



Additional notes on *Oreocharis yunnanensis*, a species of Gesneriaceae from southern Yunnan, China, including morphological and molecular data

YUN-HONG TAN^{1*}, JIAN-WU LI¹, WEN-HONG CHEN², BIN WEN¹ & MICHAEL MÖLLER^{3*}

1: Key Laboratory of Tropical Forest Ecology, Key Laboratory of Tropical Plant Resource and Sustainable Use, Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences, Menglun, Mengla, Yunnan 666303, China;

2: Key Laboratory of Biodiversity and Biogeography, Kunming Institute of Botany, Chinese Academy of Sciences, Kunming 650201, Yunnan, China;

3: Royal Botanic Garden Edinburgh, 20A Inverleith Row, Edinburgh, EH3 5LR, Scotland, United Kingdom.

* Authors for correspondence. E-mail: tyh@xtbg.org.cn, m.moeller@rbge.ac.uk

Abstract

Oreocharis yunnanensis, a recently described species from southern Yunnan, China, is here compared using morphological and molecular evidence, with its closest congener *O. aurea* and *O. hirsuta*, but can be easily distinguished from the latter two by its cordate leaves, 3–4 branched cymes with 4–16(–20) flowers, corolla larger, corolla tube constricted or slightly constricted above the base and then moderately enlarged without constriction at the throat, longer relative to the corolla lip, the upper corolla lip much smaller than the lower lip, lobes entire or calyx margins 2–3 denticulate, disc entire or subentire, and stigma capitate.

Key words molecular phylogeny, morphology, *Oreocharis*, taxonomy

Introduction

Oreocharis glandulosa Y.H.Tan & J.W.Li was illegitimately published in Phytotaxa 13 September 2013 (Tan et al. 2013), overlooking the fact that this name is invalid because it is a later homonym of *Oreocharis glandulosa* (Batalin) Mich.Möller & A.Weber, published in Phytotaxa 16 May 2011 (Möller et al. 2011). Rossini & Freitas, Brazil, quickly remedied the situation naming the new species *Oreocharis yunnanensis* Rossini & J.Freitas in Phytotaxa 26 March 2014 (Rossini and Freitas, 2014). Here, we update the description and comparison with closely related species and obtained molecular data (nuclear ribosomal internal transcribed spacer region) for the new species and compared these with two of its morphologically closest relatives, *O. aurea* Dunn (1908: 19) and *O. hirsuta* Barnett (1961: 9) and molecularly close *O. longifolia* (Craib) Mich.Möller & A.Weber in Möller et al. (2011: 23), hitherto *Briggsia longifolia* Craib (1920: 238), and demonstrate the genetic distinctness of *O. yunnanensis* from its congeners.

Taxonomic treatment

Oreocharis yunnanensis Rossini & J.Freitas (Figs. 1–2).

≡ *O. glandulosa* Y.H.Tan & J.W.Li (in Tan et al. 2013, 30); non *O. glandulosa* (Batalin) Mich.Möller & A.Weber (in Möller et al. 2011b, 21).

Oreocharis yunnanensis is similar to *O. hirsuta* and *O. aurea*, differing from these by its distinctly cordate leaves, cymes 3–4 branched, with 4–16(20) flowers, corolla larger than the two other species, corolla tube constricted or slightly constricted above the base and then slightly inflated without constriction at the throat, longer relative to the corolla lip, the upper corolla lip much smaller than the lower lip; calyx margins entire or 2–3 denticulate, disc entire or subentire, stigma capitate.

Molecular data: The new species is distinct from *Oreocharis aurea* by 15 nucleotide changes in the nuclear ribosomal DNA internal transcribed spacer sequences, and 42 steps from *Oreocharis hirsuta* from Thailand.

Type:—CHINA. Yunnan: Lancang, shady humus-rich hillsides and damp rocks under evergreen broad leaved forests, 1600m, 22°35'28"N, 99°58'55"E, 7 Sept. 2012, *Yun-Hong Tan* 6925 (holotype HITBC!, isotype HITBC!).

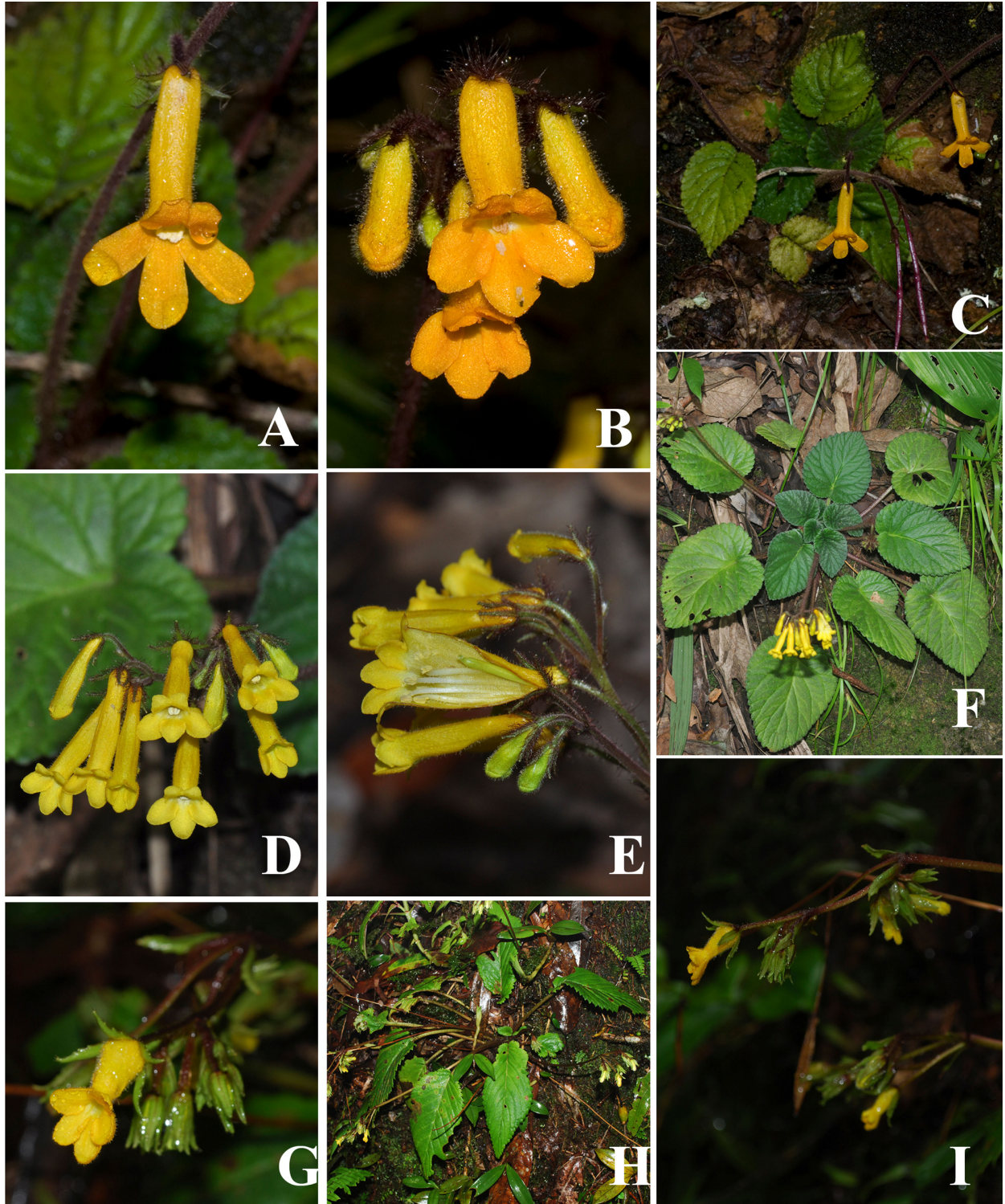


FIGURE 1. Comparisons between *Oreocharis yunnanensis*, *O. hirsuta*, and *O. aurea*. **A–C.** *Oreocharis hirsuta*. Photographs by David J. Middleton, RBGE. **D–F.** *O. yunnanensis*. Photographs by Yun-Hong Tan. **G–I.** *O. aurea*. Photographs by Bing Liu.

Perennial, rosette herbs. Rhizomatous stems, subterete, 1.8–2.0 cm long, 1 cm in diameter. Leaves basal, spirally arranged, 8–13, petiolate; petioles terete, 3–13 cm long, 2–4 mm in diameter, densely villous with brown segmented hairs, ca. 3–4 mm long; leaf blades papery when dry, cordate to broadly ovate, $3.5 \times 2.5\text{--}11.5 \times 9.0$ cm, bases cordate, margins doubly crenate to serrate, apices acute to rounded, adaxially densely appressed pubescence, abaxially densely brown villous along veins, hairs ca. 3–4 mm long; lateral veins 6–7 on each side of midrib, distinct, concave adaxially, prominent abaxially. Inflorescences cymose, axillary, 3–4-branched, 4–16(–20)-flowered; peduncles 7.0–19.5 cm long, ca. 2 mm in diameter, with densely brown segmented hairs, 3–4 mm long; bracts 2, $3.0 \times 1.0\text{--}5.0 \times 1.2$ mm, narrowly lanceolate to lanceolate, margins entire, with densely brown segmented hairs outside, hairs 2–3 mm long; bracteoles similar but smaller; pedicels 0.8–2.3 cm long, ca. 1 mm in diameter, with densely brown segmented hairs 2–2.5 mm long. Calyx actinomorphic, $4.5\text{--}6.5 \times \text{ca. } 1.0$ mm, 5-parted nearly to base, slightly unequal, lobes linear-lanceolate, with densely brown segmented hairs outside and glabrous inside, margins entire or 2–3-denticulate. Corolla yellow 2.0–2.5 cm long, outside densely glandular puberulent, inside glabrous; tube nearly cylindric, constricted or slightly constricted above the base and then moderately inflated without constriction at the throat, $15 \times 4.0\text{--}18 \times 5.5$ mm; limb distinctly two-lipped, adaxial lip bilobed to near base, lobes ovate to triangular-ovate, $3.0 \times 3.0\text{--}3.5 \times 3.5$ mm; abaxial lip trilobed to base, lobes obovate, $6.0 \times 4.0\text{--}6.5 \times 4.5$ mm. Stamens 4, adnate to corolla 4.5–5.0 mm above base, included; filaments 13.5–14.5 mm long, slender, sparsely pubescent, free; anthers oblong, $1.5 \times 0.8\text{--}2.0 \times 1.0$ mm, 2-loculed, dehiscing longitudinally, connective glabrous; staminode 1, glabrous, 3.0–3.5 mm long, adnate to corolla 4 mm above base. Disc ring-like, 2.0–2.5 mm high, glabrous, entire or subentire. Pistil 1.2–1.9 cm, glabrous; ovary 1.2–1.6 cm long, ca. 1 mm in diameter, style ca. 2 mm long; stigma capitate, orbicular, 0.8–1.0 mm in diameter. Capsules 4-angled or subterete, ca. 4 cm long and 3 mm in diameter, glabrous.

Distribution, habitat and ecology:—*Oreocharis yunnanensis* is only known from southern Yunnan and grows on shady, humus-rich hillsides and rocks in the understory of evergreen broad leaved forests or on cliffs in valleys, at an elevation of ca. 1600–1800 m. The main herbaceous companion species are: *Rhynchanthus beesianus* W.W.Sm., *Hedychium spicatum* Smith, *Peristylus calcaratus* (Rolfe) S.Y.Hu, *Begonia palmata* D.Don var. *bowringiana* (Champion ex Benth.) Golding & Kareg., *Sonerila primuloides* C.Y.Wu ex C.Chen, *Anthogonium gracile* Wall., *Tofieldia thibetica* Franch., *Lobelia angulata* G.Forst.

Phenology:—Flowering from August to October and fruiting from September to November.

Etymology:—The species is named after the type locality, Lancang county in Yunnan Province.

Relationships:—*Oreocharis yunnanensis* is morphologically most similar to *O. hirsuta* from Thailand (Barnett 1961) and *O. aurea* distributed in Yunnan and northern Vietnam. After comparison with the specimens and literature of *O. hirsuta* and *O. aurea*, we found that *O. yunnanensis* can be clearly differentiated from these two species by several characters, as described in the diagnostics above and summarized in Table 1.

TABLE 1. Morphological comparisons between *Oreocharis yunnanensis*, *O. hirsuta*, and *O. aurea*.

	<i>O. yunnanensis</i>	<i>O. hirsuta</i>	<i>O. aurea</i>
Leaves	cordate to broadly ovate, base cordate	elliptic or ovate, acute, base cuneate to subrounded or occasionally slightly cordate	lanceolate to ovate, base sometimes slightly oblique, broadly cuneate to cordate
Inflorescences	cymes 3–4 branched, with 4–16(20) flowers	cymes with 6–7 flowers	cymes with 3–10 flowers
Corolla	ca. 2.0–2.5 cm long; tube contracted or slightly contracted above the base, without contraction at throat	ca. 2.0 cm long; tube almost equal from base to throat	ca. 1.2–2.2 cm long; tube strongly contracted at throat
Corolla lip	the upper lip much smaller than the lower lip	The upper lip slightly smaller than the lower	The upper lip almost equal to the lower lip
Calyx	margins entire or 2–3 denticulate	entire	margins 2–3 denticulate
Filaments	ca. 13.5–14.5 mm long, sparsely pubescent	ca. 7–8.5 mm long, hirsute	ca. 4–5 mm long, sparsely pubescent near apex or white villous
Disc	entire or subentire, ca. 2–2.5 mm	5-lobed, ca. 1 mm	5-lobed, ca. 1–2 mm
Stigma	capitate	peltate	disc-shaped

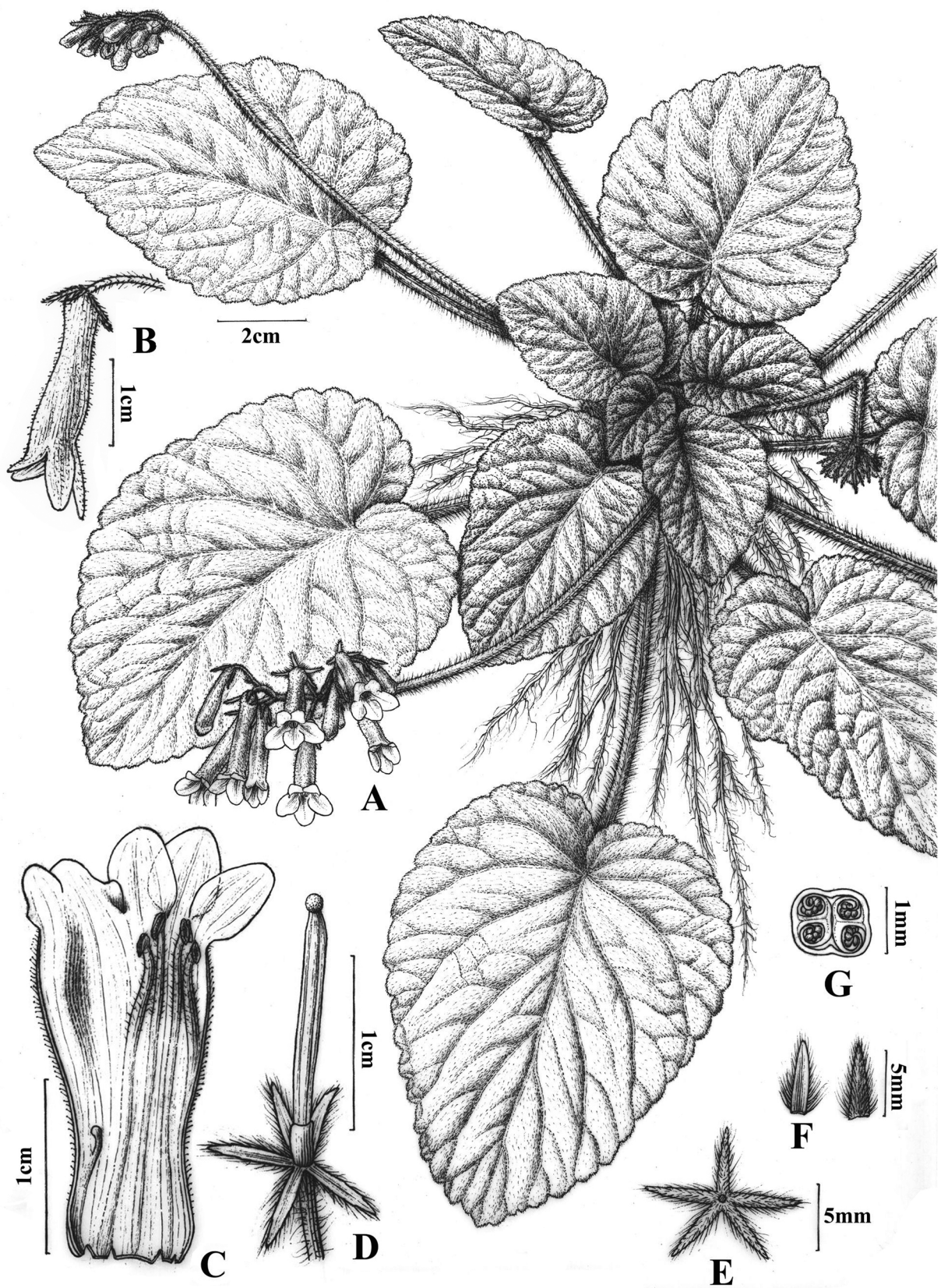


FIGURE 2. *Oreocharis yunnanensis*. **A.** Habit. **B.** Flower. **C.** Opened corolla showing stamens and staminode. **D.** Calyx and pistil with disc. **E.** Calyx. **F.** Bracts. **G.** Cross section of ovary. Illustration by Yun-Xi Zhu based on the holotype *Yun-Hong Tan* 6925.

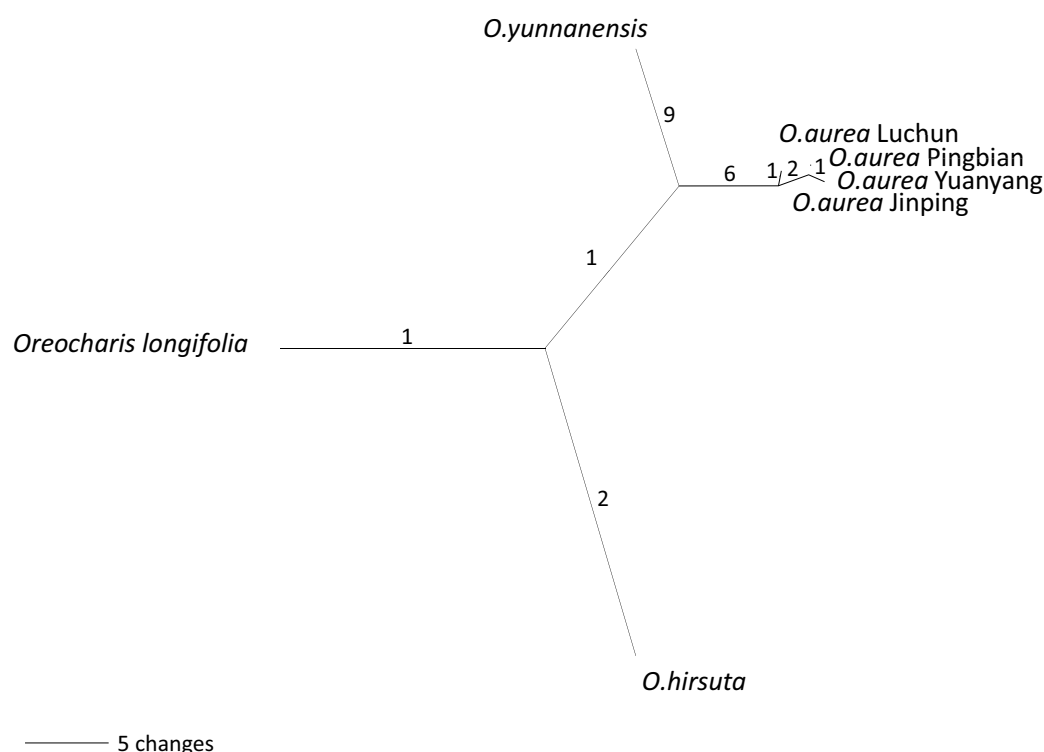


FIGURE 3. Unrooted phylogenetic parsimony tree based on 651 ITS sequence characters, after unordered and unweighted parsimony analyses with exhaustive tree search (585 characters are constant, 45 variable characters are parsimony-uninformative, 21 parsimony-informative characters), with a tree length of 68 steps, consistency index (CI) = 1.0000, and Retention index (RI) = 1.0000. The ITS sequences of *Oreocharis yunnanensis* and *O. aurea* (Luchun, Pingbian, and Yuanyang) were obtained according to Chen *et al.* (in prep.), that of *O. aurea* (Jinping), *O. hirsuta* and *O. longifolia* according to Möller *et al.* (2011b). Sample selection followed Chen *et al.* (in prep.) selecting the species found molecularly closest to *O. yunnanensis*.

Oreocharis yunnanensis is genetically close to *O. aurea* and *O. hirsuta*, and here closer to *O. aurea*, reflecting the closer geographical distance of this species with *O. yunnanensis* (Fig. 3). However, *O. yunnanensis* clearly represents a separate lineage from the distinct gene pool of *O. aurea*, indicated by the molecular closeness of the multiple samples from across the distribution range of this widespread species (Fig. 3).

Additional specimens examined (paratypes):—CHINA. Yunnan: Lancang County, Fofang, 28 August 2011, Jian-Wu Li 880 (HITBC); 25 July 2001, Hong Wang 4914 (HITBC).

Conservation assessment: *Oreocharis yunnanensis* is known only from the type locality, that included only a few hundred mature individuals. The population is thought to be decreasing due to forest and habitat destruction.

Acknowledgements

This study was financially supported by the National Science and Technology Infrastructure Program (08ZK121B02, 08ZK111B02) and the National Natural Science Foundation of China (grant no. 31000258). We thank Yun-Xi Zhu for the illustration. We are grateful to David J. Middleton and Robert R. Mill (Royal Botanic Garden Edinburgh) for suggestions, constructive comments, and (DJM) providing the photographs of *O. hirsuta*, and to Bing Liu (Institute of Botany, The Chinese Academy of Sciences) for providing the photographs of *O. aurea*. We are also grateful to Xin Yao for editing the photographs. The Royal Botanic Garden Edinburgh is supported by the Rural and Environment Science and Analytical Services division (RESAS) in the Scottish Government.

References

- Barnett, E.C. (1961) Contributions to the Flora of Thailand: LV. *Kew Bulletin* 15: 249–259.
<http://dx.doi.org/10.2307/4109363>
- Craib, W.G. (1920) [“1919”]. Gesneracearum Novitates. *Notes from the Royal Botanic Garden Edinburgh* 11: 233–254.
- Dunn, S.T. (1908) Gesneriaceae. In: *Decades kewenses plantarum novarum in herbario horti regii conservatarum*. Decades XLV–XLVI. *Bulletin of Miscellaneous Information Bulletin of Miscellaneous Information*, Kew 1908: 19.
<http://dx.doi.org/10.2307/4114866>
- Rossini, J., Freitas, J. (2014). *Oreocharis yunnanensis*, a new name for the illegitimate *Oreocharis glandulosa* (Gesneriaceae) from China. *Phytotaxa*, 163(3), 180–180.
- Möller, M., Middleton, D., Nishii, K., Wei, Y.G., Sontag, S. & Weber, A. (2011b) A new delineation for *Oreocharis* incorporating an additional ten genera of Chinese Gesneriaceae. *Phytotaxa* 23: 1–36.
- Tan, Y.H. Li, J.W., Pan, B., Wen, B., Yin, J.T., & Liu, Q. (2013) *Oreocharis glandulosa*, a new species of Gesneriaceae from southern Yunnan, China. *Phytotaxa* 131: 29–34.
<http://dx.doi.org/10.11646/phytotaxa.131.1.5>