inflorescences at both stages and so were recorded as both flowering and fruiting. Geographic distribution mapping requires latitude and longitude (either recorded on the specimen or georeferenced using NGA (2011) and rarely Rios & Bart (2010)), which was not available for all specimens, so points represent specimens with data and do not show the entire range.

The climate-distribution maps were generated with the programme Diva-GIS. Climatic data were acquired through WorldClim (Hijmans *et al.*, 2005b). Precipitation data comes from reasonable weather station coverage in Southeast Asia, with perhaps less dense coverage over Burma, Borneo and Indonesian New Guinea (Hijmans *et al.*, 2005a; Fig. 1).

Phytogeography, Biology and Uses

Further expeditions and specimen collection are needed from certain areas to accurately assess species' distributions, particularly from Burma, Northeast India, Laos, Cambodia, Vietnam, Kalimantan, Sumatra, Sulawesi and Indonesian New Guinea. Based on the many collections we do have, however, the plants are most often found growing in shady, moist environments, typically in forests, between 0 and 2120 m. The centre of diversity for the genus appears to be in continental Southeast Asia, particularly northern Thailand, Burma, southern China and India. A few of the species have notable distributions. *Rhynchotechum discolor* has a large range from the Ryukyu Islands of Japan in the north down to Papua New Guinea and Flores in the south, but does not seem to occur in continental Southeast Asia or western Malesia. *Rhynchotechum parviflorum* has an even larger range stretching from the Nicobar Islands of India in the west, north into China and east to Papua New Guinea. It seems likely that these species have excelled at colonising new islands relative to other members of the genus, but how they accomplished this is unknown.

Rhynchotechum vestitum (Griff.) Wall. ex C.B.Clarke has a disjunct distribution in continental Asia and in Sumatra and Java. Likewise *Rhynchotechum formosanum* is found in Taiwan, China and Vietnam and then in Sumatra. These ranges could indicate occurrences of long-distance dispersal or the breakdown of previously more continuous distributions. The former explanation is more likely since the species inhabit similar ecological niches and there is a continuous distribution for other species in the genus across these areas.

In general, the species tend to occur in more seasonal areas (Fig. 1), though there are a few exceptions. In addition the precipitation in the driest quarter would also appear to influence the distribution of species in the genus (Fig. 2). In general,

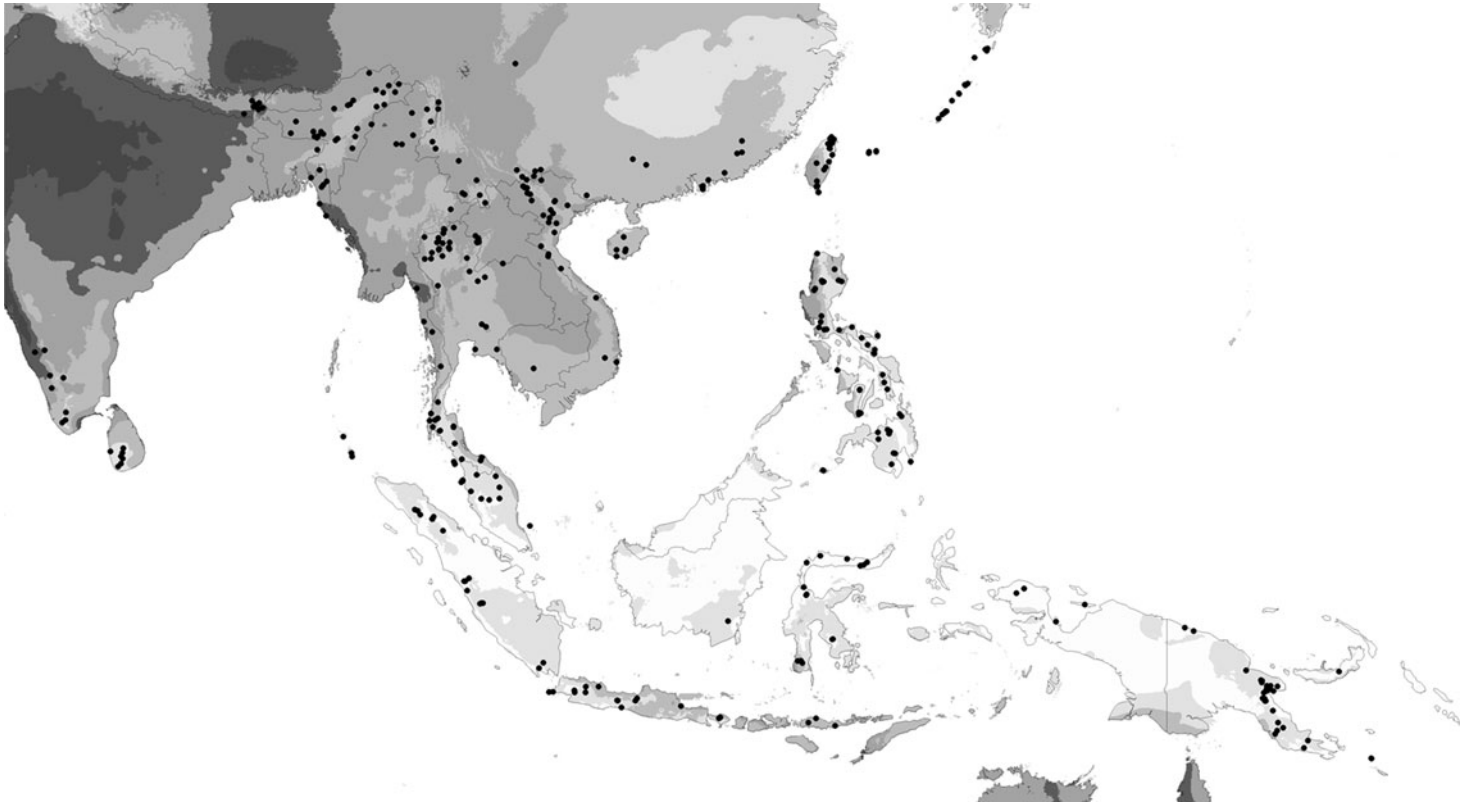

FIG. 1. Distribution of *Rhynchotechum* Blume and precipitation seasonality (coefficient of variation, or standard deviation of weekly precipitation estimates as a percentage of the annual mean; Hutchinson, 2011). Darker areas have more seasonal precipitation, while lighter areas tend to be consistently wet year round. Bioclim15 data from WorldClim (www.worldclim.org).

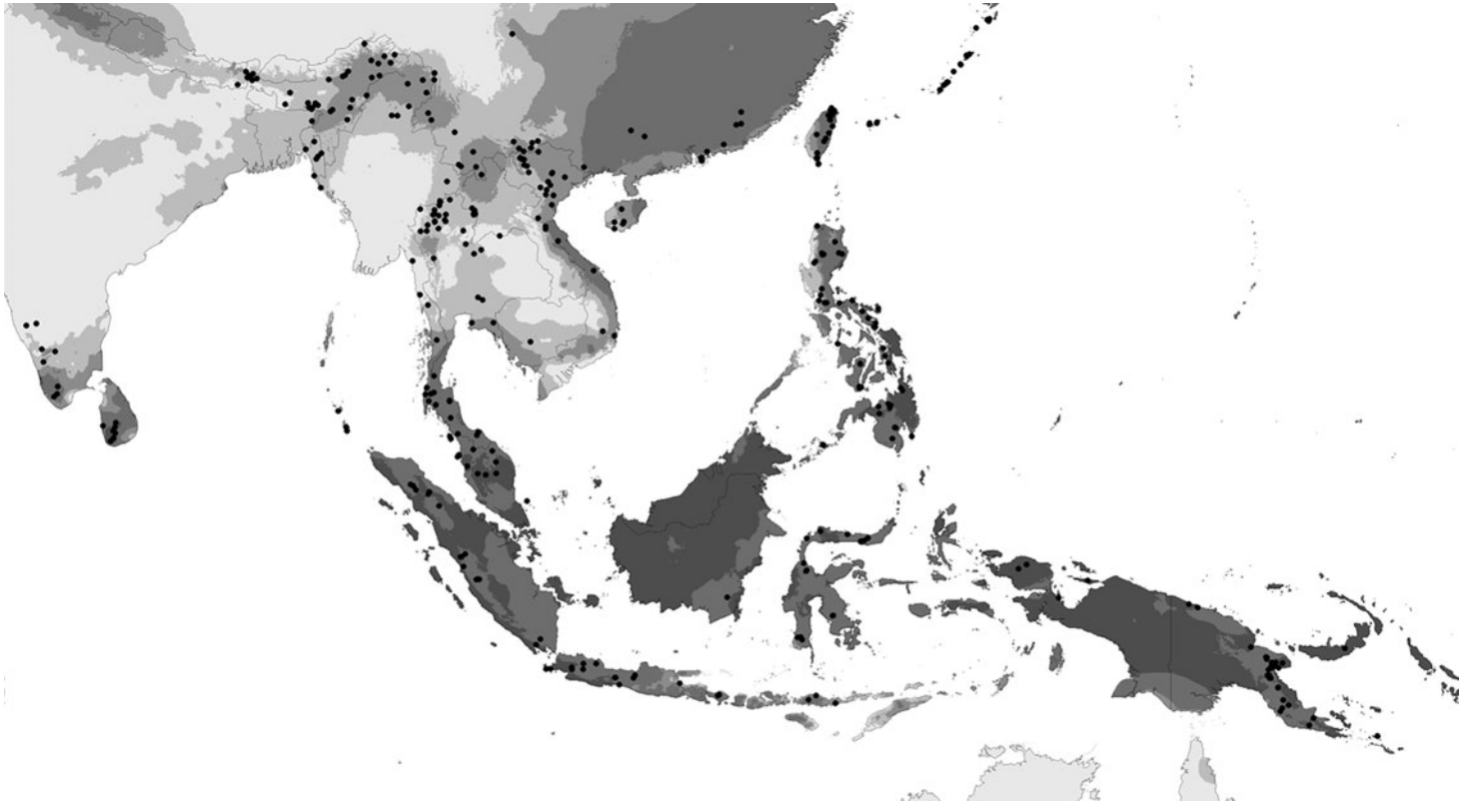

FIG. 2. Distribution of *Rhynchotechum* Blume and precipitation in the driest quarter (in mm). Darker areas have more precipitation in their driest three months (in steps of 0–25 mm, 26–50 mm, 51–100 mm, 101–400 mm, 401–2000 mm). Bioclim17 data from WorldClim (www.worldclim.org).

Rhynchotechum species are mostly found in areas with a definite dry season but would appear to require a minimum amount of rainfall in the driest three months of the year.

It is not known what pollinates the flowers or disperses the fruits. The small flowers may indicate insect pollination, while the white berries could be bird dispersed. Möller *et al.* (2009) suggest that the fleshy fruits are bird dispersed, likening them to the fruits of *Cyrtandra* which Cronk *et al.* (2005) suggest may well be bird dispersed. Theobald & Grupe (1981) did not observe pollinators for *Rhynchotechum permolle* and commented that the inflorescences are not very noticeable. Burtt (1962) suggested that *Rhynchotechum discolor* is self-fertile which, if confirmed, could make seed set high and improve colonisation and potentially explain why *R. discolor* is so widespread. It would be interesting to know whether *Rhynchotechum parviflorum* is also self-fertile.

A few *Rhynchotechum* species are used by indigenous peoples for food, medicine, smoking and fibre. In Bangladesh, the flowers and leaves of *Rhynchotechum ellipticum* (Wall. ex D.Dietr.) A.DC. are used as food and medicine, but deforestation is a threat to the species there (Uddin, 2009). In Northeast India, *Rhynchotechum ellipticum* and *R. vestitum* leaves are eaten as a vegetable (Jain & Borthakur, 1980; Neogi *et al.*, 1989; Kayang, 2007). Hilliard (2001) stated that *Rhynchotechum ellipticum* is used for fodder. According to notes on the specimen *Anderson* 5334 (A) from Thailand, *Rhynchotechum obovatum* (Griff.) B.L.Burtt leaves are smoked as a substitute for tobacco and the plant may be used to supply fibre for cording. According to Lu *et al.* (1998b), *Rhynchotechum vestitum* is used in Yunnan, China as a folk medicine treatment for hepatitis A and B. Lu *et al.* (1998b) cited clinical observations of the plant's effectiveness at reducing levels of serum glutamic-pyruvic transaminase and serum bilirubin. Liu *et al.* (1990) discovered a new anthraquinone from *Rhynchotechum vestitum* which they called rhynchotechol. Investigations have since been conducted in a search for the active compound, revealing new chemicals (Lu *et al.*, 1998a, 1998b).

Characters

Characters used were those observable with a dissecting microscope and measurable with a ruler. Anatomical, palynological and cytological features, such as cell thickness, pollen coat type and chromosome number, have not been investigated in this study. Vegetative characters were included but the majority of characters are based on the inflorescence and flower.

Stem height often overlaps between species, though it is useful for reinforcing identifications, such as with *Rhynchotechum formosanum*, which is fairly diminutive. Stem thickness does not vary considerably between species although on herbarium material the full range may not have been observed.

Leaf phyllotaxis is a useful character for distinguishing species in certain areas, such as in Taiwan, where opposite-leaved *Rhynchotechum formosanum* and alternate-leaved *R. discolor* occur, both of which can be small plants and have small leaves.

The character must be used with care, however, since species such as *Rhynchotechum obovatum* and *R. alternifolium* C.B.Clarke show both types of phyllotaxis in some specimens. Though most *Rhynchotechum obovatum* specimens have opposite leaves, the lower leaves may sometimes be alternate, and though *R. alternifolium* has alternate leaves, the upper pairs may be sub-opposite. Leaf shape and size can be somewhat diagnostic, but in more widespread species they vary and can even vary on a single plant along the stem. Leaf margin is not a useful character, though one species has a few specimens with atypical dentation (see discussion under *Rhynchotechum discolor*). Secondary vein pairs can be highly variable for some species and more consistent for others, so this is not particularly useful beyond reinforcing an identification.

Indumentum on stems and leaves is rarely a useful character, as most species have sub-glabrous to short, white pubescent adaxial leaf surfaces and yellow-rusty woolly abaxial leaf surfaces. One exception is *Rhynchotechum vestitum*, which is noticeably hispid over the entire plant. Inflorescence and calyx indumentum are useful, however, as seen in the scabrous inflorescence of *Rhynchotechum ellipticum*, or in the glandular hairs on inflorescence axes in *R. formosanum*.

Inflorescence structure and, to a lesser degree, size are very useful in the delimitation of taxa. There are two types of inflorescence: (i) pedunculate (see for example Fig. 4) and (ii) sub-fascicled (reduced/absent peduncle) (see for example Fig. 10). Pedunculate inflorescences tend to occur in the axils of persistent leaves, while sub-fascicled inflorescences are often found in the axils of deciduous leaves, thereby appearing to be on a bare stem. The degree of branching can be somewhat informative, for example when comparing *Rhynchotechum formosanum* with *R. obovatum*, the former having relatively few-branched inflorescences compared to the latter. It is not definitive, however, since sometimes material is broken or inflorescences are underdeveloped. Inflorescence branch lengths are rarely useful, though they are helpful when identifying *Rhynchotechum hookeri* (C.B.Clarke) B.M.Anderson. Inflorescence bracts are likewise not very helpful, except in the case of identifying *Rhynchotechum burmanicum* B.M.Anderson.

Calyx size and shape can be useful to distinguish species such as *Rhynchotechum calycinum* C.B.Clarke, *R. alternifolium* and *R. discolor*. Calyx indumentum, as mentioned above, can be very useful but should be used with care as exceptions may occur.

Corolla colour is not particularly diagnostic but can be helpful for reinforcing identifications based on other characters. Corolla shape and size are not particularly diagnostic for taxa except for reinforcing identifications or in delimiting particularly distinct species (e.g. *Rhynchotechum parviflorum* vs. *R. discolor*). As the corolla tube is short in all species, corolla lip lengths used in this revision include the tube length.

Stamens are distinctive in this genus although there is not much variation between species except, for some species, in anther indumentum.

Ovary size is also not very variable although the indumentum can be useful in some cases. Style length is a very useful character, especially since it is often retained in fruit and can differentiate some species, such as *Rhynchotechum obovatum* and *R. formosanum*. Stigma shape is fairly consistent across the genus.

Immature fruit shape may be useful in the recognition of some taxa (such as in the elongate ovoid fruit of *Rhynchotechum discolor*). Mature fruits may become more uniformly globose, as Burtt (1962) notes when discussing the fruits of *Rhynchotechum discolor*. Seed characters are not useful in the delimitation of species since the seeds are irregularly ellipsoid with dimples or grooves on their surfaces in all species. Wang & Wang (2000) looked at seed coat ornamentation in three species in Taiwan and found few differences between them.

Taxonomic Account

Rhynchotechum Blume, Bijdr. Fl. Ned. Ind. 775 (1826); G.Don, Gen. Hist. 663 (1838); Endl., Gen. Pl. 719 (1839); Brown in Bennett, Pl. Jav. Rar. 122 (1840); DC., Prodr. 9: 285 (1845); Miquel, Fl. Ned. Ind. 2: 749 (1858); Benth. in Benth. & Hook.f., Gen. Pl. 2: 1016 (1876); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 194 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 372 (1884); Fritsch in Engl. & Prantl, Nat. Pflanzenfam. 4(3b): 159 (1894); B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 36 (1962). – Type: *Rhynchotechum parviflorum* Blume.

Isanthera Nees, Trans. Linn. Soc. London 17: 82 (1834); Endl., Gen. Pl. 668 (1839); DC., Prodr. 9: 279 (1845); Benth. in Benth. & Hook.f., Gen. Pl. 2: 1016 (1876); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 191 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 372 (1884); Fritsch in Engl. & Prantl, Nat. Pflanzenfam. 4(3b): 159 (1894). – Type: *Isanthera permollis* Nees.

Corysanthera Wall. ex Endl., Gen. Pl. 719 (1839); L.E.Skog, Baileya 20: 1 (1976). – Type: *Corysanthera elliptica* Wall. ex D.Dietr.

[*Cheilosandra* Griff. ex Lindl., Veg. Kingd. 672 (1846) *nom. nud. pro syn.*; Benth. in Benth. & Hook.f., Gen. Pl. 2: 1025 (1876).]

Chiliandra Griff., Not. Pl. Asiat. 4: 150 (1854); Benth. in Benth. & Hook.f., Gen. Pl. 2: 1025 (1876). – Type: *Chiliandra obovata* Griff.

Subshrubs to 300 cm tall, erect or decumbent, typically unbranched. *Leaves* alternate, opposite or whorled, petiolate. Young leaves and stem apices often densely hairy, the hairs becoming less dense with age. *Inflorescences* compound cymes, pedunculate from the axils of leaves or leaf scars or with the peduncle reduced and the inflorescence branches appearing fascicled; bracts linear to triangular at branch points and below some pedicels. *Flowers* perfect, sub-regular, white to pink-purple or maroon. *Calyx* 5-lobed, divided to near the base, persistent and surrounding the fruit. *Corolla* short tubular and two-lipped, the upper lip of two lobes, the lower of three; the upper lip typically smaller and often with some colouration towards the base. *Stamens* four fertile plus one staminode, attached near the base of the corolla tube, the filaments twisted, the anthers globose with pollen sacs confluent and opening by a longitudinal slit with a valve-like dehiscence. *Ovary* of two carpels, unilocular; placentation parietal, the placentae nearly touching to make the ovary bilocular; style single, persistent in fruit, though may be broken off; disc small, surrounding the ovary at the base. *Fruit*

fleshy and indehiscent, green when immature becoming white at maturity, rarely brown. *Seeds* numerous, very small, irregular ellipsoid, dimpled or grooved.

Sixteen species in India and Sri Lanka, east through Bangladesh and Burma into China and Taiwan, south through Vietnam, Laos, Cambodia and Thailand into Sumatra, east through Java, Borneo and Sulawesi to New Guinea, and north through the Philippines to Japan. Typically growing in primary and secondary forests, sometimes disturbed, in shady and moist conditions, in clayey to sandy soils on granite or limestone bedrock, often on steep slopes.

The genus can be recognised by its four stamens with anthers having confluent pollen sacs that dehisce by a valve on the inner face, and by its often white, fleshy, indehiscent fruits that tend to be globose. The flowers are often sub-regular and have short corolla tubes. Though there is some slight anisophylly, it does not make opposite-leaved species appear alternate-leaved.

Key to the species

1a. Inflorescence with a reduced/absent peduncle so that the branches appear fascicled from leaf axils; leaves opposite _____ 2
1b. Inflorescence often with solitary peduncles from leaf axils (rarely another peduncle above the first), sometimes with a reduced peduncle but then the inflorescence unbranched; leaves opposite or alternate _____ 6

2a. Plant hispid, the hairs stiff (1–3 mm long); calyx lobes distinctly caudate (the upper 1/3 to 1/2 of the length) _____ **15. R. vestitum**
2b. Young parts of plant woolly pubescent to sub-glabrous, not hispid (hairs typically < 2 mm long, not stiff); calyx lobes triangular to linear acuminate, only rarely somewhat caudate _____ 3

3a. Style (5.5–)6–7(–7.5) mm long; pedicels and calyx lobes often scabrous, the hairs conspicuously multicellular; ovary glabrous _____ **6. R. ellipticum**
3b. Style < 5 mm long; pedicels and calyx lobes sericeous or sub-glabrous; ovary glabrous to short pubescent _____ 4

4a. Calyx lobes 5–6(–9) mm long, glabrous; corolla upper and lower lips ≥ 6 mm long, tube to 4.5(5–8) mm long _____ **4. R. calycinum**
4b. Calyx lobes < 4.5 mm long, glabrous to sericeous/villous; corolla upper and lower lips < 5 mm long, tube < 3 mm long _____ 5

5a. Inflorescence ≤ 3 cm long, branches ≤ 0.5 cm long, pedicels sub-glabrous to sparsely sericeous and making up most of the inflorescence length; ovary glabrous to slightly puberulent; style 3.5–4 mm long _____ **10. R. hookeri**
5b. Inflorescence (0.9–)1.3–6(–9) mm long, branches 0.3–3.2(–4) mm long, pedicels sericeous/villous and often shorter than the inflorescence branches; ovary puberulent to short pubescent; style 1.5–3.25(–4) mm long _____ **13. R. parviflorum**

6a. Leaves and peduncles opposite or whorled ____ 7
6b. Leaves and peduncles alternate ____ 11

7a. Calyx lobes oblong to somewhat ovate/elliptic, glabrous to sparsely sericeous; leaf apices caudate, leaves abaxially sub-glabrous between the veins ____ **1. R. alternifolium**
7b. Calyx lobes triangular, hirsute to sericeous or rarely glabrous, or calyx lobes linear, densely villous; leaf apices acuminate to acute, leaves abaxially woolly between the veins ____ 8

8a. Style ≤ 3.5 mm long; anthers glabrous ____ 9
8b. Style ≥ 3.5 mm long (usually ≥ 4 mm long); anthers puberulent with glandular hairs ____ 10

9a. Leaves elliptic to obovate, to 8.5(10.2) cm wide; calyx lobes 2–4 mm long; peduncle 0.6–4.5 cm long ____ **8. R. formosanum**
9b. Leaves oblong, to 5.8 cm wide; calyx lobes 4.5–5.2 mm long; peduncle 3.5–6.5 cm long ____ **11. R. longipes**

10a. Inflorescence bracts broad, oblong to ovate, first bract 10–17 mm long, second bract 7.5–13 mm long; style 4–4.5 mm long; pedicels and calyx lobes hirsute ____ **3. R. burmanicum**
10b. Inflorescence bracts linear acuminate to slightly triangular, first bract 5–12 mm long, second bract 3–10 mm long; style (3.5–)5–6 mm long; pedicels and calyx lobes sericeous/villous to densely so, rarely glabrous ____ **12. R. obovatum**

11a. Peduncle to > 10 cm long, or if less than 10 cm long, then calyx lobes oblong to somewhat ovate/elliptic, glabrous to sparsely sericeous, < 3.5 mm long ____ 12
11b. Peduncle to 6.8(7.5) cm long; calyx lobes linear to triangular, sericeous to densely so, rarely sub-glabrous, (2–)3–7.5(–12) mm long ____ 14

12a. Inflorescence > 30 cm long; calyx lobes sericeous and/or scabrous with glandular hairs, the hairs conspicuously multicellular ____ **16. R. vietnamense**
12b. Inflorescence ≤ 25 cm long; calyx lobes sub-glabrous to sparsely sericeous ____ 13

13a. Calyx lobes 1–1.5 mm long; style 2.5–4 mm long; leaves abaxially woolly between the veins ____ **9. R. gracile**
13b. Calyx lobes 2.5–3(–3.5) mm long; style 5–7 mm long; leaves abaxially sub-glabrous between the veins ____ **1. R. alternifolium**

14a. Style (3.5–)5–6 mm long; upper corolla lip with a brownish red to dark purple colouration at the base ____ **12. R. obovatum**
14b. Style < 3 mm long; upper corolla lip white ____ 15

15a. Calyx lobes triangular, (2–)3–5(–5.5) mm long; leaf secondary vein pairs 9–22(–25); Sri Lanka, S India, Burma, Sumatra and Java ____ 16

15b. Calyx lobes linear, (3–)4–8(–12) mm long; leaf secondary vein pairs 5–14; Japan, S China, Taiwan, the Philippines, Flores, New Guinea _____ 17

16a. Inflorescence 1.5–4.5(–5.5) cm long; fruit (dry) 3–9 mm long, puberulent; Sri Lanka, S India and Burma _____ **14. R. permolle**

16b. Inflorescence 4–12(–14) cm long; fruit (dry) 2.5–4.5 mm long, glabrous, rarely slightly puberulent; Sumatra and Java _____ **7. R. eximium**

17a. Peduncle < 0.5 cm long; inflorescence unbranched; stems 2–15 cm tall; calyx lobes 6–8(–12) mm long _____ **2. R. brevipedunculatum**

17b. Peduncle (0.5–)1.1–6(–6.7) cm long; inflorescence 2–3(–4)-branched; stems 2–60(–150) cm tall; calyx lobes (3–)4–7.5(–9) mm long _____ **5. R. discolor**

1. Rhynchotechum alternifolium C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 198 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 374 (1884). – Type: India, Upper Assam, by lake Brahmakoondo [Brahmakund], *Griffith* 3850 (lecto K (as s.n.), designated here; iso W [barcode: 0040706]). **Fig. 3.**

Stems 90–200 cm tall, to 5–7 mm diameter. *Leaves* alternate to sub-opposite; petiole 2–7 cm long; blade narrowly obovate, 5.8–24(–32.3) × (2.2–)4–9.7 cm, 2.3–3.3 times as long as wide, apex caudate, base narrowly cuneate to cuneate; margin denticulate to sub-entire, the teeth to 0.75 mm long; secondary vein pairs 11–16(–18); adaxially

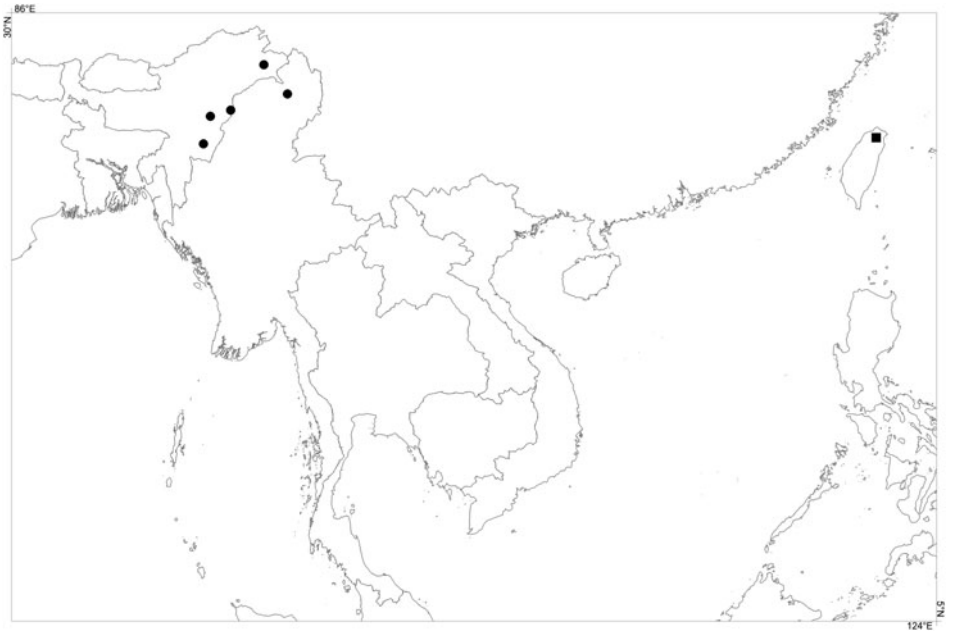

FIG. 3. Distribution map of *Rhynchotechum alternifolium* C.B.Clarke (●) and *Rhynchotechum brevipedunculatum* J.C.Wang (■).

dark green, glabrous to rarely white pubescent; abaxially pale green, short rusty woolly on the rusty veins, sub-glabrous in-between. *Inflorescence* (3–)5–20 cm long, (2–)4–5-branched; peduncle (1.2–)2.5–11.5 cm long; first branch (0.7–)1.2–4.3 cm long; second branch 0.5–1.9(–2.9) cm long; axes short rusty-yellow villous/sericeous to sub-glabrous; bracts linear to triangular, first bract (4.5–)7–11(–14) mm long, second bract 4.5–9(–11) mm long; pedicels (2–)4–10(–13) mm long, rusty-yellow sericeous to densely so. *Calyx* lobes oblong to somewhat ovate/elliptic, 2.5–3(–3.5) × 1–1.75(–2) mm, glabrous to sparsely sericeous. *Corolla* white, exterior glabrous; upper lip with darker patch, 3–3.5 × 5 mm; upper lobes 2 × 1.75–2.5 mm, apices obtuse; lower lip 4.5–5 × 7 mm; lower lobes 2.25–2.5 × 2–2.5 mm, apices rounded to obtuse; tube 1.5 mm long. *Stamens* inserted near the base of the corolla tube; filaments c.1 mm long; anthers c.1.25 mm diameter, bumpy or puberulent; staminode c.0.25 mm long. *Ovary* 1 × 1.25 mm, slightly puberulent; style 5–7 mm long; stigma apex globose/rounded to truncate. *Fruit* (dry) ovoid to widely ovoid, 2.5–5 × 2.5–4.5 mm, glabrous.

Distribution. India and Burma.

Habitat and ecology. Growing in evergreen and mixed forests, with an altitude recorded only once at 1520 m. Flowering and fruiting February, August and November.

Proposed IUCN conservation assessment. Data Deficient (DD). Although there are several collections of this species the most recent is from 1962. In addition the regions where this plant has been collected are all poorly known and accurate measures of the distribution of the species and the numbers of individuals are not available.

Additional specimens studied. INDIA. **Arunachal Pradesh**: Tirap Frontier Division, Waka, 27 viii 1958, *G. Panigrahi* 14947 (E). **Assam**: 1891, *King's Collector* s.n. (E). **Manipur**: Mayung, 16 xi 1885, *C.B. Clarke* 42038 (K). **Nagaland**: Naga Hills, 5 ii 1935, *N.L. Bor* 6285 (K); Naga Hills, Kohima, 9 i 1951, *W.N. Koelz* 27217 (L, MICH).

BURMA. Kachin hills, i 1898, *Shaik Mokim* s.n. (K [2]); Sumprabum, Hpuginhku Village, ii 1962, *J. Keenan, U.T. Aung & U Tha Hla* 3731 (E).

This species can be recognised by its alternate, sub-glabrous mature leaves with caudate apices, its often highly branched, long-peduncled inflorescences, and its oblong, sub-glabrous calyx lobes. It is most similar to *Rhynchotechum obovatum* but that species almost exclusively has opposite leaves and usually has densely sericeous calyx lobes.

Due to limited material, only one flower was available for dissection.

The type specimen does not have a number, despite the protologue indicating it is *Griffith* 3850. The number 3850 would have been an East India Company number given to a group of specimens and not a collector's number. The locality is clear on the specimen, however, and matches that given in the protologue.

2. Rhynchotechum brevipedunculatum J.C.Wang, Taiwania 45: 359 (2000). – Type: Taiwan, Taipei Hsien, Urai, c.300 m, 30 x 1992, *J.C. Wang* 7905 (holo TNU n.v.; iso E, HAST n.v., TAI n.v., TAIF n.v., TNU n.v.). **Fig. 3.**

Stems 2–15 cm tall, to 2 mm diameter. *Leaves* alternate; petiole 0.4–1.1(–2) cm long; blade narrowly elliptic to narrowly obovate, 0.7–6.5(–c.16) × 0.3–2.2(–c.2.5) cm, 2.3–4.3 times as long as wide, apex acute, base narrowly cuneate; margin denticulate to dentate, the teeth to 1 mm long; secondary vein pairs 5–6(–9); adaxially dark green, glabrous to sparsely white pubescent, denser on the midvein; abaxially pale green, rusty woolly on the rusty veins to sub-glabrous in-between. *Inflorescence* < 1 cm long, unbranched; peduncle < 0.5 (0.2 in protologue) cm long, puberulous; bracts linear, first bract 8–10 mm long; pedicels < 5 (1 in protologue) mm long, puberulous. *Calyx* lobes linear, 6–8 (10–12 in protologue) × 1–1.25 (1.5–2 in protologue) mm, sparsely to densely yellow-rusty sericeous to sub-glabrous. *Corolla* white, exterior glabrous; upper lip c.6 × 7 mm; upper lobes c.4 × 3.5 mm, apices rounded; lower lip c.7 × 12 mm; lower lobes c.5 × 4 mm, apices rounded; tube c.2 mm long. *Stamens* inserted near the base of the corolla tube; filaments c.2.5 mm long; anthers c.1 mm diameter, glabrous; staminode c.0.5 mm long. *Ovary* c.1.5(–3, see note) mm long, puberulous; style c.1.75(–3.5, see note) mm long; stigma apex globose/rounded. *Fruit* not seen.

Distribution. Taiwan.

Habitat and ecology. Growing in forest, sometimes on mountain slopes, at 300 m. Flowering in October.

Proposed IUCN conservation assessment. Not evaluated as clarification on the status of this species is necessary.

Only known from the type collection. This species can be recognised by its very short, few-flowered inflorescences and exceptionally long calyx lobes. It is most similar to *Rhynchotechum discolor* but is shorter in stature (though there are specimens of *R. discolor* as short), has larger flowers with longer corolla tubes and calyx lobes, and has a fruit with a drier exocarp according to Wang & Wang (2000).

The only material available for study was the isotype at E so the description above incorporates additional measurements from the protologue. The protologue description has the gynoecium as c.6.5 mm and the ovary as 3 mm, which suggests the style is c.3.5 mm, but the drawing of the gynoecium accompanying the protologue has a scale bar next to it, and it is clear the ovary and style are much shorter. It is possible the author included the lower portion of the receptacle attached to the base of the ovary, or that the drawing is incorrect, but a smaller style and ovary fit with *Rhynchotechum discolor* to which the author allied this species.

In the protologue the author discusses in detail the differences between this species and *Rhynchotechum discolor*. Chief among these differences is the large size of the calyx lobes, illustrated in the protologue. There are few flowers on the isotype at E, but the calyx lobes are clearly shorter than in the original description and not outside the range of variation in *Rhynchotechum discolor*. There are *Rhynchotechum discolor* specimens with young inflorescences that are not expanded, and therefore

short-peduncled, which might be mistaken for this species if the calyx lobes are not distinct. The isotype is smaller than is typical for *Rhynchotechum discolor* but further collections are necessary to clarify whether this really is a distinct species or part of the range of variation of *R. discolor*.

3. Rhynchotechum burmanicum B.M.Anderson, **sp. nov.**

Affinis *Rhynchotecho obovato* (Griff.) B.L.Burtt sed inflorescentiae bracteis permagnis, stylis brevioribus, fructu magis pubescenti et inflorescentiis foliisque magis hirsutis differt. – Type: Burma, Hkinlum, 4000 ft, 18 vii 1953, *Kingdon-Ward* 21177 (holo BM; iso E). **Figs 4, 5.**

Stems to 40 cm tall, to 5.5–9.5 mm diameter. *Leaves* opposite; petiole 2.5–7.5 cm long; blade elliptic to narrowly elliptic or slightly obovate, 15.2–27 × 6.1–9.5 cm, 1.8–3.3 times as long as wide, apex acuminate to acute, base narrowly cuneate to cuneate; margin denticulate, the teeth to 1 mm long; secondary vein pairs 16–24; adaxially dark green, glabrous to yellow hirsute, denser on the midvein; abaxially pale green, stiff yellow-rusty sericeous, denser on the veins. *Inflorescence* 4–15 cm long, 3–5-branched; peduncle 1.2–7.5 cm long; first branch (0.8–)2–3.5(–4.5) cm long; second branch 0.5–2 cm long; axes rusty tomentose becoming yellow hirsute; bracts broad, oblong to ovate, first bract 10–17 mm long, second bract 7.5–13 mm long; pedicels 2–7(–15) mm long, yellow hirsute. *Calyx* lobes triangular to ovate with acuminate apices, (3–)4–5(–6) × 1–2 mm, hirsute. *Corolla* purple, exterior glabrous; upper lip 3.25–5 × 4.5 mm; upper lobes 1.5–2 × 1.5–2 mm, apices rounded to obtuse; lower lip 4–6.5 × 7–8 mm; lower lobes 3–3.5 × 1.75–2.5 mm, apices obtuse to rounded; tube 1.5 mm long. *Stamens* inserted near the base of the corolla tube; filaments c.0.75–1 mm long; anthers c.1 mm diameter, puberulent with glandular hairs; staminode c.0.25–0.5 mm long. *Ovary* 1–1.75 × 1–1.5 mm, glabrous, but developing short pubescence; style 4–4.5 mm long; stigma apex globose/rounded to truncate. *Fruit* (dry) ovoid or oblong to widely ovoid, 4–5 × 3–4 mm, short pubescent.

Distribution. Burma.

Habitat and ecology. Growing in forest, sometimes on rocky slopes, at 450–1210 m. Flowering and fruiting July to August.

Proposed IUCN conservation assessment. Data Deficient (DD). The regions where this plant has been collected are poorly known and collected, and accurate measures of the distribution of the species and the numbers of individuals are not available.

Additional specimens studied. Burma. Myitkyina, *S.M. Toppin* 4259 (E); Myitkyina, Namma – Nammun, 1 iii 1910, *J.H. Lace* s.n. (E); Tsang valley, 2 viii 1937, *F. Kingdon Ward* 12874 (BM).

This species is similar to *Rhynchotechum obovatum*, but it is recognisably distinct in its much larger inflorescence bracts which often partly obscure the calyces of the clumped terminal flowers. Additionally, the inflorescence is more hirsute, while the

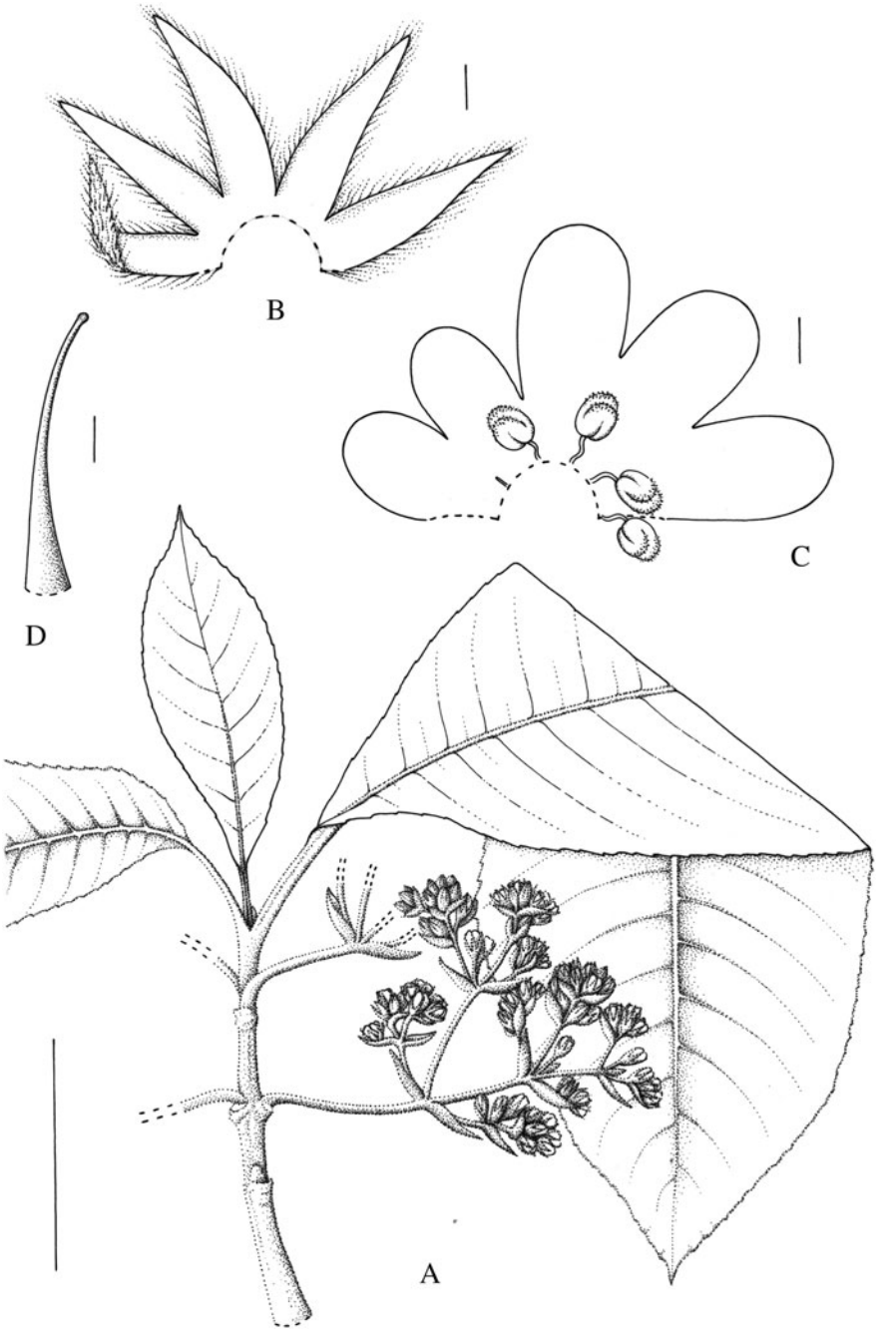

FIG. 4. *Rhynchotechum burmanicum* B.M.Anderson. A, habit; B, calyx opened out; C, corolla dissection showing the two smaller lobes of the upper lip, the three larger lobes of the lower lip and the two stamens; D, pistil. Scale bars: A = 5 cm, B–D = 1 mm. From *Kingdon-Ward* 21177 (BM, E). Drawn by Claire Banks.

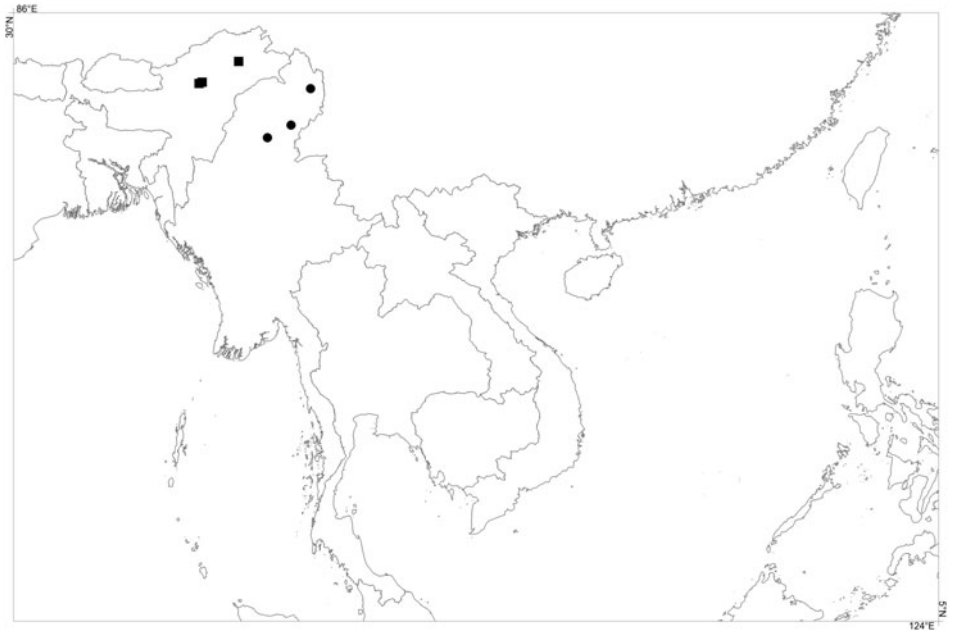

FIG. 5. Distribution map of *Rhynchotechum burmanicum* B.M.Anderson (●) and *Rhynchotechum calycinum* C.B.Clarke (■).

style is typically shorter than in *Rhynchotechum obovatum*. The ovary is initially glabrous but as it develops it becomes puberulent to short pubescent. In this it differs from *Rhynchotechum obovatum* where the ovary only rarely has any indumentum and the fruit is glabrous. The leaf hairs are also more stiff and erect than is typical in *Rhynchotechum obovatum* with its woolly leaf indumentum.

The material is limited and floral dimensions are based on only a few flowers. The BM specimen is more complete than the E specimen, so it is designated as the holotype.

4. Rhynchotechum calycinum C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 199 (1883); C.B.Clarke 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). – Type: India, Upper Assam, on the banks of the river Soondra, *Unknown* s.n. (holo K). **Fig. 5.**

Stems to 10.5 mm diameter. *Leaves* opposite; petiole 5–6.5 cm long; blade elliptic, to 24 × 8.5 cm, 2.8 times as long as wide, apex likely acuminate, base narrowly cuneate; margin entire to slightly denticulate, the teeth to 0.5 mm long; secondary vein pairs 14–15; adaxially dark green, glabrous; abaxially pale green, glabrous. *Inflorescence* 4–5 cm long, 4(–5)-branched; peduncle reduced/absent; first branch 1.8–2.5 cm long;

second branch 0.5–1 cm long; axes sub-glabrous to slightly short yellow villous; bracts triangular to linear, first bract 6–9 mm long, second bract 7 mm long; pedicels (1–)2–6 mm long, sub-glabrous. *Calyx* lobes triangular to linear tapering, apices acute to obtuse, 5–6(–9) × 1.25–1.75(–2) mm, glabrous. *Corolla* white, exterior glabrous; upper lip 6–6.5 × 5.5 mm; upper lobes 2 × 2 mm, apices rounded to obtuse; lower lip 6–6.5 × 6.5 mm; lower lobes 2.5–3 × 2 mm, apices rounded to obtuse; tube 4.5 mm long. *Stamens* inserted near the base of the corolla tube, didynamous; filaments 1–2 mm long; anthers c.0.6 mm diameter, puberulent; staminode c.0.25 mm long. *Ovary* c.2.5 × 2 mm, likely glabrous; style to 3 mm long; stigma apex globose/rounded. *Fruit* (dry) ellipsoid, 2.5–2.75 × 2–2.25 mm, glabrous.

Distribution. Northeast India.

Habitat and ecology. Growing on the margins of primary forest, often in moist and shady conditions, along streams (Pal & Thothathri, 1988) at 400–600 m. Flowering October to February, fruiting March to June (Pal & Thothathri, 1988) and possibly October.

Proposed IUCN conservation assessment. Data Deficient (DD). The regions where this plant has been collected are poorly known and collected, and accurate measures of the distribution of the species and the numbers of individuals are not available.

Additional specimens cited in Burkill (1925) and Pal & Thothathri (1988) but not seen. INDIA. **Arunachal Pradesh**: Doimukh Sagali Road, 26 x 1985, *G.D. Pal* 1941 (ARUN n.v.); East Siang, Janak Stream, *I.H. Burkill* 37282 (not located); Subansiri F.D., Itanagar, 27 vi 1978, *G.D. Pal* 75958 (ARUN n.v.).

This species is distinctive in its glabrous, large calyx lobes and in its terminally compact inflorescences. The whole plant is less pubescent than typical in other *Rhynchotechum* species, particularly in the inflorescence. From *Rhynchotechum ellipticum* it differs in its sub-glabrous and larger calyx lobes and shorter style. From *Rhynchotechum alternifolium* it differs in its opposite leaves and shorter inflorescences (which are also sub-fascicled) as well as the shorter style.

Only the type was available for examination so the description above is partly based on Pal & Thothathri (1988) who examined flowering material from Arunachal Pradesh.

The floral measurements by Pal & Thothathri (1988) include a sketch of the dissected flower along with a description. Where there is a discrepancy between their text and their figure, the figure dimensions are used.

5. Rhynchotechum discolor (Maxim.) B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 37 (1962); E.Walker, J. Jap. Bot. 46: 69 (1971); M.T.Kao & De Vol, Taiwania 17: 163 (1972); Chun (ed.), Fl. Hainan. 3: 529 (1974); E.Walker, Fl. Okinawa S. Ryukyu I. 945 (1976); M.T.Kao & De Vol in H.L.Li (ed.), Fl. Taiwan 681 (1978); T.Yamazuki in K.Iwats. *et al.*, Fl. Jap. 3a: 377 (1993); Z.Y.Li & C.F.Hsieh,

Taiwania 42: 92 (1997); Z.Y.Li & M.T.Kao in T.C.Huang, Fl. Taiwan, ed. 2 706, pl. 324, photo 362 (1998); W.T.Wang *et al.* in C.Y.Wu & P.H.Raven (eds), Fl. China 18: 394 (1998); J.C.Wang & C.C.Wang, Taiwania 45: 361 (2000). – *Isanthera discolor* Maxim., Bull. Acad. Imp. Sci. Saint-Pétersbourg 19: 538 (1874); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 192 (1883). – Type: Formosa [Taiwan], *Oldham* 380 (lecto BM [barcode: 000041738], designated here; iso BM, GH, P n.v.). **Fig. 6.**

[*Isanthera crenata* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 193 (1883) *nom. nud. pro syn.*]

Rhynchotechum tenue C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 199 (1883). – Type: Philippines, Manila [Manilla], *Perrottet* 197 (holo L).

Isanthera lanata Warb., Bot. Jahrb. Syst. 13: 418 (1891). – Type: Papua New Guinea, Saddle Mountain by Finschhafen, *Warburg* s.n. (not found).

Isanthera dimorpha Kraenzl., Philipp. J. Sci., C 8: 332 (1913). – Type: Luzon, Laguna, Mount Maquiling, c.300 m, *Merrill* 6295 (lecto US [barcode: 00126205], designated here).

Isanthera discolor Maxim. var. *austrokiushiuensis* Ohwi, Acta Phytotax. Geobot. 7: 29 (1938). – [*Isanthera austrokiushiuensis* Ohwi, Acta Phytotax. Geobot. 7: 29 (1938) *nom. inval. pro syn.*] – *Rhynchotechum discolor* (Maxim.) B.L.Burtt var. *austrokiushiuense* (Ohwi) Ohwi, Fl. Jap., revised ed. 813 (1965); T.Yamazuki in K.Iwats. *et al.*, Fl. Jap. 3a: 377 (1993). – Type: Kyushu, Yakushima Island, near Haruo, *M. Tagawa* 1867 (holo KYO).

Isanthera discolor Maxim. var. *incisa* Ohwi, Acta Phytotax. Geobot. 7: 29 (1938). – *Rhynchotechum discolor* (Maxim.) B.L.Burtt var. *incisum* (Ohwi) E.Walker,

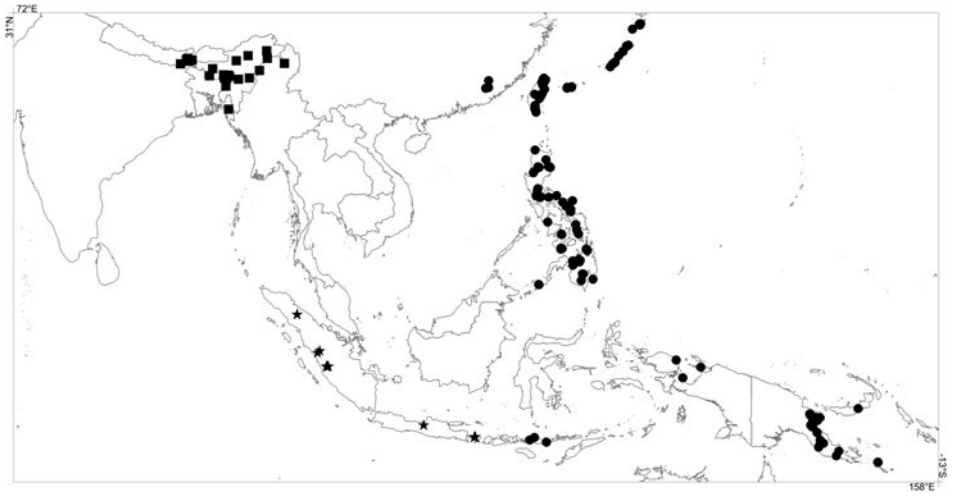

FIG. 6. Distribution map of *Rhynchotechum discolor* (Maxim.) B.L.Burtt (●), *Rhynchotechum ellipticum* (Wall. ex D.Dietr.) A.DC. (■) and *Rhynchotechum eximium* (C.B.Clarke) Schltr. (★).

J. Jap. Bot. 46: 69 (1971); E.Walker, Fl. Okinawa S. Ryukyu I. 945 (1976); Z.Y.Li & C.F.Hsieh, Taiwania 42: 93 (1997); Z.Y.Li & M.T.Kao in T.C.Huang, Fl. Taiwan, ed. 2 708 (1998); W.T.Wang *et al.* in C.Y.Wu & P.H.Raven (eds), Fl. China 18: 395 (1998). – *Rhynchotechum discolor* (Maxim.) B.L.Burtt f. *incisum* (Ohwi) Hatus. [Fl. Ryukyus 557 (1971)] ex J.C.Wang, Taiwania 45: 362 (2000). – Type: Ryukyu, Okinawa Island, Mount Nagodake, *T. Kanashiro* 9 (holo KYO).

Stems 2–60(–150) cm tall, to 3–8 mm diameter, may be recumbent with adventitious roots. *Leaves* alternate; petiole 0.9–6.5(–10) cm long; blade obovate or narrowly obovate to narrowly elliptic, slightly asymmetrical, (2–)3.5–20(–25.2) × (1.1–)1.5–6.8 cm, 2.1–5 times as long as wide, apex acuminate to acute, base narrowly cuneate; margin denticulate to serrate, the teeth typically to 1.75 mm, but sporadically to 9(–12) mm long; secondary vein pairs 6–14; adaxially dark green, glabrous to white pubescent, denser on midvein; abaxially pale green, yellow-rusty woolly, denser on the rusty veins. *Inflorescence* yellowish green, (1–)2–10(–16) cm long, 2–3(–4)-branched; peduncle (0.5–)1.1–6(–6.7) cm long; first branch 0.4–3(–4.1) cm long; second branch 0.5–1.7 cm long or absent; axes densely yellow-rusty villous/sericeous to sub-glabrous; bracts linear to triangular, first bract 4–13(–16) mm long, second bract 3–9 mm long; pedicels 1–10(–14) mm long, densely yellow-rusty sericeous. *Calyx* green to yellow or brown, lobes linear, (3–)4–7.5(–9) × 0.5–1 mm, densely yellow-rusty sericeous. *Corolla* white to cream, exterior glabrous; upper lip (2.75–)3–4(–4.5) × 3.5–5 mm; upper lobes (1–)1.5–2.5(–3) × 1.5–2.25(–3) mm, apices obtuse to rounded; lower lip (3.25–)3.5–5 × 6.5–7(–8) mm; lower lobes (1.5–)2–3.5 × 2–3 mm, apices rounded to obtuse; tube 1–2 mm long. *Stamens* inserted at 0.5–0.75 mm above the base of the corolla tube; filaments white, c.1–1.5(–1.75) mm long; anthers brown to orange-yellow, c.0.75–1 mm diameter, glabrous; staminode c.0.25–0.5 mm long. *Ovary* cream to green, 1.25–1.75 × 1–1.5 mm, slightly puberulent to puberulent; style pale yellow, 1–2 mm long; stigma apex globose/rounded to truncate or cleft. *Fruit* (dry) ovoid to widely ovoid, 4–8 × 2.5–5(–7) mm, glabrous to slightly puberulent, especially near style attachment.

Distribution. China, Taiwan, Japan, the Philippines, south to Papua New Guinea and Flores.

Habitat and ecology. Growing in primary and secondary forests, sometimes disturbed, thickets, swamps, and sometimes along trail sides, typically in moist and shady conditions, on clay to silt and sand, rarely on hardened lava, often on steep slopes, at 20–2000 m. Flowering and fruiting is recorded from all months.

Proposed IUCN conservation assessment. Least Concern (LC). This species is common and widespread.

Additional specimens studied. JAPAN. **Ryukyu Islands**: 1914, *Unknown* s.n. (A). **Kagoshima**: **Amami Oshima**: 17 vii 1919, *S. Kawagoe* s.n. (US); 11 viii 1927, *T. Naito* s.n. (US); Konia pass – Shinmura, Toho-mura, 11 viii 1956, *S. Hatusima* 20083 (L); Mt Yuwandake, 20 i 1957, *H. Noguchi* 3309 (L); Na-on Yamato-son, 25 vi 1969, *M. Furuse* 47694 (K) [as aff. *Rhynchotechum*

discolor (Maxim.) B.L.Burtt]; Naze, 31 vii 1904, *L.B. Boehmer et al.* s.n. (NY); ibid., 31 vii 1904, *Unknown* s.n. (S); Sumiyoo river, 25 iii 1975, *M. Furuse* 8080 (K). **Nakanoshima Island**: 20 viii 1912, *S. Kawagoe* s.n. (US). **Okinoerabu Island**: valley of Mt Ohyama, 17 iii 1958, *S. Hatusima* & *S. Sako* 21490 (L). **Tanegashima Island**: 11 i 1952, *S. Hatusima* 15649 (A [2]); Ushino from Shima, 24 xi 1976, *M. Furuse* 12036 (K). **Tokunoshima Island**: 18 viii 1955, *S. Hatusima* 19118 (L); Mt Inokawa-dake, 24 viii 1975, *K. Iwatsuki* & *H. Takasu et al.* 105 (L). **Yakushima Island**: 7 viii 1928, *G. Masamune* s.n. (NY); Kurio – Segiri, 24 xii 1962, *T. Yamazaki* 6877 (K); Ohkawa falls, 18 iii 1976, *M. Furuse* 10382 (K); Seaside near Ohkawa falls, 13 xii 1976, *M. Furuse* 12216 (K); The Falls Oko, Yakucoh, Kumagegun, 13 xi 1980, *K. Mimoro* & *I. Sasaki et al.* 2495 (A). **Okinawa**: **Iriomote-jima**: Hidori River, 24 viii 1951, *E.H. Walker* & *S. Tawada* 6758 (US); Nakara River Region, 31 viii 1951, *E.H. Walker* & *S. Tawada* 6885 (US); near Kampira-no-taki, 11 x 1986, *G. Murata, H. Koyama* & *A. Nitta* 56469 (A); Ohtomi hill, 6 xi 1973, *M. Furuse* 4513 (K). **Ishigaki Island**: Mt Omoto, 13 i 1973, *M. Furuse* 2043 (K); ibid., 8 x 1972, *M. Furuse* 1440 (K); ibid., 18 x 1973, *M. Furuse* 4324 (K); ibid., 20 viii 1973, *M. Furuse* 4503 (K); ibid., 12 i 1973, *M. Furuse* 1988 (K); ibid., 8 x 1972, *M. Furuse* 1402 (K). **Okinawa Island**: Kunigami, Taminato – Ugan, 10 vii 1951, *E.H. Walker* & *S. Sonohara et al.* 6132 (US); Mt Terukubi, 21 xii 1972, *M. Furuse* 1856 (K); Nakagami, Goeku – Ugan, 28 vi 1951, *E.H. Walker* & *S. Tawada* 5875 (GH, L, US); Yona, 2 xi 1972, *M. Furuse* 1711 (K).

China. **Fujian**: Liung Chon San, 22 vii 1936, *J.L. Gressitt* 1678 (E, GH, UC). **Guangdong**: Mei County, Yam Na Shan, 4 viii 1932 – 31 viii 1932, *W.T. Tsang* 21459 (GH, K, NY, S); Meizhou City, Yinna Shan, 17 viii 1999, *F-y. Zeng, H-g. Ye* & *Y-q. Chen et al.* 1901 (AAU).

Taiwan. Bankinsing, ii 1914, *U.J. Faurie* 348 (GH); ibid., *A. Henry* 849 (NY); ibid., *A. Henry* 845 (K, US); ibid., *A. Henry* 1540 (K, US); Chosenkei, 3 xii 1912, *W.R. Price* 1104 (K); Keelung, vi 1884, *C. Ford* s.n. (E, K); Mt Taiheizan, 15 viii 1925, *S. Suzuki* s.n. (A); Naikokusei – Maibara, 4 vii 1912, *W.R. Price* 737 (K); Randaizan, 10 viii 1908, *T. Kawakami* & *U. Mori* s.n. (A); Shin ten, i 1914, *U.J. Faurie* 347 (A); Suirenbi, 21 viii 1929, *Y. Yamamoto* 859 (NY). **Hualien Hsien**: Butterfly Valley, 4 vii 1988, *C-I. Peng* 11669 (US); Juisui Forest Road, 20 i 1995, *K-Y. Wang* 647 (US); Shifeng, 22 viii 1951, *H. Keng* & *M.T. Kao* 2712 (L); Shuiyuan – Luanshan, 2 viii 1963, *M. Tamura, T. Shimizu* & *M.T. Kao* 21473 (E); Taroko National Park, Qingshui Shan, 21 vii 1992, *C-C. Liao* 487 (A); Xiulin Xiang – Yuanlaonao Shan, 21 vii 1992, *W-P. Leu* 1457 (E); Yushan National Park, 30 vii 1993, *T. Chiang* 17 (E). **Keelung**: vi 1884, *C. Ford* s.n. (E, K); ibid., 1887, *O. Warburg* 9345 (K). **New Taipei**: Pinglin, 1 xii 1988, *C-F. Shen* 1890 (NY); ibid., 1 xii 1988, *C-F. Shen* 1852 (NY); Sanxia District, 15 viii 1988, *T-H. Hsieh* & *C-H. Hsiao* s.n. (NY); Shihding District, Huangdidien, 23 vii 1991, *C-H. Lin* 706 (E, US); Taihoku, 8 i 1928, *S-i. Sasaki* s.n. (S); Taihoku, Herinbi, 18 iii 1918, *E.H. Wilson* 10139 p.p. (A [2], K); Taihoku, Kankou, xii 1933, *R. Kanehira* 3126 (NY); Taihoku, Urai, 4 xi 1966, *C.G.G.J. van Steenis* 20579 (L); Taihoku, Uraisya, 28 viii 1927, *S-i. Sasaki* s.n. (UC); Wulai District, Dabaoke Shan – Neitung Forest Road, 5 xii 1992, *H-L. Ho* 859 (A); Wulai District, Wulai, 19 iii 1992, *B.M. Bartholomew* 6211 (A, US); ibid., 24 vii 1985, *C-I. Peng* 8371 (US). **Taipei**: Datun Shan, 18 ii 1962, *T.I. Chuang* & *P.I. Lin* 4818 (A [2]); Nangang Shan, 10 i 1989, *C-I. Peng* 12256 (A); Shoei-guan-in-shan, 24 vii 1985, *B.L. Shie* 1139 (BR); Taipei – Ilan, 8 viii 1957, *R.R. Ream* 551 (GH). **Nantou County**:Chitou, 10 i 1963, *C.S. Feung* & *M.T. Kao* 322 (A). **Pingtung County**: Kenting National Park, 17 ix 1991, *W.L. Wagner* 6589 (US); Kenting National Park, Nanren Shan, 17 ix 1991, *C-C. Wang* 511 (A); Nanjunshan, 13 ix 1978, *Ou* & *M.T. Kao* 9053 (NY); Tahan Forest Road, 4 xii 1994, *S-C. Hsiao* 1043 (US); Wutai, Ali – Hsiaokueihu, 28 ix 1992, *C-C. Liao* 691 (A). **Tainan County**: Hsienkungmiao, 28 vii 1984, *C-I. Peng* 7089 (US). **Taitung County**: Guzilun Shan, 29 viii 1957, *M.T. Kao* & *T.I. Chuang* 1137 (A). **Taoyuan County**: Hsiayun – Hsiayunping, 11 i 1987, *C-I. Peng* 10288 (US); Peichatienshan, 29 xi 1986, *C-I. Peng* 10109 (US). **Yilan County**: Chi-Lan Forest Station – Yuen-Yang Lake Natural Reserve, 8 vii 1977, *D.E. Boufford* 19430 (GH); Chi-Lan Shan,

11 xi 1993, *Edinburgh Taiwan Expedition* 312 (E); Wushihpi Coast Nature Reserve, 17 vii 1992, *C-I. Peng* 15136 (US).

INDONESIA. **Nusa Tenggara Timur**: **Flores**: Geli Mutu, 30 iii 1962, *J.J. Loeters* 1603 (L); Manggarai, 1985, *Father E. Schmutz S.V.D.* 6111 (L); N coast of Rana Messe, *A.J.G.H. Kostermans & N. Wirawan* 846 (K, L). **Papua**: Kainoei, 25 vii 1939, *Aet & Idjan* 136 (L); Mentembue, 22 vii 1939, *Aet & Idjan* 61 (L). **West Papua**: Arfak Mountains, Minjambau, 23 v 1962, *C. Versteegh* 12696 (L); Wandammen Peninsula, Pegunungan Wondiwoi, 28 ii 1962, *F.A.W. Schram* 10737 (L).

PHILIPPINES. Kantipla, vii 1995, *D. Bicknell* 863 (L). **Catanduanes**: Catanduanes Island, vii 1928 – ix 1928, *M. Ramos & G. Edano* s.n. (SING). **Luzon**: Manilla, 1841, *H. Cuming* 506 (K [2]); *T. Lobb* 444 (E, K [2]). **Abra**: Marririat, 16 v 1946, *G.L. Alcasid et al.* 228 (A); Mt Posuey, ii 1917, *M. Ramos* s.n. (US). **Albay**: Mt Mayon, 4 vi 1953 or v 1953 – vi 1953, *D.R. Mendoza* 1253 (L [2]); ibid., 10 vi 1953, *D.R. Mendoza* 1340 (K, L [2]); ibid., ix 1928, *M. Ramos & G. Edano* s.n. (SING); ibid., 15 xi 1991, *Reynoso, E.M. Romero & R. Fuentes* 3589 (GH); ibid., 4 ix 1908 – 6 ix 1908, *C.B. Robinson* s.n. (L, US). **Benguet**: vii 1907, *E.A. Mearns* s.n. (US); Baguio, viii 1906, *H.M. Curran* 4913 (BR); ibid., vi 1904, *A.D.E. Elmer* 6578 (K); ibid., iii 1907, *A.D.E. Elmer* 8407 (K); ibid., 19 i 1903 – 26 ii 1903, *D.L. Topping* 88 (US); ibid., 7 viii 1904, *R.S. Williams* 1366 (GH, K, US). **Bulacan**: Angat, ii 1919, *M. Ramos & G. Edano* s.n. (GH). **Cagayan**: Penablanca, 1 v 1917 – 18 vi 1917, *M. Adduru* 256 (GH, K). **Camarines Norte**: Paracale, xi 1918 – xii 1918, *M. Ramos & G. Edano* s.n. (A, K, L). **Cavite**: Talisay Ridge, 20 i 1917 – 21 i 1917, *E.D. Merrill* 10627 (K, L, SING, US). **Ifugao**: Banaue, Bangaan View Point, 5 viii 1992, *E.J. Reynoso, Sagcal & Garcia* 7126 (GH); Banaue, Mt Panawatan, Amganad, 30 vii 1961, *H.C. Conklin & del Rosario* 61 (A, K, L); Banaue, Mt Taggutu, 1 viii 1961, *H.C. Conklin & del Rosario* 157 (A, K, L); Banaue, U-ung, 24 xii 1961, *G. Banlugan et al.* 523 (A, L); Mt Polis, ii 1913, *R.C. McGregor* s.n. (US). **Ilocos Norte**: Bangui – Claveria, viii 1918, *M. Ramos* s.n. (K); Mt Sicapoa range, Mt Bubonbilit – miner's camp, 2 xii 1975, *K. Iwatsuki, G. Murata & H.G. Gutierrez* 486 (L). **Isabela**: San Jose, 6 iii 1997, *G.C.G. Argent, F. Gaerlan & Reynoso et al.* 20010 (K); ibid., 6 iii 1997, *M. Mendum & G.C.G. Argent et al.* 29010 (E); San Mariano, ii 1926 – iii 1926, *M. Ramos & G. Edano* s.n. (S). **Kalinga**: Lubuagan, Mt Masingit, ii 1920, *M. Ramos & G. Edano* s.n. (A). **Laguna**: vi 1915 – viii 1915, *R.C. McGregor* s.n. (US); Calauan, xi 1910 – xii 1910, *R.C. McGregor* s.n. (SING); Mt Makiling, 1 ix 1935, *H.H. Bartlett* 15627 (A, MICH); ibid., vi 1917 – vii 1917, *A.D.E. Elmer* 17599 (GH, K, L); ibid., 13 vii 1916, *C. Mabesa* 253 (US). **Mountain Province**: Bomco, 25 vi 1911, *Unknown* s.n. (BR). **Naga**: Penicuason, Mt Isarog, 22 iii 1997, *M. Mendum & G.C.G. Argent et al.* 29145 (E). **Quezon**: Alabat Island, 21 xii 1916 – 30 xii 1916, *E.D. Merrill* 10466 (US). **Sorsogon**: Irosin, Mt Bulusan, xii 1915, *A.D.E. Elmer* 15368 (A, GH, K, L, S, US); ibid., xi 1915, *A.D.E. Elmer* 14843 (GH, K, L); Irosin, Patag, 11 v 1957, *G. Edano & H.G. Gutierrez* 7 (L, SING); Lake Bulusan, 16 vi 1958, *J. Sinclair & G. Edano* 9570 (E [2], K, SING). **Mindanao**: **Agusan**: Asiga River, iv 1931 – v 1931, *M. Ramos & P. Convocar* s.n. (A); Cabadbaran, Mt Urdaneta, viii 1912, *A.D.E. Elmer* 13558 (E, L, US). **Bukidnon**: Del Monte, xii 1940 – i 1941, *H.H. Bartlett* 17239 (MICH); Impasug-ong, Mt Kitanglad, Intavas, 18 vii 1991, *F. Gaerlan, Sagcal & Fernando* 3295 (GH); Mt Candoon, vi 1920 – vii 1920, *M. Ramos & G. Edano* s.n. (A); Mt Katanglad, iii 1949, *M.D. Sulit* 3399 (A, L [2]). **Cotabato**: Mt Apo, ix 1909 or vii 1909, *A.D.E. Elmer* 11700 (E, GH [2], K, L, US). **Davao del Sur**: Mt McKinley, 12 viii 1946, *G. Edano* 609 (A, L). **Davao Oriental**: Mt Mansamuga, 12 ix 1949, *G. Edano* 1837 (A). **Lanao del Sur**: Dansalan – Momungan, 29 ix 1938, *A.L. Zwickey* 230 (A, MICH); Pugaan Hill, 10 ix 1935, *H.H. Bartlett* 15906 (A, MICH, US). **South Cotabato**: Mt Matutum, iv 1932, *M. Ramos & G. Edano* s.n. (A). **Surigao**: Mt Cantugas, iii 1931, *M. Ramos & P. Convocar* s.n. (A). **Negros**: **Negros Occidental**: 8 xi 1999, *P. Wilkie & F. Gaerlan et al.* 75 (E); Mt Mandalagan, 8 xi 1999, *P. Wilkie & F. Gaerlan et al.* 87 (E) (and cultivated at RBGE). **Negros Oriental**: Cuernos de Negros, 6 vi 1948 or v 1948, *G. Edano*

426 (A, BR); Cuernos Mts, Dumaguete, iii 1908, *A.D.E. Elmer* 10436 (E, K, L, US); Lake Balinsasayo, 17 v 1991, *D.A. Madulid et al.* 913 (GH); Sibulan, Manlangco, 28 ix 1948, *G. Edano* 702 (A). **Panay**: **Antique**: Mt Balingaso, 7 iii 1976, *M.J.S. Sands* 3273 (A, K, L). **Sulu Archipelago**: **Sulu**: Jolo Island, Bud Sungal, 16 ix 1935, *H.H. Bartlett* 16081 (A, MICH). **Eastern Visayas**: **Biliran**: Biliran Island, Mt Suiro, 27 iv 1954, *M.D. Sulit* 5314 (L [2]). **Leyte**: 28 vi 1913, *C.A. Wenzel* 288 (GH); Baybay, Kalbiga Stream, 24 iii 1993, *F. Gaerlan, Sagcal* & *E.M. Romero* 10577 (GH); Ormoc, Lake Danao National Park, Lake Danao, 26 vi 1993, *D.D. Soejarto, O. Fernando* & *R. Majaducon* 8083 (L). **Samar**: iii 1914 – iv 1914, *M. Ramos* s.n. (US); Mount Sarawag, xii 1951, *G. Edano* s.n. (L).

Papua New Guinea. EV1 river, 3 xii 1935, *C.E. Carr* 13585 (A, L, SING [2]). **Central**: Boridi, 20 xi 1935, *C.E. Carr* 13440 (K, L, SING [3]); Koitaki, 5 vi 1935, *C.E. Carr* 12532 (L); Owen Stanley Range, Musa Mts, Doma, 28 x 1962, *P.J.B. Woods* 181 (E [2]). **Milne Bay**: Misima Island, Bwagaoia, 25 x 1971, *H. Streimann* & *Y. Lelean* 52677 (E, L); Misima Island, Mt Sisa, 24 vii 1956, *L.J. Brass* 27486 (L); Rabaraba, 26 vi 1972, *P. Katik* 56279 (E, L). **Morobe**: Atzera Range, 13 xii 1993, *W.N. Takeuchi* 9300 (A); Atzera Range, near Bubia, 11 v 2002, *W.N. Takeuchi* & *D. Ama* 16261 (A, K); ibid., 28 iii 2001, *W.N. Takeuchi* & *D. Ama* 15304 (A); Boana, 14 vi 1938, *M.S. Clemens* 8278 (B); Bulolo River gorge, 4 iv 1963, *T.G. Hartley* 11567 (A, K, L); Bulolo – Wau, 12 x 1962, *P.J.B. Woods* 93 (E [2]); Busu River, 25 ix 1962, *E.E. Henty* 14836 (E, K, L); Finisterre Range, Mountain near Kikiepa Village, 2 vi 1960, *J.S. Womersley* & *R.F. Thorne* 12674 (K, US); Gabensis, 30 x 1990, *W.N. Takeuchi* 6992 (E); Garaina – Saureli, 11 v 1968, *P.J.B. Woods* 1112 (E); Herzog Mountains, 13 viii 1991, *W.N. Takeuchi* 7392 (A, K); Matap, 26 iii 1940, *M.S. Clemens* 41068 (E, MICH, US); near Piera, 19 i 1964, *T.G. Hartley* 12620 (A, AAU, L, MICH); Oomsis Creek, 16 iii 1962, *T.G. Hartley* 10016 (A, L); Oomsis Logging Area, 20 vii 1966, *J.S. Womersley* 24776 (L, SING); Rawlinson Mts, Aregenang – Belah, 19 vi 1968, *P.J.B. Woods, M. Black* & *Y. Lelean* 1898 (A, E, K, L); Rawlinson Mts, Gawan – Sambue, 21 ii 1963, *P. van Royen* 16103 (K, L, SING); Ridge complex between the Erap and Busu basins, 1 iii 1989, *W.N. Takeuchi* 4479 (E, L); Wantoat, 7 viii 1968, *W.R. Philipson* & *M.N. Philipson* 3282 (A, E, K, L); Wau District, McAdam National Park, 24 viii 1971, *P.F. Stevens* 54718 (A, E, L); Wau District, Upper Watut, Slate Creek, Andarora, 10 xii 1970, *H. Streimann* & *A. Kairo* 44560 (E, K, L); Wau District, Wau, 4 x 1962, *P.J.B. Woods* 24 (E). **New Britain**: Nakanai Range, Yauyau, 5 vii 1973, *G.W. Gillett* 2561 (E); ibid., 5 vii 1973, *G.W. Gillett* 2564 (E). **Northern**: Alola, xii 1935, *C.E. Carr* s.n. (SING); Saga, 19 ix 1953, *R.D. Hoogland* 3939 (A, K, L, US).

This is a fairly variable species across its large range but always has distinctive linear calyx lobes and usually has few-branched inflorescences. It is also the only alternate-leaved species east of Wallace's line and north into the Philippines, China and Japan. Chinese specimens generally have more symmetrical leaves, while Japanese specimens tend to be more robust and have larger inflorescences. Larger specimens are also observed in New Guinea, however, and the maturity of the plants (or even possibly a biennial life cycle) might explain why there are smaller and larger specimens. Regional variation requires a focused study of this taxon across the entire range. This may lead to varieties being recognised but this variation is not great enough to recognise separate species.

Isanthera discolor var. *austrokiushiuensis* was erected by Ohwi (1938) to account for plants with much condensed inflorescences with flowers in glomerules. According to Walker (1976), who synonymised the variety under the species, Ohwi withdrew his variety since these plants seemed to be immature and the inflorescences unexpanded. Condensed inflorescences in specimens from New Guinea have also been observed.

Isanthera discolor var. *incisa* was erected by Ohwi (1938) to account for plants with uncharacteristically deeply toothed leaves (to 9 or 12 mm). Indeed, these plants are distinct in this character from every other *Rhynchotechum* specimen. The occurrence is sporadic, however, and so the variety was reduced to the level of a forma by Hatusima (1971), though without reference to the basionym. As these plants occur sporadically in areas with otherwise typical *Rhynchotechum discolor* populations they are probably not a distinct biological group and as such they do not deserve nomenclatural status. In the type specimen the secondary venation in the leaf is branched more around the teeth.

Clarke's *Rhynchotechum tenue* was described as having opposite leaves. The type specimen, however, has sub-opposite leaves which appear alternate and is otherwise indistinguishable from *Rhynchotechum discolor*.

In the protologue of *Isanthera lanata*, Warburg (1891) suggests his species is similar to *I. permollis* and possibly to *I. discolor* (though he admits he has not seen the fruits of *I. discolor*). His description fits *Rhynchotechum discolor* and, since *R. permolle* and *R. eximium* (C.B.Clarke) Schltr. do not occur in Papua New Guinea, *Isanthera lanata* has been synonymised under *R. discolor* (the only alternate-leaved species in this region). The type has not been found and was likely lost when the Berlin herbarium was destroyed in World War II.

The type of *Isanthera dimorpha* is clearly *Rhynchotechum discolor*, though Kränzlin (1913) suggests two types of flowers in the protologue. According to Kränzlin, one type is showy with a large corolla (4 mm) while the other resembles a 'globose capsule', and they both occur in the same inflorescence. It is possible that Kränzlin may have been misinterpreting young vs. mature flowers, as globose unopened flowers are present in other *Rhynchotechum* species (e.g. *R. parviflorum*).

The *Ford* s.n. specimen from Taiwan has small leaves and an unexpanded inflorescence with one flower that is difficult to adequately examine. The alternate leaf scars and the linear calyx lobes suggest that it is this species, but it is smaller than most *Rhynchotechum discolor* specimens.

The *Mearns* s.n. specimen from the Philippines has reduced inflorescence branches resulting in the flowers clumping together at the end of the peduncle. This is aberrant compared to other *Rhynchotechum discolor* specimens.

The *Furuse* 47694 specimen from Japan has longer calyces than typical *Rhynchotechum discolor* specimens but the peduncles are too long and it is too large to be *R. brevipedunculatum*.

6. Rhynchotechum ellipticum (Wall. ex D.Dietr.) A.DC. in DC., Prodr. 9: 285 (1845); Hook.f., Curtis's Bot. Mag. 96: t. 5832 (1870); C.B.Clarke, Commelyn. Cyrtandr. Bengal. 131, pl. 41 (1874); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 196 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 373 (1884); B.L.Burtt, Thai Forest Bull., Bot. 29: 106 (2001); Hilliard in Grierson & D.G.Long, Fl. Bhutan 2(3): 1326, fig. 108h–i (2001). – *Corysanthera elliptica* Wall. ex D.Dietr., Syn. Pl. 3: 582 (1842). – Type: Mts Sylhet, *F. de Silva, W. Gomez* & *H. Bruce* in *Wallich* 6411 (lecto K-W, designated here; iso BR, E, K ×2, W). **Fig. 6.**

Rhynchotechum ellipticum (Wall. ex D.Dietr.) A.DC. var. *pilosior* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 196 (1883). – Type: Sikkim, 19 viii 1869, *C.B. Clarke* 8710 (holo K).

Stems (15–)60–180(–300) cm tall, to 5–10 mm diameter. *Leaves* opposite; petiole 1–4 cm long; blade elliptic to narrowly elliptic or slightly obovate, (5.5–)9–25.5(–29.3) × 3.5–10.5(–17.5) cm, 1.4–2.6(–3.1) times as long as wide, apex acuminate, rarely acute or obtuse, base narrowly cuneate to cuneate; margin denticulate to serrulate, the teeth to 2 mm long; secondary vein pairs 11–20(–25); adaxially dark green, glabrous to sparsely white pubescent; abaxially pale green, yellow-rusty woolly, denser and darker on the veins. *Inflorescence* pink, 1.2–8(–13.5) cm long, 2–5(–7)-branched; peduncle reduced/absent; first branch 0.4–3.3(–5.8) cm long; second branch 0.2–1.7(–2.3) cm long; axes short yellow-rusty sericeous/villous becoming scabrous to sub-glabrous higher up; bracts linear to triangular, first bract (1.5–)3–6 mm long, second bract (2–)3–5(–7) mm long; pedicels 1–13 mm long, scabrous, the hairs short and conspicuously multicellular, to sub-glabrous, hairs occasionally glandular. *Calyx* pink to pale pink, lobes triangular to linear acuminate with apices rounded, 3–4.5(–5.5) × c.1–1.5 mm, scabrous, the hairs short and conspicuously multicellular, to rarely sericeous, hairs occasionally glandular. *Corolla* red-purple, exterior scabrous with glandular hairs; upper lip 3–4 × (3–)4–5 mm; upper lobes 1–2 × 1.5–2.5 mm, apices rounded to obtuse; lower lip 5–7 × 7–8.5 mm; lower lobes 2–2.5 × 1.75–3 mm, apices rounded to obtuse; tube 1.5–2 mm long. *Stamens* inserted near the base of the corolla tube; filaments c.1 mm long; anthers purple, c.1–1.5 mm diameter, slightly puberulent; staminode c.0.25–0.5 mm long. *Ovary* 1–1.5 × 1–1.75 mm, glabrous to rarely puberulent with glandular hairs; style (5.5–)6–7(–7.5) mm long; stigma apex globose/rounded to truncate. *Fruit* (dry) widely ovoid, 3–4.5 × 3–4.5 mm, glabrous.

Distribution. India, Bhutan (Hilliard, 2001), Bangladesh, Nepal and Burma.

Habitat and ecology. Growing in forests, typically in shady and moist conditions, on limestone bedrock, sometimes on steep slopes, at 150–2120 m. Flowering and fruiting July to January.

Proposed IUCN conservation assessment. Least Concern (LC). This species is widespread and not subject to significant threats.

Additional specimens studied. NEPAL. Chula Chuli, 15 ix 1967, *L.H.J. Williams* & *J.D.A. Stainton* 8498 (K).

INDIA. East Himalaya: 1940, *K. Biswas* 4736 (A); *W. Griffith* s.n. (GH); *W. Griffith* s.n. (W); i 1912, *Ribu* & *Rhomoo* s.n. (E); *Ribu* & *Rhomoo* s.n. (E). **Arunachal Pradesh**: Kimin – Khunipahar, 24 ix 1959, *G. Panigrahi* 19349 (BR); Mishmi Hills, Sadiya Plain, *W. Griffith* 641 (K); Subansiri F.D., Palin – Radang village, 16 xi 1964, *A.R.K. Sastry* 40676 (L); Tirap Frontier Division, Changlang, 20 viii 1958, *G. Panigrahi* 14443 (E). **Assam**: *W. Griffith* s.n. (K); *W. Griffith* s.n. (K); *W. Griffith* s.n. (K); *F. Jenkins* s.n. (L); *F. Jenkins* s.n. (E); *F. Jenkins* s.n. (L); *J.W. Masters* s.n. (L); *J.W. Masters* s.n. (E); *Mrs. Marks* s.n. (K); *Simons* s.n. (L); *Unknown* s.n. (GH); *N. Wallich* s.n. (GH); *N. Wallich* s.n. (L); Cachar, Shapore, 17 ix 1873,

R.L. Keenan s.n. (K); Darrang, Charduar Reserved Forest, 17 i 1971, *J.D.A. Stainton* 6701 (K); Goalpara, 12 vii 1808, *F. Buchanan-Hamilton* 1375 (E); North Cachar Hills, Haflong, 17 viii 1908, *W.G. Craib* 274 (K); Pingrei, *W. Griffith* s.n. (L); Ralioui, v 1890, *G. Wall* 101 (E); Upper Assam, 1841, *F. Jenkins* & *J.D. Hooker* 293 (K). **Bengal**: *K. Biswas* 1691 (A). **Manipur**: xi 1907, *A. Meebold* 1200 (S); Karong, 1 x 1950, *T.R. Chand* 3759 (E, MICH). **Meghalaya**: Garo Hills, Chitmang, 18 xi 1929, *N.E. Parry* 967 (K); Garo Hills, Nenkra, 12 i 1929, *N.E. Parry* 1223 (K); Jowai, 26 i 1957, *G.K. Deka* 5196 (E); Khasia, *J.D. Hooker* & *T. Thomson* s.n. (K); Khasia Hills, *J.D. Hooker* & *T. Thomson* s.n. (L); ibid., *J.D. Hooker* & *T. Thomson* s.n. (E); ibid., *J.D. Hooker* & *T. Thomson* s.n. (BR); ibid., *J.D. Hooker* & *T. Thomson* s.n. (GH); ibid., *J.D. Hooker* & *T. Thomson* s.n. (L); ibid., *J.D. Hooker* & *T. Thomson* s.n. (US); ibid., *J.D. Hooker* & *T. Thomson* s.n. (NY); ibid., *J.D. Hooker* & *T. Thomson* s.n. (S); ibid., *T. Lobb* s.n. (K); ibid., *T. Lobb* s.n. (K); Khasia Hills, Cherrapunjee, 10 viii 1850, *J.D. Hooker* & *T. Thomson* 2046 (K [2]); ibid., 6 viii 1952, *W.N. Koelz* 30992 (MICH); Khasia Hills, Mawryngkneng, 30 ix 1951, *T.R. Chand* 4888 (E, MICH); Khasia Hills, Pynursla, 16 viii 1949, *W.N. Koelz* 23513 (E, MICH); Khasia, Mairang, 1 x 1855 – 30 x 1855, *H.A.R.v. Schlagintweit-Sakünlünski* s.n. (GH, US); Khasia, Murklow, 1850, *J.D. Hooker* & *T. Thomson* 2511 (K); Khasia, Umwai, 7 xi 1872, *C.B. Clarke* 19341 (US); Khasia, Walong, 21 x 1871, *C.B. Clarke* 16220 (L). **Nagaland**: Naga Hills, xi 1898, *Dr. Prain's Collector* 480 (A [2]); Naga Hills, Perenmi, 4 viii 1935, *N.L. Bar* 6452 (K). **Sikkim**: *G.H. Cave* s.n. (A); *J.D. Hooker* s.n. (K); *J.D. Hooker* s.n. (L); *J.D. Hooker* s.n. (S); *J.D. Hooker* s.n. (GH); *J.D. Hooker* s.n. (K); 16 xi 1875, *C.E.O. Kuntze* 6639 (NY); *T. Thomson* s.n. (L); Gt. Rangit, xi 1879, *J.S. Gamble* 7357 (K); Teesta valley, 20 viii 1874, *W.J. Treutler* 621 (K). **West Bengal**: Darjeeling District, *J.M. Cowan* s.n. (E); Darjeeling, Mungpo, 24 ix 1875, *C.B. Clarke* 26764 (L); Darjeeling, Rishap, 2 viii 1870, *C.B. Clarke* 12286 (L); ibid., 2 viii 1870, *C.B. Clarke* 12387 (L); Darjeeling, Sevoke, iii 1873, *J.S. Gamble* 3506 (K); Darjeeling, Sureil – Mungpo, 21 x 1902, *J.H. Lace* 2449 (E); Dooars, Muragha't, i 1880, *J.S. Gamble* 7659 (K); Gorubathan, 10 viii 1923, *J.M. Cowan* s.n. (K).

BANGLADESH. *W. Griffith* s.n. (NY). **Chittagong**: Rajarhat, 9 i 1934, *C.E. Parkinson* 3426 (GH, NY). **Sylhet**: 4 xii 1850, *J.D. Hooker* & *T. Thomson* s.n. (K).

BURMA. Kanang, 27 xii 1961, *J. Keenan, U.T. Aung* & *U Tha Hla* 3037 (E).

UNKNOWN. *F. Buchanan-Hamilton* s.n. (K); *W. Roxburgh* s.n. (BR); *Unknown* s.n. (K).

This species can be recognised by its often scabrous inflorescences and its typically broad elliptic leaves, as well as its long style. The indumentum tends to be scabrous higher up the inflorescence and in more mature inflorescences, and almost always so on the calyx lobes. Some younger inflorescences are more sericeous lower down and may be mistaken for *Rhynchotechum parviflorum*, which has a smaller flower and style but may have scabrous calyx lobes with the hairs glandular and conspicuously multicellular. A few specimens were found with more sericeous calyx lobes and perhaps more secondary vein pairs, but apart from that they do not differ from *Rhynchotechum ellipticum* and occur in the same geographic area.

The *Keenan et al.* 3037 specimen from Burma has more glandular hairs than typically seen in *Rhynchotechum ellipticum* specimens and its leaves are sub-glabrous. These differences are insufficient to distinguish it as a separate taxon.

Rhynchotechum ellipticum var. *pilosior* C.B.Clarke has slightly more hispid inflorescences and leaves, approaching *R. vestitum*, but the hairs are shorter, the style is longer and the calyx lobes are distinct from that species. There was no material other than the type that could be referred to this variety, and it does not differ enough from typical *Rhynchotechum ellipticum* to be taxonomically distinguished.

Burtt (2001) notes that this species does not occur in Thailand despite the use of the name. He points out that in the *Flora of China* (Wang *et al.*, 1998) *Rhynchotechum obovatum* is incorrectly treated as synonymous with this name, a conclusion with which we agree. He distinguishes *Rhynchotechum ellipticum* from *R. obovatum* by its scabrous rather than woolly calyx indumentum. Though this is often the case, there are rare exceptions, and the difference in inflorescence structure is a better discriminator (*Rhynchotechum obovatum* has peduncled inflorescences).

A study by Lalfakawma *et al.* (2009) on the species composition and density in disturbed and undisturbed forest sites in Northeast India revealed that *Rhynchotechum ellipticum* had a higher density in the disturbed forest.

7. Rhynchotechum eximium (C.B.Clarke) Schltr., Bot. Jahrb. Syst. 58: 303 (1923). – *Isanthera eximia* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 193 (1883). – Type: Java, *Junghuhn* 35 (lecto L [barcode: 0003118], designated here; iso L ×2). **Fig. 6.**

Rhynchotechum angustifolium Ridl., J. Malayan Br. Roy. Asiat. Soc. 1: 80 (1923). – Type: Sumatra, Berastagi woods, 5000 ft, 12 ii 1921, *Ridley* s.n. (lecto K, designated here).

Stems 100–200 cm tall, to 5–9(–15) mm diameter. *Leaves* alternate; petiole (1.6–)2.1–4.5(–5.5) cm long; blade narrowly elliptic/oblong to slightly obovate, (8.7–)10.5–21(–29) × 2.9–7(–8.6) cm, 2.3–4.5 times as long as wide, apex acuminate, base narrowly cuneate; margin denticulate, rarely sub-entire, the teeth to 1.25 mm long; secondary vein pairs 12–22(–25); adaxially dark green, glabrous to white pubescent, denser on the veins; abaxially pale green, yellow-rusty woolly, denser on the rusty-brown veins. *Inflorescence* 4–12(–14) cm long, 3–4-branched; peduncle 1.7–6.8(–7.5) cm long; first branch (0.6–)1.2–3.5 cm long; second branch 0.4–1.8(–2.5) mm long; axes yellow-rusty villous/sericeous to densely so; bracts triangular to linear, first bract (4–)7–15 mm long, second bract 4.5–11 mm long; pedicels 1–13(–16) mm long, densely yellow sericeous/villous. *Calyx* yellowish green, lobes triangular with apices rounded, (2–)2.5–4(–4.5) × 0.75–1.25(–1.5) mm, densely yellow sericeous. *Corolla* white, exterior glabrous; upper lip 2.5–3.25 × (2.5–)3–4 mm; upper lobes 1–1.5 × 1–2 mm, apices rounded to obtuse; lower lip 3–4.5 × 4–6.5 mm; lower lobes 1.5–2.5 × 1–2 mm, apices rounded to obtuse; tube 1.5 mm long. *Stamens* inserted at 0.5 mm above the base of the corolla tube, slightly didynamous; filaments c.0.5–1.25 mm long; anthers c.0.75–1 mm diameter, bumpy or puberulent; staminode c.0.25–0.5 mm long. *Ovary* 1–2 × (0.75–)1–2 mm, glabrous, rarely slightly puberulent; style (1.25–)1.5–2 mm long; stigma apex globose/rounded to truncate or cleft. *Fruit* (dry) ovoid to widely ovoid, 2.5–4.5 × 2–3.5 mm, glabrous, rarely slightly puberulent.

Distribution. Sumatra, Java and Bali.

Habitat and ecology. Growing in montane forests, sometimes secondary vegetation, sometimes near rivers, on loam, at 910–1850 m. Flowering and fruiting January to April, August and October.

Proposed IUCN conservation assessment. Least Concern (LC). Although it is only known from relatively few collections these are over a wide area and several of the collecting localities are in protected areas.

Additional specimens studied. INDONESIA. **Sumatra**: **Jambi**: Gunung Kerinci, 5 iii 1920, *H.A.B. Bünnemeijer* 8460 (K, L); ibid., iv 1914, *H.C. Robinson* & *C.B. Kloss* 37 (K). **Sumatera Barat**: Batang Sangir, 1 viii 1956, *M. Jacobs* 4433 (B, K, L); Gunung Merapi, 19 vii 2006, *D. Girmansyah* 757 (E); Mt Sago, 8 x 1956, *P. Maradjo* 82 (L); Pesisir Selatan Kerintji, Gunung Tujuh, 4 viii 1956, *W. Meijer* 6525 (L). **Sumatera Utara**: Berastigi, 4 vi 1928, *R.S. Boeea* 406 (MICH, NY, SING); Karohochebene, 21 i 1929, *J.A. Lörzing* 15099 (L); Karohoogulakte by Berastagi, 18 vii 1919, *J.A. Lörzing* 6709 (L). **Java**: 14 v 1932, *E.W. Clason* & *Laarman* 133 (L); *Unknown* 240 *partim* (L). **Jawa Tengah**: Gunung Ungaran, *F.W. Junghuhn* 20 (L). **Bali**: Batoe kaoe, i 1935, *C.N.A. de Voogd* 2136 (L); Batukau Nature Reserve, iii 1992, *J.J. Afriastini* 161 (K); Bedoegoel, 11 iv 1936, *C.G.G.J. van Steenis* 8082 (GH, K, SING); Bedugul forest region, Gunung Batukaru, 24 iii 1964, *A. Dilmy* 997 (K, US); ibid., 22 ix 1958, *A.J.G.H. Kostermans* & *E. Kuswata Kartawinata et al.* 69 (L); Central Bali, Tabanan, Mt Lesung, 25 vii 1994, *J.A. McDonald* & *R. Ismail* 4846 (A, E, K, L).

This species can be recognised by its alternate leaves and typically large inflorescences with flowers which have short, stout styles. The inflorescences may be more condensed when immature. It differs from *Rhynchotechum discolor* in its shorter, less linear calyx lobes and in its more highly branched, broader inflorescences. Often leaves only occur at stem apices with inflorescences below these in the axils of fallen leaves.

The *Unknown* 240 *partim* (L) specimen has no collector noted but is probably the Junghuhn specimen Clarke (1883) lists in the protologue.

As suspected by Burtt (1962), *Rhynchotechum angustifolium* is a synonym of this species.

8. Rhynchotechum formosanum Hatus., J. Jap. Bot. 15: 132, fig. 1 (1939); M.T.Kao & De Vol, Taiwania 17: 163 (1972); M.T.Kao & De Vol in H.L.Li (ed.), Fl. Taiwan 683 (1978); Z.Y.Li & C.F.Hsieh, Taiwania 42: 93 (1997); Z.Y.Li & M.T.Kao in T.C.Huang, Fl. Taiwan, ed. 2 708, photo 363 (1998) *pro parte*; W.T.Wang *et al.* in C.Y.Wu & P.H.Raven (eds), Fl. China 18: 394 (1998) *pro parte*; J.C.Wang & C.C.Wang, Taiwania 45: 363 (2000) *pro parte*. – Type: Formosa [Taiwan], Taihoku, Kanko [Kankou], 30 x 1932, *Hatusima* s.n. (holo FU n.v., photograph seen). **Fig. 7.**

Lysimachia saurauifolia S.S.Ying, Quart. J. Chin. Forest. 20(4): 123, pl. 1, figs 1 & 2 (1987). – [*Rhynchotechum saurauifolium* (S.S.Ying) S.S.Ying, Mem. Coll. Agric. Natl. Taiwan Univ. 29(2): 47 (1989) *nom. inval. pro syn.*] – *Rhynchotechum ellipticum* (Wall. ex D.Dietr.) A.DC. var. *saurauifolium* (S.S.Ying) S.S.Ying, Mem. Coll. Agric. Natl. Taiwan Univ. 29(2): 47, pl. 1–2, colour photos 1–4 (1989).

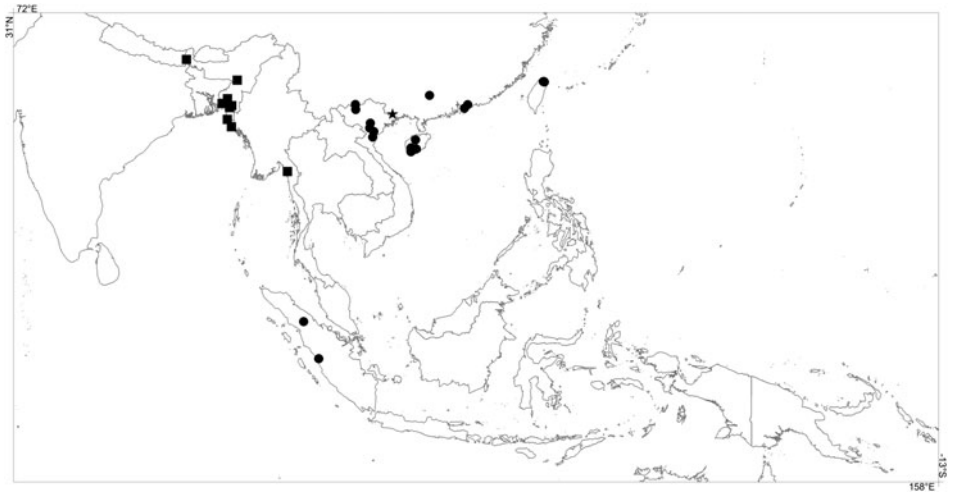

FIG. 7. Distribution map of *Rhynchotechum formosanum* Hatus. (●), *Rhynchotechum hookeri* (C.B.Clarke) B.M.Anderson (■) and *Rhynchotechum longipes* W.T.Wang (★).

– Type: New Taipei, Hsintien, Kung-ping Shan, 2 viii 1986, *S.S. Ying* s.n. (holo NTUF).

Rhynchotechum ellipticum auct. non (Wall. ex D.Dietr.) A.DC.: Merrill, Lingnan Sci. J. 13: 71 (1934); Chun (ed.), Fl. Hainan. 3: 528 (1974) *pro parte*.

Stems < 15–60(–270; see note) cm tall, to 3–5.5 mm diameter. *Leaves* opposite; petiole 1.4–5.5 cm long; blade elliptic to obovate, 4.5–20.5 × 2.4–8.5(–10.2) cm, 1.5–2.9(–3.2) times as long as wide, apex acuminate, base narrowly cuneate; margin denticulate to entire, the teeth to 2 mm long; secondary vein pairs 9–19; adaxially dark green, glabrous to sparsely long white pubescent, denser on the midvein; abaxially pale green, yellow-rusty woolly, denser on the rusty veins. *Inflorescence* 2.6–8.5(–11) cm long, 2–3(–4)-branched; peduncle 0.6–4.5 cm long; first branch 0.6–3 cm long; second branch 0.4–1.9 cm long or absent; axes yellow-rusty sericeous/villous to densely so, sometimes with glandular hairs; bracts linear to triangular, first bract 1–7 mm long, second bract 1–5 mm long; pedicels (1–)4–15(–18) mm long, sericeous to densely so, often with glandular hairs present. *Calyx* red to purple, lobes triangular with rounded apex, 2–4 × 0.75–1.25 mm, sericeous to densely so, sometimes with glandular hairs. *Corolla* white to yellowish white, exterior glabrous; upper lip 3–4 × 3–4.5 mm; upper lobes 1–2 × 1.5–2 mm, apices obtuse; lower lip (3.5–)4–5 × 6–8 mm; lower lobes 2–2.5(–3.5) × 1.5–2(–2.5) mm, apices obtuse; tube 1–1.75 mm long. *Stamens* inserted at 1 mm above the base of the corolla tube; filaments c.0.5–0.75 mm long; anthers c.0.75–1 mm diameter, rarely reduced, glabrous; staminode to c.0.25–0.5 mm long or rarely absent. *Ovary* 1–1.5 × 1–2 mm, puberulent; style 2–3.5 mm long; stigma apex rounded to obtuse or truncate. *Fruit* (dry) obloid or ovoid to ellipsoid, 3–5.5 × 2–3.5 mm, glabrous to puberulent.

Distribution. Taiwan, China, Vietnam and Sumatra.

Habitat and ecology. Growing in forests, thickets and dense scrub, typically in moist and shady places, on clayey to moist sandy soil on limestone bedrock, on gentle to steep slopes, at 280–1150 m. Flowering and fruiting March to July.

Proposed IUCN conservation assessment. Least Concern (LC). This species is common and widespread.

Additional specimens studied. China. **Guangdong**: viii 1887, *C. Ford* 108 (K); Huiyang District, Lin Fa Shan, 1 x 1935 – 19 x 1935, *W.T. Tsang* 26030 (A, AAU); Ting-wu Shan, 1 vii 1963, *K.C. Ting* & *K.L. Shih* 666 (L). **Guangxi**: Leng District, Ku-lung Village, 2 x 1937, *L.H. Chun* 91334 (A); Sun-to District, Po Yam Shan, 20 x 1933, *W.T. Tsang* 23043 (GH); Sup-man-ta Shan, 28 vii 1937, *H.Y. Liang* 69875 (A). **Hainan**: 1 x 1933, *C. Wang* 34455 (NY); Danzhou County, Sha Po Shan, 26 v 1928, or *W.T. Tsang* 521 (A [2], K, NY, UC [2], US); Hung Mo Shan, 26 vii 1929, *W.T. Tsang* & *Fung* 587 (A [2], K, NY); ibid., 19 vi 1929, *W.T. Tsang* & *Fung* 330 (GH, K, NY, UC); Ledong, 16 vi 1936, *S.K. Lau* 27142 (A); Po-ting, 5 vii 1935, *F.C. How* 73097 (GH); ibid., 17 iv 1935, *F.C. How* 71972 (GH); Yaichow, 16 vii 1933, *H.Y. Liang* 62137 (GH, NY); ibid., 23 ix 1933, *H.Y. Liang* 63058 (NY). **Hong Kong**: Tai Po, G. Barretto's Garden, 18 vi 2003, *S.Y. Hu* & *K.H. Yung* 609 (A). **Yunnan**: Wenshan, Maguan County, Gulinqing, 1 x 1985 – 10 x 1985, *Z.R. Xu* 5660 (US).

Taiwan. **New Taipei**: Shihding District, Leigongpo, 18 i 1989, *C-I. Peng* 12294 (A, US); Taihoku, Herinbi, 18 iii 1918, *E.H. Wilson* 10139 p.p. (A, K); Xindian District, Wenshan Experimental Forest, 29 vii 1994, *K-Y. Wang* 85 (A).

Vietnam. Ramvi, 1899, *S. Wilson* 2766 (K). **Ha Tay**: Mt Bavi, 1888, *B. Balansa* 4300 (K). **Hoa Binh**: Tan Lac District, Man Duc, 30 viii 1994, *P.C. Boyce* 864 (E, K, NY). **Lao Cai**: 19 xii 1964, *Sino-Vietnam Expedition* 3123 (not located; photocopy) [as cf. *Rhynchotechum formosanum* Hatus.]. **Ninh Binh**: Nho Quan District, Cuc Phuong National Park, 28 xii 1994, *P.K. Loc* 6918 (E); ibid., 15 ii 1965, *Sino-Vietnam Expedition* 4749 (not located; photocopy) [as cf. *Rhynchotechum formosanum* Hatus.].

Indonesia. **Sumatra**: **Sumatera Barat**: Barisan Range, Air Sirah above Padang, 9 v 1985, *E.F. de Vogel* & *J.J. Vermeulen* 7570 (L); Gunung Kerinci, Siolak Daras, 18 iii 1914, *H.C. Robinson* & *C.B. Kloss* s.n. (K). **Sumatera Utara**: Toba, Dolok Ri da Bolak, 9 x 1936 – 4 xii 1936, *R.S. Boeea* 11242 (A, US).

Unknown. 2 vi 1983, *Unknown* 568 (AAU).

This species can be recognised by its short stature, its peduncled inflorescences with puberulous ovaries, and its glandular hairs on the pedicels and sometimes other axes of the inflorescences. It varies in the size of the inflorescences and leaves within the same geographic area, but this effect may be due to differences in maturity. This species differs from *Rhynchotechum parviflorum* in the nature of the inflorescence peduncle. While *Rhynchotechum parviflorum* has a reduced or absent peduncle so that the inflorescence branches appear sub-fascicled, *R. formosanum* has proper peduncles arising from leaf axils. Rarely, two peduncles may appear to come from the same leaf axil, but always vertically offset from each other, not branching from the same point.

One specimen observed has some male-sterile flowers (*How* 73097). This is atypical for the species and for *Rhynchotechum* in general.

Two specimens had questionable height measurements in that the specimens clearly had roots and were less than 60 cm high yet the labels said the plants were 1.5 m and 9 ft high. These are likely errors, possibly because of incorrect copying of field notes to printed labels or a mismatch between descriptions and specimens, or perhaps because larger specimens, which we have not seen, were given the same collection number.

The specimens in Sumatra have somewhat wider styles in flower but not in fruit. In other characters they are not distinct and cannot be separated. Further collecting in Sumatra may help elucidate any differences. They are geographically isolated, and may represent a long-distance dispersal event. In Vietnamese specimens the developing fruit is more elongated but the specimens are also within the range of variation for the species in other characters and are not distinct enough to separate.

The name *Rhynchotechum formosanum* has been incorrectly applied to a number of specimens from China that we include in *R. parviflorum*. This is a potential source of confusion in regional floras. For example, the description of *Rhynchotechum formosanum* in the *Flora of Taiwan*, 2nd edn (Li & Kao, 1998) includes aspects of *R. parviflorum* such as paired cymes. Interestingly, the description says the corolla is white despite the photo showing a purple corolla, which is consistent with *Rhynchotechum parviflorum*.

Merrill (1934) identified some specimens from Hainan as *Rhynchotechum ellipticum*, though without flowering material. He stated that they seemed to fit within the limits of that species but that they could also be something else. Merrill cited the specimens by their Lingnan University numbers as *Tsang* & *Fung* 17864 and 18121. The correct numbers are 330 and 587, respectively, and the specimens are *Rhynchotechum formosanum*. Chun (1974) cited Merrill under his account of *Rhynchotechum ellipticum*, but the figure accompanying the account looks to be *R. parviflorum*.

The location of the type specimen was taken from Li & Hsieh (1997), as only a small photograph of the type was available and the label was unreadable.

The description provided with the protologue of *Lysimachia saurauifolia* S.S.Ying is odd in that it gives two different style lengths and indicates the seeds are 2–3 mm long, which is an order of magnitude larger than any other *Rhynchotechum* seeds (and indeed doesn't fit with a fruit that is not much larger than that). The seed measurement is probably a mistake, and the illustration provided with the protologue fits our concept of *Rhynchotechum formosanum*.

9. Rhynchotechum gracile B.M.Anderson, **sp. nov.**

Affinis *Rhynchotecho alternifolio* C.B.Clarke sed inflorescentia longiore et graciliore, calyce minore, stylo breviore et foliis magis elongatis hirsutisque recedit. – Type: India, Assam, *Masters* s.n. (holo L). **Fig. 8.**

Stems to $>$ 3 mm diameter. *Leaves* alternate to sub-opposite; petiole 1.5–3 cm long; blade narrowly elliptic to narrowly obovate, 13–20.5 $\times$ 2.7–6.3 mm, 3.3–4.8 times as

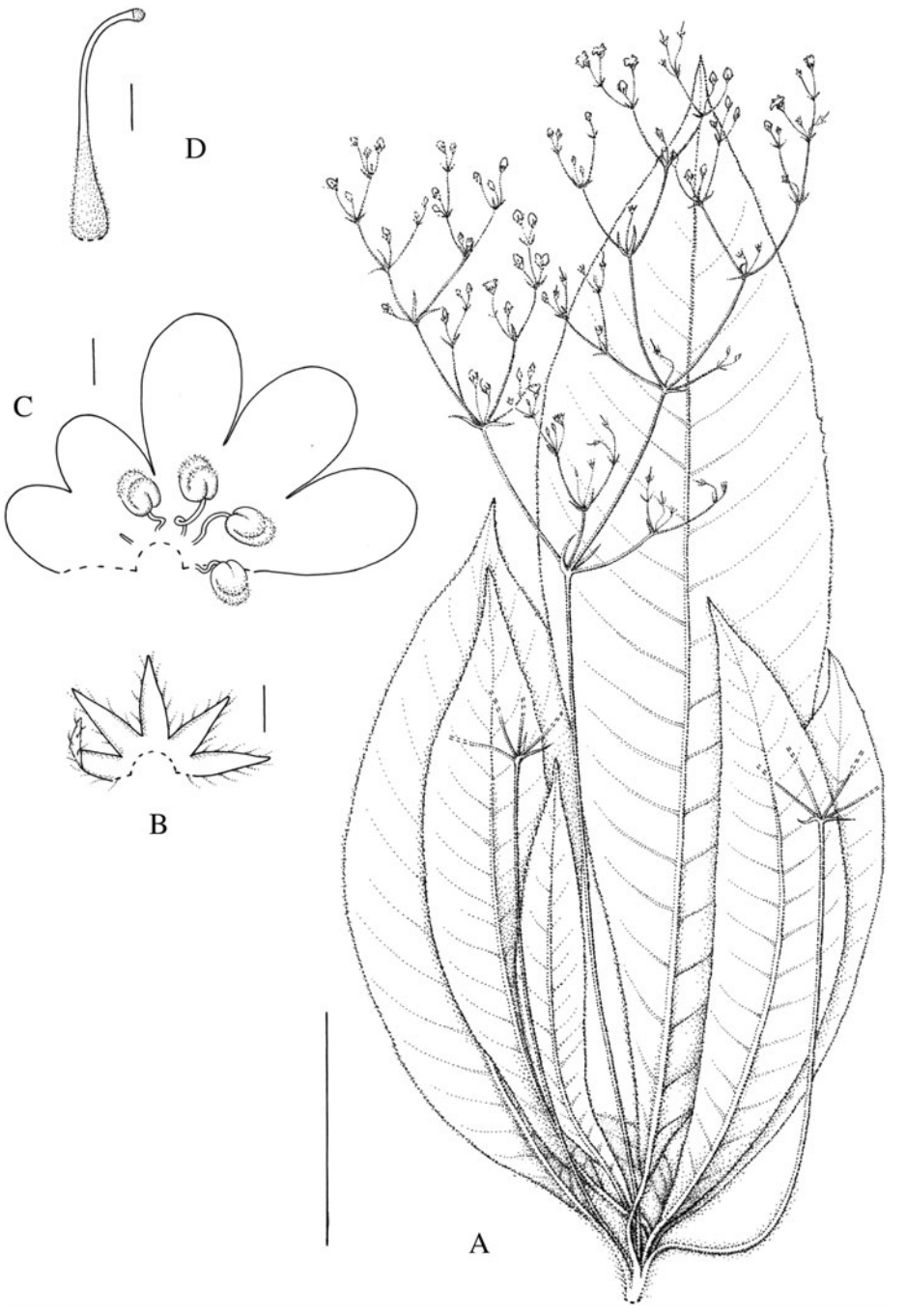

FIG. 8. *Rhynchotechum gracile* B.M.Anderson. A, habit; B, calyx opened out; C, corolla dissection showing the two smaller lobes of the upper lip, the three larger lobes of the lower lip and the two stamens; D, pistil. Scale bars: A = 5 cm, B–D = 1 mm. From *Masters* s.n. (L). Drawn by Claire Banks.

long as wide, apex acuminate, base narrowly cuneate; margin entire to slightly denticulate, the teeth to 0.25 mm long; secondary vein pairs 14–19; adaxially dark green, white pubescent to woolly; abaxially pale green, short yellow-rusty woolly, denser on the rusty veins. *Inflorescence* 19–25 cm long, 5–6-branched; peduncle 11–13.5 cm long; first branch 1.5–4.3 cm long; second branch 1–3 cm long; axes short rusty villous; bracts linear, first bract 4–9 mm long, second bract 2–6 mm long; pedicels 3–8 mm long, sub-glabrous to rusty villous/sericeous. *Calyx* lobes triangular, 1–1.5 × 0.5 mm, sub-glabrous to sparsely rusty villous. *Corolla* colour unknown, exterior glabrous; upper lip 2.5–3 × 3.25 mm; upper lobes 0.75–1 × 1.25 mm, apices rounded to obtuse; lower lip 4–5 × 6 mm; lower lobes 2.5 × 2 mm, apices rounded to obtuse; tube 1.5 mm long. *Stamens* inserted at 0.5 mm above the base of the corolla tube; filaments c.0.75–1 mm long; anthers c.1 mm diameter, bumpy; staminode < 0.4 mm long. *Ovary* 1–1.5 × 0.5 mm, puberulent; style 2.5–4 mm long; stigma apex globose/rounded to truncate. *Fruit* not seen.

Distribution. India. Known only from the type collection.

Habitat and ecology. Unknown.

Proposed IUCN conservation assessment. Data Deficient (DD). This species is only known from one collection, the exact provenance of which is unknown.

This species can be recognised by its slender inflorescence and very small flowers. Its calyces are smaller than any other *Rhynchotechum* specimen, while in other characters it is at the higher end to beyond the range of *Rhynchotechum alternifolium*. From that species it differs in the calyx shape and size, the shorter style, the more elongate and hairy leaves, and in the longer and more branched inflorescence.

10. Rhynchotechum hookeri (C.B.Clarke) B.M.Anderson, **comb. nov.** – *Rhynchotechum ellipticum* (Wall. ex D.Dietr.) A.DC. var. *hookeri* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 197 (1883). – Type: East Bengal, Chittagong, on Seetakoondo hill, *Hooker & Thomson* 481 (lecto K, designated here). **Fig. 7.**

Rhynchotechum ellipticum (Wall. ex D.Dietr.) A.DC. var. *angusta* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 197 (1883). – Type: Lower Burma, Martaban, *Parish* 19 (lecto K, designated here).

Stems to > 50 cm tall, to 6.5–9 mm diameter. *Leaves* opposite; petiole 1.4–3.8 cm long; blade narrowly elliptic, 15.5–25 × 4.4–8.2 cm, 2.5–3.5 times as long as wide, apex acuminate, base cuneate; margin denticulate to entire, the teeth to 0.5 mm long; secondary vein pairs 15–21; adaxially dark green, glabrous to sparsely white pubescent; abaxially pale green, short rusty woolly, denser on the rusty veins. *Inflorescence* 1–3 cm long, 2–4-branched; peduncle reduced/absent; first branch 0.2–0.5 cm long; second branch 0.2–0.5 cm long; axes rusty sericeous/villous to sparsely so; bracts linear to triangular, first bract 3–6 mm long, second bract 2.5–4.5 mm long; pedicels 3–11 mm long, sparsely rusty sericeous to sub-glabrous. *Calyx* pinkish, lobes triangular to linear

acuminate, 1.75–3 × 0.5–1 mm, sparsely sericeous/villous to glabrous. *Corolla* pink-lilac, exterior glabrous to sparsely puberulent; upper lip 3 × 3 mm; upper lobes 1.25 × 1.25–1.5 mm, apices rounded to obtuse; lower lip 4–4.5 × 6 mm; lower lobes 1.5 × 1.5–2 mm, apices rounded to obtuse; tube 1.5 mm long. *Stamens* inserted near the base of the corolla tube; filaments c.1 mm long; anthers c.1 mm diameter, slightly puberulent with glandular hairs; staminode c.0.25 mm long. *Ovary* 1–1.25 × 1.25 mm, glabrous to slightly puberulent; style 3.5–4 mm long; stigma apex globose/rounded to truncate. *Fruit* (dry) ellipsoid to ovoid, 2.5–3 × 2–2.5 mm, glabrous.

Distribution. India, Bangladesh and Burma.

Habitat and ecology. Growing in rainforest and woodland, at 0–300 m. Flowering and fruiting in March and July to September.

Proposed IUCN conservation assessment. Least Concern (LC). Although not known from a large number of specimens the extent of occurrence is more than 20,000 km^2. The area of occupancy (AOO) is difficult to estimate as so much of the potential range is within Burma which is so poorly collected. However, given the known ecological preferences for this species it is unlikely to have an AOO low enough to qualify for a threat category.

Additional specimens studied. INDIA. **Assam**: Cachar, *J.D. Hooker & T. Thomson* s.n. (K); ibid., *R.L. Keenan* s.n. (K); below Cachar, 1 xii 1850, *J.D. Hooker & T. Thomson* s.n. (K). **Mizoram**: Demagri, 10 ii 1873, *C.B. Clarke* 19627 (K). **West Bengal**: Darjeeling District, *J.M. Cowan* s.n. (E).

BANGLADESH. **Chittagong**: 20 viii 1920, *J.M. Cowan* 923 (E); *J.D. Hooker & T. Thomson* s.n. (L); *J.D. Hooker & T. Thomson* s.n. (GH); *J.D. Hooker & T. Thomson* s.n. (W); Chittagong Hill Tracts, Barkal, iii 1880, *J.S. Gamble* 7837 (K); Cox's Bazaar, Kelatali, 29 vii 1943, *J. Sinclair* 3083 (E); Cox's Bazaar, Teknaf, Howaikong Reserve Forest, 6 viii 1997, *M.A. Rahman et al.* 1727 (K); Sitapahar, ix 1920, *J.M. Cowan* 1336 (E).

This species can be recognised by its fairly compact and sub-glabrous inflorescences (note particularly that most of the length of the inflorescence comes from the pedicels rather than the branches). When Clarke (1883) established *Rhynchotechum ellipticum* var. *hookeri* he speculated that it might represent a distinct species. We agree that it is a good species which differs from *Rhynchotechum ellipticum* in the more elongate leaves, the non-scabrous inflorescence, the reduced inflorescence branch length, the shorter and more sub-glabrous calyx lobes, and the shorter styles.

This species differs from *Rhynchotechum parviflorum* in its more entire leaves, its smaller inflorescence, its less puberulent ovary, and its typically longer style, though there is a Burmese *R. parviflorum* specimen that has a style of similar length. Additional sampling in Burma and nearby localities may eventually show that these two species are not as different as they currently appear.

The flower measurements are based on a single flower due to the lack of suitable material.

Clarke (1883) suggested that his *Rhynchotechum ellipticum* var. *angusta* might be the same taxon as *Rhynchotechum ellipticum* var. *hookeri*. Some of the *Rhynchotechum*

ellipticum var. *angusta* specimens show somewhat longer inflorescence branches and may be distinct, but this is not a large enough difference to prevent uniting them.

The two *J.D. Hooker & T. Thomson* s.n. specimens from Cachar may be syntypes of *Rhynchotechum ellipticum* var. *angusta*, though Clarke (1883) only lists the collector of the type as 'Hooker f., in h. Kew'.

11. Rhynchotechum longipes W.T.Wang, Guihaia 4: 187 (1984); W.T.Wang *et al.* in C.Y.Wu & P.H.Raven (eds), Fl. China 18: 394, fig. 392 (1998). – Type: Guangxi, Ningming, Nanan, 8 vii 1977, *Wen Ki-qiang* 2-144 (holo GXMI n.v., photograph seen). **Fig. 7.**

Stems to c.35 cm tall, to 5 mm diameter. *Leaves* opposite; petiole 0.5–3 cm long; blade oblong, 10–19 × 3.5–5.8 cm, apex attenuate, base narrowly cuneate; margin denticulate; secondary vein pairs 12–15; adaxially glabrous; abaxially brown sericeous. *Inflorescence* spreading; peduncle 3.5–6.5 cm long; axes dense brown pubescent; bracts linear acuminate, first bract 6–7 mm long; pedicels 5–16 mm long. *Calyx* lobes linear with acute apices, 4.5–5.2 × 0.8 mm, densely appressed brown villous. *Corolla* white, exterior glabrous; upper lip c.3 × c.2.75 mm; upper lobes c.1.5 × c.1.5 mm, apices rounded to obtuse; lower lip c.3 × c.4.5 mm; lower lobes c.1.5 × c.1.5 mm, apices obtuse to rounded; tube 1.3–1.8 mm long. *Stamens* inserted at 1 mm above the base of the corolla tube; filaments c.0.6–0.8 mm long; anthers c.0.6–0.7 mm diameter, glabrous; staminode c.0.3–0.5 mm long. *Ovary* 1–1.2 mm long, minutely puberulent; style 3–3.2 mm long, puberulent at base; stigma small. *Fruit* (dry) minutely puberulent.

Distribution. China.

Habitat and ecology. Mostly unknown but flowering in July.

Proposed IUCN conservation assessment. Data Deficient (DD). This species is only known from the type and its full distribution and any potential or real threats are unknown.

Only a photograph of the type and a photocopy of the isotype were available, so flowers could not be examined. The protologue description could just as easily be of *Rhynchotechum formosanum*, apart from the leaf shape, longer peduncle, longer calyx and slightly smaller corolla dimensions. It is possible the type is a slightly atypical *Rhynchotechum formosanum* and that the author based floral measurements on an atypical flower. Without being able to closely examine the type or other specimens we retain this species as distinct based on the differences given but acknowledge that further study is necessary.

In the absence of specimens to examine, the description is based on the protologue and associated sketch.

12. Rhynchotechum obovatum (Griff.) B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 38 (1962); Chun (ed.), Fl. Hainan. 3: 528 (1974); B.L.Burtt, Thai Forest Bull., Bot. 29: 107 (2001). – *Chiliandra obovata* Griff., Not. Pl. Asiat. 4: 150 (1854). – Type: Griff., Icon. Pl. Asiat. 4: pl. 438 (1854) (lecto, designated here). Epitype: Mishmee, *Griffith* s.n. (epi K [barcode: K000249997], designated here). **Fig. 9.**

Rhynchotechum latifolium Hook.f. & Thomson ex C.B.Clarke, Commelyn. Cyrtandr. Bengal. 133, pl. 93 (1874); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 198 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 374 (1884); Merr., Lingnan Sci. J. 5: 168 (1927); P.H.Ho, Illustr. Fl. Vietnam 3(1): 25 (1993). – Type: Assam, *Wallich* s.n. (lecto GH, designated here).

[*Chelone latifolia* Buch.-Ham. ex C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 198 (1883) *nom. nud. pro syn.*; C.B.Clarke in Hook.f., Fl. Brit. India 4: 374 (1884) *pro syn.*]

Cyrtandra hillii H.Lév., Repert. Spec. Nov. Regni Veg. 10: 145 (1911); H.Lév., Fl. Kouy-Tcheou 182 (1914–1915); L.A.Lauener, Notes Roy. Bot. Gard. Edinburgh 38: 472 (1980). – Type: Guizhou, Lo-Fou, x 1908, *Cavalerie* 3529 (holo E).

Rhynchotechum ellipticum auct. non (Wall. ex D.Dietr.) A.DC.: W.T.Wang *et al.* in C.Y.Wu & P.H.Raven (eds), Fl. China 18: 394, fig. 391 (1998).

Stems 30–300(–600; see note) cm tall, to 5–10(–15) mm diameter. *Leaves* opposite or whorled to rarely alternate lower down; petiole 2.2–6 cm long; blade obovate or

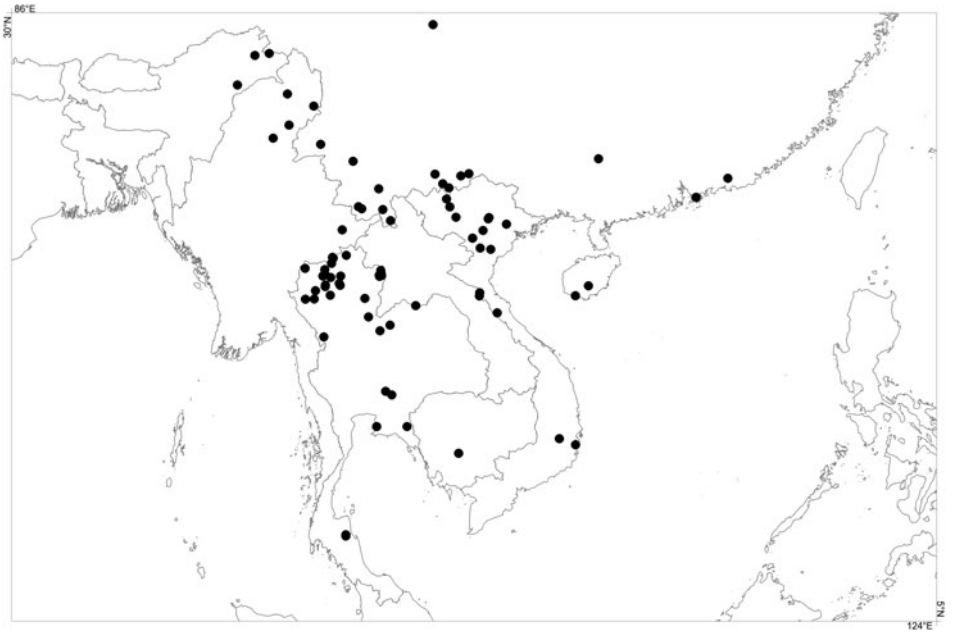

FIG. 9. Distribution map of *Rhynchotechum obovatum* (Griff.) B.L.Burtt (●).

narrowly obovate to elliptic or narrowly elliptic, (7.5–)10–25.5(–41) × 4.7–8.1(–21) cm, 2.2–3.3(–4.3) times as long as wide, apex acuminate to acute, base narrowly cuneate; margin denticulate, the teeth to 2 mm long; secondary vein pairs 13–24; adaxially dark green, glabrous to sparsely white pubescent, denser and yellower on the midvein; abaxially pale green, yellow-rusty woolly, denser on the veins. *Inflorescence* green to light brown, 2.5–9(–13.5) cm long, (2–)3–5-branched; peduncle 0.8–3(–6.8) cm long; first branch (0.5–)0.9–2.7(–3.7) cm long; second branch 0.4–2 cm long; axes densely yellow-rusty sericeous/villous; bracts linear acuminate to slightly triangular, first bract 5–12 mm long, second bract 3–10 mm long; pedicels 1–10 mm long, yellow-rusty sericeous/villous to densely so. *Calyx* green to light brown, lobes triangular with rounded or rarely slightly caudate apices, 2–4 × 0.75–1.5 mm, densely yellow-rusty sericeous to rarely glabrous. *Corolla* white or greenish white to pale pink, exterior glabrous or rarely slightly puberulent; upper lip with a brownish red to dark purple colouration at the base, 3–4.5 × 3–4.5 mm; upper lobes 1–1.5(–2) × 1–2(–2.5) mm, apices rounded to obtuse; lower lip 5–7 × 5–8 mm; lower lobes 1.5–3(–3.5) × 1–2.5(–2.75) mm, apices obtuse to rounded; tube 1.75–2(–2.5) mm long. *Stamens* inserted at 0.5 mm above the base of the corolla tube; filaments c.0.75–1 mm long; anthers cream to yellow or light brown, c.0.75–1.25 mm diameter, puberulent with glandular hairs; staminode c.0.25 mm long. *Ovary* 1–2 × (0.75–)1–1.5 mm, glabrous to rarely slightly puberulent; style white to greenish, (3.5–)5–6 mm long; stigma apex globose/obtuse to truncate. *Fruit* (dry) ovoid to widely ellipsoid/ovoid or obloid, (2.5–)3–5 × (2.5–)3–5 mm, glabrous.

Distribution. Bangladesh, India, Burma, Thailand, Vietnam, Laos, Cambodia and China.

Habitat and ecology. Growing in wet to dry primary and secondary evergreen forests and thickets, sometimes disturbed, often in wet and shady conditions, on granite or rarely limestone or sandstone bedrock, on gentle to steep slopes, at 197–2120 m. Flowering and fruiting recorded for all months except March and December.

Proposed IUCN conservation assessment. Least Concern (LC). This species is common and widespread.

Additional specimens studied. INDIA. **Arunachal Pradesh**: Delei Valley, 2 viii 1928, *F.K. Ward* 8508 (K [2]); Mishmi Hills, *W. Griffith* s.n. (L). **Assam**: *N. Wallich* s.n. (K); *N. Wallich* s.n. (L); *N. Wallich* s.n. (W). **Nagaland**: Rusa, Rusa – Bimalpur, 7 ix 1958, *G. Panigrahi* 17037 (E).

BANGLADESH. sin. loc., *W. Griffith* s.n. (GH, S).

CHINA. **Guangdong**: Huiyang District, Lin Fa Shan, 1 x 1935 – 19 x 1935, *W.T. Tsang* 26030 (A, AAU); Thai-Yong, 15 vii 1901, *J.M. Dalziel* s.n. (E [2]); Ying Tak, Wan Tong Shan, 12 x 1926 – 13 x 1926, *W.T. Tsang* & *K.C. Wong* 2648 (A, UC). **Guangxi**: Yao Shan, 14 xii 1936, *C. Wang* 40648 (A). **Guizhou**: Lo-Fou, 1909, *J. Cavalerie* 3528 (K); ibid., 1909, *J. Cavalerie* s.n. (E). **Hainan**: 9 xii 1933, *C. Wang* 35263 (A, NY); Hung Mo Shan, 23 vi 1929, *W.T. Tsang* & *Fung* 356 (A, K, NY, UC); Kan-en District, Chim Fung Ling, 25 iv 1934, *S.K. Lau* 3860 (A [2], S); Kan-en District, Chim Fung Mt, 2 i 1935 – 31 i 1935, *S.K. Lau* 5222 (A, E); S of Shui Mun, 14 v 1922, *F.A. McClure* 3048 (NY, UC [3], US); Wuzhi Shan, 4 vi 1920, *W.Y. Chun* 6946 (UC); Yaichow,

18 viii 1933, *H.Y. Liang* 62691 (A, NY). **Hong Kong**: New Territories, Tai Mo Shan, 10 x 1973, *K.Y. Chan* 1277 (K). **Sichuan**: Emei Shan, vii 1904, *E.H. Wilson* 4759 (A, K). **Yunnan**: Che-li Hsien, Ban-chiou-chian, x 1936, *C.W. Wang* 79699 (A); Che-li Hsien, Nan-hsien-ho, x 1936, *C.W. Wang* 79497 (A); Che-li Hsien, Sheau-bang-chou-chian, ix 1936, *C.W. Wang* 79667 (A); Fo-Hai, vi 1936, *C.W. Wang* 74824 (A); ibid., vii 1936, *C.W. Wang* 74896 (A); Jenn-yeh Hsien, x 1936 – xi 1936, *C.W. Wang* 80287 (A); Lung-ling Hsien, 10 i 1934, *H.T. Tsai* 55061 (A); Mengla, 26 vi 1976, *S.K. Pei* 1405 (E); ibid., xi 1936, *C.W. Wang* 80676 (A); ibid., 13 x 1974, *S.H. Yang* 13379 (E); Mengla County, Xiao Meng Yang – Menglun, 18 ix 1983, *Sino-American Expedition to Yunnan* 222 (GH); Mengtze, *A. Henry* 9382 (A, K, NY); ibid., *A. Henry* 9382A (E [2], K, US); Mienning, 9 xi 1938, *T.T. Yü* 18198 (A, E); Nan-Chiao, vi 1936, *C.W. Wang* 76940 (A); Ping-pien Hsien, 27 vii 1934, *H.T. Tsai* 61282 (A); ibid., 28 vii 1934, *H.T. Tsai* 61321 (A); ibid., 5 vi 1934, *H.T. Tsai* 62300 (A); Simao, *A. Henry* 12111 (A, K, US); ibid., *A. Henry* 12111A (A, E [2], K); ibid., *A. Henry* 12111B (A, K, NY); ibid., *A. Henry* 12111C (A, K, NY); ibid., *A. Henry* 12111D (A, E [2], K); Wenshan, Maguan County, Gulinqing, 1 x 1985 – 10 x 1985, *Z.R. Xu* 5593 (E); Xichou Xian, Fa Dou, 16 ix 1947, *K.M. Feng* 11806 (A); Xichou Xian, Xiangpingshan, 2 ix 1947, *K.M. Feng* 11563 (A).

BURMA. Htawgaw, ix 1924, *G. Forrest* 24921 (E, K); Katha District, Kadu Still, 22 ii 1910, *J.H. Lace* 5099 (E, K); Keng Tung, Valley of the Meh Len, 27 i 1922, *J.F.C. Rock* 2079 (A, UC, US); Myitkyina, *S.M. Toppin* 4049 (E); Myitkyina, Nansonti Reserve, ii 1909, *E.M. Buchanan* 45 (E); Sittung, 1890, *J.C. Prazer* s.n. (K); Sumprabum Sub-Division, Kanat Bum, 17 ii 1962, *J. Keenan, U.T. Aung & U Tha Hla* 3459 (A, E); Sumprabum Sub-Division, Kanat Bum, Ning W'Krok, 19 i 1962, *J. Keenan, U.T. Aung & U Tha Hla* 3328 (A, E); Sumprabum, Hpuginhku Village, iii 1962, *J. Keenan, U.T. Aung & U Tha Hla* 3818 (E); Sumprabum, Ndum-Zup – Hpuginhku Village, 30 xii 1961, *J. Keenan, U.T. Aung & U Tha Hla* 3091 (A, E).

THAILAND. Huey Ya, 24 ii 1964, *B. Hansen, G. Seidenfaden & T. Smitinand* 11248 (E). **Chanthaburi**: Pong Namron, Khao Soi Dao Wildlife Sanctuary, 8 ii 1966 – 9 ii 1966, *K. Iwatsuki & N. Fukuoka* 7140 (E); ibid., 29 iv 1930, *A.F.G. Kerr* 19220 (K); Pong Namron, Khao Soi Dao Wildlife Sanctuary, Khao Soi Dao, 13 xi 1969, *C.F.v. Beusekom & T. Smitinand* 2184 (AAU, E, L). **Chiang Mai**: Huei Mae Mae, 17 vi 1998, *W. Pongamornkul* 123 (QBG); Mae Rim District, Queen Sirikit Botanic Garden to Ban Mae Sa Mai, 11 viii 1998, *W. Nanakorn et al.* 11726 (QBG); Mae Rim District, QSBG, Huai Pu, 9 vii 1998, *S. Watthana* 148 (QBG); Fang District, 10 km W of Fang, 24 vii 1968, *K. Larsen, T. Santisuk & E. Warncke* 2631 (AAU, E, L); Chai Prakan, Sidongyen Subdistrict, Ban Wieng Pa Pattana (Lahu village), 9 vii 1991, *J.F. Maxwell* 91-622 (CMU-Pharmacy, GH, L); Chiang Dao, Doi Chiang Dao Wildlife Sanctuary, Doi Pa Kia, 9 xi 1996, *J.F. Maxwell* 96-1506 (A, CMU); Doi Inthanon, 3 viii 1988, *H. Takahashi* 62717 (AAU); ibid., 25 vii 1988, *S. Tsugaru* 61786 (AAU, L, QBG); Fang, 11 vi 1960, *T. Smitinand & H. St. John* 6829 (K); Mae Chaem, 16 vii 1922, *A.F.G. Kerr* 6292 (K); Mae Taeng, Doi Mawn Ngaw, 14 viii 2002, *P. Palee* 545 (L); Mae Tang, Doi Sutep-Doi Pui National Park, Doi Pui-Puping Meditation Centre, 27 xi 1995, *J.F. Maxwell* 95-1188 (A, L); Mueang Chiang Mai, Doi Suthep-Doi Pui National Park, Chang Kian Valley, 17 vi 1992, *J.F. Maxwell* 92-296 (AAU, CMU, E, GH, L); Mueang Chiang Mai, Doi Suthep-Doi Pui National Park, Doi Suthep, 25 vii 1976, *E.F. Anderson* 3763 (UC); ibid., 20 vi 1957, *Khantchai* 635 (E); ibid., 12 viii 1987, *J.F. Maxwell* 87-785 (AAU, CMU-Pharmacy, L); ibid., 19 xii 1987, *J.F. Maxwell* 87-1619 (CMU-Pharmacy, L); ibid., 29 vi 1988, *J.F. Maxwell* 88-814 (AAU, CMU-Pharmacy, L); ibid., 30 x 1994, *W. Nanakorn et al.* 2570 (E); ibid., 25 x 1920, *J.F.C. Rock* 77 (US); ibid., 21 vi 1958, *T. Sorensen, K. Larsen & B. Hansen* 3668 (K). **Chiang Rai**: Doi Nang Ka, 1 xi 1930, *N. Put* 3285 (ABD, K); near Li Pa, 18 xii 1983, *E.F. Anderson* 5334 (A); Wiang Pa Pao, Khun Chae National Park, along a tributary of the Mae Toh Stream, 17 xi 1997, *J.F. Maxwell* 97-1357 (A, CMU); Doi Tung, 4 ix 2006, *J.F. Maxwell* 06-619 (CMU, QBG). **Lampang**: Muang Bahn, Chae Son, along Mae Mae Stream, 21 vi 1996, *J.F. Maxwell*

96-833 (A, CMU, L); Muang Bahn, Chae Son, Mae Jam (Yao) village, 9 xi 2003, *J.F. Maxwell* 03-433 (A, CMU). **Lamphun**: Mae Tha, Doi Khun Tan National Park, 5 v 1994, *J.F. Maxwell* 94-618 (A, CMU). **Loei**: Phu Luang NP, Wong Saphung, 25 xi 1957, *D. Bunpheng* 1020 (E); Na Haew, 21 vi 1995, *W. Nanakorn et al.* 3837 (QBG). **Mae Hong Son**: Mae Sariang, Ban Mae Sawan Noi stream, 3 iii 1991, *J.F. Maxwell* 91-224 (CMU-Pharmacy, L); Muang District, Hauy Pha Subdistrict, Ban Hauy Phung, 13 xii 2007, *N. Tanaka et al.* HN8318 (QBG). **Nakhon Ratchasima**: Khao Yai National Park, 14 iii 1968, *C.F.v. Beusekom* & *C. Phengklai* 43 (K, L); ibid., i 1964, *C. Phengklai* 612 (E, K, L). **Nakhon Si Thammarat**: Lan Saka, Khao Luang National Park, 23 x 1951, *T. Smitinand* 990 (E); Lan Saka, Khao Luang National Park, Khao Luang, 22 v 1968, *C.F.v. Beusekom* & *C. Phengklai* 927 (AAU, E, K, L); ibid., 25 i 1966, *B. Hansen* & *T. Smitinand* 12076 (E, SING); ibid., 28 iv 1928, *A.F.G. Kerr* 15439 (ABD, K); ibid., 24 viii 1995, *K. Larsen* & *S.S. Larsen et al.* 45935 (SING). **Nan**: Doi Khun Sathan, 19 xi 1993, *K. Larsen* & *S.S. Larsen et al.* 44563 (AAU); Doi Phu Kha National Park, 13 xii 1990, *K. Larsen* & *S.S. Larsen et al.* 41923 (AAU, K); ibid., 25 vi 1999, *P. Srisanga* 737 (E, QBG); ibid., 4 xi 1999, *P. Srisanga* 1129 (QBG); Pua, Doi Phu Kha National Park, 22 viii 2001, *P. Srisanga* & *C. Maknoi* 2046 (QBG); Sapan Waterfall, Doi Phu Kha National Park, 28 vi 2002, *P. Srisanga* 2582 (QBG); Doi Phu Kha National Park, Nan Watershed, 5 xi 1998, *P. Srisanga* 304 (E). **Phitsanulok**: Phu Miang, 27 vii 1966, *K. Larsen, T. Smitinand* & *E. Warncke* 936 (AAU, L); Phu Hin Rong Kla, 15 x 1998, *P. Suksathan* 1359 (QBG). **Prachin Buri**: Khao Yai National Park, 12 vii 1966, *K. Larsen, T. Smitinand* & *E. Warncke* 331 (AAU); ibid., i 1964, *C. Phengklai* 612 (E, K, L). **Tak**: Umphang, Doi Hua Mod, 12 vi 1933, *H.B.G. Garrett* 804 (K, L [2], US).

Cambodia. 20 iii 1929, *E. Poilane* 16082 (A). **Kampong Speu**: Thpong, Mt Knang Repoeu, v 1870, *J.B.L. Pierre* 852 (A, E, K, MICH, NY, UC).

Laos. **Vientiane**: Pak Munung, 24 iv 1932, *A.F.G. Kerr* 21233 (K, L).

Vietnam. *E. Poilane* 4418 (NY); Van Son, 4 i 1965, *Sino-Vietnam Expedition* 952 (IBSC, PE). **Dac Lac**: Krong Bong District, Cu Pui Municipality, Dak Tour Village to main peak of Chu Yang Sinh Mountain range along Dak Tour River, 5 v 2000, *L. Averyanov et al.* 6030 (E). **Ha Tay**: Mt Bavi, iv 1908, *A.C.d. Alleizette* 5435 (L); ibid., 29 v 1939, *A. Pételot* 2365 (E, US). **Ha Tinh**: Huong Son, Nga Doi, 17 v 1998, *N.T. Hiep* & *P.K. Loc et al.* 588 (E, SING); Huong Son, Rao An-Ngam Thep, 28 iv 1998, *N.T. Hiep* & *V.V. Can* 376 (E). **Hoa Binh**: Mai Chau District, Pa Co, 20 ix 2005, *V.X. Phuong* & *N.V. Du et al.* 612 (K); Mai Chau District, Pa Co, Na Pai Village, 9 xii 2002, *D.K. Harder, N.T. Hiep* & *L. Averyanov* 8071 (E); Mai Chau District, Xa Linh, 20 vi 2006, *P.K. Loc* & *L.D. Tan et al.* 498 (NY). **Khanh Hoa**: Nha Trang, vi 1909, *A.C.d. Alleizette* s.n. (L). **Lao Cai**: Sa Pa, vii 1940, *A. Pételot* 7181 (E); ibid., 7 xii 1964, *Sino-Vietnam Expedition* 90 (PE); Van Ban District, Nam Xe Municipality, Nam Xi Tan Village, 2 ii 2001, *D.K. Harder, P.K. Loc* & *G.E. Schatz* 7030 (E). **Ninh Binh**: Nho Quan District, Cuc Phuong National Park, May Bac Mountain, 28 xii 1994, *D.D. Tirvengadum, P.K. Loc* & *N.T. Hiep et al.* 3368 (AAU). **Quang Binh**: Minh Hoa, Ke Bang, 18 v 1997, *L. Averyanov, N.T. Hiep* & *P.K. Loc* 4787 (AAU). **Son La**: Ngoc Chien, Ban Pieng, 3 x 2008, *N.V. Du* & *B.H. Quang et al.* 2320 (K). **Thanh Hoa**: Ba Thuoc District, Thanh Son Municipality, Phu Tho, *Eberhardt* 5069 (US). **Vinh Phu**: Tam Dao, 27 viii 1994, *P.C. Boyce* 843 (K); ibid., 9 vii 1996, *P.K. Loc* 7068 (E).

Unknown. vii 1924, *E. Poilane* 10571 (GH).

This species can often be recognised by its broad, branching inflorescences with many flowers and its large obovate leaves. It often has three inflorescences per node (whorled), and the inflorescence and calyx tend to be densely sericeous. It has a larger stature, longer style, and a less puberulent ovary than *Rhynchotechum formosanum*, and the inflorescence is typically more branched.

Many Chinese specimens of *Rhynchotechum obovatum* have been incorrectly identified as *R. ellipticum*, and the name *R. obovatum* has been made synonymous with *R. ellipticum* in the *Flora of China* (Wang *et al.*, 1998), but the two species are distinct, especially in the form of the inflorescence. *Rhynchotechum obovatum* has peduncled inflorescences that are single from the axils of leaves, whereas *R. ellipticum* has reduced peduncles so that the inflorescences appear fascicled in leaf axils. In addition, *Rhynchotechum obovatum* tends to have densely sericeous calyx lobes while *R. ellipticum* tends to have scabrous calyx lobes with conspicuously multicellular hairs. Finally, the leaves of *Rhynchotechum obovatum* tend to be more elongate and obovate than the leaves of *R. ellipticum*, though this character is not a strong differentiator. When Clarke (1874) published *Rhynchotechum latifolium*, he included an illustration of that species along with one of *R. ellipticum* which clearly show the difference in inflorescence structure.

When Clarke (1874) included the illustration of *Rhynchotechum latifolium*, he showed that the lower leaves could be alternate. In most specimens the leaves are clearly opposite, though the lower leaves are not always visible and may be alternate. Two specimens from Burma (*Toppin* 4049 and *Buchanan* 45) have all but the upper leaves alternate and are atypical of *Rhynchotechum obovatum*, though they are included because their flowers have sericeous calyx lobes, long styles, puberulent anthers, darkened upper corolla lobes, and glabrous ovaries. It is possible that with further sampling in Burma it may become clear that they represent a distinct entity. The *Lace* 5099 specimen from Burma has sub-opposite leaves and may be close to these.

The *Anderson* 5334 (A) specimen from Thailand is sterile but the leaves look close to *Rhynchotechum obovatum* and are whorled at one node. It is noted on the specimen that the leaves are smoked as a substitute for tobacco and that the plant also produces a fibre used for cording.

One of the labels has the height as 20 ft and describes the plant as a tree. This seems to be an error, as it is well beyond the height range of any other *Rhynchotechum obovatum* or any other species of *Rhynchotechum*.

The protologue does not mention a locality, so we are unable to verify whether the Griffith specimen from K is original material (Griffith's attached note has 'Cheilosandra' rather than 'Chiliandra'). The plate to which the initial publication refers has details of the flower (including puberulent anthers), is undoubtably original material and is lectotypified here. The Griffith specimen is designated as an epitype.

The lectotype of *Rhynchotechum latifolium* is designated here with a specimen from GH, despite there being a specimen of Wallich's from Assam at K. The K specimen had 'Assam diputatum' written on it and was possibly number 11. This casts some doubt on whether the specimen is indeed the one referred to in the protologue, so the GH specimen is lectotypified instead. No specimens likely to be type material were found in K-W. There are also specimens from L and W, but since the specimens are without numbers and may not be duplicates, they are considered syntypes.

Clarke was probably unaware that the name *Chelone latifolia* had been used earlier as *Chelone latifolia* Muhl. ex Elliott, Sketch Bot. S. Carolina 2: 127 (1822), referring to a different plant.

In a study on Gesneriaceae pollen morphology in Thailand, Palee *et al.* (2003) describe the pollen of *Rhynchotechum obovatum* as 'spheroidal, tricolpate, with long apertures, and microreticulate sculpturing. The colpi are long, elliptical with pointed ends, and granular.'

13. Rhynchotechum parviflorum Blume, Bijdr. Fl. Ned. Ind. 775 (1826); G.Don, Gen. Hist. 663 (1838); DC., Prodr. 285 (1845); Miquel, Fl. Ned. Ind. 2: 750 (1858); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 195 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 373 (1884); Ridl., J. Straits Branch Roy. Asiat. Soc. 44: 84 (1905); Ridl. in King & Gamble, Mat. Fl. Malay. Penins. 21: 787 (1909); Ridl., Fl. Malay Penins. 2: 541 (1923); P.H.Ho, Illustr. Fl. Vietnam 3(1): 25 (1993); B.L.Burtt, Thai Forest Bull., Bot. 29: 107 (2001). – Type: Java, Seribu mountains, *Blume* s.n. (lecto L [barcode: 0834014], designated here). Epitype: Java, Preanger, Paroenkoeda [Parungkuda], 20 xii 1920, *Bakhuizen van den Brink* 5055 (epi L, designated here). **Figs 10, 11.**

Rhynchotechum parviflorum Blume var. *penangensis* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 196 (1883). – Type: Prince of Wales Island [Penang], *Unknown* s.n. (holo K).

[*Rhynchotechum lasianthus* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 195 (1883) *nom. inval. pro syn.*]

[*Cyrtandra microcarpa* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 195 (1883) *nom. inval. pro syn.*]

Isanthera parviflora Ridl., Trans. Linn. Soc. London, Bot. 3: 331 (1893). – Type: Pahang, Kwala Tahan, viii 1891, *Ridley* 2171 (lecto SING, designated here).

Cyrtandra polycarpa K.Schum., Nachtr. Fl. Schutzgeb. Südsee 377 (1905). – *Rhynchotechum polycarpum* (K.Schum.) Schltr., Bot. Jahrb. Syst. 58: 304 (1923). – Type: [Papua New Guinea], Kaiser-Wilhemsland, on the way from Ramu to the coast, ii 1902, *Schlechter* 14203 (lecto E, designated here; iso NY).

Cyrtandra copelandii Elmer, Leafl. Philipp. Bot. 7: 2661 (1915). – *Rhynchotechum copelandii* (Elmer) Elmer ex Merr., Enum. Philipp. Fl. Pl. 3: 455 (1923). – Type: Mindanao, Agusan, Cabadbaran (Mt Urdaneta), ix 1912, *Elmer* 13716 (lecto BM, designated here; iso E, L).

[*Rhynchotechum hoevellianum* Schltr., Bot. Jahrb. Syst. 58: 304 (1923) *nom. nud.*]

Rhynchotechum ellipticum auct. non (Wall. ex D.Dietr.) A.DC.: Chun (ed.), Fl. Hainan. 3: 528 (1974) *pro parte*.

Rhynchotechum formosanum auct. non Hatus.: Z.Y.Li & M.T.Kao in T.C.Huang, Fl. Taiwan, ed. 2 708, photo 363 (1998) *pro parte*; W.T.Wang *et al.* in C.Y.Wu & P.H.Raven (eds), Fl. China 18: 394 (1998) *pro parte*; J.C.Wang & C.C.Wang, Taiwania 45: 363 (2000) *pro parte*.

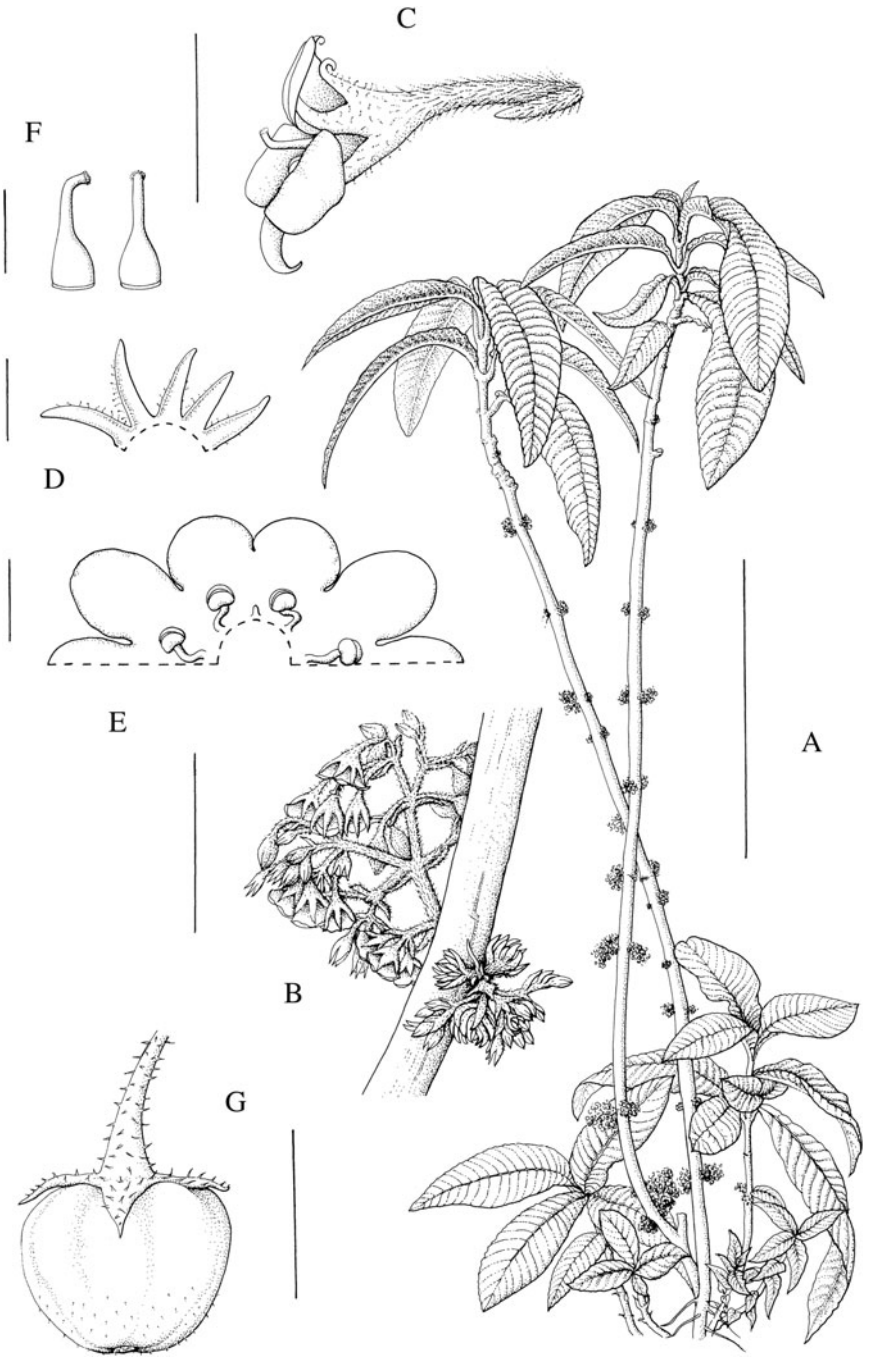

FIG. 10. *Rhynchotechum parviflorum* Blume. A, habit; B, inflorescence; C, flower; D, calyx opened out; E, corolla dissection with the two smaller lobes of the upper lip and the three larger lobes of the lower lip; F, pistil; G, fruit. Scale bars: A = 20 cm, B = 2 cm, C, G = 5 mm, D–F = 2.5 mm. All parts from RBGE cultivated collection 20021851. Drawn by Claire Banks.

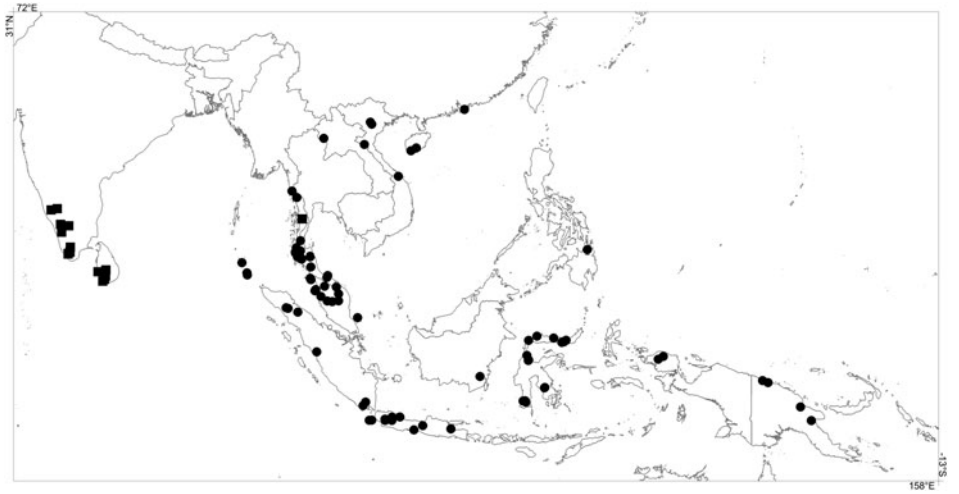

FIG. 11. Distribution map of *Rhynchotechum parviflorum* Blume (●) and *Rhynchotechum permolle* (Nees) B.L.Burtt (■).

Stems 20–180(–460; see note) cm tall, to 4.5–8 mm diameter, sometimes with multiple stems from a single base. *Leaves* opposite, rarely sub-opposite; petiole 1.7–4.5(–7.5) cm long; blade elliptic to narrowly elliptic or obovate to narrowly obovate, 9–27(–37) × 3.4–12 cm, 1.8–3.5(–6) times as long as wide, apex acuminate to acute, rarely obtuse or caudate, base narrowly cuneate to cuneate; margin denticulate to dentate, the teeth to 3 mm long; secondary vein pairs 9–24; adaxially dark green, glabrous to white pubescent, denser on the midvein; abaxially pale green, glabrous to yellow-rusty woolly, denser on the rusty-brown veins. *Inflorescence* dark purplish red or green to pinkish brown, (0.9–)1.3–6(–9) cm long, (2–)3–4(–5)-branched; peduncle reduced/absent; first branch 0.3–3.2(–4) cm long; second branch 0.3–1.6(–1.9) cm long; axes rusty-yellow villous/sericeous to sub-glabrous, rarely with glandular hairs present; bracts linear to triangular, first bract 2–6 mm long, second bract 2–8 mm long; pedicels 1–11 mm long, yellow-rusty sericeous/villous. *Calyx* purplish red or green to pinkish brown, lobes triangular with apices rounded, rarely somewhat caudate, (1.5–)2–3.5(–4) × (0.5–)0.75–1(–1.5) mm, yellow-rusty sericeous/villous to sub-glabrous or scabrous with glandular hairs. *Corolla* white to pale purple, exterior glabrous to slightly puberulent; upper lip with purple-red colouration at the base, 2.25–3.5 × 2–4 mm; upper lobes 0.75–1.5 × 0.75–2 mm, apices obtuse to rounded; lower lip (2.75–)3.5–4.5(–5) × (3–)4.5–6(–8) mm; lower lobes 1–2 × 1–2.25 mm, apices obtuse to rounded; tube (1–)1.5–2 mm long. *Stamens* inserted at 0.5–0.75(–1) mm above the base of the corolla tube; filaments c.0.5–1 mm long; anthers yellow to red-brown, c.0.5–0.75 mm diameter, glabrous, rarely slightly puberulent; staminode c.0.25–0.5 mm long. *Ovary* (0.5–)0.75–1.25 × (0.5–)0.75–1.5 mm, short pubescent to puberulent; style white, 1.5–3.25(–4) mm long; stigma white, apex truncate to globose/rounded. *Fruit* (dry) ellipsoid to widely ellipsoid or widely ovoid, (2.5–)3–4 × 2–3.5(–5) mm, glabrous to slightly puberulent.

Distribution. India (Nicobar Isl.), Burma, Thailand, Vietnam, China, Sumatra, Kalimantan, Sulawesi, Indonesian New Guinea, Papua New Guinea and the Philippines.

Habitat and ecology. Growing in primary and secondary forests and thickets, sometimes disturbed, sometimes near streams, in shady conditions, on clayey loam to moist sandy soil on granite, limestone or sandstone bedrock, sometimes on steep slopes and in ravines, at 0–1600 m. Flowering and fruiting recorded in all months.

Proposed IUCN conservation assessment. Least Concern (LC). This species is common and widespread.

Additional specimens studied. INDIA. **Andaman and Nicobar Islands**: Great Nicobar Island, 16 vi 1977, *N.P. Balakrishnan* 5792 (E [2]); Great Nicobar Island, Galathea riverside, 24 vii 1976, *N.P. Balakrishnan* 4000 (E, L); Great Nicobar Island, Navy Dera, 14 vi 1981, *D.K. Hore* 8814 (E); Katchal Island, Mildera, 17 xii 1974, *P. Chakraborty* 2201 (E); ibid., 5 xi 1976, *P. Chakraborty* 4627 (L [2]).

CHINA. **Guangdong**: viii 1887, *C. Ford* 109 (K [2]). **Guangxi**: Bose, Bako Shan, 27 ix 1928, *R.C. Ching* 7702 (NY, US); Fangcheng District, Kung Ping Shan, 10 ix 1936 – 18 ix 1936, *W.T. Tsang* 26854 (A, E, K). **Hainan**: Bo-ting, 11 x 1936, *S.K. Lau* 27967 (A); Dung Ka, 25 ix 1932, *N.K. Chun & C.L. Tso* 43946 (A, NY, US); Lam Ko District, Top of Lin Fa Shan, 2 viii 1927, *W.T. Tsang* 287 (A, K, NY, UC, US); Lingshui Xian, Tongteiling, 16 x 1956, *L. Teng* 2617 (AAU); Po-ting, 21 v 1935, *F.C. How* 72532 (GH); Ya Xian, 10 x 1933, *C. Wang* 34570 (A, NY); Yaichow, 18 iii 1933, *F.C. How* 70372 (NY). **Hong Kong**: Wah Shan Kuek, 23 viii 1970 – 24 viii 1970, *S.Y. Hu* 10939 (A).

BURMA. Tavoy, South of Paungdaw Power Station, 6 ix 1961, *J. Keenan, U.T. Aung & R.H. Rule* 1419 (A, E); Tawer District, Tebyu Township, 16 x 1998, *J.F. Maxwell* 98-1125 (L).

THAILAND. **Chumphon**: Langsuan, Ban Kraye, 19 ii 1927, *A.F.G. Kerr* 12001 (K, L). **Krabi**: Khao Phanom Bencha, 27 iii 1930, *A.F.G. Kerr* 19379 (K); Khao Phanom District, Khao Phanom Bencha, Trail from Ban San to top of Khao Phanom Bencha, 18 vi 2006, *K. Williams* 1866 (E). **Nakhon Si Thammarat**: Lan Saka, Khao Luang National Park, 21 vii 1999, *S. Watthana, S. Inthamusik & P. Suksathan* 449 (E, QBG); Lan Saka, Khao Luang National Park, Groong Ching waterfall, 12 viii 1986, *J.F. Maxwell* 86-585 (A, CMU-Pharmacy, L). **Nan**: East side of Nan River, 7 xii 1957, *E.H. Walker* 7984 (US); Thung Chang, Ban Huai Dong at Road 1080, 20 xi 1993, *K. Larsen & S.S. Larsen et al.* 44639 (AAU). **Pattani**: Kao Kalakiri, 31 iii 1928, *A.F.G. Kerr* 14930 (K, L). **Phang Nga**: 15 km N of Takuapah, 13 vii 1972, *K. Larsen & S.S. Larsen et al.* 30933 (E, L); Khao Phra Mi, Khao Khlong Yang, 6 vii 1972, *K. Larsen & S.S. Larsen et al.* 30680 (AAU, L); Muang Phangnga, Sra Manora Forest park, 16 ix 2010, *D.J. Middleton & K. Bunpha et al.* 5446 (E). **Satun**: Koh Talutao, 17 vi 1974, *R. Geesink, T.A. Hattink & C. Charoenphol* 7317 (L). **Surat Thani**: Chieo Lan Dam and surroundings, 28 x 1990, *K. Larsen & S.S. Larsen et al.* 40919 (AAU); Phanom, Khao Sok National Park, 25 x 1990, *K. Larsen & S.S. Larsen et al.* 40906 (AAU). **Trang**: Khao Chong, 12 viii 1975, *J.F. Maxwell* 75-788 (AAU, L); Khao Chong National Park, 13 vii 1985, *J.F. Maxwell* 85-709 (L); ibid., 11 x 1985, *J.F. Maxwell* 85-952 (A); Trang chong forest, 14 ix 1933, *Mrs. D.J. Collins* 2386 (K, US). **Yala**: Betong, 26 viii 1923, *A.F.G. Kerr* 7198 (K); ibid., 1 viii 1923, *A.F.G. Kerr* 7451 (ABD [2], K); Mueang Yala, Waterfall at Yala, 21 x 1970, *C. Charoenphol, K. Larsen & E. Warncke* 4109 (AAU).

VIETNAM. **Ha Tay**: Mt Bavi, 2 x 1940, *A. Pételot* 7184 (E). **Hoa Binh**: Luong Son, 31 viii 1994, *P.C. Boyce* 878 (E, K). **Nghe An**: Pu Mat, Khe Kem waterfall, 14 x 2008, *N.V. Du & B.H. Quang*

et al. 2929 (K). **Quang Nam-Da Nang**: Mt Bana, v 1927 – vii 1927, *J. Clemens* & *M.S. Clemens* 4220 (BM, K, NY, UC).

MALAYSIA. **Peninsular Malaysia**: **Kedah**: Langkawi, Gunung Raya, 13 xi 1921, *M. Haniff* & *M. Nur* 7181 (K, SING); ibid., 19 vi 1932, *A.F.G. Kerr* 21719 (K, L, SING); Pulau Langkawi, 27 viii 1925, *R.E. Holttum* 17442 (SING). **Kelantan**: Bukit Temangan, 14 ii 1923, *M. Haniff* & *M. Nur* 10263 (SING); Kuala Aring, *R.H. Yapp* s.n. (K). **Pahang**: Pulau Tioman, Ayer Susin, 17 iv 1929, *D.M. Henderson* 21674 (SING); Telom, xi 1908, *H.N. Ridley* 13897 (SING); Ulu Batang Padang, xi 1908, *H.N. Ridley* 13612 (SING). **Penang**: Penang Hill, 16 x 1951, *J. Sinclair* 39333 (SING); Pulau Betong, xi 1898, *C. Curtis* s.n. (SING); ibid., xi 1898, *C. Curtis* s.n. (SING); ibid., 12 ix 1968, *S. Hardial* 692 (L, SING); Pulau Pinang, Penara Bukit, vii 1893 or 1890, *C. Curtis* 3035 (SING [2]). **Perak**: *L. Wray* 3245 (SING); G. Ijuk, viii 1884, *B. Scortechini* 1222 (SING [2]); Jor, 13 ix 1924, *M. Haniff* 14217 (SING); Taiping, Bukit Larut, viii 1881, *King's Collector* 2237 (SING [4]); ibid., xii 1902, *H.N. Ridley* s.n. (SING).

INDONESIA. **Sumatra**: **Aceh**: Gunung Leuser Nature Reserve, Lau Alas Valley, Ketambe, 12 vi 1972, *W.J.J.O. de Wilde* & *B.E.E. de Wilde-Duyfjes* 12811 (K, L); Mt Kemiri, 22 viii 1971, *K. Iwatsuki* & *G. Murata et al.* 921 (L). **Lampung**: Gunung Dempo, *H.O. Forbes* 2178 (L); Mt Tanggamus, 25 iv 1968, *M. Jacobs* 8034 (K, L). **Sumatera Barat**: Gunung Kerinci, Siolak Daras, 19 iii 1914, *H.C. Robinson* & *C.B. Kloss* s.n. (K); ibid., 14 iii 1914, *H.C. Robinson* & *C.B. Kloss* s.n. (SING); Gunung Singgalan, *P.W. Korthals* 183 (L). **Sumatera Utara**: Sibolangit, 17 x 1927, *J.A. Lörzing* 12181 (L); ibid., 22 x 1917, *J.A. Lörzing* 5376 (L); Sibolangit, Karohoogul by Koeala, 10 v 1919, *Galoengi* 288 (L). **Java**: 22 vi 1930, *C.A.B. Backer* 36355 (L); ibid., *C.L. Blume* 240 (L); ibid., *H.O. Forbes* 537 (K); ibid., *P.W. Korthals* 84 (L); ibid., *P.W. Korthals* 240 (L); ibid., *Zippel* 77 (L). **Banten**: 4 ii 1954, *T.O. van Kregten* 44 (K, L); Ujung Kulon Reserve, Gunung Cibinua, 8 v 1992, *J.A. McDonald* & *J.J. Afriastini* 3319 (A, K, L, SING, US); Ujung Kulon Reserve, Gunung Payung, 9 i 1964, *N. Wirawan* 285 (K, L). **Jawa Barat**: Ci Kao, *P.W. Korthals* 98 (L); Cicarak, Citpatak, 2 v 1961, *Unknown* s.n. (K); Cipatat, 2 v 1947, *L.R. Lanjouw* s.n. (L); Gunung Salak, 14 iii 1904, *B.P.G. Hochreutiner* 151 (L); Preanger, Kokonengan, 8 xii 1917, *W.F. Winckel* 8 (L); Trogong, *P.W. Korthals* 184 (L). **Jawa Tengah**: Gunung Merapi, *F.W. Junghuhn* 29 (L [2]); Karangbolong, 24 ii 1898, *S.H. Koorders* 29731 (K, L). **Jawa Timur**: Pasuruan, 25 vi 1896, *S.H. Koorders* 23796 (L). **Kalimantan**: **Kalimantan Selatan**: Gunung Besar, 19 ii 1979, *G. Murata, M. Kato* & *Y.P. Mogea* 3907 (L). **Sulawesi**: Bantimurung, 20 ii 1938, *P. Buwalda* 3806 (A, K, L); Bontorihu, 15 v 1912, *Noerkas* 232 (L); Gunung Dako, 24 iii 1985, *Ramlanto* & *Z. Fanani* 512 (L); Gunung Sojol, 25 ii 2000, *M. Mendum, G.C.G. Argent* & *Hendrian* 148 (E); ibid., 25 ii 2000, *M. Mendum, G.C.G. Argent* & *Hendrian* 148A (E); Karaenta Nature Reserve, 17 ii 1981, *Swedish Expedition to Sulawesi 1981* 20 (L); Kolaka, Mt Pondunaah, 13 v 2008, *D. Girmansyah* 882 (US); Mt Nokilalaki, 5 v 1975, *W. Meijer* 10037 (L); Mt Nokilalaki, above kampong Toro, 22 iv 1975, *W. Meijer* 9441 (L); Pass from Palu to east coast, 23 ii 2000, *M. Mendum, G.C.G. Argent* & *Hendrian* 126 (E); Sanggona, 21 iii 1929, *G.K. Kjellberg* 944 (S); Tongoa, 2 iii 1981, *Swedish Expedition to Sulawesi 1981* 137 (E, L). **Gorontalo**: Bululitua – Gunung Boliohutu, 22 iv 2002, *M. Mendum* & *H. Atkins et al.* 145 (E); Dumoga Bone National Park, Tinayola Camp on the Sungai Olama, 9 viii 1991, *W. Milliken* 865 (E, K, L); Tulabolo, 4 iv 2002, *M. Mendum* & *H. Atkins et al.* 11 (E); ibid., 2002, *S. Scott* SUL02-11 (E cultivated, 13 ix 2007, *D.J. Middleton* 4230); Tulabolo – Pinogu, 2002, *S. Scott* SUL02-18 (E cultivated, 13 ix 2007, *D.J. Middleton* 4231). **Sulawesi Utara**: tributary of Sungai Ilanga, 17 iii 1990, *J.S. Burley, Tukirin et al.* 3975 (K, L, SING). **Indonesian New Guinea**: **West Papua**: 29 iii 1996, *A.M. Polak* 1187 (E); Vogelkop Peninsula, Tohkiri Mts, Aifat river valley, 7 xi 1961 – 8 xi 1961, *P. van Royen* & *H.O. Sleumer* 7241 (A, K, L).

PAPUA NEW GUINEA. **Madang**: Kani Mts, 9 x 1907, *F.R.R. Schlechter* 16672 (UC). **Morobe**: Bupu, 3 iii 1964, *A.N. Millar* 23263 (E, L).

UNKNOWN. *P.W. Korthals* 33 (L).

This species can be recognised by its hairy, small-flowered, sub-fascicled inflorescences that occur along the stem and its typically elongate and denticulate leaves. One of the most widespread *Rhynchotechum* species, it has regional variation that would benefit from more focused study, especially in Hainan and South China where the specimens have broader leaves and somewhat different inflorescence hairs and are somewhat disjunct from the rest of the distribution of the species. These characters vary across the range of the species and leaf shape may vary in a single plant. For instance, specimens in Sulawesi and the Philippines tend to have scabrous calyx lobes with glandular hairs, while a similar indumentum is also found on some of the southern China specimens. Specimens from New Guinea look more like those from Peninsular Malaysia to Java though with slightly larger inflorescences and slightly shorter, stouter styles. There may also be flower colour differences within geographic areas as well, such as the Sulawesi specimens which may have white or pinkish flowers. A Burmese specimen had a slightly longer style and shorter calyx (which was described as cream) than typical *Rhynchotechum parviflorum*, and the corolla was said to have pinkish dots.

Rhynchotechum parviflorum can be distinguished from *R. formosanum* by the form of the inflorescence (sub-fascicled) and by the lack of glandular hairs further down the inflorescence. It has a shorter style and smaller flower than *Rhynchotechum ellipticum* as well as a puberulent ovary, which *R. ellipticum* lacks. It has smaller flowers with smaller calyx lobes than *Rhynchotechum calycinum*.

One of the specimens has a height of 15 ft on the label, but the specimen is clearly shorter than that and the recorded value is probably an error. The *Maxwell* 85-952 specimen from Thailand has massive inflorescences and leaves and was originally identified as *Rhynchotechum ellipticum*. The sericeous calyx lobes and short styles place it in *Rhynchotechum parviflorum* though the plant is more robust than most specimens.

The *Rhynchotechum parviflorum* specimens from China have been confused with both *R. ellipticum* and *R. formosanum*. When Chun (1974) described *Rhynchotechum ellipticum* from Hainan, he included a figure which appears to be of *R. parviflorum*. Though we have not seen material from Taiwan of this species, the descriptions in Li & Kao (1998) and in Wang & Wang (2000) suggest they may have seen specimens of *Rhynchotechum parviflorum* in Taiwan. The description of *Rhynchotechum formosanum* in the *Flora of China* (Wang *et al.*, 1998) suggests they too included *R. parviflorum* specimens in their concept of *R. formosanum*, and many of the *R. parviflorum* specimens were previously determined as *R. formosanum* by Wang or Weitzman & Skog.

The type material for the species is sterile, but it is the only unequivocal original material from Java that we have seen. The leaves are on the larger side, with one extremely long leaf. In order to better explain the species, another specimen from Java is designated as an epitype, since it has flowering material.

The type of *Rhynchotechum copelandii* from Mindanao has a short inflorescence but is not distinct enough to separate. The inflorescence could be immature and unexpanded, and it shares characters such as calyx indumentum with the Sulawesi

material. The protologue suggests that the ovary is glabrous, but the type material actually has a puberulent ovary.

Rhynchotechum parviflorum Blume and *Isanthera parviflora* Ridl. are heterotypic and the shared specific epithets appear to be coincidental.

When Clarke (1883) established *Rhynchotechum parviflorum* var. *penangensis*, he did so based on a larger flower and longer style, saying that it was probably a larger-flowered variety of *R. parviflorum* or a closely related species. The specimen had been identified as *Rhynchotechum ellipticum*, but Clarke pointed out that it had a different calyx indumentum than *R. ellipticum* and a puberulent ovary. The material is not distinct enough, however, to be separated from the rest of *Rhynchotechum parviflorum*. Other specimens from Peninsular Malaysia tend to have fewer secondary vein pairs than the rest of the species, but the character is not consistent and some specimens have more vein pairs, suggesting a more continuous variation.

The invalidly published name *Rhynchotechum hoevellianum* was mentioned by Schlechter (1923) when he was discussing *R. polycarpum*, a name synonymous with *R. parviflorum*. He suggested that *Rhynchotechum polycarpum* was related to *R. hoevellianum* from Celebes, but differed in leaf indumentum and length of calyx lobes and filaments. It seems that the *Rhynchotechum hoevellianum* he mentions is *R. parviflorum* from Sulawesi.

14. Rhynchotechum permolle (Nees) B.L.Burtt, Notes Roy. Bot. Gard. Edinburgh 24: 39 (1962); Ramamoorthy in C.J.Saldanha & Nicolson, Fl. Hassan Dist. 531 (1976); W.L.Theob. & Grupe in Dassan. & Fosberg, Revis. Handb. Fl. Ceylon 3: 105, fig. 8 (1981). – *Isanthera permollis* Nees, Trans. Linn. Soc. London 17: 82 (1834); Walp., Repert. Bot. Syst. 3: 124 (1844); DC., Prodr. 9: 280 (1845); Wight, Icon. Pl. Ind. Orient. 4: pl. 1355 (1848); Walp., Ann. Bot. Syst. 3(1): 99 (1852); Miquel, Fl. Ned. Ind. 2: 749 (1858); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 192 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 372 (1884). – Type: Unknown locality [probably India], *Heyne* s.n. in *Wallich* 9073 (lecto K, designated here; iso GH, K). **Fig. 11.**

[*Cyrtandra lanuginosa* R.Br. in Wall., Numer. List 7131 (1832) *nom. nud.*]

Isanthera floribunda Gardner, Calcutta J. Nat. Hist. 6: 483 (1846); Walp., Ann. Bot. Syst. 3(1): 99 (1852). – Type: Ceylon [Sri Lanka], *Gardner* 605 (lecto K, designated here; iso BR, K ×2).

Isanthera permollis Nees var. *paucinervia* C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 192 (1883). – Type: Lower Burma, Mergui, *Griffith* s.n. (holo K).

Stems 10–60(–100) cm tall, to 5.5–8 mm diameter, may be decumbent and rooting at nodes. *Leaves* alternate; petiole (1.9–)2.4–6.2(–7.6) cm long; blade obovate to narrowly obovate or oblong to elliptic, (5–)7–20(–25) × 1.9–9(–10) cm, 2.2–3.1 times as long as wide, apex acuminate or caudate to acute, base narrowly cuneate; margin entire to denticulate, the teeth to 1 mm long; secondary vein pairs 9–20; adaxially dark green to green, glabrous to white pubescent, denser on the midvein; abaxially pale green, yellow-rusty woolly to rarely sub-glabrous, denser on the rusty-brown veins.

Inflorescence 1.5–4.5(–5.5) cm long, 2–3(–4)-branched; peduncle 0.8–2.3(–2.8) cm; first branch 0.3–1.5(–2.2) cm long; second branch 0.3–1 cm long or absent; axes yellow-rusty sericeous/villous to densely so; bracts linear to triangular, first bract 3–13 mm long, second bract 3–12 mm long; pedicels (1–)2–10(–12) mm long, yellow-rusty sericeous/villous to densely so. *Calyx* lobes triangular, apices may be somewhat caudate, sometimes toothed, 3–5(–5.5) × 1–1.5(–1.75) mm, densely yellow-rusty sericeous, rarely villous. *Corolla* white, exterior glabrous; upper lip 3–4(–5.5) × 4–5(–7) mm; upper lobes 1.5–2(–4.5) × (1.5–)2–3 mm, apices rounded to obtuse; lower lip 3.5–5.5 × 7–10(–12) mm; lower lobes 2–3(–4) × (2.25–)2.5–3.5(–4.5) mm, apices rounded to obtuse; tube 1–1.5 mm long. *Stamens* inserted at 0.75(1) mm above the base of the corolla tube; filaments c.0.75–1(–1.25) mm long; anthers yellow, c.(0.5–)0.75–1.25 mm diameter, glabrous to slightly puberulent with glandular hairs; staminode c.< 0.2–0.5 mm long. *Ovary* 1–1.5 × 1–2 mm, puberulent; style 1.25–2.5 mm long; stigma apex truncate, sometimes globose/rounded to slightly cleft. *Fruit* (dry) ovoid, 3–9 × 3–7 mm, puberulent.

Distribution. India, Sri Lanka and possibly Burma.

Habitat and ecology. Growing in evergreen and monsoon forests, sometimes dry or disturbed, often near streams (Theobald & Grupe, 1981), on moist clayey or sandy soils, sometimes on steep slopes, at 250–1200 m. Flowering and fruiting June to November, probably year round (Theobald & Grupe, 1981).

Proposed IUCN conservation assessment. Least Concern (LC). This species is common and widespread.

Additional specimens studied. INDIA. *Herb. Wight* s.n. (E); Courtallam, *Herb. Wight* 2035 (GH, K, L). **Karnataka**: Mysore, Hassan, Kenchankumri State Forest, 15 viii 1971, *T.P. Ramamoorthy* 2022 (E, US); Mysore, Hassan, Kenchankumri State Forest, Shiradi Ghat, 18 vii 1969, *C.J. Saldanha* 14221 (E, MICH); ibid., 5 viii 1970, *C.J. Saldanha* & *T.P. Ramamoorthy* 406 (K, US). **Kerala**: Kannur District, Chandanathode, 29 vi 1965, *J.L. Ellis* 25242 (E); Palghat District, Silent Valley, 24 vi 1976, *C.E. Ridsdale* 244 (K, L, SING); Ponmudi, 8 vi 1976, *C.E. Ridsdale* 64 (K, L, SING). **Tamil Nadu**: Courtallam, *Herb. Wight* 590 (K); ibid., viii 1835, *Herb. Wight* 593 (E [2], NY); ibid., 1835, *Herb. Wight* 2035 (GH, K, L); ibid., viii 1835, *Herb. Wight* 793 (E); Devala, xi 1884, *J.S. Gamble* 15633 (K); Nilghiri Mountains, *G. Thomson* 61 (K); ibid., *G. Thomson* s.n. (GH); Nilghiri Mountains, Caicou Ghat, x 1886, *J.S. Gamble* 18320 (K); Puliampatty, xi 1852, *Herb. Wight* 2351 (K [2], L); Sivagiri, 1837 or viii 1836, *Herb. Wight* 3511 (E [2], L).

SRI LANKA. *G. Gardner* s.n. (K); iii 1836, *Herb. Wight* 696 (E, K); *G.H.K. Thwaites* s.n. (K); *Walker* 1373 (E); *Mrs. Walker* 1761 (E, K); *Mrs. Walker* 43 (K). **Central Province**: Kandy District, Kotmale – Nawalapitiya, 30 viii 1969, *D.A. Grupe* 198 (US); ibid., 30 vi 1968, *W.L. Theobald* & *D.A. Grupe* 2312 (US). **Sabaragamuwa**: Ratnapura, Adams Peak, Gilimale, 17 ix 1977, *H.P. Nooteboom* & *Huber* 3174 (L, US); Ratnapura, Dotalugala, 9 xi 1975, *S.H. Sohmer* & *S. Waas* 10505 (US); Ratnapura, Rasagalla, 17 vii 1969, *R.W. Read* 2201 (K, US [2]); Ratnapura, Sinharaja Forest Reserve, 4 xi 1977, *H. Huber* 558 (US). **Southern Province**: Galle District, Udugama – Hiniduma, 26 vii 1968, *W.L. Theobald* & *D.A. Grupe* 2361 (US).

UNKNOWN. *Herb. Wight* s.n. (K, L).

This is the only species from southern India and Sri Lanka and it can be recognised by its alternate leaves and condensed, short-peduncled inflorescences just below or among the leaves. The Sri Lanka specimens tend to have fewer vein pairs, but that character seems to grade into the values for the southern India material. Some of the Sri Lanka specimens also have toothed calyx lobes.

This species is relatively geographically isolated from the rest of the genus, and is similar to *Rhynchotechum discolor* and *R. eximium*. It differs from *Rhynchotechum discolor* in its broader leaves and often shorter calyx lobes, and from *R. eximium* in its shorter, more contracted inflorescences and often longer fruit.

There is no material of *Wallich* 9073 in K-W.

The type of *Rhynchotechum permolle* var. *paucinervia* from Burma has 'var. Burmannica' written in Clarke's handwriting, but he published it as var. *paucinervia* because of the fewer vein pairs (Clarke says 6–8, but actually 8–9). The inflorescence is in poor condition and it is not clear whether it is a specimen of *Rhynchotechum permolle* or if it is a strange form of *R. alternifolium*. The sericeous calyx lobes, however, along with the few vein pairs and short inflorescence make it unlikely to be *Rhynchotechum alternifolium*. There is also the possibility that the specimen was mislabelled and the locality is incorrect, or that there was an odd long-distance dispersal event, since it is the only specimen of *Rhynchotechum permolle* from that area.

Herat & Theobald (1979) include *Rhynchotechum permolle* in their study of Gesneriaceae vegetative morphology in Sri Lanka and conclude that the species has unusual stomata, among other features. They also mention the hairs with long thin cells which can be seen in other *Rhynchotechum* species.

The Wight (1848) plate shows the anthers incorrectly (the slit is longitudinal rather than medial).

15. Rhynchotechum vestitum (Griff.) Wall. ex C.B.Clarke, Commelyn. Cyrtandr. Bengal. 132, pl. 92 (1874); C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 197 (1883); C.B.Clarke in Hook.f., Fl. Brit. India 4: 373 (1884); W.T.Wang *et 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). – *Corysanthera vestita* Griff., Itin. Pl. Khasyah Mts. 124 (1848). – Type: Bhutan, Geeree nuddee, 3300 ft, *Griffith* 426 (lecto K [barcode: K000249996], right-hand specimen on sheet, designated here; iso K ×2). **Fig. 12.**

Rhynchotechum hispidum C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 197 (1883). – Type: Java, *Horsfield* s.n. (lecto K [barcode: K000250000], designated here; iso BM, K).

Stems 60–150(–180) cm tall, to 5–7.5(–12) mm diameter, sometimes decumbent and rooting at nodes. *Leaves* opposite; petiole 2–7 cm long; blade elliptic to narrowly elliptic, (4.5–)6.5–22(–28) × 2.2–7.8(–12) cm, (1.4–)1.9–2.8 times as long as wide, apex acuminate, rarely acute, base narrowly cuneate to cuneate; margin denticulate to sub-entire, rarely dentate, the teeth to 2 mm long; secondary vein pairs 8–19;

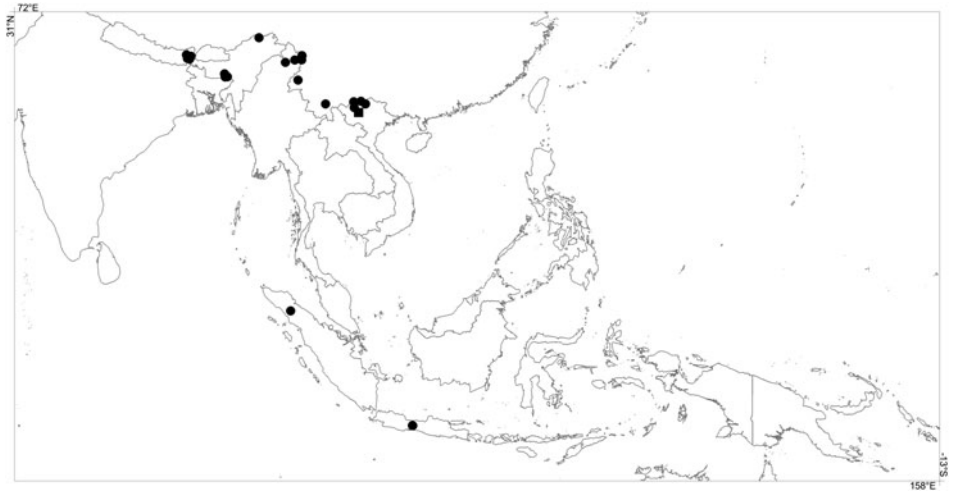

FIG. 12. Distribution map of *Rhynchotechum vestitum* (Griff.) Wall. ex C.B.Clarke (●) and *Rhynchotechum vietnamense* B.M.Anderson (■).

adaxially dark green, long rusty-yellow appressed hispid, the hairs 1–3 mm long, stout; abaxially pale green, long yellow-rusty appressed hispid, denser on the reddish-brown veins. *Inflorescence* 1.2–4.8(–5.5) cm long, (2–)3–4-branched; peduncle reduced/absent; first branch (0.4–)0.9–2.4 cm long; second branch 0.3–1(–1.7) cm long; axes densely long yellow hispid, rarely yellow villous/sericeous; bracts triangular to linear, first bract 5–16(–24) mm long, second bract 3–9 mm long; pedicels (2–)4–14 mm long, densely long yellow hispid, rarely yellow sericeous. *Calyx* whitish to greenish, lobes triangular with apices caudate (the upper 1.5–3 mm), (3.5–)4–6(–7) × (0.75–)1–2(–2.5) mm, densely long hispid. *Corolla* pink to white, exterior glabrous; upper lip 3–4 × 4–6 mm; upper lobes 1.5–2 × 2–2.5 mm, apices rounded to obtuse; lower lip (4.5–)5–6(–6.5) × (5–)6–8 mm; lower lobes 2–3 × 1.5–3 mm, apices rounded to obtuse; tube 1.5–2 mm long. *Stamens* inserted at 0.75 mm above the base of the corolla tube, slightly didynamous; filaments c.1(1.25) mm long; anthers c.(0.75–)1–1.25(–1.5) mm diameter, puberulent with glandular hairs to rarely glabrous; staminode c.0.25–0.5 mm long. *Ovary* (0.75–)1–1.5 × 1–2 mm, slightly puberulent with or without glandular hairs; style 2–3(5–6, see note) mm long; stigma apex truncate to globose/rounded. *Fruit* (dry) ovoid to very widely ovoid, 3–4 × 3–4 mm, glabrous to rarely slightly puberulent.

Distribution. India, Bhutan (Hilliard, 2001), Bangladesh, China, Vietnam, Sumatra and Java.

Habitat and ecology. Growing in rainforests, sometimes disturbed, in damp and shady conditions, in loam on granite and limestone, sometimes in ravines, at 450–1820 m. Flowering and fruiting in March and July to September.

Proposed IUCN conservation assessment. Least Concern (LC). This species is common and widespread.

Additional specimens studied. INDIA. **Arunachal Pradesh**: Tuting, 3 iv 1958, *G.K. Murthy* 13131 (E). **Assam**: *Simons* 2 (L); *N. Wallich* s.n. (GH). **Meghalaya**: Khasia, 11 xii 1871, *C.B. Clarke* 15086 (L); ibid., *J.D. Hooker & T. Thomson* s.n. (K); ibid., *J.D. Hooker & T. Thomson* s.n. (K); Khasia Hills, *J.D. Hooker & T. Thomson* s.n. (L); ibid., *J.D. Hooker & T. Thomson* s.n. (GH); ibid., *T. Lobb* s.n. (K); Khasia Hills, Cherrapunjee, *Herb. Wight* s.n. (L); ibid., 28 viii 1850, *J.D. Hooker & T. Thomson* 2174 (K); Khasia Hills, Mahadeo, *W. Griffith* s.n. (K); Khasia Hills, Pynursla, 26 viii 1949, *T.R. Chand* 2076 (MICH); ibid., 25 xi 1956, *G. Panigrahi* 4634 (E). **Sikkim**: *J.S. Gamble* s.n. (K); *J.D. Hooker* s.n. (K); *J.D. Hooker* s.n. (GH); *J.D. Hooker* s.n. (L); *J.D. Hooker* s.n. (K); Rungbee, 19 ix 1875, *J.S. Gamble* 3504 (K); Singtam, viii 1881, *J.S. Gamble* 9638 (K). **West Bengal**: Darjeeling District, 30 viii 1875, *C.B. Clarke* 27260 (K); Darjeeling District, Rongsong, 29 v 1912, *G.H. Cave* s.n. (E); Darjeeling, Rishap, 19 viii 1869, *C.B. Clarke* 8722 (L); Darjeeling, Sureil, 7 xi 1911, *Ribu & Rhomoo* s.n. (E); Darjeeling, Sureil – Mungpo, 21 x 1902, *J.H. Lace* s.n. (E).

BANGLADESH. *W. Griffith* s.n. (GH).

CHINA. **Yunnan**: Baoshan, Tengchong – Lungling, x 1922 – xi 1922, *J.F.C. Rock* 7091 (A, UC, US); Nujiang Lisu Aut. Pref., Fugong, Salween tributary along 'First School Valley' west of Fugong, 30 ix 1997, *Gaoligong Shan Expedition 1997* 9739 (E); Nujiang Lisu Aut. Pref., Lishadixiang, Mi'eluo Cun, 12 viii 2005, *Gaoligong Shan Biodiversity Survey* 27333 (GH); ibid., 12 viii 2005, *Gaoligong Shan Biodiversity Survey* 27340 (GH); Nujiang Lisu Aut. Pref., Majixiang, 19 viii 2005, *Gaoligong Shan Biodiversity Survey* 27893 (GH); Ping-pien Hsien, 14 vii 1934, *H.T. Tsai* 60883 (A); Simao, *A. Henry* 12216 (E [2], K [2], L, NY, US); ibid., *A. Henry* 12216A (E [2], K, NY); ibid., *A. Henry* 12216B (US); Sinhausiang, Chengkang, 19 vii 1938, *T.T. Yü* 16848 (A, E); Wenshan, Maguan County, 1 x 1985 – 10 x 1985, *Z.R. Xu* 5626 (E).

BURMA. Myitkyina, Hkinlum, 21 vii 1953, *F. Kingdon Ward* 21194 (E); Sumprabum Sub-Division, Kanat Bum, 17 ii 1962, *J. Keenan, U.T. Aung & U Tha Hla* 3458 (E).

VIETNAM. **Ha Giang**: Vi Xuyen, Cao Bo, Tam Ve Village, 9 ix 2000, *D.K. Harder & P.K. Loc et al.* 5368 (E). **Lao Cai**: Ta Yang Ping, ix 1942, *A. Pételot* 7910 (E).

INDONESIA. **Sumatra**: **Aceh**: Gajolanden, Paloh – Kongke, 4 iii 1937, *C.G.G.J. van Steenis* 9476 (K, L, SING). **Java**: **Jawa Tengah**: Gunung Slamet, 19 iii 2004, *W.S. Hoover & J. Hunter et al.* HW11351 (US); ibid., 18 iii 2004, *H. Wiriadinata & S. Hoover et al.* HW11346 (A, US) [as aff. *Rhynchotechum vestitum* (Griff.) Wall. ex C.B.Clarke].

A distinctive species which can be recognised by its long, hispid hairs, which cover the plant, and by its calyx lobes, which are noticeably caudate. The geographic range is peculiar, with most of the specimens being from India and southern China, only two specimens from Vietnam, one from Sumatra, and six from Java. The material from Sumatra and Vietnam looks similar to the material from India and China, but some of the material from Java is rather distinct. Two of the Java specimens (a single collection, *Wiriadinata et al.* HW11346) is a dwarf example of the species, with shorter hairs and smaller flowers; another specimen looks intermediate between the species in general and the dwarf collection; and the remaining three specimens are type material of *Rhynchotechum hispidum* and are typical *R. vestitum*. The dwarf specimens, although rather distinct, are linked to *Rhynchotechum vestitum* as found in Java and elsewhere by the intermediate specimen and are not recognised as a distinct taxon.

When Clarke (1883) described *Rhynchotechum hispidum* he differentiated it from *R. vestitum* by the longer-petiolate leaves and the smaller corolla. The petioles are not longer, however, and the flowers are in poor condition on the *Rhynchotechum hispidum* type. Regardless, a smaller corolla is not a large enough difference to separate the two taxa in this case.

One atypical specimen (*Tsai* 60883 from Yunnan) had exceptionally long styles, a slightly different corolla shape, and a thicker stem, but is otherwise not separable from *Rhynchotechum vestitum*.

16. Rhynchotechum vietnamense B.M.Anderson, **sp. nov.**

Similis *Rhynchotecho alternifolio* C.B.Clarke sed inflorescentia et pedunculis longioribus, calycis lobis glanduloso-scabridis et magis triangularibus, et foliis cum paribus venarum secundariarum pluribus differt. – Type: Vietnam, Lao Cai, Van Ban, Liem Phu Community, 700 m, 17 vii 2002, *Van der Werff et al.* 17398 (holo E; iso MO n.v.). **Figs 12, 13.**

Stems to 100 cm tall, to 10 mm diameter. *Leaves* alternate; petiole 4.4–5.6 cm long; blade narrowly elliptic to narrowly obovate, 16.5–24.5 × 4.7–8 cm, 3.1–3.5 times as long as wide, apex long acuminate to caudate, base narrowly cuneate; margin serrulate, the teeth to 1 mm long; secondary vein pairs 23–25; adaxially dark green, glabrous to sparsely short rusty pubescent, denser on the midvein; abaxially pale green, short rusty villous/sericeous, denser on the veins. *Inflorescence* 31–36 cm long, 5–6-branched; peduncle 18.5–25 cm long; first branch 4.5–5.5 cm long; second branch 1.5–3.3 cm long; axes short rusty villous to densely villous/sericeous; bracts linear, first bract 11–17 mm long, second bract 6–10 mm long; pedicels 4–10 mm long, rusty sericeous to sub-glabrous. *Calyx* lobes triangular to linear, 2–3 × 0.75–1 mm, sericeous and/or scabrous with glandular and conspicuously multicellular hairs. *Corolla* maroon, exterior slightly puberulent with some glandular hairs; upper lip 3–3.25 × 3.25 mm; upper lobes 1–1.25 × 1.5 mm, apices obtuse to rounded; lower lip 5–5.75 × 6 mm; lower lobes 2 × 1.5–2 mm, apices obtuse to rounded; tube 1.5–2 mm long. *Stamens* inserted near the base of the corolla tube; filaments c.0.75–1 mm long; anthers c.1.25 mm diameter, slightly puberulent to papillate; staminode c.0.25 mm long. *Ovary* 2.25 × 2 mm, slightly puberulent with glandular hairs; style 7–7.5 mm long; stigma apex globose/rounded. *Fruit* not seen.

Distribution. Vietnam. Known only from the type collection.

Habitat and ecology. Growing in a selectively logged forest on granite bedrock at 700 m. Flowering in July.

Proposed IUCN conservation assessment. Data Deficient (DD). This species is only known from the type and its full distribution is unknown.

This species is most distinct in its large inflorescence size. The peduncles and inflorescences are longer than those of any other *Rhynchotechum* specimen. The

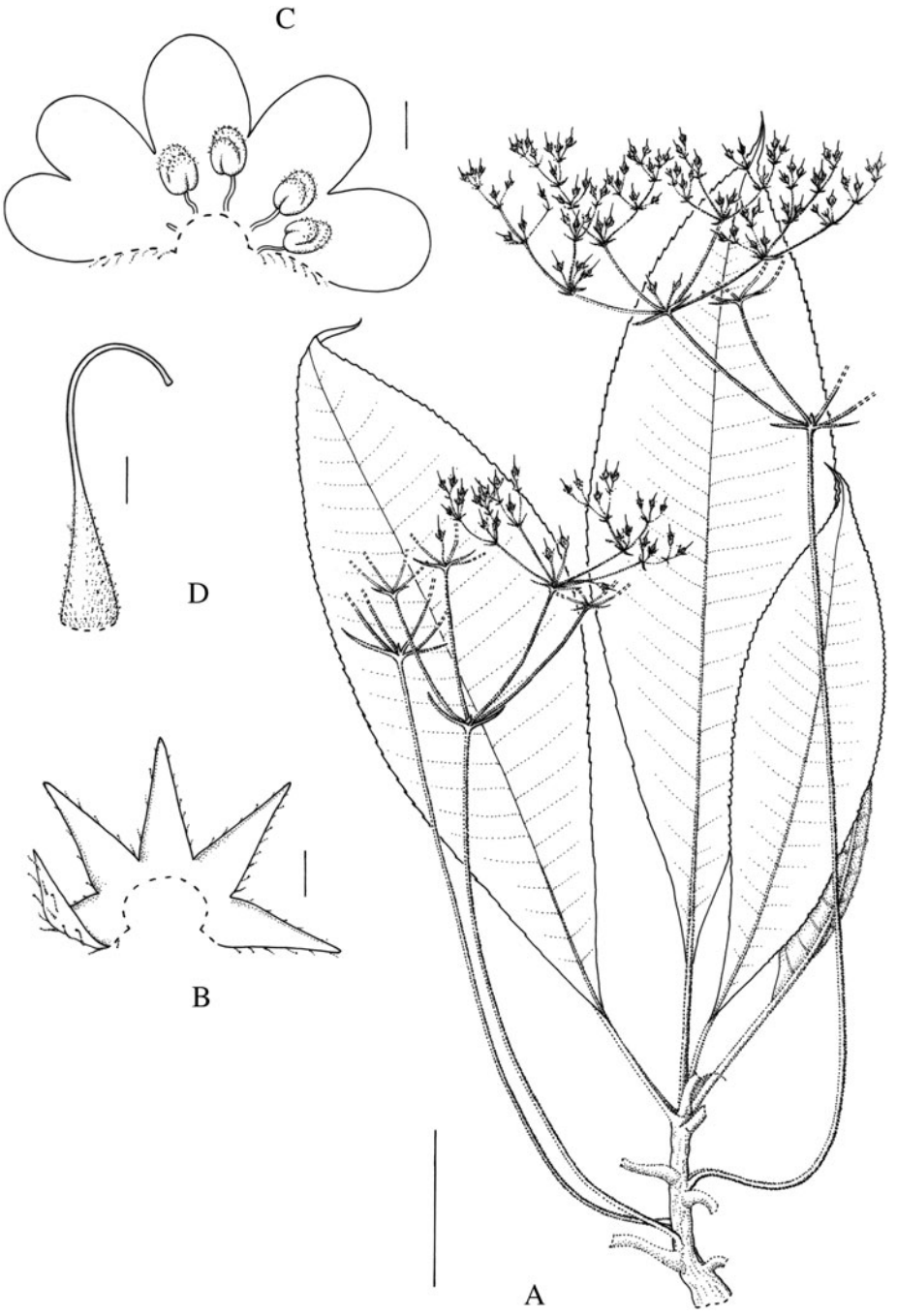

FIG. 13. *Rhynchotechum vietnamense* B.M.Anderson. A, habit; B, calyx opened out; C, corolla dissection showing the two smaller lobes of the upper lip, the three larger lobes of the lower lip and the two stamens; D, pistil. Scale bars: A = 5 cm, B–D = 1 mm. From *Van der Werff* 17398 (E). Drawn by Claire Banks.

alternate leaves, long styles and highly branched inflorescences suggest an affinity with *Rhynchotechum alternifolium* but, in addition to the inflorescence size difference, the calyx lobes have a different indumentum and shape, the leaves have more vein pairs, and the floral dimensions differ from that species. In addition, *Rhynchotechum alternifolium* is known only from India and Burma, while this new species occurs in Vietnam.

Insufficiently Known

Rhynchotechum brandisii C.B.Clarke in A.DC. & C.DC., Monogr. Phan. 5(1): 199 (1883). – *Stauranthera brandisii* (C.B.Clarke) C.B.Clarke in Hook.f., Fl. Brit. India 4: 372 (1884). – Type: Burma, Pegu, Thoungyun, *Brandis* s.n. (holo K).

The specimen *Brandis* s.n. (K) from Burma has 'Cyrtandra sp.' and 'Stauranthera' written on the sheet, and Clarke recorded it as *Rhynchotechum brandisii* C.B.Clarke but later also as *Stauranthera brandisii* (C.B.Clarke) C.B.Clarke. The leaves are not those of a *Rhynchotechum*, the inflorescence differs, and the seeds appear to have ornamentation unlike other *Rhynchotechum* species. Burtt (1962) noted that the specimen vegetatively resembled *Tetraphyllum bengalense* C.B.Clarke. What is clear is that it is not a *Rhynchotechum*. Burtt placed the specimen in a *Tetraphyllum* folder at Kew but a combination in *Tetraphyllum* has not been published.

Acknowledgements

We thank the curators of the following herbaria for the loan or consultation of material: A, AAU, ABD, B, BM, BR (images only), CMU, CMU-Pharmacy, E, GH, GXMI (images only), IBSC (image only), K, K-W, KYO, L, MICH, NY, PE (images only), QBG, S, SING, UC, US and W (images only); and the curatorial staff at the Royal Botanic Garden Edinburgh (RBGE) for handling these loans. The library staff at RBGE are thanked for help with finding literature; Martin Pullan is thanked for his help with database management; Henry Noltie shed light on some of the older Indian specimens and literature; Robert Mill translated the diagnoses into Latin; and James Richardson and Craig Costion provided useful input on the climate-distribution figures.

References

Bentham, G. (1876). Gesneraceae. In: Bentham, G. & Hooker, J. D., *Genera plantarum*, Vol. 2, part 2, pp. 990–1025. London: L. Reeve & Co.

Blume, C. L. (1826). *Bijdragen tot de flora van Nederlandsch Indië*, pp. 759, 775–776. Batavia: Ter Lands Drukkerij.

Brown, R. (1840). In: [Extracts from] Bennett, J.J. *Plantae Javanicae Rariores*. In: Brown, R. (1867). *The Miscellaneous Botanical Works of Robert Brown*, Vol. 2. London: Robert Hardwicke.

BURKILL, I. H. (1924–1925). The botany of the Abor expedition. *Rec. Bot. Surv. India* 10: 1–420.
BURTT, B. L. (1962). Studies in the Gesneriaceae of the Old World XXI: *Rhynchotechum* and *Isanthera*. *Notes Roy. Bot. Gard. Edinburgh* 24: 35–39.
BURTT, B. L. (2001). Flora of Thailand: annotated checklist of Gesneriaceae. *Thai Forest Bull., Bot.* 29: 81–109.
BURTT, B. L. & WIEHLER, H. (1995). Classification of the family Gesneriaceae. *Gesneriana* 1: 1–4.
CHUN, W. Y. (ed.) (1974). *Flora Hainanica*, Vol. 3, pp. 527–529. Beijing: Science Press.
CLARKE, C. B. (1874). *Commelynaceae et Cyrtandraceae Bengalenses (paucis aliis ex terris adjacendtibus additis)*. Calcutta: Thacker, Spink and Co.
CLARKE, C. B. (1883). Cyrtandreae (Gesneracearum tribus). In: CANDOLLE, A. L. P. P. DE & CANDOLLE, A. C. P. DE, *Monographiae phanerogamarum*, Vol. 5, pp. 1–303. Paris: G. Masson.
CLARKE, C. B. (1884). Gesneraceae. In: HOOKER, J. D., *The Flora of British India*, Vol. 4, pp. 336–375. London: L. Reeve & Co.
CRONK, Q. C. B., KIEHN, M., WAGNER, W. & SMITH, J. F. (2005). Evolution of *Cyrtandra* (Gesneriaceae) in the Pacific Ocean: the origin of a supertramp clade. *Amer. J. Bot.* 92: 1017–1024.
DON, G. (1838). *A general history of the dichlamydeous plants*. Vol. 4. – *Corolliflorae*, pp. 643–645, 663. London: J.G. & F. Rivington *et al.*
ELLIOTT, S. (1822). *A sketch of the botany of South-Carolina and Georgia*, Vol. 2, p. 127. Charleston: J.R. Schenck.
ENDLICHER, S. (1839). *Genera plantarum secundum ordines naturales disposita*, pp. 716–719. Wien: Fr. Beck.
HATUSIMA, S. (1971). *Flora of the Ryukyus [Ryukyu shokubutsu shi]*, pp. 556–557. Okinawa: The Biological Society of Okinawa.
HERAT, R. M. & THEOBALD, W. L. (1979). Comparative studies of vegetative anatomy and morphology of the Gesneriaceae of Sri Lanka. *Bot. J. Linn. Soc.* 78: 285–298.
HIJMANS, R. J., CAMERON, S. E., PARRA, J. L., JONES, P. G. & JARVIS, A. (2005a). Very high resolution interpolated climate surfaces for global land areas. *Int. J. Climatol.* 25: 1965–1978.
HIJMANS, R. J., CAMERON, S. E., PARRA, J. L., JONES, P. G. & JARVIS, A. (2005b). (under continuous development). WorldClim – global climate data. Version 1.4 (release 3). www.worldclim.org (accessed 25 August 2011).
HILLIARD, O. M. (2001). *Rhynchotechum*. In: GRIERSON, A. J. C. & LONG, D. G. (eds) *Flora of Bhutan, including a record of plants from Sikkim and Darjeeling*, Vol. 2, part 3, pp. 1326–1327. Edinburgh: Royal Botanic Garden Edinburgh & Royal Government of Bhutan.
HUTCHINSON, M. F. (2011). BIOCLIM. http://fennerschool.anu.edu.au/publications/software/anuclim/doc/bioclim.html (accessed 25 August 2011).
IVANINA, L. I. (1965). Application of the carpological method to the taxonomy of Gesneriaceae. *Notes Roy. Bot. Gard. Edinburgh* 26: 383–403.
JAIN, S. K. & BORTHAKUR, S. K. (1980). Ethnobotany of the Mikirs in India. *Econ. Bot.* 34: 264–272.
KAO, M. T. & DE VOL, C. E. (1978). Gesneriaceae. In: LI, H. L. (ed.) *Flora of Taiwan*, Vol. 4, pp. 664–687. Taipei: Epoch Publishing Co., Ltd.
KAYANG, H. (2007). Tribal knowledge on wild edible plants of Meghalaya, Northeast India. *Indian J. Tribal Knowledge* 6: 177–181.

KIEHN, M. & WEBER, A. (1997). Chromosome numbers of Malayan and other paleotropical Gesneriaceae. II. Tribes Trichosporeae, Cyrtandreae and Epithemateae. *Beitr. Biol. Pflanzen* 70: 445–470.

KRÄNZLIN, F. (1913). Cyrtandraceae novae Philippinenses, II. *Philipp. J. Sci. Section C. Bot.* 8: 311–333.

LALFAKAWMA, SAHOO, U. K., ROY, S., VANLALHRIATPUIA, K. & VANALALHLUNA, P. C. (2009). Community composition and tree population structure in undisturbed and disturbed tropical semi-evergreen forest stands of North-east India. *Appl. Ecol. Env. Res.* 7: 303–318.

LI, Z. Y. & HSIEH, C. F. (1997). Notes on the genus *Rhynchotechum* Blume (Gesneriaceae) in Taiwan. *Taiwania* 42: 91–98.

LI, Z. Y. & KAO, M. T. (1998). Gesneriaceae. In: HUANG, T. C. (ed.) *Flora of Taiwan*, 2nd edn. Vol. 4. *Angiosperms, Dicotyledons, Diapensiaceae – Compositae*, pp. 688–711. Taipei: Editorial Committee of the Flora of Taiwan, Second Edition.

LIU, G. M., CHEN, Z. N., YAO, T. R. & DING, W. G. (1990). Studies on the chemical constituents of *Rhynchotechum vestitum* Hook. f. et Thoms. *Acta Pharm. Sin.* 25: 699–704. [Abstract only]

LU, Y., XU, P. J., CHEN, Z. N. & LIU, G. M. (1998a). The anthraquinones of *Rhynchotechum vestitum*. *Phytochemistry* 47: 315–317.

LU, Y., XU, P. J., CHEN, Z. N. & LIU, G. M. (1998b). Anthraquinone glycosides from *Rhynchotechum vestitum*. *Phytochemistry* 49: 1135–1137.

MERRILL, E. D. (1934). A fifth supplementary list of Hainan plants. *Lingnan Sci. J.* 13: 53–73.

MÖLLER, M., PFOSSER, M., JANG, C. G., MAYER, V., CLARK, A., HOLLINGSWORTH, M. L. *ET AL.* (2009). A preliminary phylogeny of the 'didymocarpoid Gesneriaceae' based on three molecular data sets: incongruence with available tribal classifications. *Amer. J. Bot.* 96: 989–1010.

NATIONAL GEOSPATIAL-INTELLIGENCE AGENCY (NGA). (2011). GEOnet Names Server. http://geonames.nga.mil/ggmaviewer/ (accessed August 2011).

NEES, C. G. (1834). Dr. Nees von Esenbeck's monograph of the East Indian Verbascinae. *Trans. Linn. Soc. London* 17: 78–82.

NEOGI, B., PRASAD, M. N. V. & RAO, R. R. (1989). Ethnobotany of some weeds of Khasi and Garo Hills, Meghalaya, Northeastern India. *Econ. Bot.* 43: 471–479.

OHWI, J. (1938). Symbolae ad floram Asiae Orientalis 16. *Acta Phytotaxon. Geobot.* 7: 29.

PAL, G. D. & THOTHATHRI, K. (1988). Critical notes on little known plants from Arunachal Pradesh. *Bull. Bot. Surv. India* 30: 173–175.

PALEE, P., SAMPSON, F. B. & ANUSARNSUNTHORN, V. (2003). Pollen morphology of some Thai Gesneriaceae. *Nat. Hist. Bull. Siam Soc.* 51: 225–240.

RADFORD, A. E., DICKISON, W. C., MASSEY, J. R. & BELL, C. R. (1976). *Vascular Plant Systematics*, Chapter 6. New York: Harper and Row. Available online: www.ibiblio.org/botnet/glossary/ (accessed August 2011).

RATTER, J. A. (1962). Some chromosome numbers in the Gesneriaceae. *Notes Roy. Bot. Gard. Edinburgh* 24: 221–229.

RIOS, N. E. & BART, H. L. (2010). GEOLocate (Version 3.22) [Computer software]. Belle Chasse, LA: Tulane University Museum of Natural History. Available online: www.museum.tulane.edu/geolocate/web/WebGeoref.aspx (accessed August 2011).

SCHLECHTER, R. (1923). Gesneriaceae Papuanae. *Bot. Jahrb. Syst.* 58: 255–379.

THEOBALD, W. L. & GRUPE, D. A. (1981). Gesneriaceae. In: DASSANAYAKE, M. D. & FOSBERG, F. R. (eds) *A Revised Handbook to the Flora of Ceylon*, Vol. 3, pp. 79–107. New Delhi: Amerind Publishing Co. Pvt. Ltd.

THIERS, B. (2012). (continuously updated). Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/ (accessed 24 April 2012).

UDDIN, S. N. (2009). *Rhynchotechum*. In: AHMED, Z. U., HASSAN, M. A., BEGUM, Z. N. T., KHONDKER, M., KABIR, S. M. H., AHMAD, M. *ET AL.* (eds) *Encyclopedia of Flora and Fauna of Bangladesh.* Vol. 8. *Angiosperms: Dicotyledons (Fabaceae – Lythraceae)*, pp. 242–243. Dhaka: Asiatic Society of Bangladesh.

WALKER, E. H. (1976). *Flora of Okinawa and the Southern Ryukyu Islands*, pp. 945–946. Washington, DC: Smithsonian Institution Press.

WANG, J. C. & WANG, C. C. (2000). The genus *Rhynchotechum* Blume (Gesneriaceae) in Taiwan. *Taiwania* 45: 355–365.

WANG, W. T. (1984). Revisio *Rhynchotechi* sinici (Gesneriaceae). *Guihaia* 4: 183–190.

WANG, W. T., PAN, K. Y., LI, Z. Y., WEITZMAN, A. L. & SKOG, L. E. (1998). Gesneriaceae. In: WU, Z. & RAVEN, P. H. (eds) *Flora of China.* Vol. 18. *Scrophulariaceae through Gesneriaceae*, pp. 244–401. Beijing: Science Press and St Louis: Missouri Botanical Garden Press.

WARBURG, O. (1891). Beiträge zur Kenntnis der Papuanischen Flora. *Bot. Jahrb. Syst.* 13: 230–455.

WEI, Y. G., WEN, F., CHEN, W. H., SHUI, Y. M. & MÖLLER, M. (2010). *Litostigma*, a new genus from China: a morphological link between basal and derived didymocarpoid Gesneriaceae. *Edinburgh J. Bot.* 67: 161–184.

WIGHT, R. (1848). *Icones plantarum Indiae orientalis*, Vol. 4, pl. 1355. Madras: J.B. Pharoah.

Received 27 February 2012; accepted for publication 19 November 2012