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Aphyllorchis montana (Orchidaceae): A new record to the flora of Bhutan

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Abstract

Two *Aphyllorchis* species are described in the Orchids of Bhutan. During recent floristic exploration, specimens of *Aphyllorchis* Bl. were collected from the warm broadleaved and subtropical forests of Mongar and Wangdue Dzongkhags. The specimens were identified as *Aphyllorchis montana* Rchb.f. which is a new record to the flora of Bhutan and is described and illustrated. *A. montana* can be distinguished from *A. alpina* by slender stem bearing up to 15 flowers on the inflorescence, flowers less than 1 cm long and ovary less than 3 mm wide. Detailed descriptions, phenology, habitat, conservation status, distribution, taxonomic notes and photographic illustration are provided. The IUCN status of this species is assessed as Data Deficient.

Keywords: Bhutan, conservation status, Data Deficient, descriptions, ecology, taxonomy

Introduction

The genus *Aphyllorchis* Blume (Orchidaceae) is a leafless mycotrophic-terrestrial orchid (King & Pantling, 1890; Pearce & Cribb, 1999, 2002; Chen & Gale, 2009) comprising of 37 species of which 25 are valid (www.worldfloraonline.org) and are distributed in the temperate to tropical regions of the world. Pearce and Cribb (2002) incorporated descriptions of two species of *Aphyllorchis* Blume: *Aphyllorchis alpina* King & Pantl. 1898 and *Aphyllorchis montana* Rchb.f. 1877 in the Orchids of Bhutan based on the type materials collected from Darjeeling and Sikkim states of India. So far, only one species of the genus has been reported from Thimphu district in Bhutan (Gurung, 2006). No further exploration was conducted in the country until recent observations made by the authors. Addition of one species n the present study has increased the number of species to two in Bhutan. Detailed morphological descriptions, phenology, habitat, conservation status, updated global distribution, taxonomic notes and photographic illustration are provided based on the collected specimens.

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Materials and Methods

During recent floristic exploration in the warm

broadleaved and subtropical forests of Mongar and Wangdue Dzongkhags between the years 2016–2020, the authors collected specimens of an unfamiliar terrestrial mycotropic orchid belonging to the genus *Aphyllorchis* Blume at 800–1400 m elevation. After substantial morphological studies and literature (Hooker, 1890; King & Pantling, 1898; Pearce & Cribb, 2002; Lucksom, 2007; Chen & Gale, 2009; Aravindhan *et al*., 2013; Rao & Kumar, 2015), the species was identified as *Aphyllorchis montana* Rchb.f. which is a new record to the flora of Bhutan. Additionally, further consultation of some online herbarium specimens

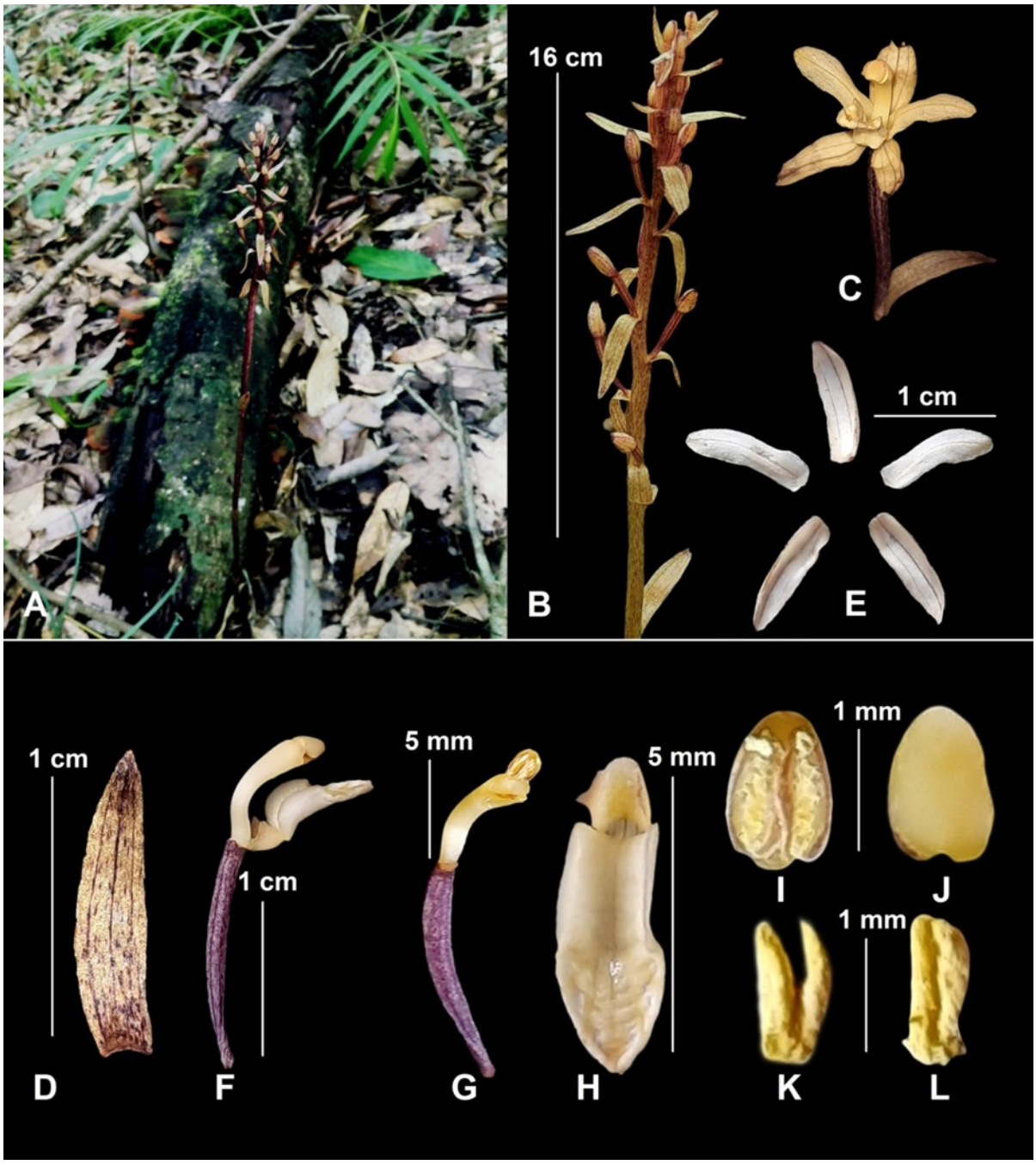

Figure 1: *Aphyllorchis montana* H.G. Reichenbach: **A.** habit; **B.** inflorescence; **C.** flower ; **D.** floral bract (adaxial view); **E.** perianth; **F**. pedicel and ovary (column and lip attached); **G.** column with ovary and pedicel; **H.** lip (adaxial view); **I & J.** anther cape abaxial and adaxial view (left to right); **J & K.** pollinia side and front view (left to right).

from the region available at the Global Biodiversity Information Facility (https://www.gbif.org/) confirmed the collected specimens as *Aphyllorchis montana* Rchb.f.

Photographs of habit and plants were taken using Nikon D3400 camera, macro-morphological characters recorded and measurements taken using 30 cm scale in the field. Morphological observations and measurements of different parts of the plants are based on living plants and fresh materials observed in the field; and the plant described accordingly (Figure 1). The voucher specimens collected during the study are deposited at the National Herbarium (THIM), National Biodiversity Centre, Thimphu, Bhutan.

Results and Discussions

Taxonomic enumeration

Aphyllorchis montana Rchb.f. in Linnaea 41 (1): 57. 1876. Hook. f., Fl. Brit. India 6: 116. 1890; King & Pantl. in Ann. Roy. Bot. Gard. (Calcutta) 8: t. 349. 1898; Pearce & Cribb. Orch. of Bt. 3(3): 37. 2002; Chen et al. Fl. of Ch. 25: 177-179. 2009.

Aphyllorchis benguetensis Ames, Orchidaceae (Ames) 2: 49. 1908; *Aphyllorchis borneensis* Schltr., Bull. Herb. Boissier Ser. II. vi. 299. 1906; *Aphyllorchis odoardoi* Rchb.f. Bot. Centralbl. 7(28): 345. 1886; *Aphyllorchis prainii* Hook.f. Fl. Brit. India, [J. D. Hooker], 6(17): 117. 1890;

Aphyllorchis purpurea Fukuy., Bot. Mag. (Tokyo) 48: 43. 1934; *Aphyllorchis tanegashimensis* Hayata, J. Coll. Sci. Imp. Univ. Tokyo 30(Art.1): 344. 1911; *Aphyllorchis unguiculata* Rolfe ex Downie, Bull. Misc. Inform. Kew, 10: 415. 1925.

Type:— Sri Lanka (Ceylon), Ambagumowa district, Thwaites 3189 (holo.K! iso.BM!).

Description

Plant terrestrial mycotropic herb, 35–75 cm tall. **Rhizome** 2–3 mm thick, fleshy with laxly arranged scales. **Roots** from rhizome, 1–2 mm width. **Stem** erect, purplish-brown to brownish, laxly 3–7 sheaths like bracts along the stem. Basal bracts are smaller (7–11 mm long) and upper most one longer (18–22 mm) long, glabrous. **Inflorescence** raceme, erect, 18–32 cm long, having 12-16 distantly arranged flowers. **Floral bracts** oblong-lanceolate, 1.2–1.5 cm x 0.3–0.4 cm, shorter than pedicel and ovary, pale brown, glabrous, apex broadly acute, 3 veined. **Pedicel** and **ovary,** 15–20 x 1.5–2 mm, purplish-brown, glabrous. **Flowers** small, erect, with pale golden yellow with purplish-brown line and stripes of sepals externally; **dorsal sepal** oblong, 9–10 x 2–3 mm, cucullate, yellowish-brown, apex sub-acute, 3 veined; **lateral sepals** oblong 8.5–10 x 2–3 mm, weakly falcate, concave, apex broadly acute, 3 veined; **petals** oblong 8–9 x 1.5–2 mm, slightly falcate, apex broadly acute, 3 veined. **Lip** 3-lobed, fleshy, 9–11 x 4–5 mm; **lateral lobes** triangular, 1.8–2 mm long, apex broadly acute; **mid-lobe** oblong-ovate, apex sub-acute, margin involute, minute yellowish tubercles on disc of the inner lip surface. **Gynostemium** oblong, 8–10 x 2.5–3 mm, pale yellow, slightly curved, apex obtuse. **Anther cape** 2.5 x 1.5 mm, pale yellow, glabrous adaxially, margin entire. **Pollinia** 4, ca. 2 x 1 mm, yellow, soft and bipartite.

***Specimens examined*:** BHUTAN: Wangdue district, Athang, Sesho, 1240 m, 27°17'38.72"N and 90°06'14.3"E, 28 August 2020*, S. Tshewang, 001-002* (THIM15865, THIM15855).

***Global distribution*:** Bhutan (Mongar, Wangdue and Zhemgang), Borneo, Cambodia, China, India, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam.

Phenology: Flowering in July–August and fruiting in September–October.

***Habitat*:** *Aphyllorchis montana* is a terrestrial mycotropic herb growing in the warm broad-leaved and subtropical forests at 800–1400 m elevation in the loamy soil rich in humus contents under the close canopy of a tree. The vegetation composed of *Ageratina adenophora*

(Spreng.) R.M. King & H. Rob., *Alnus nepalensis* D.Don*, Bischofia javanica* Blume, *Castanopsis tribuloides* (Sm.) A.DC., *Glochidion velutinum* Wight, *Heynea trijuga* Roxburgh, *Lyonia ovalifolia* (Wall.) Drude*, Rapanea capitellata* (Wall.) Mez, *Rhododendron arboreum* Smith*, Rhus chinensis* Mill*, Schima wallichii* (DC.) Korth., *Sloanea tomentosa* (Benth.) Rehder & E.H. Wilson, *Syzygium cumini* (Lindl.) Skeels*, Quercus glauca* Thunb., *Quercus griffithii* Hook.f, & Thomson ex Miq. & *Quercus lanata* Smith.

***Conservation status*:** Globally, *Aphyllorchis montana* is distributed in Cambodia, China, India, Indonesia, Japan, Malaysia, Philippines, Sri Lanka, Thailand and Vietnam (Rao & Kumar, 2015). In Bhutan, this species is known from three districts with a population of about 40 individuals. A few natural populations located in the right-of-way of farm road and settlement could deplete the population and habitat due to anthropogenic and developmental activities. Besides these causes, the population located in Sokshing (leaf litter collection area) seems to impact the germination of the species. It has been observed that the species is being grazed by cattle and wild ungulates which lead to the decline of natural population. Additional exploration is required to better understand its distribution and population trend. Throughout its distribution range, its IUCN Red List status has not been evaluated. Until substantial study and assessment are done throughout its distribution range, this species can be assessed as Data Deficient based on IUCN criteria (2019).

***Taxonomic notes*:** The present taxonomic name *Aphyllorchis montana* was first described by H.G. Reichenbach in Linnaea 41 (1): 57. 1875 from the type collected from Ambagumowa district, Sri Lanka. It is native to tropical and subtropical Asia. Pearce and Cribb (1999) described and added *Aphyllorchis sanguinea* Pearce & Cribb 1999. (Figure 1) as a new species for Bhutan based on the specimens collected from Talukha Goenpa, Simtokha, Thimphu distrct by J.R.I. Wood in 19 June 1988, which is catalogue in the Royal Botanic Garden Edinburgh, 6403 (E00027282). *A. sanguinea* and *A. montana* are separated by its dark red colour, strongly 5 -nerved sepals and 7-nerved petals. However, the latter has pale purple-brown flowers and sepals are 3 nerved. In 2002, *A. sanguinea* was placed in the genus *Oreorchis* Lindl. as *Oreorchis sanguinea* (Pearce & Cribb) Pearce & Cribb, comb. nov. in the Orchids of Bhutan by placing *A. sanguinea* as a synonym of *A. montana.* It is distinguish from *A. alpina* by slender stem, up to 15 flowers on the inflorescence, flowers less than 1 cm long and ovary less than 3 mm wide.

Other Specimens examined: BHUTAN: Mongar, Shermuhung, 1294 m, 27.37339°N & 90.36506°E, 01 October 2018, K. Sangay, 188 (THIM15868); Trashiyangtse, Dalingmang, 1980 m, 30 May 2000, 27.5°N, 91.52°E, Cribb, P.; Pearce, N. & Dorji, Y., 77 (K). INDIA: Naga Hills, August 1886, *D. Prain*, 68 (K); Suru Bathan, 609.6 m, August 1894, *R. Pantling*, 344 (MNHN); Sikkim, 609.6 m, August 1898, *R. Pantling*, 344 (HUH); Sikkim, 609.6 m, August 1898, *R. Pantling*, 344 (M); Singalelah, 3962 m, July 1896, *R. Pantling*, 462 (K); Tehri Garhwal, Nagtibba, 2743 m, August 1899, *Ramsukh*, 23000 (K); Tehri Garhwal, Bok Hill, 2743 m, July 1900, *Harsuth, s.n.* (K); Meghalaya, East Khasi Hills, 1067 m, 30 August 1951, *K.N. Walter*, 28252 (MICH).

Conclusion

Aphyllorchis montana is reported here as a new record to Bhutan. This addition confirms two *Aphyllorchis* species found in Bhutan. This orchid prefers shady areas rich in humus content. Currently, it is known from three locations but with additional exploration, we expect to find this species in other parts of the country in similar habitats.

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