



## NOTE

## Additions to Orchid Flora of Bhutan-I

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**ABSTRACT:** Eight orchid species, *Bulbophyllum caudatum*, *Bulbophyllum thaiorum*, *Bulbophyllum yingjiangense*, *Habenaria reniformis*, *Liparis glossula*, *Oberonia angustifolia*, *Peristylus aristatus*, and *Zeuxine augyokuana* are added to the orchid flora of Bhutan. The total orchid number for Bhutan now stands at 487 species. A brief description of all the species listed here is provided along with their flowering period, distribution in Bhutan, updated global distribution and photographic plates.

**KEY WORDS:** *Bulbophyllum*, *Habenaria*, *Liparis*, new record, *Oberonia*, Orchidaceae, *Peristylus*, *Zeuxine*.

### INTRODUCTION

Orchidaceae is one of the largest and most diverse families of the flowering plants. It comprises nearly 736 genera with 28,000 species worldwide (Christenhusz and Byng, 2016). In Bhutan, around 369 species were recorded by Pearce and Cribb (2002) along with additional 210 from neighbouring areas with a hope that they might also occur in Bhutan (Pearce and Cribb 2002). Gurung (2006) reported around 423 species, illustrating 319 of them, hence adding 54 new records. Since then, there has been an increase in the number of orchids reported with more rigorous surveys being undertaken and many new publication being made on the Bhutanese orchids (Dalström and Gurung 2013; Gyeltshen *et al.*, 2017; Dalström *et al.*, 2019; Rabgay and Kumar 2019; Gyeltshen *et al.*, 2019; Rabgay and Dalström, 2020; Zangpo *et al.*, 2019; Gyeltshen *et al.*, 2020a,b; Dechen *et al.*, 2020; Wangchuk *et al.*, 2020; Zangpo *et al.*, 2021). The total orchid number for Bhutan now stands at 487 species. However, despite tremendous work by earlier botanists on orchid flora in Bhutan, the orchid diversity in different parts of Bhutan still remain under-documented and a lot of work and scientific exploration is needed.

As a result of rigorous surveys conducted during 2018–2019, further eight species, hitherto new for the country were collected from various locations. These eight species are presented here with their brief description and additional information on flowering period, place of occurrence in Bhutan and updated global

distribution following Govaerts *et al.* (2021). The voucher specimens collected are either deposited at the National Biodiversity Centre (THIM), Thimphu or are available in the living collections as well as herbarium collections of Sherubtse College and College of Natural Resources, Royal University of Bhutan. However, the latter two herbaria is not yet recognized by Index Herbariorum, hence they do not have an acronym.

### ENUMERATION OF THE SPECIES

**1. *Bulbophyllum caudatum*** Lindl., Gen. Sp. Orchid. Pl.: 56 (1830); *Phyllorkis caudata* (Lindl.) Kuntze, Revis. Gen. Pl. 2: 677 (1891). **Type:** Nepal, Sanko, *N. Wallich* 1983 (K-LINDL!, AMES!, K-W!, W!)

#### Fig. 1A, B

Epiphytic herbs with 1 mm thick rhizome, lacking sheath. Pseudobulbs ovoid, grooved, about 1 cm long, 0.8 cm wide, placed on rhizome at intervals of 2 to 7 cm. Leaf solitary, ovate-lanceolate, acute, coriaceous, 1.5–3.2 cm long, 0.7–1.4 cm wide. Inflorescence arising from the base of the pseudobulb, erect, umbellate with 4–9-flowered, scape slightly longer than the length of pseudobulb. Flowers white, 1.5–2 cm long; dorsal sepal ovate, 2.3–2.5 mm long, 1.5–1.7 mm wide, acute, margin erose, forming a hood over the column; lateral sepals ovate at base with about 2–3 mm long, 1.5–2 mm wide, extending to a filiform apex of 1.5–2 cm long; petals 1.5–3.5 mm long, 0.5–0.6 mm wide, acute; lip oblong, up to 2–4 mm long, 0.4–0.6 mm wide; column very short, up to 1.5 mm long, stelia deltoïd, pointing towards the lip.



**Flowering:** June–July.

**Habitat:** Found growing as epiphytic species in broad-leaved forest at 500–2000 m.

**Specimens examined:** BHUTAN, Punakha, Toeb Gewog, D.B. Gurung *s.n.* (College of Natural Resources, Royal University of Bhutan, Bhutan).

**Distribution in Bhutan:** Toeb gewog, Punakha District.

**Global Distribution:** Bhutan, China, India, Myanmar and Nepal.

**Taxonomic Note:** *Bulbophyllum caudatum* Lindl., was placed under the synonymy of *B. sterile* (Lam.) Suresh by Pearce and Cribb (2002) along with *Cirrhopetalum caudatum sensu* (Lindl.) King & Pantl. This mistake continued in the treatment followed by Gurung (2006) and Dalström *et al.*, (2017). However, *B. sterile* is a species endemic to south India.

*Bulbophyllum caudatum* looks very close to *B. vaginatum* (Lindl.) Rchb.f. both bearing white clumped flowers with long lateral sepals, however, former is a much smaller plant where length of inflorescence do not exceed the length of single vegetative plant and the stielidia is much shorter (<0.5mm), whereas, it exceed the length of a single vegetative plant and length of stielidia is ≥1.0.mm) in latter.

**2. *Bulbophyllum thaiorum*** J.J.Sm., Bull.Jard. Bot. Buitenzorg, Ser.2, 8: 28 (1912); *Cirrhopetalum papillosum* Rolfe, Bull. Misc. Inform. Kew 1908: 70 (1908); *Bulbophyllum papillosum* (Rolfe) Seidenf. & Smitinand, Orch. Thail. (Prelim. List): 364 (1961), *nom. illeg.*; *Bulbophyllum thailandicum* Seidenf. & Smitinand, Orch. Thail. (Prelim. List): 797 (1965), *nom. illeg.* **Type:** Mountain round Chiangmai, Thailand (*Kerr s.n.* AMES! K!; *Kerr 104* AMES!, K!)

**Fig. 1C, D**

Plants epiphytic or lithophytic, 6.4–10 cm tall. Pseudobulbs ovoid-conical, 1.8–3 cm long, 1–1.6 cm wide, covered with thin fibrous sheaths, inserted at gaps of 2 cm along rhizome. Leaf solitary, linear-oblong, 4.6–7.7 cm long, 1.3–1.8 cm broad, obliquely retuse, shortly petiolate. Inflorescence arising from the base of the pseudobulb, erect, slender, umbellate with 5–11-flowered. Floral bract narrowly lanceolate, acuminate, 2 cm long, 0.2 cm wide. Flowers opening simultaneously, 3.6–4 cm long, 0.5 cm wide; dorsal sepal, oblong-ovate, 0.6 cm long, 0.3 cm wide, transparent with purple stripe, retuse, margin ciliated towards apex; lateral sepal linear-oblong, fused, 2.8 cm long, 0.6 cm wide, thickly papillose at base and lightly papillose towards apex; petals broadly elliptic, 0.5 cm long, 0.3 cm wide, purple stripes, apex rounded, margin ciliated towards apex; lip fleshy, rigid, narrowly oblong, decurved, 0.3 cm long, upper surface yellowish, lower surface yellowish with red stains; column stout, 0.18 cm long, stielidia pointed, projecting forwards.

**Flowering:** September–October

**Habitat:** It was found growing on shrub branches in cool broadleaved forest at an elevation of 1992 m.

**Specimens examined:** BHUTAN, Trashigang, Wamrong, 06 October 2019, K. Rabgay 20191006-08 (THIM!).

**Taxonomic Note:** Pseudobulbs were originally described as elliptic oblong, with leaves up to 4 cm long, however, in Bhutan plants pseudobulbs are ovoid-conical and leaves are more than 4 cm long (up to ~7 cm).

**Distribution in Bhutan:** Wamrong, Trashigang District.

**Global Distribution:** Bhutan, Thailand and Vietnam.

**3. *Bulbophyllum yingjiangense*** B.M.Wang & J.W.Zhai, Phytotaxa 298 (1): 79 (2017). **Type:** China, Yunnan, Yingjiang, Xima, *Zhai 0180* (IBSC-Holotype)

**Fig. 1E, F**

Epiphytic herbs with stout rhizome, densely covered with short tubular sheaths. Pseudobulb ovoid, 3.0–5.5 cm long, 1.2–2.0 cm wide, placed 2.0–3.0 cm apart, ribbed on four sides, glabrous, with brown scaly sheaths at the base. Leaf single, broadly elliptic, 14.0–16.0 cm long, 4.5–5.5 cm wide, apex obtuse, succulent, base cuneate into a short petiole. Inflorescence arising from the base of the pseudobulbs, terete with 3–4 sterile bracts, 10.5–12.0 cm long, bearing up to 4 flowers; pedicel and ovary 1.5–2.3 cm long, terete. Flower yellowish-green, 4.0–4.5 cm long, 1.5–1.8 cm wide; floral bracts unequal; dorsal sepal ovate, 1.3–1.5 cm long, 0.5–0.8 cm wide, cymbiform, margin ciliate of up to 0.3 cm length, apex acuminate with a few appendage; lateral sepal broadly lanceolate, ca. 5 cm long, ca. 1 cm wide, apex acuminate, loosely attached on the margin in the apical half; petals obliquely falcate, 0.8–1.0 cm long, 0.3–0.4 cm wide, with motile appendages on the margin, apex acuminate with a clump of appendages at the tip; lip ligulate, lacking side lobes, 0.7–0.9 cm long, 0.6–0.8 cm wide, channeled longitudinally with 2 minutely ciliate ridges on the side; column short and stout, 0.7–0.8 cm long, 0.6 cm wide, bearing a pair of stielidia at the apex; stielidia up to 0.1 cm long, slightly hooked and bent down at right angle from the column.

**Flowering:** Early October.

**Habitat:** Epiphytic species growing occasionally on *Rhododendron* spp. in oak forest at elevation of 1500m.

**Specimens examined:** BHUTAN, Trashigang, Kanglung, Tshering Nidup *s.n.* (Sherubtse College, Royal University of Bhutan, Bhutan).

**Distribution in Bhutan:** Lamai Goenpa, Kangpara gewog, Trashigang District.

**Global Distribution:** Bhutan and China.

**Taxonomic Note:** This species was recently described from China and believed to be endemic to the country (Wang and Zhai, 2017) until its discovery in Bhutan. The sheath on the rhizome and at the base of the pseudobulb in the original description was greyish coloured, however, in Bhutanese plants they are reddish-brown.



Fig. 1. *Bulbophyllum caudatum*: A. inflorescence, B. close up of flower. *Bulbophyllum thaiorum*: C. plant in habitat, D. close up of flower. *Bulbophyllum yingjiangense*: E. close up of pseudobulbs, F. close up of flower.



**4. *Habenaria reniformis*** (D. Don) Hook. f., Fl. Brit. India 6: 152 (1890); *Aopla reniformis* (D. Don) Lindl., Edwards's Bot. Reg. 20: t. 1701 (1835); *Herminium reniforme* (D. Don) Lindl. ex Wall., Numer. List 7067 (1832); *Listera reniformis* D. Don, Prodr. Fl. Nepal. 28 (1825); *Neottia reniformis* (D. Don) Spreng., Syst. Veg. 3: 707 (1826). *Habenaria clovisii* Gagnep., Bull. Soc. Bot. France 78: 68 (1931). **Type:** Nepal, *N. Wallich s.n.* (BM!-holotype)

**Fig. 2A, B**

Plant terrestrial up to 15–20 cm tall with fleshy globose and fleshy tubers; Leaf 1–2, opposite, reniform to orbicular, fleshy, 1.5 cm long, 1.5–2.8 cm wide, base often cordate, apex acute to obtuse, Inflorescence racemose, few flowered. Flowers small, greenish to white, glabrous, 4–5 mm long, 1.8 mm wide; floral bracts lanceolate, acuminate; dorsal sepal erect, concave, narrowly ovate-oblong, 5 cm long, 1.7 cm wide, 3-veined, apex obtuse; lateral sepals spreading or reflexed, obliquely ovate-lanceolate, 6 mm long, 1 mm wide, 3-veined, apex acuminate; petals entire, oblong, lanceolate, falcate as long as sepal; lip sessile, linear, slightly longer than or as long as sepals; spur often absent; column short, stout, up to 2.5 mm tall; anther locule clavate with stigma placed below and projecting beyond the lower tip of the anther locule.

**Flowering:** August–September.

**Habitat:** Plants were found growing in partially open shrub forest with mixed chir pine forest at an elevation of around 1555 m.

**Specimens examined:** BHUTAN. Trashigang, Galing, 4 September 2018, *K. Rabgay, 20180904-06* (THIM!).

**Distribution in Bhutan:** Galing, Shongphu Gewog, Trashigang District, Eastern Bhutan.

**Global Distribution:** Bhutan, Cambodia, China, India, Myanmar, Nepal, Sumatra, Thailand and Vietnam.

**Note:** *Habenaria reniformis* is categorized as Endangered (Kurzweil, 2009), however, it is not so uncommon in India (Kumar *et al.*, 2007; Kumar *et al.*, 2013). This may be attributed to their inconspicuous habit of appressed leaves on the forest floor, which remain unnoticed until they produce flowers.

**Taxonomic Note:** This is a very variable species with or without spur, or with spur of variable length; lip is entire or 3-lobed or even lobe on one side missing or the lobes are present but length is short (Hooker 1894, Kumar *et al.*, 2007). However, in Bhutan, the flowers were without spur and the lip was without side lobes.

**5. *Liparis glossula*** Rchb. f., Linnaea 41: 44 (1876); *Leptorchis glossula* (Rchb. f.) Kuntze., Revis. Gen. Pl. 2: 671 (1891); *Leptorkis glossula* (Rchb. f.) Kuntze. Revis. Gen. Pl. 2: 671 (1891). **Type:** India, unlocalised, *B. Rozl s.n.* (W!).

**Fig. 2C, D**

Terrestrial herb. Pseudostems clustered, ovoid, 1.0–1.5 cm long, 0.5–0.8 mm wide, multinoded, covered with white membranous sheaths. Leaf 1, elliptic-oblong, 5.0–

9.0 cm long including petiole, 1.3–1.5 cm wide, acute, base conduplicate, cuneate. Inflorescence up to 25 cm long, peduncle slightly compressed, narrowly winged on either side; rachis 3–12 cm long, several flowered, winged; floral bracts lanceolate. Flower purplish red, laxly spaced, 1.4–1.6 cm wide, resupinate; sepals similar, linear-lanceolate, 1.0–1.4 cm long, up to 0.4 mm wide, acute; petals filiform, 1.0–1.3 cm long, up to 0.7 cm wide, 1-veined, obtuse; lip broadly oblong, 0.9–1.1 mm long, 0.5–0.6 mm wide, apex acute to mucronate, base tapering with a longitudinally placed band of oil gland, margin minutely ciliate; column arching over the labellum, 0.4–0.6 cm long, up to 0.1 cm wide, slightly winged at the apex, 2 calli at the base.

**Flowering:** June–August.

**Habitat:** Plants were found growing in mossy ground among bushes under the canopy of *Cupressus* spp. and *Quercus* spp. forest at approximately 2506 m elevation.

**Specimens examined:** BHUTAN, Trashigang, Kanglung, *Tshering Nidup s.n.* (Sherubtse College, Royal University of Bhutan, Bhutan).

**Distribution in Bhutan:** Yonphula, below the domestic airport, Kanglung Gewog, Trashigang District.

**Global Distribution:** Bhutan, China, India and Nepal.

**6. *Oberonia angustifolia*** Lindl., Fol. Orchid. 8: 5 (1859); *Iridorchis angustifolia* (Lindl.) Kuntze., Revis. Gen. Pl. 2: 669 (1891); *Iridorkis angustifolia* (Lindl.) Kuntze, Revis. Gen. Pl. 2: 669 (1891); *Malaxis angustifolia* (Lindl.) Rchb. f., Ann. Bot. Syst. 6: 213 (1861); *Oberonia denticulata* var. *angustifolia* (Lindl.) S. Misra., J. Orchid Soc. India 3: 70 (1989). **Type:** INDIA. Darjeeling, July 1842, *Griffith s.n.* (K-LINDL!-Syntype).

**Fig. 2E, F**

Plant epiphyte with leafy stem, 6–11 cm tall; leaf 4–6, conduplicate, linear-lanceolate, acute, 1–2.5 mm long, 0.1–0.4 mm wide. Inflorescence erect, verticillate, many flowered; floral bracts lanceolate, apiculate, apical margins erose. Flower green to olive green, 0.5 mm long; sepals similar, ovate-elliptic, obtuse, 0.5–0.6 mm long, 0.4 mm wide; petals ovate, 0.4–0.5 mm long, 0.3 mm wide, acute, margin erose; lip obscurely 3-lobed; lateral lobes broadly ovate, obtuse; midlobe subquadrate, divided at apex into 2 irregularly truncate lobes; column 0.2–0.3 mm tall.

**Flowering:** July–August.

**Habitat:** It was found growing on moss covered shrub branches in cool broadleaved forest at an elevation of 2000 m.

**Specimens examined:** BHUTAN. Trashigang, Galing, 17 July 2019, *K. Rabgay 20190717-04* (THIM!).

**Distribution in Bhutan:** Galing, Shongphu Gewog, Trashigang District, Eastern Bhutan.

**Global Distribution:** Bhutan and India

**Note:** *Oberonia angustifolia* Lindl. was thought to be extinct in India (Ansari and Balakrishnan, 1990), however, this report proves that the species is still surviving in the wild in Bhutan.



Fig. 2. *Habenaria reniformis*: A. plant in habitat, B. close up of flower. *Liparis glossula*: C. plant in habitat, D. close up of flower. *Oberonia angustifolia*: E. plant, F close up of flower.



**Fig. 3.** *Peristylus aristatus*: A. plant in habitat, B. close up of flower. *Zeuxine augyokuana*: C. plant in habitat, D. close up of flower.

**7. *Peristylus aristatus*** Lindl. Gen. Sp. Orchid. Pl. 300 (1835); *Habenaria aristata* (Lindl.) Hook.f. Syst. Cat. Fl. Pl. Ceylon 91 (1885); *Peristylus exilis* Wight Icon. Pl. Ind. Orient. 5: t. 1698 (1851). **Type:** Sri Lanka, *J. Macrae* 56 (K!)

**Fig. 3A, B**

Plant terrestrial to 20–35cm tall. Tuber cylindric, 1.2–2.5 cm long, 0.5–1 cm wide. Leaf 5, elliptic-lanceolate, apex acute, 4–5 cm long, 1–2.5 cm wide. Inflorescence spike, erect, slender, 7–18 cm long. Flower pale green, laxly arranged, 4–5.5 mm wide; dorsal sepal elliptic-oblong, 5 mm long, 1.8 mm wide, obtuse; lateral sepals lanceolate, 3.5 mm long, 1.8 cm wide, obtuse; petals oblanceolate, 5 mm long, 2.4 mm wide, acute; lip 3-lobed, lobes unequal; lateral lobes linear, acute, 6–7.5 mm long, 0.5 mm wide; midlobe oblong, 2.5 mm long, 0.9 mm wide, obtuse; spur ellipsoid, acute, 3.2 mm long, 1.5 mm wide; column short globose, up to 1 mm tall; anther locule clavate with short projecting stigma below; stigma not projecting beyond the lower tip of the anther locules.

**Flowering:** August-September

**Habitat:** Plants were found growing in partially open deciduous oak (*Quercus griffithii*) forest.

**Specimens examined:** BHUTAN. Trashigang, Rangzhikhar, 22 August 2019, *K. Rabgay* 20190822-07 (THIM!).

**Distribution in Bhutan:** Rangzhikhar and Wamrong in Trashigang, Eastern Bhutan.

**Global Distribution:** Assam, Bhutan, India, Myanmar, Nepal and Sri Lanka.

**8. *Zeuxine agyokuana*** Fukuy., Bot.Mag. (Tokyo) 48; 433 (1934); *Hetaeria agyokuana* (Fukuy.) Nackej., Biol. Mag. 8: 82 (1971); *Hetaeria cristata* var. *agyokuana* (Fukuy.) S.S.Ying., Col. Ill. Orch. Taiwan 2: 558 (1990). **Type:** Taiwan, Taoyuan County, Mt. Nachieh, 1000–1500 msl, 28 August 2010, *T.C Hsu* 3124 (TAIF!-Neotype)

**Fig. 3C, D**

Terrestrial herb up to 9–25 cm tall with short rhizome hardly distinguishable from the aerial stem. Stem purplish



green. Leaves 4–7, ovate-elliptic, 2–6.5 cm long, 1–2.5 cm wide, apex acute, margin undulate, abaxially pale green and adaxially deep green, clustered at stem apex, without distinct white median stripe, Inflorescence reddish brown, 5–15 cm long with 2 or 3 sterile bracts, puberulent; rachis laxly 3–14-flowered; floral bracts ovate-lanceolate, apex acuminate. Flower resupinate, small; sepals reddish brown, glabrous, 4–5.5 mm long, 2–4 mm wide; dorsal sepal ovate, concave, apex acute to obtuse, forming hood with petals; lateral sepals widely spreading, lanceolate to narrowly ovate with acute apex; Petals white, narrowly obovate, 5.5 mm long, 1.4 mm wide, apex acute; lip pale yellowish, ovate, 4.5 mm long, 2.5 mm wide, with distinct hypochile and epichile; column short, upto 1 mm long, feebly winged; rostellum bifid, up to 2.5 mm long; ovary purplish green, cylindrical, 8–11 mm long, 1.6 mm wide, glabrous.

**Flowering:** August–September.

**Habitat:** Found growing near stream among the litter on the ground in a moist *Castanopsis* forest at 1559 m.

**Specimens examined:** BHUTAN. Trashigang, Radhi, 04 September 2018, *K. Rabgay 20180904-05* (THIM!).

**Distribution in Bhutan:** Radhi gewog, Trashigang District, Eastern Bhutan

**Global Distribution:** India, Japan, Taiwan, Thailand and Vietnam.

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