

Whytockia (Gesneriaceae), a new generic record for India, based on a new species, *W. arunachalensis*, from Arunachal Pradesh, India

Taram M.¹, Borah D.^{1,2}, Tag H.^{1,*}, Möller M.³ & A. Weber⁴

¹Department of Botany, Rajiv Gandhi University, Rono Hills, Doimukh, Arunachal Pradesh – 791 112, India

²Department of Botany, Goalpara College, Goalpara, Assam – 783 101, India

³Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh EH3 5LR, Scotland, UK

⁴Department of Botany and Biodiversity Research, University of Vienna, Rennweg 14, A-1030, Vienna, Austria

*E-mail: hui.tag@rgu.ac.in

Abstract: Based on recent collections from Arunachal Pradesh (Northeast India), a new species of Gesneriaceae, *Whytockia arunachalensis*, Taram, D.Borah & Tag is described. It differs from the other species of *Whytockia* W.W.S.m. by its extensive, dense and uniform indumentum over the entire plant and is closely related to the white, but smaller-flowered congeners *W. tsiangiana* (Hand.-Mazz.) A.Weber and *W. sasakii* (Hayata) B.L.Burtt. Up to now, *Whytockia* was only known from South and Central China and Taiwan and this is the first record of the genus for India. For that reason, some general information (including a key to the genus and genus description) and critical notes on the species and characters of *Whytockia* are provided.

Keywords: China, Didymocarpoideae, Epithemateae, Monophyllaeinae, Taiwan, Taxonomy.

Introduction

During a botanical expedition to the Siang district in Arunachal Pradesh, India, by two of the authors (DB and MT), a member of Gesneriaceae was collected that could not be assigned to any of the genera known from India (Möller *et al.*, 2017; Weber *et al.*, 2020). Detailed morphological studies of the specimens including identification keys (Li & Wang, 2004; Weber, 2004; Weber *et al.*, 2020), consultation of protologues, herbarium sheets and digital images of the types and other specimens

(BM, E, HGAS, IBSC, K, KUN, NAS, PE, W) and evaluation of the relevant taxonomic literature (Handel-Mazzetti, 1934; Burtt, 1941; Hayata, 1941; Weber, 1976, 1982, 2004; Wang, 1995, 2003; Wang & Li, 1997, 2000; Wang *et al.*, 1998) showed that the specimens belonged to *Whytockia* W.W.Sm.. The diagnostic genus characters found in the specimens included: leaves strongly anisophyllous, inflorescences unilateral pair-flowered cymes (pair-flowered cincinni), emerging exclusively from the axils of the larger leaves, absence of bracteoles, imbricate sepal aestivation, short tubular to infundibuliform corolla with bilabiate limb, globose, bilocular ovary with axile placentation, and a style sharply set off from the ovary.

Whytockia was hitherto known only from South and Central China (with most of the eight species occurring in Yunnan) and Taiwan. The present finding thus extends the distribution of the genus to Northeast India, around 300 km away from the westernmost localities in China (*W. gongshanensis* Yin Z.Wang & H.Li, Gongshan, Northwest Yunnan). More difficult proved the assessment of the species. By the white and rather small flowers, it became clear at once that the collected specimens are closely related to *W. sasakii* (Hayata) B.L.Burtt) or *W. tsiangiana* (Hand.-Mazz.) A.Weber or possibly would represents a new species closely related to it. A close morphological analysis was therefore conducted which resulted in the

recognition of the Indian plants as a new species. This is described and illustrated here.

Because of its importance as a new generic record for India and the geographic consequences for the genus, we present, in addition to the formal description of the new species, some general information on *Whytockia* (generic description, brief taxonomic history, general comments on new species, critical discussion of characters of *Whytockia* and its new species). We start with an identification key to the genera of tribe Epithemateae to which *Whytockia* belongs. The key emphasises salient morphological features characterising the four genera of Epithemateae now known for India (out of seven in total).

Key to the genera of Tribe Epithemateae in India

1. Leaves mostly opposite, those of a pair $\pm$ of same shape and size, symmetrical or slightly asymmetrical at base, first cauline leaf solitary and distinctly larger than the paired leaves; inflorescences in terminal and axillary positions, consisting of a stalk, a single dense-flowered head (much condensed pair-flowered, ebracteolate cyme, flowers in four rows), and a small or conspicuous cucullate subtending bract; fruit a pyxis (capsule with circumscissile dehiscence, bowl-shaped when open) *Epithema*
1. Leaves alternate, or if opposite then those of a pair strongly unequal (anisophyllous), always strongly asymmetrical at base; inflorescences either unilateral racemes in terminal position or pair-flowered cymes in axillary positions; fruit capsular, opening with two or four valves, or breaking irregularly in pieces 2
2. Leaves (in the Indian species) always alternate (by complete reduction of smaller leaf); inflorescence a terminal, unilateral raceme, flowers several to many, placed in two rows (superficially similar to a scorpioid cyme), all or some associated with a small subtending bract or bracts lacking; corolla strongly

bilabiate, with enlarged, undivided plate-like or 3-parted lower lip, and upper lip reduced to a small erect or reflexed bilobed rim, mouth closed (personate) *Rhynchoglossum*

2. Leaves in pairs, those of a pair strongly unequal in size; inflorescences cymose, either pair-flowered or conventional cymes, ebracteolate; corolla almost actinomorphic or with bilabiate limb, lower lip not much enlarged, mouth open 3
3. Small leaves $\pm$ of same shape as the large leaves; inflorescences pair-flowered cymes, emerging only from the axils of the large leaves, ebracteolate; calyx imbricate (margins overlapping); corolla zygomorphic, bilabiate, short-tubed-infundibuliform; ovary bilocular, with axile placentae (four ovule-bearing arms arising from the middle of the complete septum) *Whytockia*
3. Small leaves reduced to scale- or stipule-like appendages; inflorescence a terminal thyrs, in vigorous plants comprising 2–3 pair-flowered or conventional cymes; calyx valvate-plicate; corolla either actinomorphic and ecalcarate, or bilabiate and with distinct spur at base; ovary unilocular, placentae parietal *Stauranthera*

Whytockia W.W.Sm., Trans. Bot. Soc. Edinburgh 27: 338. 1919. *Type: Whytockia chiritiflora* (Oliv.) W.W.Sm.

Perennial herbs. Stem base decumbent or creeping, rooting from the nodes, flowering stem ascending or erect; rarely branched or branching from the creeping part (from the axils of fallen leaves). Leaves strongly anisophyllous, thinly membranous, pubescent, with scattered, sessile chalk glands on the underside, sessile or the large-leaves with a short petiole, ovate, strongly unequal at base, apex acute, margins obscurely serrate. Cymes unilateral (pair-flowered cincinni) emerging from the axils of the large leaves, ebracteolate. Sepals free or connate at base, aestivation descending-imbricate, slightly striate (by the presence of secretory canals), chalk glands on inner sides. Corolla white or pink to light

violet-purple, short tubular to infundibuliform, limb bilabiate, lobes rounded. Stamens 4, didynamous, inserted at corolla base; filaments hairy in the upper part; anthers coherent, thecae divaricate. Ovary globose or subglobose, glabrous, bilocular throughout or for the most part, placentation axile; style strongly set off from ovary; stigma capitate or bilobed. Capsule globose or subglobose, 2-valved or opening irregularly.

Brief taxonomic history of *Whytockia*

Whytockia is one of the seven genera of Gesneriaceae subfam. Didymocarpoideae tribe Epithemateae. Its closest ally is the unifoliate genus *Monophyllaea* R.Br. (Weber, 1976), both forming the subtribe Monophyllaeinae within tribe Epithemateae (Weber *et al.*, 2013). *Whytockia* was established by W.W. Smith (1919, honouring James Whytock, 1845–1926, then president of the Botanical Society of Edinburgh during the years 1917–1920) for a species originally described in *Stauranthera* Benth., *S. chiritiflora* Oliv. Concomitantly, Smith (1919) also described a new variety of this species (*S. chiritiflora* var. *minor* W.W.Sm.). More than 20 years later, Burtt (1941) transferred a species of *Rhychoglossum* Blume (from Taiwan) to *Whytockia* (*W. sasakii* (Hayata) B.L.Burtt). More than 40 years later, another species of *Stauranthera* was transferred to *Whytockia*: *W. tsiangiana* (Hand.-Mazz.) A.Weber (Weber 1982, with recognition of three varieties). More recently, and essentially by the work of Wang (1995, 2003) and Wang and Li (1997, 2000), the species number was raised to eight and one variety (GRC, 2022), either by description of new species (*W. bijiensis* Yin Z.Wang & Z.Yu Li, *W. gongshanensis*, *W. hekouensis* Yin Z.Wang, *W. purpurascens* Yin Z.Wang), or raising a variety to species rank (*W. wilsonii* (A.Weber) Yin Z.Wang).

The nature of the species of *Whytockia*

Most of the species of *Whytockia* are known only from a single locality. The specific differences are rather slight. Only one species, *W. tsiangiana*, has a wide distribution, covering South and Central

China (from Yunnan to Hunan provinces; Wang *et al.*, 1998). This is followed by the close ally *W. sasakii*, known from the north-eastern part of Taiwan. The remaining species are known only from a single locality, with the newly collected Indian material having the furthest western distribution. Very little is known about the variability of *W. tsiangiana* across its distribution area, and a critical study of *Whytockia*, based on recollections and molecular data, is badly needed. Despite this shortcoming, we below critically compare the Indian material with its congeners, in particular with its morphologically closest, *W. tsiangiana* and *W. sasakii*, to establish its new species status.

Evaluation of key characters in relation to the Indian material

Plant size: With stems of up to 60 cm, the Indian material belongs to the species with largest size (followed by *W. bijiensis* and *W. sasakii*: up to 50 cm tall (Li & Wang, 2004; Wei *et al.*, 2010), all other species are distinctly smaller). There is considerable variation of plant size in all species, certainly depending on growing conditions. Plant size is thus a character of limited taxonomic value.

Stem succulence and colour: The stems of the Indian plants appear to be more succulent than in any other species (Fig. 1g), recalling those of some species of *Microchirita* (C.B.Clarke) Yin Z.Wang. The colour varies from dirty green to dark purple, while it is dark green in most other species (purple from purple hairs and glands in *W. purpurascens*).

Stem indumentum: Like in the leaves (below), the hairs on stems of the Indian plants are always eglandular (like in most species, mixed with glandular hairs in *W. purpurascens*), of equal length (c. 1 mm long), erect and very dense (Fig. 1g), more than in other species (e.g. Fig. 3d).

Petiole (of larger leaves in a pair): Absent (leaves sessile) in the Indian material (Fig. 1c, d). Generally, in other species, the leaves are (sub-)sessile or shortly petiolate, particularly *W. hekouensis* (to 10 mm) and *W. tsiangiana* (to 7 mm). The petiole length may

depend on ecological conditions and the vigour of the plants and thus is often a variable characteristic.

Leaf lamina size: Apparently, in correspondence with the relatively tall stature, the leaves of the Indian material are the largest in the *Whytockia* species, up to 18 cm long and 10 cm wide. The next largest leaves in other species are those of *W. bijiensis* (c. 15 × 4 cm) and *W. tsiangiana* (c. 13 × 4.5 cm).

Leaf colour – adaxially: The available data suggest that the leaves of the Indian material are yellowish-green (Fig. 1a–d), rather than dark and dull green in the other species (e.g. Fig. 3b, f) and/or with purple hairs and glands as in *W. purpurascens*.

Leaf colour – abaxially: In the Indian material it is whitish, not from hyaline hairs, but from the pale colour of the epidermis (Fig. 1f). In other species it is green, dark green, or purple (*W. purpurascens*, sometimes also in *W. wilsonii*). However, leaf colour is a difficult character to establish from herbarium specimens and thus of limited taxonomic value.

Leaf indumentum: This is different in the Indian material from all other *Whytockia* species by the presence of long (c. 1 mm), thin, dense and erect hairs (Fig. 1e). The hairs are, as usual, uniseriate and eglandular, but consist of more cells (8–10), with lower cells as long as wide, upper cell(s) long-tapering and thin-walled. The apical ends are often curved. In young leaves the hairs make a dense felt which is velvety to the touch. In other species, the hairs consist of fewer (4–6) cells, are stiff and coarse and are less dense and more appressed than erect (e.g. Fig. 3e, h). The long hairs are also present on the lower side in the Indian material (not only on the veins as in e.g. *W. sasakii*), but also in the intercostae (Fig. 1f).

Inflorescences: In all species the cymes are axillary (the uppermost ones sometimes pseudoterminal), unilateral with the flowers in the cymes placed in pairs (pair-flowered cincinni) and ebracteolate (e.g. Figs. 1, 3). The number of flowers within a cyme is variable, ranging from 2 to several in the Chinese/

Taiwanese species (e.g. Fig. 3e, reaching exceptionally 9, Fig. 3h), and 3 to 15 in the Indian material plants (Fig. 1h, i). The flower number seems to depend predominantly on the growing conditions and the vigour of the plants and is taxonomically irrelevant.

Indumentum on cyme axes and pedicels: In the Indian material this is similar as in leaves and stems in length and poise but consists of glandular hairs (Fig. 1h, i), and is similar in other species particularly *W. sasakii* (Fig. 3e) and *W. tsiangiana* (Fig. 3h) and thus of less diagnostic value.

Calyx indumentum: This appears one of the most conspicuous characters of the Indian plants. The hairs are c. 1.5 mm long and thus longer than those on the leaves and pedicels (Figs. 1h, i, 2a, b). There is no intermixture of both hair types. The calyx hairs are spreading and make roughly a 90° angle to the calyx surface, thus spreading in all directions like sunrays. The hairs are prominent in the buds, the open flowers and even in the post-floral stage. In other species there appears a distinct cline in the number of hairs in the calyx (more on the top sepals, Fig. 4e, f, i) and on the sepals themselves (more hairs at the base, Fig. 4f, i).

Chalk glands and secretory canals in sepals: The presence of chalk glands and secretory canals in the sepals has been evidenced by microtome sections as a generic feature by Weber (1976) and is shared with the genus *Monophyllaea*. No microtome sections are available for the Indian material.

Corolla colour: In the Indian plants the corolla colour is (apart from the two rows of coloured glands) plain white, like in *W. tsiangiana* and *W. sasakii* (Figs. 3, 4; see also Wei *et al.*, 2010, p. 734–739). In the other species the corolla is pink to light violet-purple. However, corolla colouration is not a strong indicator of relationships.

Corolla size: In the keys of Wang (2003) and Li and Wang (2004), the corolla of *W. tsiangiana* and *W. sasakii* is 0.8–1.2 cm long, in contrast to the other species with a length of 1.5–2.5 cm (Smith,

1919; Weber, 1982; Wang, 1995, 2003; Wang & Li, 1997, 2000; Wang *et al.*, 1998). However, the measurements given in the literature (Weber, 1982; Wei *et al.*, 2010) differ to some degree and the species cannot be neatly grouped in two categories of corolla size.

Corolla outside indumentum: One of the most discriminating characteristics of the Indian plants is the hairiness of the outside of the corolla (Fig. 2a, b). All other species have glabrous corollas (*e.g.* Fig. 4a, g), whereas *W. sasakii* has a few hairs along the margins of the lobes.

Corolla glands: The corolla of the Indian plants possesses two rows of glandular hairs along the corolla floor and around the corolla opening (Fig. 2c–g). These appear whitish–pale yellow in the early stage of flower opening, but change colour to pink in later stages. There are additional thinner hyaline glandular hairs towards the base of the tube (Fig. 2e), and shorter hyaline glandular hairs around the corolla opening (Fig. 2c) which are not found in any other species. The corolla of *W. sasakii* and *W. tsiangiana* also has these glands along the floor and between upper and lower lip, and they are deep yellow at all stages of flower maturity (Fig. 4a, b, h).

Form of glands: The glands of the Indian material have a long stalk and a single-celled head and are 0.3–0.7 mm long. The head is globose or drop-like, not clavate. In *W. tsiangiana* and *W. sasakii* they are much longer, 1.2–1.6 mm, one-celled glands consisting of a long stalk and a clavate (club-shaped) head (Fig. 4b, c, h).

Style length: This is used as a taxonomic character in the keys of Wang (2003) and, Li and Wang (2004). However, it is more probable that style length changes (increases) during anthesis. It would only make sense in self-pollinated, homomorphic flowers, but we have no adequate information on the anthesis and pollination for any *Whytockia* species. Thus, style length is regarded as of dubious taxonomic value. In *W. sasakii* however, just opened flowers, mature and old flowers do not show

significant differences in style length (1.4–1.6 mm) or stigma shape and size (*c.* 1.2 × 0.75–1 mm) (Fig. 4d, e; see also below), and thus shows a difference to the Indian material.

Stigma shape: In the Chinese species descriptions and in the keys of Wang (2003), Li and Wang (2004) and in Wei *et al.* (2010), there can be 1 or 2 stigmas (equal to stigma lobes in the non-Chinese literature). Weber (1982) reports a “slightly bilobed” stigma for *W. tsiangiana*. No description says whether the stigma lobes are in upper/lower or left/right position. Our impression is that the latter is the case. However, it is likely that these differences do not hold a taxonomic significance, but represent successive stages during anthesis: the lobes are small and pressed together in the early (male) phase and enfold in the later (female) stage of anthesis. For *W. sasakii* the stigma is undivided in young and mature flowers (Fig. 4d, e).

Internal structure of gynoecium: The ovary of *Whytockia* is divided into two locules by a complete transversal septum that bears the four placentae in the middle (Weber, 1976; fig. 5), and this can be observed also in the Indian material (Fig. 2j). This feature, also found in the genus *Monophyllaea* is exceptional in Gesneriaceae, but of little relevance at species level.

From the above it is difficult to extract reliable information on some characters and/or their taxonomic value for the genus. However, in sum there is good evidence that the Indian plants stand morphologically apart from the other species and can be readily recognised as a distinct species. The habit, leaf colour, indumentum of stem, leaf, calyx, and corolla, provide enough differences to its closest congeners, *W. tsiangiana* and *W. sasakii*.

Taxonomic Treatment

Whytockia arunachalensis Taram, D.Borah & Tag, sp. nov. Figs. 1–4

Whytockia arunachalensis can be distinguished from all other species in the genus (particularly the white-flowered *W. sasakii* and *W. tsiangiana*) by its relatively

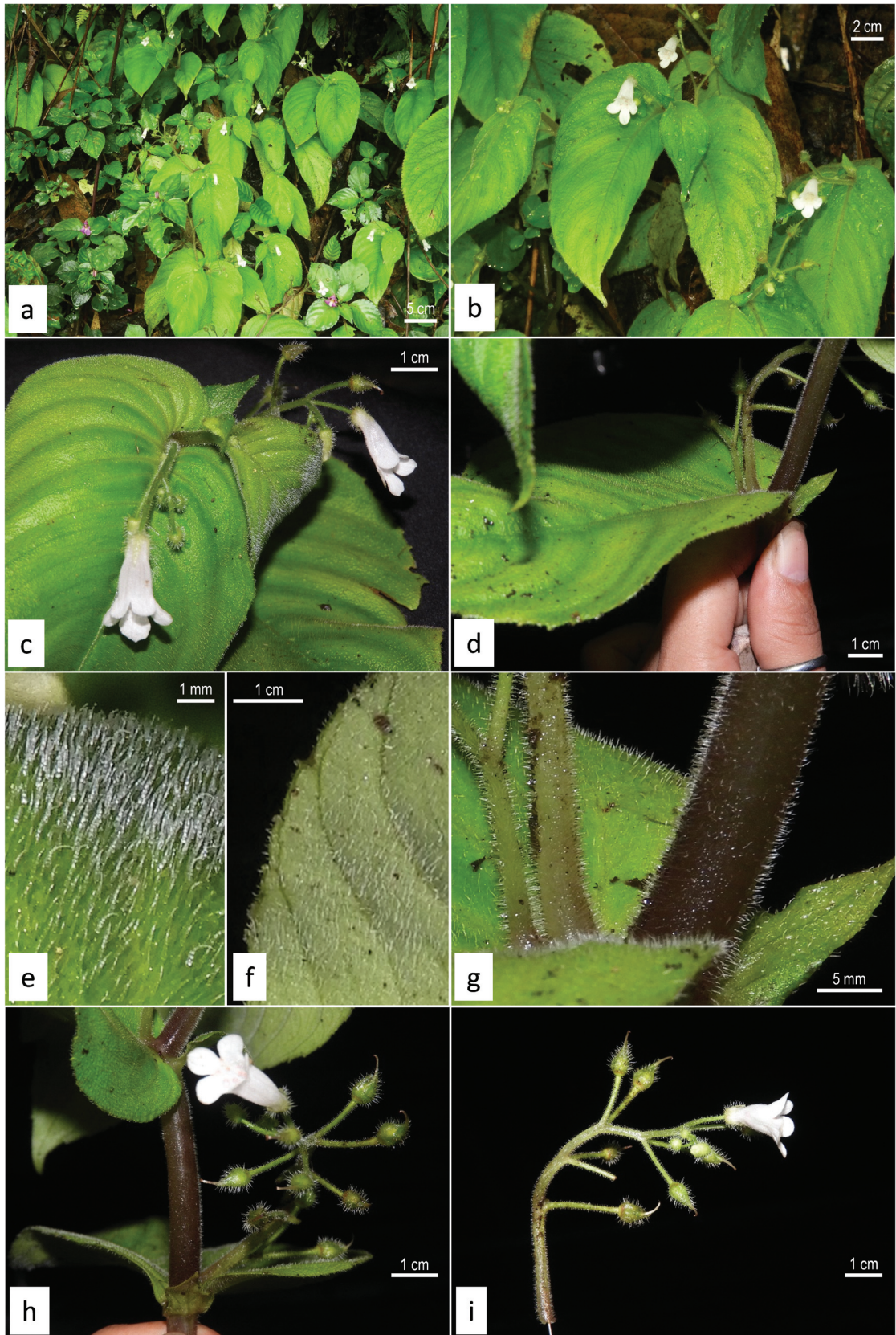


Fig. 1. *Whytockia arunachalensis* Taram, D.Borah & Tag: **a.** Habit and habitat; **b.** Flowering plant; **c.** Inflorescence; **d.** Two axillary inflorescences; **e.** Leaf indumentum—adaxial; **f.** Leaf indumentum—abaxial; **g.** Stem, peduncle and pedicel indumentum; **h.** Single flowering axillary inflorescence; **i.** Flowering inflorescence (photos by M. Taram).

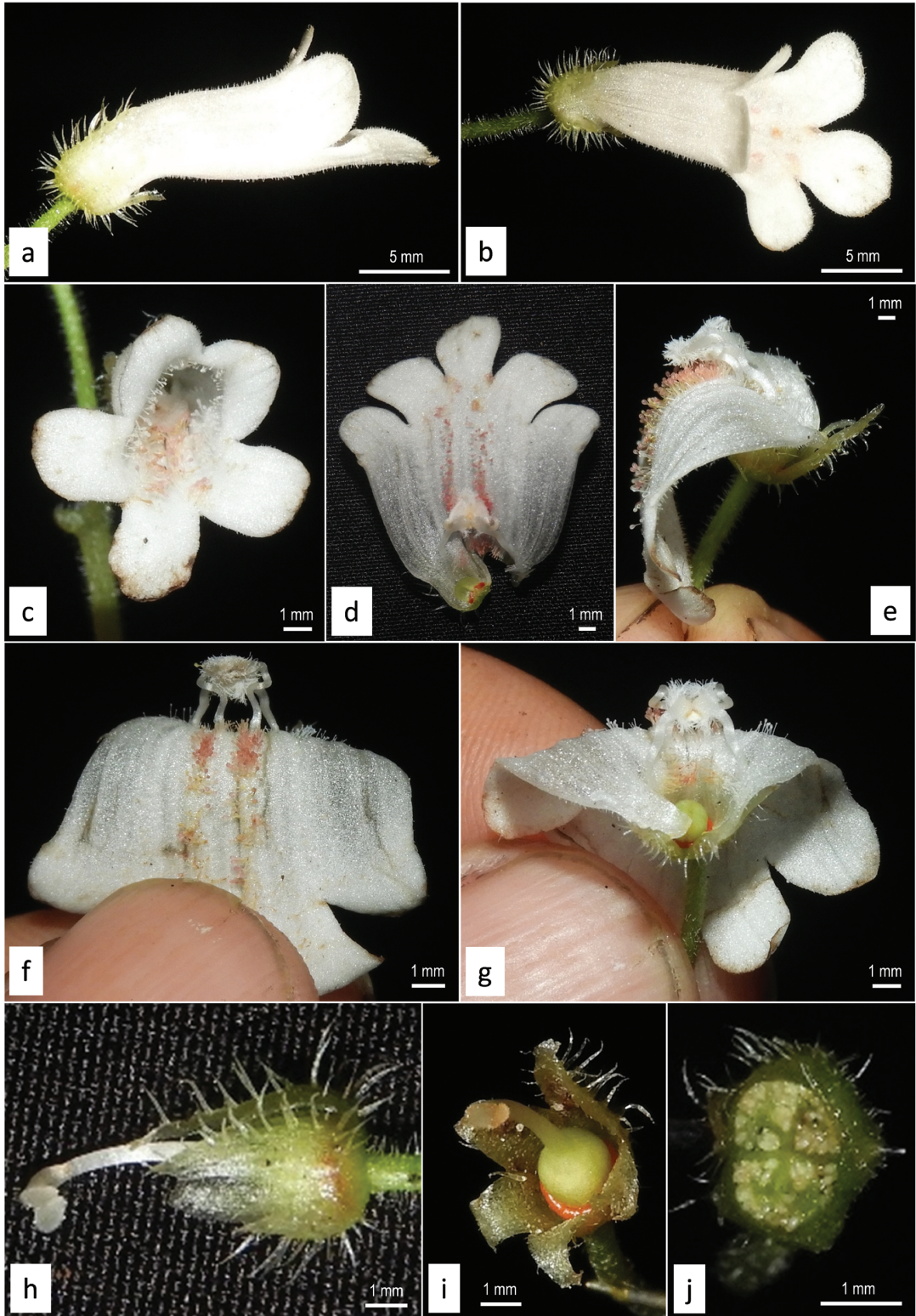


Fig. 2. *Whytockia arunachalensis* Taram, D.Borah & Tag: **a.** Flower–side view, showing indumentum on the corolla outside; **b.** Flower–top view; **c.** Flower–front view, showing pink glandular hairs on the corolla floor and glandular hairs around the corolla opening; **d.** Cut open corolla–top view, showing pink glandular hairs on the corolla floor; **e.** Cut open corolla–side view, showing stamens with twisted filaments; **f.** Cut open corolla–front view, showing two rows of pink glandular hairs on the corolla floor and stamens with twisted filaments; **g.** Cut open corolla–back view, showing two rows of smaller glandular hairs on the corolla floor to the left and right of the rows of pink glandular hairs and stamens with twisted filaments; **h.** Pistil; **i.** Calyx and pistil with orange disc; **j.** Ovary–transverse cross-section, showing two locules and bifid intrusive placentae (photos by M. Taram).

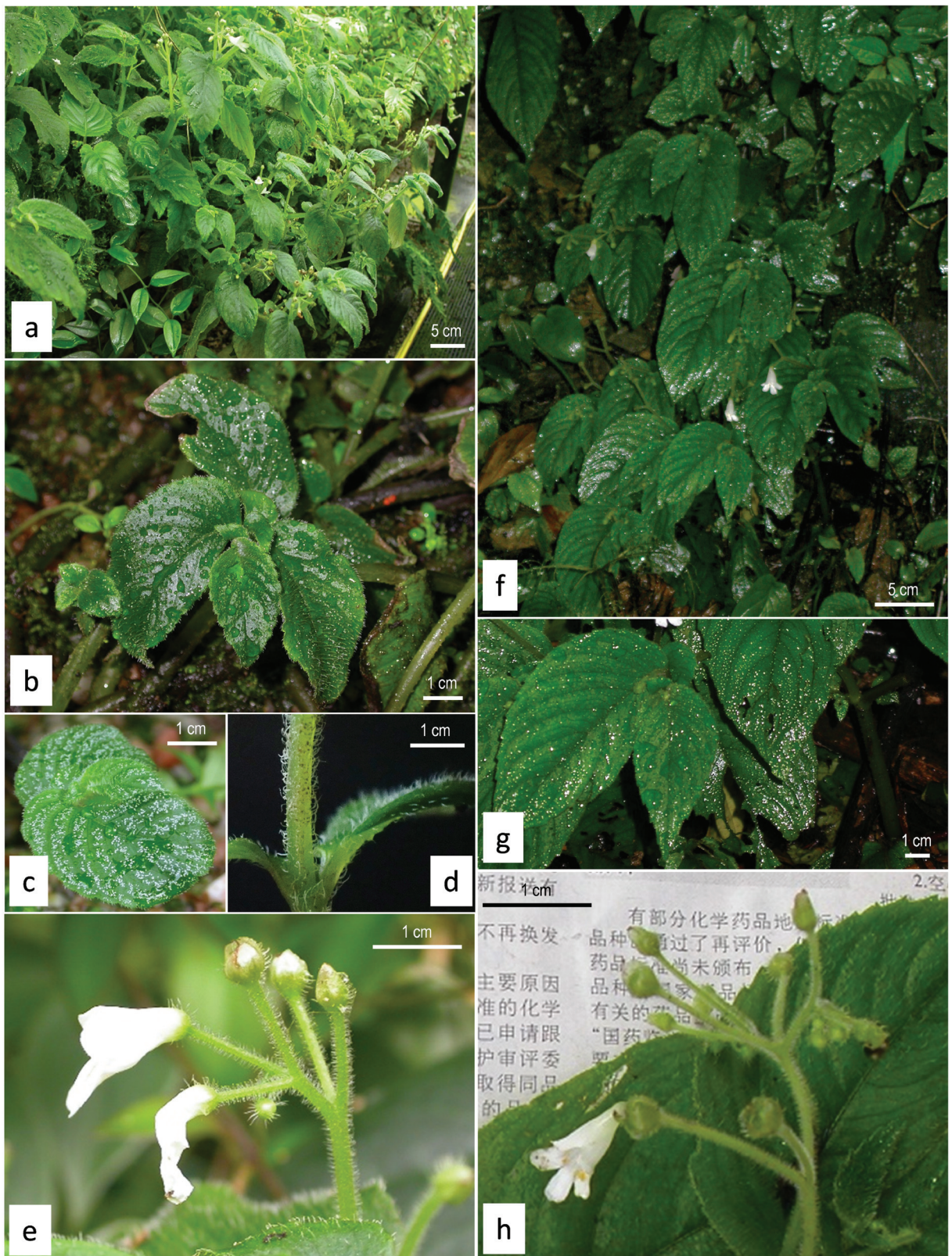


Fig. 3. Congeners of *Whytockia arunachalensis* Taram, D.Borah & Tag: *W. sasakii* (Hayata) B.L.Burt: **a.** Habit; **b.** Vegetative shoot; **c.** Leaf with chalk excretions; **d.** Stem section with node; **e.** Inflorescence. *W. tsiangiana* (Hand.-Mazz.) A.Weber: **f.** Plant in natural habitat; **g.** Vegetative shoot; **h.** Inflorescence (photos by M. Möller).

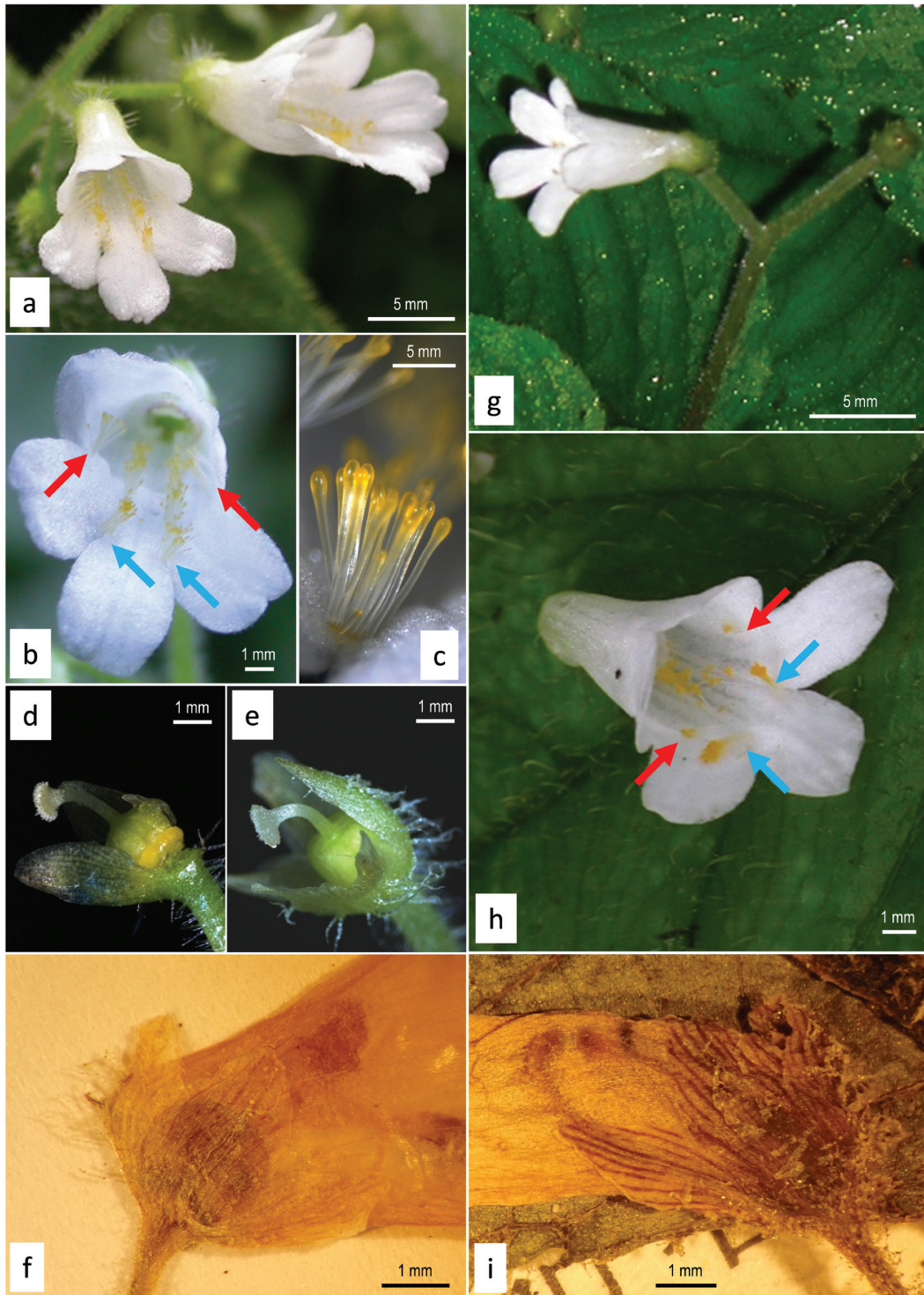


Fig. 4. Congeners of *Whytockia arunachalensis* Taram, D. Borah & Tag: *W. sasakii* (Hayata) B.L. Burt: **a.** Flowers—oblique front view, showing glabrous outside of corolla and two lines of long yellow glandular hairs on the corolla floor; **b.** Flower—front view, showing two lines of long yellow glandular hairs on the corolla floor (blue arrows), and additional long glandular hairs in lateral positions (red arrows); **c.** Clavate hairs on flower tube floor; **d.** Calyx and pistil of young flower—some sepals removed to show ovary, style and stigma; **e.** Calyx and pistil of mature flower—some sepals removed to show ovary, style and stigma; **f.** Calyx indumentum (Wen-Pen Leu 1592 [E]); *W. tsiangiana* (Hand.-Mazz.) A. Weber: **g.** Flower-oblique lateral view; **h.** Corolla—oblique front view, showing two lines of very long yellow glandular hairs on the corolla floor ending in a prominently long cluster of hairs (blue arrows), and additional very long yellow glandular hairs in lateral positions (red arrows); **i.** Calyx indumentum (Möller M. & Wei Y.G. MMO 06-811 [E]); (photos by M. Möller).

large habit and large leaves (the largest in the genus; up to 18×10 cm *vs.* *W. sasakii* 10.5×4.5 cm; *W. tsiangiana* 13×4.5 cm), by the dense and *c.* 1 mm long stem indumentum (*vs.* *W. sasakii* glabrescent; *W. tsiangiana* puberulent), the dense *c.* 1 mm, thin, and erect leaf indumentum (*vs.* sparsely puberulent in both species), and calyx with uniform 1.5 mm long indumentum (*vs.* asymmetric calyx indumentum in both species). From *W. sasakii* and *W. tsiangiana*, the new species can be further distinguished by the puberulent outer side of the corolla (*vs.* glabrous in both species), the presence of two rows of pinkish glandular hairs on the corolla tube floor in *Whytockia arunachalensis* (*vs.* two rows of yellow glandular hairs in both species), glandular unicellular hairs around the tube opening (*vs.* limited to lateral patches in both species).

Type: INDIA, Arunachal Pradesh, East Siang district, Rottung, N $28^{\circ}07'56.1''$, E $95^{\circ}07'46.5''$, around 200 m, 08.07.2021, Taram 9699 (holo CAL!; iso ASSAM!).

Perennial caulescent herbs. Stems 20–60 cm tall, 0.5–1 cm in across, shortly hairy (*c.* 1 mm long), hairs white-hyaline, erect, usually not branched, base decumbent, rooting at lower nodes, dirty green to dark purple in fresh material, internodes 4–15 cm long. Leaves opposite, anisophyllous, in each pair very unequal in size, sessile, adaxially yellowish-green, abaxially pale green; dense white hyaline indumentum of *c.* 1 mm long uniform uniseriate, erect, eglandular hairs on both surfaces; larger leaves ovate, $8\text{--}18 \times 5\text{--}10$ cm, asymmetrical, base oblique to cordate, apex acute to acuminate, margins entire or sub-entire, lateral veins sub-opposite, 11–13 pairs; smaller leaves ovate $1.5\text{--}3 \times 1\text{--}1.5$ cm, base cuneate, apex acute, margin sub-entire to serrate, lateral veins sub-opposite, 2–3 pairs. Inflorescences 1(–2) with pair-flowered cincinni, axillary, emerging from the axils of the larger leaves, uppermost one often pseudo-terminal, ebracteolate, lax, shortly hairy, 6–10 cm long, each with 3–12 flowers, flowers in pairs; peduncles 1.5–4 cm long, pedicels 0.6–1 cm long, both covered in short (*c.* 1 mm) erect glandular hairs. Calyx segments free to base, 5 (rarely 6), imbricate, lanceolate, $0.3\text{--}0.6 \times 0.1\text{--}0.2$ cm, outer surface with long, perpendicularly spreading eglandular hairs, glabrous inside. Corolla plain white, zygomorphic,

short tubular infundibuliform, 1.8–2.3 cm long, face 1.2–1.4 cm wide, tube 0.8–1.5 cm long, mouth *c.* 0.4 cm high, *c.* 0.25 cm wide, slightly curved downwards, puberulent outside, glandular unicellular hairs (0.3–0.7 mm long) around the tube opening and towards the base, inner side of tube with two rows of pink, clavate to capitate hairs on the floor and two rows of smaller white glandular hairs to the left and right along the tube floor from corolla base to mouth; limb 2-lipped; adaxial lip 2-lobed, lobes *c.* 0.2×0.2 cm, round, abaxial lip 3-lobed, lobes $0.2\text{--}0.6 \times 0.2\text{--}0.4$ cm, ovate to orbicular. Stamens 4, up to 0.4 cm, adnate to corolla tube near base, included, didynamous; filaments of abaxial (anterior) stamens 0.2–0.3 cm long, those of adaxial (posterior) stamens 0.1–0.2 cm long, all 0.5 mm thick, strongly twisted near middle, glabrescent; anthers 0.1×0.1 cm, dorsifixed, confluent at apex, coherent in pairs, long papillose on the back. Staminode 1, linear, *c.* 0.1 cm long, glabrous. Disc annular, *c.* 0.5 mm high, orange. Pistils 0.6–0.9 cm long; ovary globose, $c.$ 0.2×0.2 cm, glabrous, 2-loculed with a complete transversal septum; placentae 2, axile, 2-cleft, each of the 4 ovule-bearing arms projecting inwards; style 0.4–0.6 cm long, sharply set off from ovary, bent downwards near tip, glabrescent; stigma bilobed, lobes placed laterally, 0.1–0.1 cm long. Ripe fruits, dehiscence and seeds not known. Immature seeds brown, unappendaged.

Flowering & fruiting: Flowering from July to August, fruiting from August to September.

Habitat: The plants grow in moist shady places near stream sides in association with *Rhynchotechum parviflorum* Blume and *Henckelia urticifolia* (Buch.-Ham. ex D.Don) A.Dietr. (Gesneriaceae), *Impatiens siangensis* Gogoi (Balsaminaceae), *Phrynium pubinerve* Blume (Marantaceae), *Hydrocotyle javanica* Thunb. (Araliaceae), *Musa* sp. (Musaceae), *Elatostema* sp. (Urticaceae), and *Strobilanthes* sp. (Acanthaceae).

Distribution: Thus far, only two populations have been observed, one in Rottung and another in Boleng, in the East Siang and Siang districts of

Arunachal Pradesh and roughly 40 km apart as the crow flies.

Etymology: The specific epithet refers to the state of Arunachal Pradesh, where this species was discovered.

Additional specimens examined: INDIA, **Arunachal Pradesh**, Siang district, Boleng, around 500 m, 15.07.2021, Taram 9721 (ASSAM).

Conservation status: Two localities of the new species are known so far, in Boleng and Rottung, situated c. 40 km apart. One population (with more than 100 mature plants) is located near the roadside, which is under potential threat from road widening, which is ongoing in several districts of Arunachal Pradesh. The other population (with more than 250 mature plants) was found near a stream, with no immediate threats. However, none of the populations is in a protected area. Given the generally inaccessible terrain around and between the localities, it is difficult to ascertain whether more suitable habitats exist nearby in which more populations of the new species may be discovered. Therefore, we assess the conservation status for *W. arunachalensis* provisionally as Data Deficient (DD) (IUCN, 2022).

Final Remarks

Whytockia is one of the genera with very little morphological variation among the species. Despite this, *Whytockia arunachalensis* shows several characteristics that are not found in any or most other species. It is overall a robust plant with thick stems and the largest leaves in the genus. One of its characteristic features is the relatively uniformly short and dense indumentum across most of the plant, even on the outside of the corolla (Figs. 1–4, Table 1).

The two localities of *Whytockia arunachalensis* in Northeast India greatly extend the distribution of the genus that hitherto was thought to be endemic to South and Central China and Taiwan. The geographically nearest species to *W. arunachalensis* is *W. gongshanensis* in Northwest Yunnan, China,

which has much smaller leaves (3–6 × 1.7–3 cm), smaller (0.8–1 cm), pale blue–purple corollas, and undivided stigmas (Wang & Li, 2000; but see above). The morphologically closest congener to *W. arunachalensis*, *W. tsiangiana*, occurs further away in Southeast Yunnan and South Sichuan. It would be interesting to explore whether intervening landscapes between China and India, such as Myanmar, are suitable to harbour *Whytockia* plants.

The discovery of *Whytockia* is significant for the diversity of Gesneriaceae in India. Until now, there were only nine species of tribe Epithemateae in three genera from three subtribes reported from India, namely *Rhynchoglossum* (subtribe Loxotidinae G.Don), *Stauranthera* (subtribe Loxoniinae A.DC.), and *Epithema* Blume (subtribe Epithematinae DC. ex Meisn.) (Möller *et al.*, 2017; GRC, 2022). The new species brings the total to ten species and four genera in India. Interestingly, each of these genera represents a subtribe in the tribe, and with *Whytockia* now added, the last of the four subtribes in tribe Epithemateae, subtribe Monophyllaeinae, is now also represented in India. The new genus record for India also increases the total number of Gesneriaceae genera in India to 24. The number given in Möller *et al.* (2017: 23 genera) thus has to be corrected and the parts referring to tribe Epithemateae modified and widened by the inclusion of *Whytockia*.

Acknowledgements

The authors are thankful to Rajiv Gandhi University for providing necessary facilities to MT, DB, HT. The authors are grateful to the horticultural staff at the Royal Botanic Garden Edinburgh (RBGE) for the cultivation of *W. sasakii* material. RBGE is supported by the Scottish Government's Rural and Environment Science and Analytical Services Division.

Literature Cited

- BURTT B.L. 1941. *Whytockia* and *Oshimella* (Gesneriaceae). *Bulletin of Miscellaneous Information, Royal Botanic Gardens, Kew* 1941(3): 31–33.

- GRC 2022 [continuously updated]. *Gesneriaceae Resource Centre*. Royal Botanic Garden Edinburgh. Available at: <https://padme.rbge.org.uk/GRC>. (Accessed on 16.03.2022).
- HANDEL-MAZZETTI H. 1934. *Plantae novae tsiangianae* II. *Sinensia* 5(1–2): 17–22.
- HAYATA B. 1941. Gesneriaceae. In: HAYATA B. (ed.), *Icones Plantarum Formosanarum*, Volume 6, Government of Formosa Bureau of Productive Industries, Taihoku (Taipei). pp. 34–35.
- IUCN 2022. Guidelines for Using the IUCN Red List Categories and Criteria. Version 15. Prepared by the Standards and Petitions Committee. Available at: <https://www.iucnredlist.org/documents/RedListGuidelines.pdf> (Accessed on 16.03.2022).
- LI Z.Y. & Y.Z. WANG 2004. *Plants of Gesneriaceae in China*. Henan Science and Technology Publishing House, Zhengzhou [in Chinese].
- MÖLLER M., NAMPY S., JANEESHA A.P. & A. WEBER 2017. The Gesneriaceae of India: consequences of updated generic concepts and new family classification. *Rheede* 27(1): 23–41. <https://dx.doi.org/10.22244/rheede.2017.27.1.5>
- SMITH W.W. 1919. *Whytockia*, a new genus of Gesneriaceae. *Transactions and Proceedings of the Botanical Society of Edinburgh* 27: 338–339. <https://doi.org/10.1080/03746601909468495>
- WANG W.T., PAN K.Y., LI Z.Y., WEITZMAN A.L. & L.E. SKOG 1998. Gesneriaceae. In: WU Z.Y. & P.H. RAVEN (eds.), *Flora of China*, Volume 18. Science Press, Beijing and Missouri Botanical Garden Press, St. Louis. pp. 244–401.
- WANG Y.Z. & H. LI 2000. A new species of *Whytockia* W.W.Smith (Gesneriaceae) from Yunnan, China. *Acta Phytotaxonomica Sinica* 38(2): 189–191.
- WANG Y.Z. & Z.Y. LI 1997. A new species of the genus *Whytockia* W.W.Smith (Gesneriaceae) from Guizhou, China. *Acta Phytotaxonomica Sinica* 35(1): 67–69.
- WANG Y.Z. 1995. Two new species of *Whytockia* (Gesneriaceae) from Yunnan. *Acta Phytotaxonomica Sinica* 33(3): 297–301.
- WANG Y.Z. 2003. Nomenclatural actions in *Whytockia* (Gesneriaceae). *Novon* 13(4): 483–486. <https://doi.org/10.2307/3393386>
- WEBER A. 1976. Beiträge zur Morphologie und Systematik der Klugieae und Loxonieae (Gesneriaceae). III. *Whytockia* als morphologische und phylogenetische Ausgangsform von *Monophyllaea*. *Beiträge zur Biologie der Pflanzen* 52: 183–205.
- WEBER A. 1982. Contributions to the morphology and systematics of Klugieae and Loxonieae (Gesneriaceae) IX. The genus *Whytockia*. *Notes from the Royal Botanic Garden Edinburgh* 40: 359–367.
- WEBER A. 2004. Gesneriaceae. In: KUBITZKI, K. & J. KADEREIT (eds.), *The families and genera of vascular plants*. Vol. 7. Flowering Plants. Dicotyledons. Lamiales (except Acanthaceae including Avicenniaceae). Springer Verlag, Berlin & Heidelberg. pp. 63–158.
- WEBER A., CLARK J.L. & M. MÖLLER 2013. A new formal classification of Gesneriaceae. *Selbyana* 31(2): 68–94. <https://www.jstor.org/stable/24894283>
- WEBER A., MIDDLETON D.J., CLARK J.L. & M. MÖLLER 2020. Keys to the infrafamilial taxa and genera of Gesneriaceae. *Rheede* 30(1): 5–47. <https://dx.doi.org/10.22244/rheede.2020.30.01.02>
- WEI Y.G., WEN F., MÖLLER M., MONRO A., ZHANG Q., GAO Q., MOU H.F., ZHONG S.H. & C. CUI 2010. *Gesneriaceae of South China*. Guangxi Science and Technology Publishing House, Nanning.