

ADDITIONS TO THE ORCHID FLORA OF BHUTAN IV

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ABSTRACT. Five orchid species belonging to four genera, namely, *Bulbophyllum deergongense*, *Bulbophyllum nepalense*, *Liparis sootzeanensis*, *Spiranthes himalayensis* and *Zeuxine gracilis*, are reported for the first time from Bhutan. These findings are based on systematic native floristic diversity field surveys carried out between 2023 and 2025. We provide descriptions, along with information on type, distribution, phenology, habitat, notes, and colour plates to facilitate accurate species identification and support practical conservation efforts.

KEYWORDS / PALABRAS CLAVE: biodiversidad, biodiversity, Orchidaceae, sección *Brachyantha*, sección *Reptantia*, section *Brachyantha*, section *Reptantia*, taxonomy, taxonomía

Introduction. The pioneer work on orchids of Bhutan was done by Pearce and Cribb (2002), who reported 369 orchid species. Since then, there has been a notable increase in the number of orchid species due to recent discoveries of species new to science and new records for Bhutan (Chaidia & Tashi, 2020; Dalström *et al.*, 2017, 2021; Dechen *et al.*, 2020; Dorji, 2008; Dorji *et al.*, 2023; Ghalley *et al.*, 2022; C. Gyeltshen *et al.*, 2019; N. Gyeltshen *et al.*, 2017, 2020; P. Gyeltshen *et al.*, 2020, 2021, 2023, 2024; Gurung, 2006; Rabgay & Kumar, 2019; Rabgay *et al.*, 2021; Tobgay *et al.*, 2024; Tshewang *et al.*, 2021; Zangpo *et al.*, 2019, 2021). Recently, two new species, *Calanthe hastilabia* S.Tobgay, T.Nidup & K.Wangchuck (Tobgay *et al.*, 2025) and *Zeuxine drukyulensis* P.Gyeltshen, K.Rabgay & Kumar (Gyeltshen *et al.*, 2025) were also added to the orchid flora of Bhutan. With these discoveries, the total number of orchid species in Bhutan now stands at 501, including 12 species reported from unconfirmed localities. Several species reported by Gurung (2006), Dalström *et al.* (2017, 2021), and Chaidia & Tashi (2020), are known only from photographs and lack adequate descriptions, therefore, these records require proper documentation and the collection of herbarium specimens.

In continuation with the ongoing surveys and publications, we present here five additional orchid species previously not known from Bhutan. The findings are based on systematic field surveys carried out between 2023 and 2025. With these additions, the orchid flora of Bhutan now comprises 506 species. This increasing species count underscores the significance of continued exploration and research.

Materials and methods. This study was based on floristic assessments conducted in Bhutan between January 2023 and July 2025. Following careful examination of collected specimens, consultation of herbarium materials at CAL, FAFU, KATH, E, K, PE, and THIM (herbarium codes follow Thiers *et al.*, 2025, continuously updated), and review of protologues along with other relevant literature (Chen *et al.*, 2009; King & Pantling, 1898; Miao *et al.*, 2023; Pearce & Cribb, 2002; Raskoti & Ale, 2013; Tetsana *et al.*, 2019), we concluded that five orchid species had not previously been reported from Bhutan. We present these five species in this manuscript with their descriptions, distribution maps, habitat notes, and colour photographs to facilitate accurate species identification and support practical conservation efforts.

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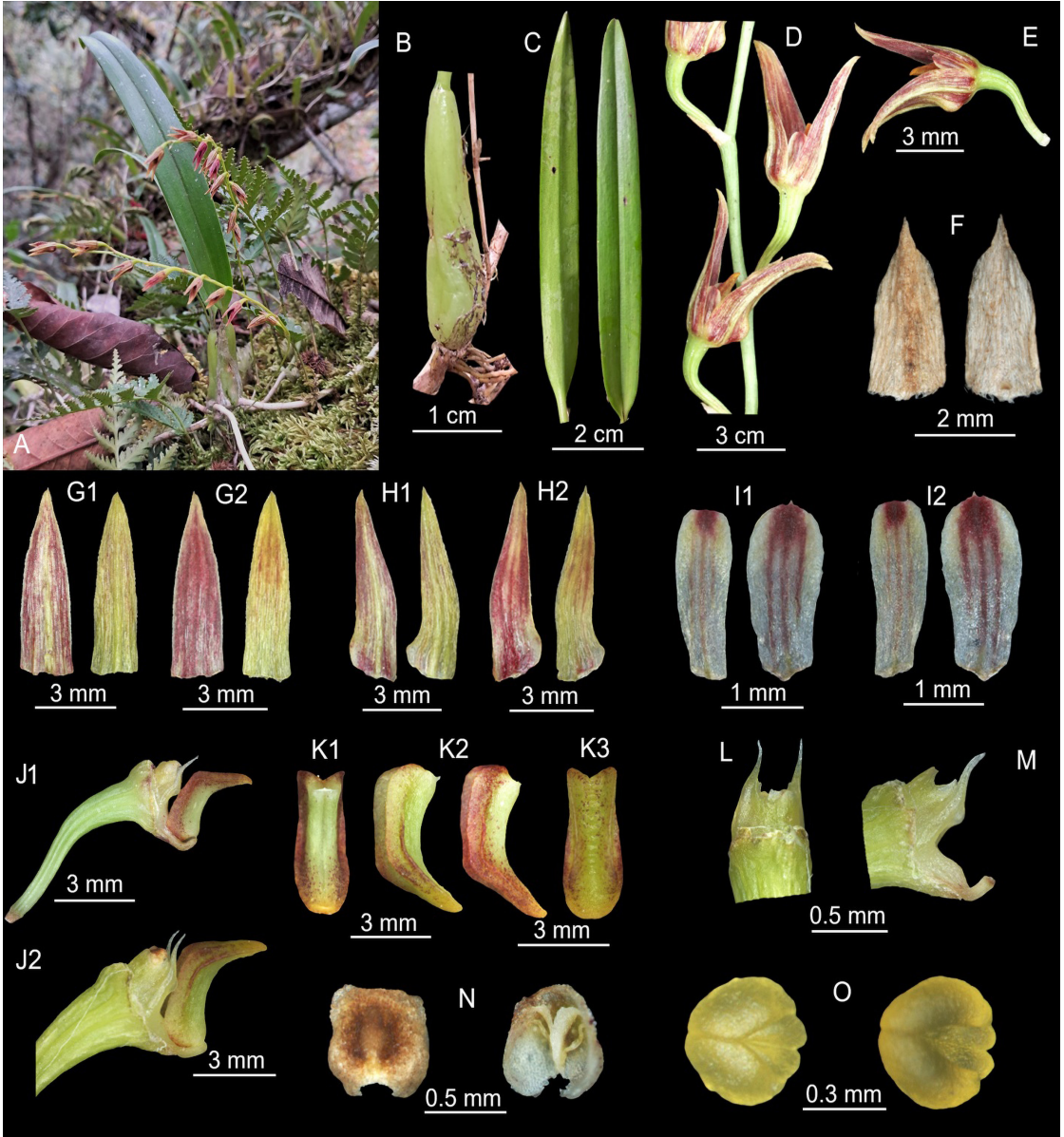


FIGURE 1. *Bulbophyllum deergongense* J.L.Miao & J.W.Zhai. **A.** Plant in the habitat. **B.** Pseudobulb. **C.** Leaf. **D.** Part of Inflorescence. **E.** Flower, lateral view. **F.** Floral bract, abaxial and adaxial views. **G1–2.** Dorsal sepal, abaxial and adaxial views. **H1–2.** Lateral sepals, abaxial and adaxial views. **I1–2.** Petals, abaxial and adaxial views. **J.** Pedicel and ovary with labellum attached, lateral views. **K1–3.** Labellum, abaxial, lateral and adaxial views. **L–M.** Column abaxial and lateral views. **N.** Anther cap, abaxial and adaxial views. **O.** Pollinia, abaxial and adaxial views. Photographs and illustrations assembled by Phub Gyeltshen based on *Gyeltshen 483* (THIM).

Author abbreviations follow the International Plant Names Index (IPNI, 2025). The circumscription and terminology used in the morphological descriptions follow Pearce & Cribb (2002) and Beentje (2024).

Measurements of vegetative and reproductive structures of at least five randomly selected flowers of each species were taken *in situ*. Geographical information, including elevation and geo-coordinates, was recorded

using a Garmin GPS (eTrex 40), while photographs were captured with a digital camera. Macro images were obtained using a Z-stacking microscope (ZEISS Stereo Discovery V20, Carl Zeiss Microscopy GmbH) at the National Biodiversity Centre, Thimphu, Bhutan. Coloured plates were prepared and edited using Adobe Photoshop. Distribution data were mapped with QGIS software version 3.38.1 (QGIS Development Team, 2024), and voucher specimens were deposited at the Bhutan National Herbarium (THIM).

TAXONOMIC TREATMENT

Bulbophyllum deergongense J.L.Miao & J.W.Zhai, Phytotaxa 619(2): 200. 2023. Fig. 1.

TYPE: China. Tibet, Motuo, Deergong, *Zhai 0180* (holotype: FAFU; isotype: IBSC).

Plant epiphytic, 10–12 cm tall. *Rhizome* thick, covered with fibrous sheaths, (–3) 5–14 (–17) × 2–3 mm. *Roots* emerging from under surface of rhizome throughout its length. *Pseudobulbs* oblong-conical, 2.0–4.5 × 0.8–1.2 cm, glabrous, green. *Leaf* solitary, petiolate; petiole 5–10 mm long, obliquely notched on the pseudobulb; lamina leathery, oblong-elliptic to oblong-lanceolate, 8.0–16.5 (–21 cm) × 1.0–1.5 cm (–2 cm), apex subacute, margin entire, base slightly attenuate. *Inflorescence* racemose, 1–2-flowered, erect or sub-erect, emerging from the base of the pseudobulbs or rhizome near the base of the pseudobulbs, 6.5–25.5 cm long; laxly bearing (–3) 5–14 (–16) flowers; peduncle terete, 4.5–10.0 cm long, 2 to 3 sheathing bracts, deflexed at distal portion whilst blooming. *Sheathing bracts* oblong-lanceolate, 6–12 mm long, glabrous; rachis (–2.5) 4–12 (–16) cm. *Flowers* not fully open, 2–5 mm across, yellow to reddish-brown. *Floral bracts* lanceolate, 3–4 × 1.0–1.4 mm, apex acuminate, glabrous; pedicel and ovary, 5–7 mm long, glabrous, yellowish green; *dorsal sepal* oblong, 6.3–7.8 × 2.0–2.2 mm, apex acute, margin entire, yellowish-green to red, 3-veined; *lateral sepals* obliquely oblong-lanceolate, 6.7–8.0 × 1.8–2.1 mm, apex acuminate, margin entire or inconspicuously crenate, more than ½ of the inner margin connate, yellow with red stripes; *petals* broadly oblong-obovate, 2–3 × 1.0–1.2 mm, apex truncate or rounded, apiculate, margin entire, with a red spot in the middle, 3-veined. *Labellum* ovate-oblong, 2.7–3.0

× 1.3–1.5 mm, apex obtuse, papillose, deflexed near the apex, attached to the end of the column-foot by a mobile joint, greenish-yellow abaxially, and yellowish-green with a red tinge or red flush adaxially, margin reddish or yellowish-green with a red tinge, with two high ridges close to the edge. *Column* quadrangular, ca. 1.0–1.1 × 0.8–1.0 mm, glabrous, green, with forward and incurved foot; foot rectangular, 1.5 mm long, glabrous, yellow; *stelia* 2, 0.8–1.0 mm long, with a tooth on the upper margin and round to triangular protrusion on the lower margin; *anther cap* oblong, c. 1 × 1 mm, verrucous abaxially, brown. *Pollinia* 4, 2 pairs, each pair unequal in size, fusiform, 0.3–0.5 mm long, yellow. *Capsules* unknown.

PHENOLOGY: Flowering in February–April and fruiting in March–July.

HABITAT: *Bulbophyllum deergongense* occurs in warm broadleaved forests at an elevation of 1000–2000 m in association with *Dendrobium nobile* Lindl., *Bulbophyllum hirtum* (Sm.) Lindl., *Bulbophyllum spathulatum* (Rolfe ex E.W.Cooper) Seidenf., *Callostylis rigida* Blume, *Coelogyne articulata* (Lindl.) Rchb.f. and *Coelogyne prolifera* Lindl.

It is epiphytic on *Agapetes variegata* (Roxb.) D.Don ex G.Don, *Lyonia ovalifolia* (Wall.) Drude, *Quercus griffithii* Hook.f. & Thomson ex Miq. and *Rhododendron arboreum* Sm.

DISTRIBUTION: Bhutan (Wangdue Phodrang, Fig. 2) and China (Tibet Autonomous Region). An additional population has been observed in Zhemgang District; however, due to the absence of a voucher specimen, it has not been included in the distribution map.

SPECIMEN EXAMINED: BHUTAN: Wangdue District, Athang Gewog, near Athang Lake, 1270 m, 27.292278°N, 90.108647°E, 08 March 2025, *P. Gyeltschen 483* (THIM21793, THIM21794, THIM21795, THIM21796, THIM21797).

NOTES: In the original description, *Bulbophyllum deergongense* was differentiated from *Bulbophyllum reptans* (Lindl.) Lindl. in having cylindrical pseudobulbs with prominent ridges, pseudobulbs distantly placed on the rhizome, 15–20 cm apart; inflorescences with 12–15

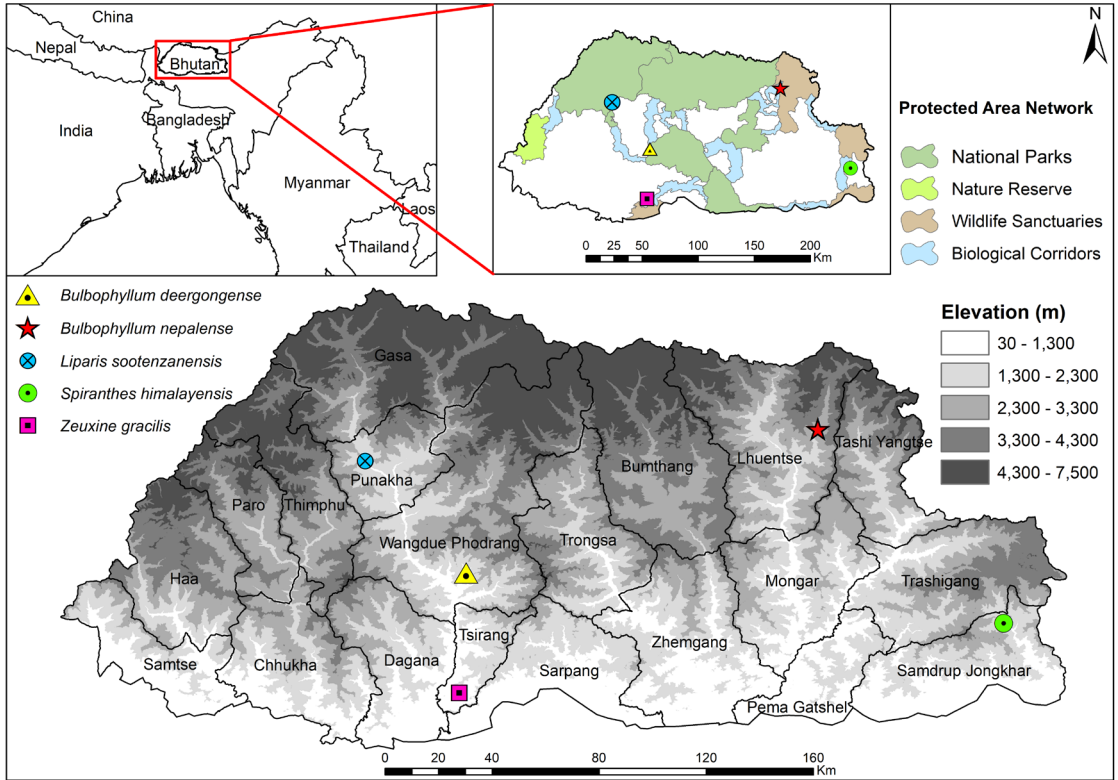


FIGURE 2. Distribution map of *Bulbophyllum deergongense*, *B. nepalense*, *Liparis sootenzanensis*, *Spiranthes himalayensis* and *Zeuxine gracilis* in Bhutan. Map by Phub Gyeltshen.

flowers (vs. 3–6 flowers); flowers yellowish green without stripe, with a purple-brown rounded spot at the apex, dorsal sepal with prismatic projection abaxially and lateral sepals yellowish green, without stripes (Miao *et al.*, 2023). However, specimens of *B. deergongense* from Bhutan have yellowish-green sepals with red striations; petals broadly oblanceolate or spatulate, white with a rounded reddish spot at the apex, 3 prominent veins, margins entire or with a few small teeth towards the apex, apex truncate or rounded, sometimes apiculate; labellum deflexed less in the middle, with papillate hairs towards the apex abaxially. Therefore, *B. deergongense* can be morphologically differentiated from *B. reptans* by floral bracts shorter than pedicel (vs. longer floral bracts), and petals broadly oblanceolate or spatulate with rounded reddish spot at the apex, three prominent red veins (vs. oblong to oblong-elliptic petals without spot and whitish striations).

Bulbophyllum deergongense has been placed in the *Bulbophyllum* section *Reptantia* J.J.Verm. (Miao *et al.*,

2023) because it has branched and creeping rhizome, pseudobulbs with single persistent leaf, inflorescence an elongate raceme arising from the basal node of the new shoot and with laxly arranged flowers, dorsal sepal 3-veined, lateral sepals spreading, petals half as long as dorsal sepal, labellum mobile, and stielidia almost falcate with a tooth along the lower margin (Pearce *et al.*, 2001; Vermeulen *et al.*, 2014). Section *Reptantia*, as circumscribed by Vermeulen *et al.* (2014), is most similar to *Bulbophyllum* section *Adelopetalum* (Fitz.) J.J.Verm., particularly in having petals that are half as long as, or shorter than, the dorsal sepal. It is distinguished by its inflorescence that arises from the basal nodes of newly developing shoots (Vermeulen *et al.*, 2014). Biogeographically, section *Reptantia* is predominantly distributed across East, South, and South-east Asia (Chen & Vermeulen, 2009; Pearce & Cribb, 2002), whereas section *Adelopetalum* is largely confined to Australia and New Zealand (Simpson *et al.*, 2024; Vermeulen, 1993).

Bulbophyllum nepalense Raskoti & Ale, Edinburgh J. Bot. 70(2): 381. 2013. Fig. 3.

TYPE: Nepal. Sivapuri National Park, 2300 m, 3 August 2010, R. Bhakta B.325 (holotype: KATH!).

Plant epiphytic, 10–12 cm tall. *Rhizome* thick, covered with fibrous sheaths, 10–13 × 4–5 mm. *Roots* emerging from all along the rhizome. *Pseudobulbs* narrowly conical, 2.0–3.2 × 0.8–1.1 cm, lightly angular with longitudinal furrows, glabrous, green. *Leaf* solitary, petiolate; petiole 5–6 mm long, obliquely notched on the pseudobulb, green; lamina oblong-elliptic, 5.0–7.7 × 0.8–1.2 cm, leathery, apex subacute, margin entire, base slightly attenuate. *Inflorescence* sub-umbellate, erect or sub-erect, emerging from the base of the pseudobulbs; 5 to 10 flowered; peduncle terete, 4.5–8.0 cm long, covered with 2 to 3 sheathing bracts, green with dark brown streaks, deflexed at distal portion whilst blooming. *Sheathing bracts* oblong-lanceolate, 7–10 mm long, glabrous, upper sheathing bracts lime green, basal bracts brown. *Flowers* resupinate, 2.0–3.2 cm long, golden yellow. *Floral bracts* lanceolate, 5.5–7.0 × 1.0–2.0 mm, apex acuminate, glabrous, pale greenish white or yellowish-green; pedicel and ovary, 5.5–7.0 mm long, glabrous, yellowish green; *dorsal sepal* oblong, 3.8–4.2 × 1.8–2.0 mm, apex obtuse or unevenly dentate, glabrous towards apex and papillate at the base, pinkish with three prominent red veins, margin entire; *lateral sepals* obliquely oblong-lanceolate, 1.4–2.5 × 0.2–0.3 cm, apex acuminate, papillate at base and glabrous towards apex, base yellow with three red stripes and yellow distally, lower margin connate towards the base, upper margin free at the base and connate towards the apex, base oblique; *petals* obliquely oblong, 2.8–3.0 × 1.8–2.0 mm, apex obtuse, margin entire and red, glabrous, pinkish with three red veins. *Labellum* ovate, 2.0–2.5 × 1.0–1.5 mm, apex subacute, deflexed in the middle, attached to the end of the column-foot by a mobile joint, base grooved, maroon abaxially, maroon with golden yellow adaxially. *Column* quadrangular, ca. 1 × 1 mm, with forward pointed and incurved foot, glabrous, red; foot rectangular, 1.6–2.0 × 1.0–1.3 mm, glabrous, yellow; *stelia* 2, narrowly triangular, ca. 1 mm long, with adaxial teeth present; *anther cap* ca. 1.1 × 1.0 mm, brown. *Pollinia* 4, fusiform, c. 1 mm long. *Capsules* unknown.

PHENOLOGY: Flowering in July–August and fruiting unknown.

HABITAT: *Bulbophyllum nepalense* was found growing as an epiphyte on the *Alnus nepalensis* D. Don and *Juglans regia* L. trees in the cool broadleaved forest at 2140 m elevation.

DISTRIBUTION: Nepal (Shivapuri National Park) and Bhutan (Lhuentse-Bumdeling Wildlife Sanctuary, Fig. 2).

SPECIMEN EXAMINED: Lhuentse, Khoma Gewog, Tshango area, 2140 m, 27.77526 N, 91.29000E, 13 August 2023, K. Sangay 355 (THIM18793).

NOTES: *Bulbophyllum nepalense* has been placed in the sect. *Cirrhopetalum* (Lindl.) Rchb.f. (Raskoti & Ale, 2013). It is epiphytic on shrubs growing in the moist humid area in the oak forest at an elevation of 2300 m, and it flowers from July to August in Nepal (Raskoti & Ale, 2013). *Bulbophyllum nepalense* differs from *Bulbophyllum retusiusculum* Rchb.f. by its narrowly ovoid-conical pseudobulbs (Raskoti & Ale, 2013), sepals broader at base, ovate labellum with two ridges with minutely colliculate on the adaxial surface. According to Pridgeon *et al.* (2014), *Bulbophyllum* sect. *Cirrhopetalum* (Lindl.) Rchb.f. has a creeping rhizome, subumbellate inflorescence arising from the base of the one-leaved pseudobulb, pedicellate ovary of the lowermost flower twice as long as rachis or longer, petals (partly) ciliolate, fimbriate or paleate, and stelia with an antrorse tooth on the adaxial surface. However, the holotype has entire or scabrid petals and stelia without an antrorse tooth on the adaxial surface (Raskoti & Ale, 2013). The analysis of the same species from Bhutan also suggests that *B. nepalense* has entire petals, sepals twisted proximally, connate along upper margins, stelia tapering towards the apex, with a triangular tooth along the upper margin, and a labellum undivided. Therefore, we propose, *B. nepalense* to be placed under the *Bulbophyllum* section *Brachyantha* Rchb.f.

Liparis sootenzanensis Fukuy., in Ann. Rep. Taihoku Bot. Gard. 3: 84. 1933. *Liparis macrantha* var. *sootenzanensis* (Fukuy.) S.S. Ying, Coloured III.

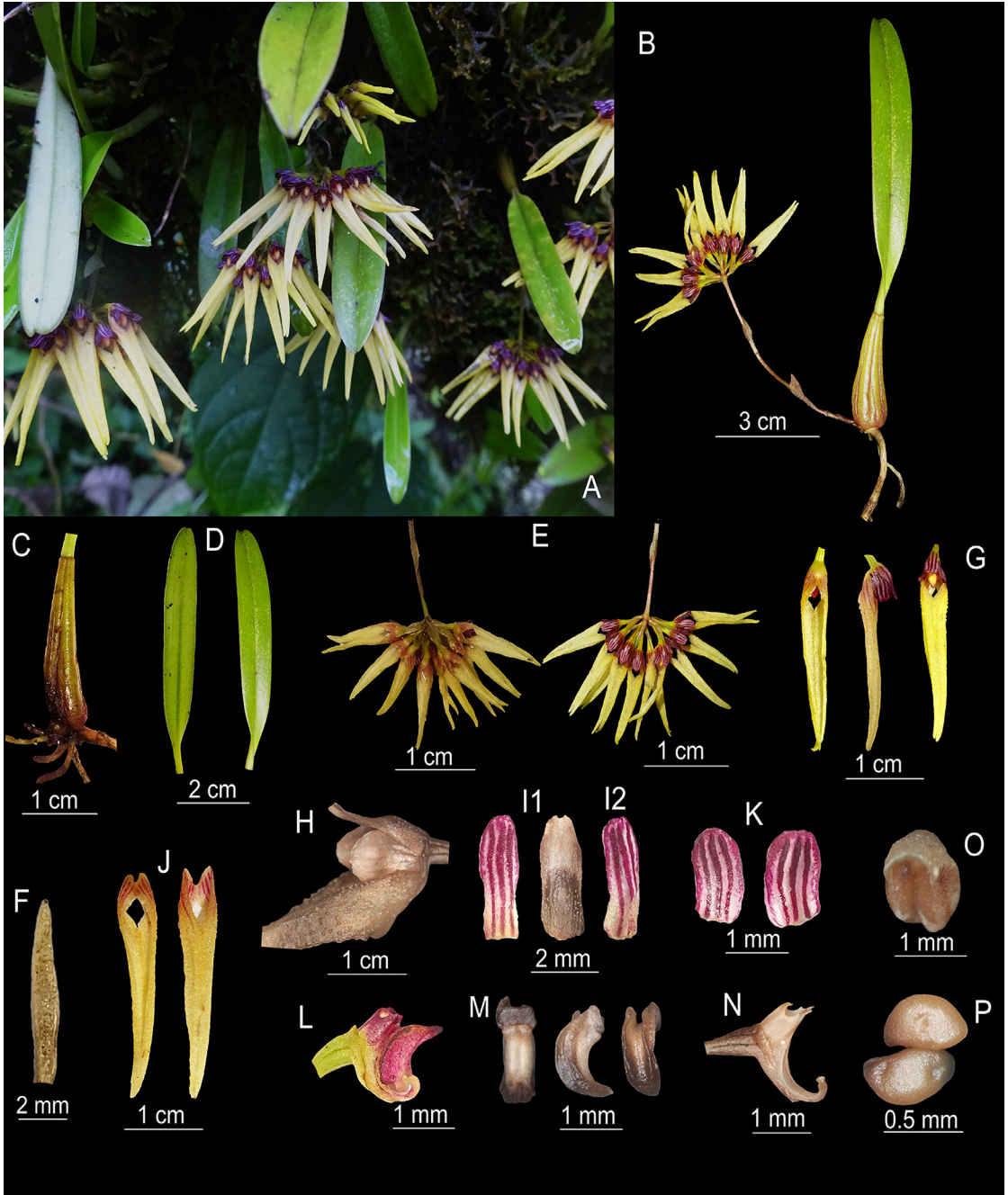


FIGURE 3. *Bulbophyllum nepalense* Raskoti & Ale. A. Plant in its natural habit. B. Habit. C. Pseudobulb. D. Leaf, abaxial and adaxial views. E. Inflorescence, abaxial and adaxial views. F. Floral bract, adaxial view. G. Flowers, abaxial, lateral and adaxial views. H. Close up flower, lateral view. I1–2. Dorsal sepal, abaxial and adaxial views. J. Lateral sepals, abaxial and adaxial views. K. Petal, abaxial and adaxial views. L. Column with labellum attached, lateral view. M. Labellum, abaxial, lateral and adaxial views. N. Column, lateral view. O. Anther cap with pollinia attached, adaxial view. P. Pollinia, lateral view. Photographs by Karma Sangay (A–G, J–L) and Phub Gyeltshen (H, I, M–P). Illustration assembled by Phub Gyeltshen based on K. Sangay 355 (THIM).

Indig. Orchids Taiwan 1(2): 224. 1977; *Liparis nigra* var. *sootenzanensis* (Fukuy.) T.S.Liu & H.J.Su, Fl. Taiwan 5: 1047. 1978; *Diteilis sootenzanensis* (Fukuy.) M.A.Clem. & D.L.Jones, Orchadian 15(1): 41. 2005; *Empusa sootenzanensis* (Fukuy.) T.C.Hsu, III. Fl. Taiwan 2: 20. 2016. Fig. 4.

TYPE: Taiwan. Shinchiku, Minamisooten-zan, May 1933, *N. Fukuyama 4104* (holotype: KPM!).

Plant terrestrial herb, 20–46 cm tall. *Stems* 2–3, borne in tight clusters on short rhizomes, erect, bearing 3–4 leaves clustered at the apex, the older ones leafless. *Pseudobulbs* cylindrical-conoid, 8–12 × 2–2.5 cm, 3–4-noded, enclosed in papery sheaths. *Basal sheaths* triangular, 1.5–8.7 × 2.0–4.6 cm; middle and apex sheaths oblong-lanceolate, 12.5–13.6 × 3.8–4.3 cm, green, 9-veined, prominent. *Leaves* oblique, elliptic 18–23 × 7.5–9.6 cm, plicate, apex acute, margin undulate, sheathing at base, green, 7–10-veined; sheathing base 2.8–4.6 cm long. *Inflorescence* terminal, erect, arising from stem apex between leaf bases, 20.0–33.5 cm long; peduncle 10–15 cm long, with 1 small deltoid sterile bract, 10–12 × 3.5–4.0 mm, abaxial midvein prominent; rachis 10.0–18.5 cm long, bearing 10–34 laxly to sub-densely arranged flowers, ridged, green. *Floral bracts* ovate-triangular, 3–7 × 2–4 mm, apex acuminate, green. *Flowers* 13–20 mm across, petals and sepals spreading backwards and curved, green flushed orange-yellow, becoming orange with age; pedicel and ovary patent, arching upwards at the apex, 8–25 mm long, ridged, green; *dorsal sepal* linear, 13.5–14.0 × 2.8–3.0 mm, arching forwards over column, apex obtuse, margins rolled backwards; *lateral sepals* oblong-lanceolate, 12–14 × 3.8–4.0 mm, apex obtuse, margins rolled backward; *petals* linear, 12.5–13.0 × 1.0–1.1 mm, apex acute; *labellum* flabellate, 13.7–14.0 × 8.6–10.0 mm, slightly notched at apex, strongly decurved above the base and rolling backwards at middle, apical margins serrulate, distinctly longitudinally grooved at centre, bearing 2 bulbous calli near base which give rise to 2 diverging ridges that extend to below the middle, lateral margins cuneate and entire below widest point. *Column* clavate, arching forwards, 6–7 × 1.0–1.1 mm, winged, with a pair of small triangular stelia below the apex; anther cape, orbicular, cape c. 1 × 1 mm. *Pollinia* 4 in 2 pairs, clavate, 0.5 mm long, orange. *Capsules* ellipsoid-obovoid, 1.5–2.2 cm long.

PHENOLOGY: Flowering occurs from late April to May.

HABITAT: *Liparis sootenzanensis* grows in the marshy area in the subtropical forest at 1400 m in elevation.

DISTRIBUTION: Bhutan (Punakha, Fig. 2), China, India, Japan, Laos, Taiwan, Thailand and Vietnam. An additional population has been observed in Tashiyangtse; however, due to the absence of a voucher specimen, it has not been included in the distribution map.

SPECIMEN EXAMINED: Punakha, Goenshari Gewog, Rimchu area, 1415 m, 27.6677N, 89.7688E, 29 May 2024, *P.Gyeltshen & K.Rabgay 267* (THIM22890, THIM22891).

NOTES: In Bhutan, *Liparis sootenzanensis* differs from *Liparis nervosa* (Thunb.) Lindl. by large green flowers and with serrulate apical margins of the labellum. *Liparis sootenzanensis* is also similar to *L. gigantea* C.L.Tso, which is widely distributed from the Indo-Myanmar region to Southeastern China and Taiwan. It can be distinguished by the absence of prominent, rounded to triangular wings at the column apex (vs. presence of prominent round or triangular-shaped wings).

Spiranthes himalayensis Survesw., Kumar & Mei Sun, PhytoKeys 89: 118. 2017. Fig. 5.

TYPE: India. Manipur, Ukul district, Imphal-Jessami road, 1 May 2016. *S.Surveswaran 1* (JCB 1001) (holotype: JCB!).

Plant terrestrial herbs with tuberous roots, 10.0–30.5 cm tall. *Tubers* terete, 7–13-numbered, 1.5–6.5 cm long, 2–5 mm in diameter, creamy brown. *Stem* erect, 1.5–2.5 cm long, green, leaf clustered towards the base. *Leaf* 5 to 13 per plant; lamina linear-lanceolate, 3.7–7.3 × 0.4–0.9 cm, obscurely 5-veined with depression on the upper surface and elevated lining underneath, mid-vein prominent. *Inflorescence* racemose, up to 28.2 cm long, terete, up to 5 sterile bracts sheathing the peduncle; peduncle terete, 10.5–11.5 cm long, glabrous towards base, glandular-pubescent towards apex; rachis 16.5–17.5 cm long, glandular-pubescent, flowers spirally arranged, flowers evenly distributed along the rachis, flowers opening from the

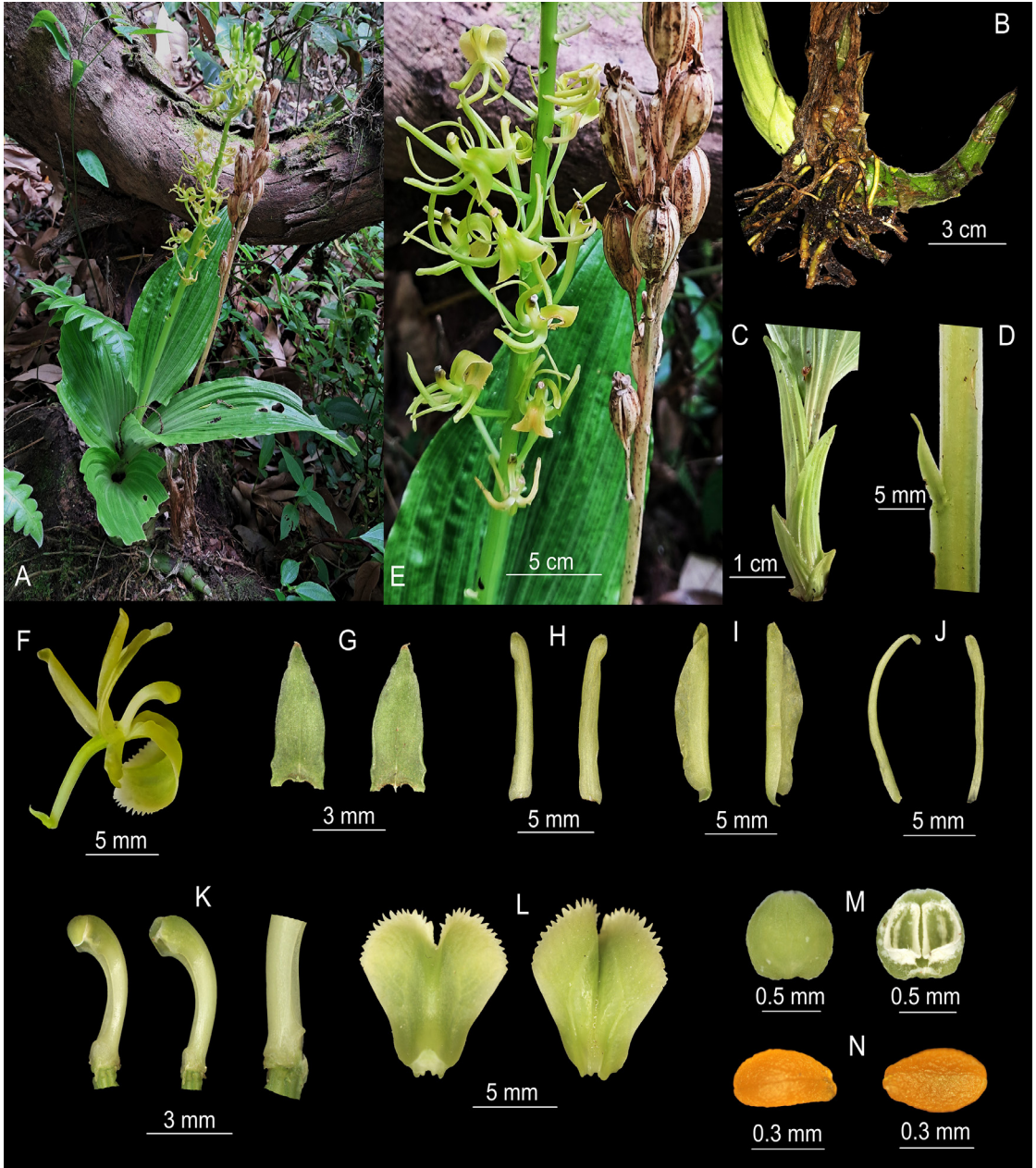


FIGURE 4. *Liparis sootenzanensis* Fukuy. A. Habit. B. Rhizome. C. Basal sheaths, lateral view. D. Portion of stem with sterile bract attached. E. Inflorescence. F. Flower, lateral view. G. Floral bracts, abaxial and adaxial views. H. Dorsal sepal, abaxial and adaxial views. I. Lateral sepal, abaxial and adaxial views. J. Petal, abaxial and adaxial views. K. Column, lateral view. L. Labellum, abaxial and adaxial views. M. Anther cap, abaxial and adaxial views. N. Pollinia, abaxial and lateral views. Photographs and illustrations assembled by Phub Gyeltshen based on P.Gyeltshen & K.Rabgay 267 (THIM).

base, pubescent abaxially with glandular hairs. *Sterile bracts* linear-lanceolate, 15–30 × 2.5–3.2 mm, apex acuminate, glabrous, green. *Floral bracts* linear-lan-

ceolate to lanceolate, 5–13 × 1.5–3.0 mm, longer than the combined length of pedicel and ovary, apex acuminate, margin entire, white, green. *Flowers* widely

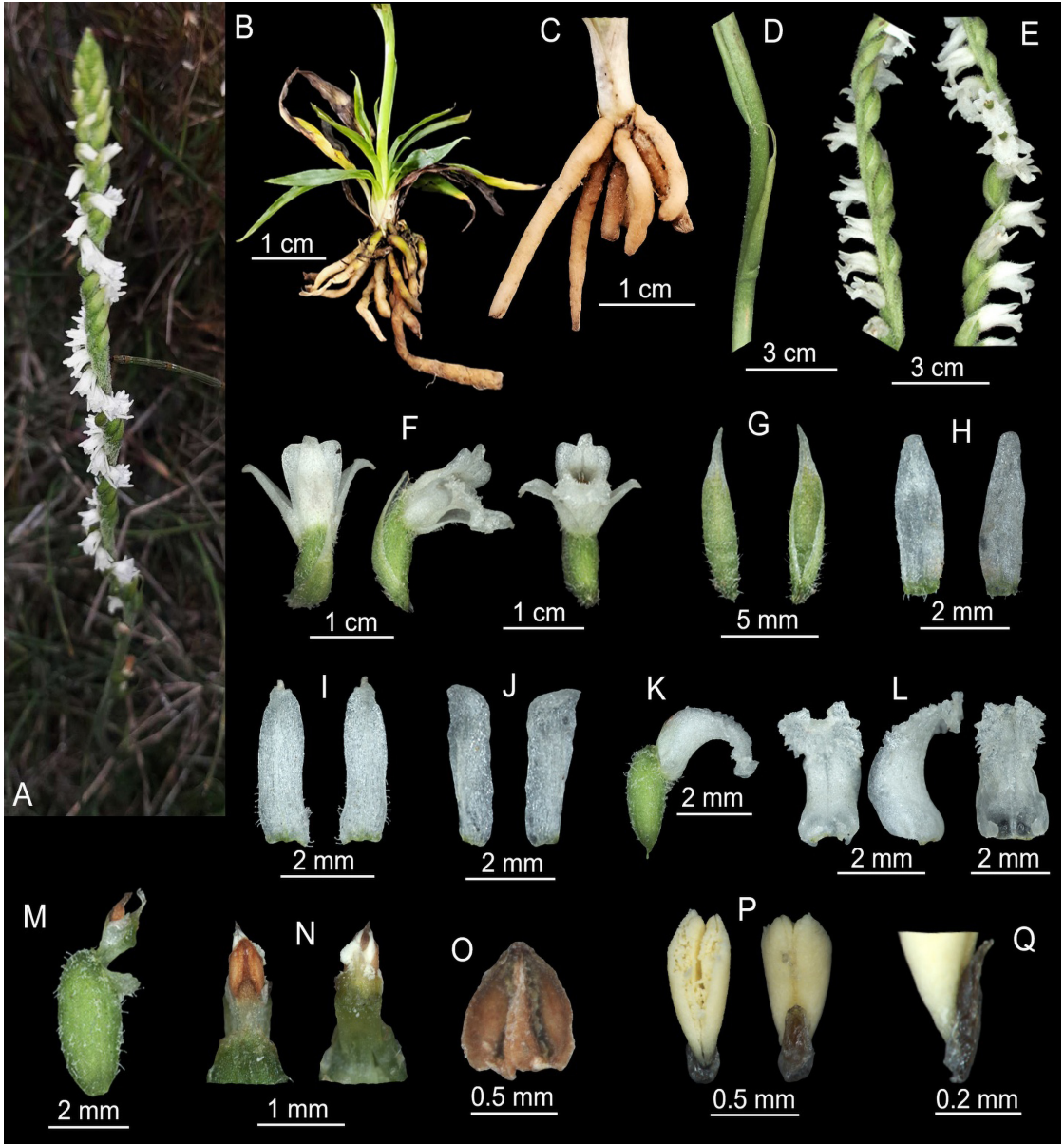


FIGURE 5. *Spiranthes himalayensis* Survesw., Kumar & Mei Sun. **A.** Habitat. **B.** Roots and leaves. **C.** Tubers. **D.** Portion of stem with bract attached. **E.** Portion of Inflorescence. **F.** Flower, abaxial, lateral and adaxial views. **G.** Floral bract, abaxial and adaxial views. **H.** Dorsal sepal, abaxial and adaxial views. **I.** Lateral sepal, abaxial and adaxial views. **J.** Petal, abaxial and adaxial views. **K.** Ovary with labellum attached. **L.** Labellum, abaxial, lateral and adaxial views. **M.** Ovary with column and androecium attached, lateral view. **N.** Column with androecium attached, abaxial and adaxial views. **O.** Anther cap, adaxial view. **P.** Pollinaria with viscidium attached, abaxial and adaxial views. **Q.** Viscidium, lateral view. Photographs by Pema Tobgay (A) and Phub Gyeltshen (B–Q). Illustration assembled by Phub Gyeltshen based on *P. Gyeltshen & P. Tobgay 485* (THIM).

open, recurved, white; *dorsal sepal* oblong-ovate or broadly lanceolate, 3–5 × 1.5–2.0 mm, apex obtuse; *lateral sepals* obliquely oblong to oblong-lanceolate,

3.8–5.0 × 1.5–2.0 mm, apex acute to obtuse; *petals* linear, 3.6–4.0 × 1.0–1.2 mm, apex obliquely rounded, glabrous. *Labellum* distinctly divided into hypochile

and epichile with a constriction in the middle, 3.8–4.5 mm; hypochile broadly ovate to suborbicular when flattened, 2.0–3.0 × 2.0–3.0 mm, concave, attached at the base of short foot below the column, saccate, with one semi-globular gland on each side, margin entire and raised upwards till the constriction; epichile oblong or broadly obovate, 1.5–2.0 × 1.3–2.0 mm, margin undulate, dentate with dense papillose hairs adaxially. *Column* obconical, ca. 1.0 × 0.5–8.0 mm, with a short foot at the base, ca. 0.2 mm long, stigma at the apex on the lower side, green in colour, shiny, filled with viscid liquid. *Rostellum* well developed with two semi-transparent, clavate, rostellum arms projecting in the front above the stigma, 0.5–1.0 mm long. *Pollinarium* elliptic from the side outline, with a deep cleft, ca. 1.2 × 0.5 mm, narrower end at both the apex, lobes inside covered with an operculum, with a ligulate viscidium at the narrower end, creamy white; *viscidium* rhombic, 0.4–0.5 × 0.20–0.22 mm, brown. *Operculum* ovate to deltoid, convex, ca. 1.0–1.3 × 1.0 mm, yellow-brown coloured, partly embedded on the upper part of the column, not free. *Ovary* subsessile, fusiform, 3.0–5.0 × 1.5–2.0 mm, sparsely to densely glandular-haired, green. *Capsules* unknown.

PHENOLOGY: Flowering occurs from late April to May.

HABITAT: *Spiranthes himalayensis* grows along the stream and river banks at 1000–1300 m elevation in association with *Ageratina adenophora* (Spreng.) R.M.King & H.Rob. (Asteraceae), *Cheirostylis yunnanensis* Rolfe (Orchidaceae) and *Berberis* L. sp. (Berberidaceae).

DISTRIBUTION: The global distribution remains unclear until its taxonomic ambiguity relative to *Spiranthes flexuosa* (Sm.) Lindl. is resolved; see note below. Until then, we consider *S. himalayensis* as a distinct species (Fig. 2).

SPECIMEN EXAMINED: BHUTAN: Samdrup Jongkhar District, Lauri Gewog, Jompa area, left bank of the Jomo river, 1300 m, 27.122069°N, 91.913789°E, *P.Gyeltshen* & *P.Tobgay* 485 (THIM21799).

NOTES: According to Surveswaran *et al.* (2017), *Spiranthes himalayensis* is similar to *Spiranthes hongkongensis* S.Y.Hu & Barretto in having pubescent

glandular hairs on the inflorescence and white flowers, but differs in being allogamous (*vs.* autogamous), rostellum well-developed (*vs.* rostellum absent or inconspicuous), basal callosities semi-globular (*vs.* trapezoid), epichile margin is undulate and slightly dentate with papillose hairs (*vs.* margin is undulate and slightly dentate, and glabrous), flowers 4–5 mm wide (*vs.* 1.0–1.2 mm wide). Molecular studies support it as distinct species clade, sister to *S. nivea* T.P.Lin & W.M.Lin (Surveswaran *et al.*, 2017).

Recently, Pace *et al.* (2019) synonymised *S. himalayensis* under *Spiranthes flexuosa*. Based on the protologue, *S. himalayensis* differs from *S. flexuosa* by petals oblong (*vs.* lanceolate), semi-circular basal gland (*vs.* conical or obovate basal gland), and column 2.5 mm long (*vs.* 1.7–2.2 mm long). Additionally, based on the present study, *S. himalayensis* differs from *S. flexuosa* by rhombic viscidium (*vs.* linear). Further investigation is needed; for now we retain the two as separate species.

Zeuxine gracilis (Breda) Blume, Coll. Orchid.: 69:1858. *Psychechilos gracilis* Breda in Gen. Sp. Orchid. Asclep. 2: t. 9. 1829; *Monochilus gracilis* (Breda) Lindl. in Fol. Orchid.: 5.1854; *Adenostylis gracilis* (Breda) Merr. in J. Straits Branch Roy. Asiat. Soc. 84: 141. 1921. Fig. 6–7.

TYPE: Breda in Gen. Sp. Orchid. Asclep. 2: t. 9. 1829 (Lectotype [Icon]-designated by Bhattacharjee *et al.* 2011).

Plant terrestrial herbs, 10.5–29.5 cm tall. *Rhizome* 1.0–3.5 cm long, 1.6–4.1 mm thick, pale green, creeping, terete, rooting at nodes. *Roots*, pale brown, fleshy, with minute root hairs. *Stem* 2.5–10.0 cm long, 1.7–4.0 mm thick, brownish to pale green, erect, glabrous, with few membranous sheaths formed by withered leaf bases. *Leaf* 3–8, scattered along the stem or crowded near apex, glabrous; petiole 6–7 mm long, sheathing at base; lamina ovate to ovate-lanceolate, 1.5–4.1 × 0.7–1.8 cm, acute to acuminate at apex, base cuneate, green, 5–9-veined. *Inflorescence* racemose, terminal, 17.0–19.7 cm long, sub-densely up to 26-flowered, brown, pubescent peduncle 9–12 cm long, with 2–3 sheathing bracts; rachis 6.0–8.3 cm long; *sheathing bracts* ovate-lanceolate, 8.0–13 mm long, clasping at 1/4 to 1/3 of the sheath, apex acuminate, pubescent out-

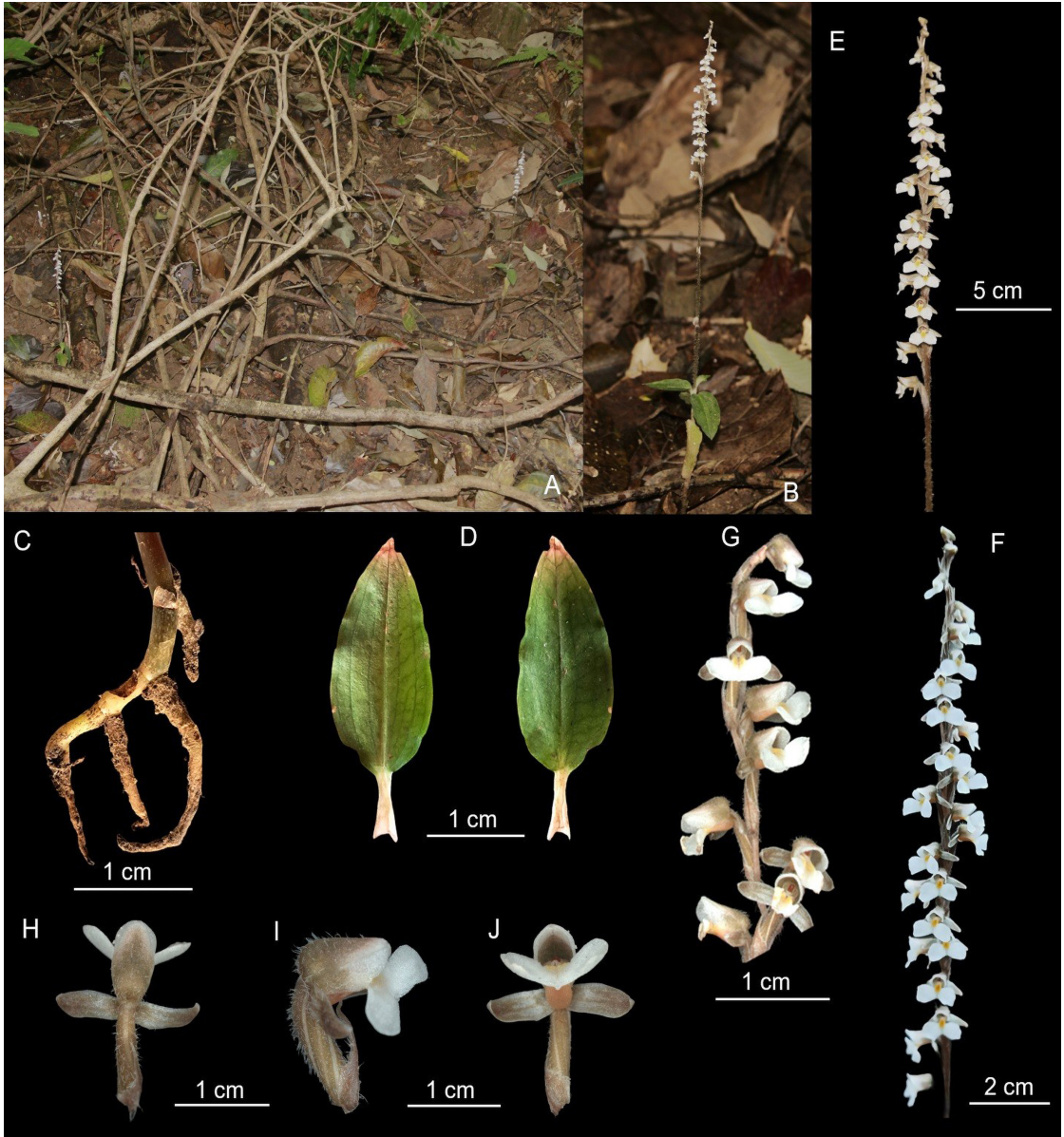


FIGURE 6. *Zeuxine gracilis* (Breda) Blume. A–B. Plant in the habitat. C. Rhizome. D. Leaf, abaxial and adaxial views. E–F. Inflorescence. G. Upper portion of inflorescence. H–J. Flower, abaxial, lateral and adaxial views. Photographs by Kezang Tobgay (A–B, E–F) and Phub Gyeltshen (C–D, G–J). Illustration assembled by Phub Gyeltshen based on *P. Gyeltshen et al.* 482 (THIM).

side, pale brown. *Floral bracts* ovate-lanceolate, 5–8 × 2–3 mm, shorter or longer than pedicel and ovary, apex caudate, pubescent abaxially, pale white. *Flowers* 5–8 mm across, brown, resupinate; pedicel and ovary fusiform, 4–6 mm long, twisted, pubescent, brown; *dorsal sepal* ovate, 3–5 × 2–3 mm, apex obtuse, sparsely pubescent abaxially; *lateral sepals* oblong-ovate to

ovate-lanceolate, 4–5 × 1.5–2.0 mm, spreading, apex obtuse, margin incurved, sparsely pubescent abaxially; *petals* obliquely elliptic or oblong-elliptic, 3.0–4.9 × 1.6–2.0 mm, apex obtuse, pale brown base with white apex portion, glabrous, 1-veined. *Labellum* 3.5–5.0 mm long; *hypochile* saccate, sub-globose 1.2–2.0 × 1.0–1.5 mm, pale reddish-orange, with 1 filiform gland

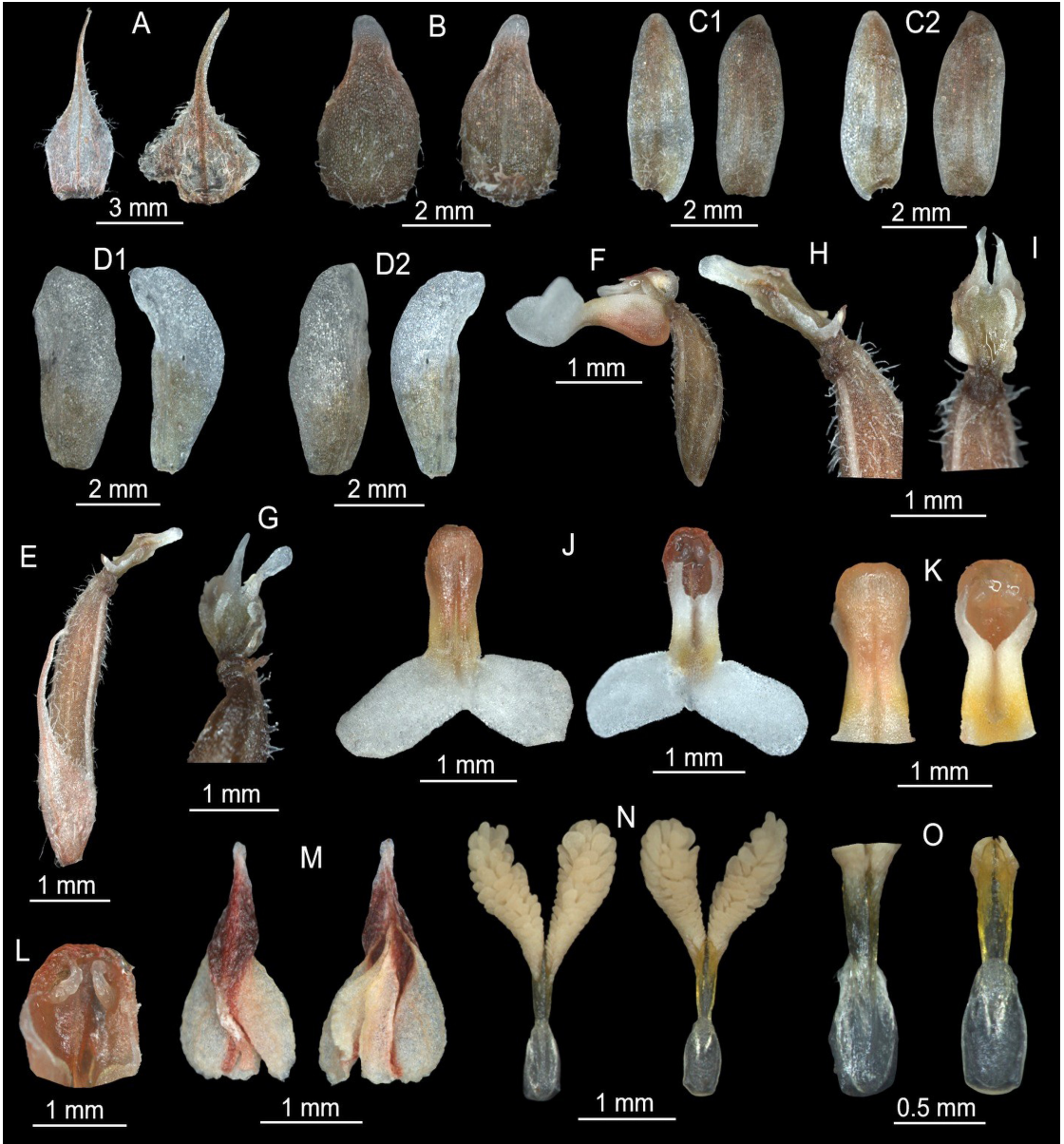


FIGURE 7. *Zeuxine gracilis* (Breda) Blume. **A.** Floral bracts, abaxial view. **B.** Dorsal sepal, abaxial and adaxial views. **C1–2.** Lateral sepals, abaxial and adaxial views. **D1–2.** Petals, abaxial and adaxial views. **E.** Ovary with floral bract attached. **F.** Ovary with labellum attached. **G–I.** Column, abaxial, lateral and abaxial views. **J.** Labellum, abaxial and adaxial views. **K.** Labellum hypochile & mesochile, abaxial and adaxial views. **L.** Labellum hypochile, adaxial view. **M.** Anther cap, abaxial and adaxial views. **N.** Pollinarium, abaxial and adaxial views. **O.** Stipe and Viscidium, abaxial and adaxial views. Photographs and illustrations assembled by Phub Gyeltshen based on *P. Gyeltshen et al.* 482 (THIM).

on each side; *mesochile* oblong, 1.2–1.5 × 0.8–1.0 mm, margin incurved, white with golden yellow adaxially, orange-yellow abaxially; *epichile* 2-lobed, lobes oblong or broadly obovate, 1.5–2.3 × 1.1–2.0 mm, white.

Column 0.8–1.5 mm long, pale brown, with elongated 2 wings; *steldia* narrowly deltoid and oblanceolate, 0.7–1.0 mm long, white; without wings but with a seam with 2 upwards oblong process-like below ros-

tellum; *anther cap* lanceolate, 1.5–2.0 × 0.7–1.0 mm, red to white. *Pollinarium* 1.7–2.2 mm long; *pollinia* 2, obovate to obclavate, 1.0–1.3 mm long; *stipe* oblong-elliptic, 0.5–0.7 × 0.2 mm, golden yellow; *viscidium* oblong, 0.4–0.5 × 0.2–0.3 mm, semi-transparent. *Capsules* unknown.

PHENOLOGY: Flowering occurs from late April to May.

HABITAT: *Zeuxine gracilis* grows in the *Schima wallichii* (DC.) Korth. (Theaceae) forest at 676 m. The associated species are *Nephrolepis cordifolia* (L.) C.Presl (Polypodiaceae) and *Oplismenus* P.Beauv. species (Poaceae).

DISTRIBUTION: Bhutan (Tsirang, Fig. 2), Borneo, China, India, Indonesia, Malaysia, Thailand and Vietnam.

SPECIMEN EXAMINED: BHUTAN: Tsirang District, Mendrelgang Gewog, Kaligon, 676 m, 26.8890°N, 90.0846°E, 23 February 2025, P.Gyeltshen, K.Tobgay, K.Dechen & S.Dema 482 (THIM21791, THIM21792).

NOTES: *Zeuxine gracilis* is similar to *Zeuxine affinis* (Lindl.) Benth. ex Hook.f. but differs by triangular sepals with short ciliate margins (*vs.* lanceolate with entire margins), orange-yellow labellum at base with whitish epichile (*vs.* white), oblong to sub-rectangular epichile, forming an obtuse angle with the axis of the labellum (*vs.* ovate-oblong, with acute angle) (Pearce

& Cribb, 2002; Ranjan *et al.*, 2020). Ranjan *et al.* (2020) reported *Z. gracilis* to have oblong-terete pollinia, 0.7–1.0 mm long, whereas, we find that pollinia are obovate to obclavate, 1.0–1.3 mm long.

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