



## NOTE

## A new variety of *Habenaria* (Orchidaceae; Orchideae; Habenariinae) and new records of orchids from Nepal

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**ABSTRACT:** A new variety of *Habenaria* that is *Habenaria pubescens* var. *nepalensis* (Orchidaceae) is described from Nepal, which is similar to typical *Habenaria pubescens* but can be distinguished by having a much more vigorous stature, a spur equal or longer than the ovary (including pedicel) and deeply bifurcated lateral lobes of the lip. A detailed description of the new variety with illustrations, photographs of dissected parts, key to the allied species and preliminary conservation status are provided. Additionally, we report four new records of orchids for the flora of Nepal.

**KEY WORDS:** *Habenaria pubescens* var. *nepalensis*, new variety, *Herminium*, *Nephelaphyllum*, *Zeuxine*, taxonomy, Nepal.

### INTRODUCTION

*Habenaria* Willd. (Habenariinae, Orchidoideae, Orchidaceae), with more than 892 species, is a large and nearly cosmopolitan genus (POWO, 2022), occurring in the tropical, subtropical, temperate and alpine regions of the world (Pridgeon *et al.*, 2001; King and Pantling, 1898; Seidenfaden, 1977; Chen and Cribb, 2009). Based on molecular analysis by Ngugi (2020), *Habenaria* belongs to the subtribe Habenariinae. According to the current delimitation of *Habenaria*, the genus is characterized by having undivided tubers, a spurred lip, long or short column and caudicle, anther loculi either adjoined or separated by a U-shaped connective, a naked viscidia, and long and freely projecting stigma stalks at the entrance of the spur (Pridgeon *et al.*, 2001; King and Pantling, 1898).

A series of recent studies have reported new descriptions of *Habenaria* species from both the Old World and the New World (Kolanowska *et al.*, 2015; Long *et al.*, 2015; Batista *et al.*, 2016, 2017; Lin and Huang, 2017; Mejia-Marin *et al.*, 2017; Zhang *et al.*, 2017; Batista, 2018; Peinado-Arellanes, 2018; Raskoti and Ale, 2019a, 2019b). During a botanical exploration in central Nepal, a *Habenaria* similar to *H. pubescens* was collected by the first author. Some morphological characters of this plant did not match with *Habenaria pubescens*. Hence, we performed a comparative taxonomic study of the newly collected *Habenaria* in order to ascertain its taxonomic identity.

Additionally, this work has added four new records of orchids for the flora of Nepal.

### MATERIALS AND METHODS

Vegetative and reproductive characters were studied based on fresh and preserved specimens. Characters such as tuber, stem, phyllotaxy, leaf shape, shape of bracts,

sepals, petals, lip and column were carefully examined and measured under a stereomicroscope. The photographs were taken with a Nikon D7200 camera fitted with a Sigma 150 mm (F2.8, AF APO EX DG OS HSM) lens. The characters were compared with allied species deposited in various herbaria available online (E, KATH, K, PE) and published information (Pedersen *et al.*, 2011; Chen and Cribb, 2009; Kurzweil, 2009). The plants were dried and herbarium specimens were prepared and deposited in the National Herbarium and Plant Laboratories (KATH), Godawari, Lalitpur, Nepal.

After comparing morphological characters with described *Habenaria* species, we found it different from all the known species of *Habenaria* except *Habenaria pubescens*. Compared with *Habenaria pubescens*, it differs in having a more vigorous stature, a spur equal to or longer than the ovary (including pedicel), and deeply bifurcated (vs. slightly notched) lateral lobes of the lip. These characteristics are consistent in its populations. Based on the morphological differences, the taxon is described here as a new variety of *Habenaria pubescens*, namely *H. pubescens* var. *nepalensis*.

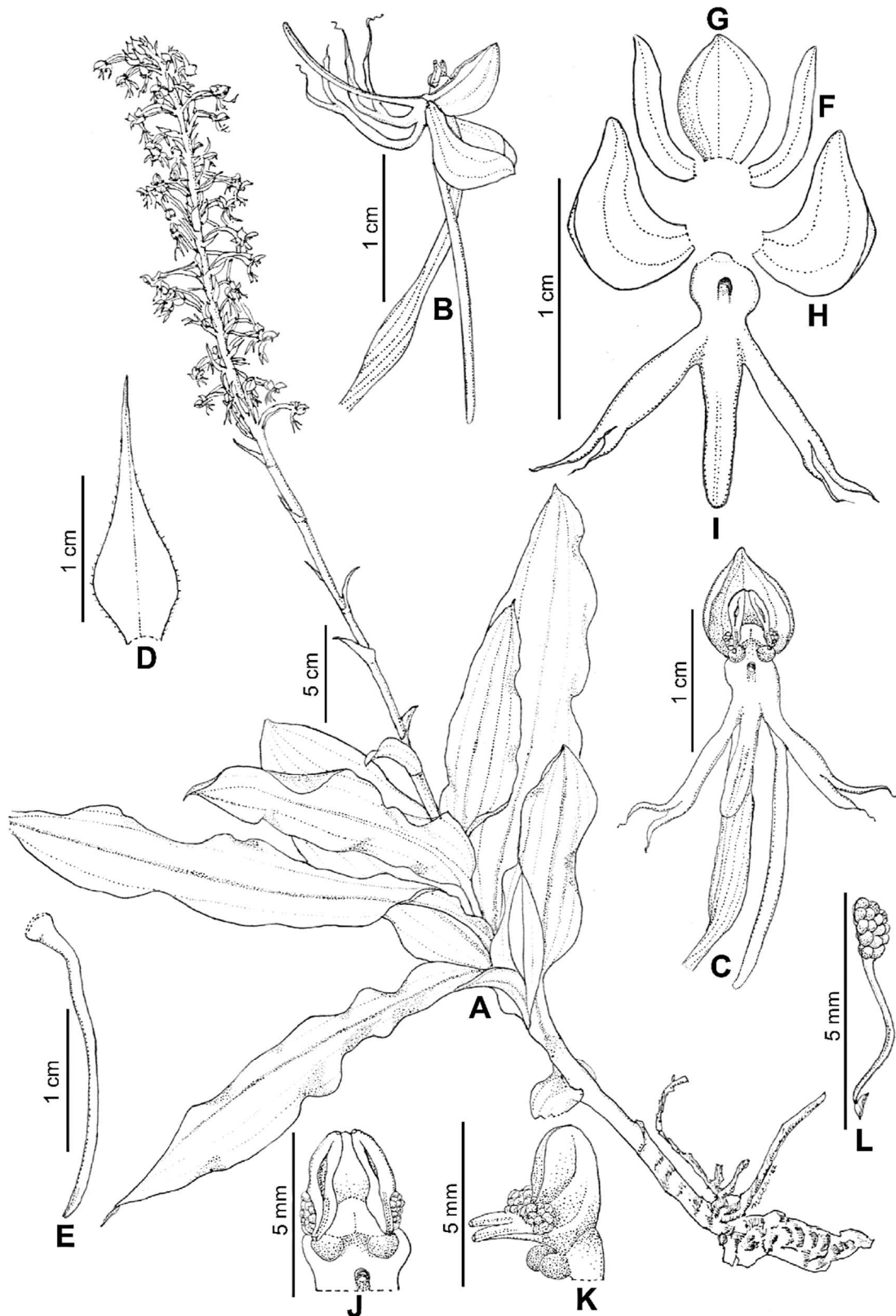
### TAXONOMIC TREATMENT

*Habenaria pubescens* var. *nepalensis* Raskoti, *var. nov.*

**Figs. 1–2**

**Type:** NEPAL, Lumbini Province, Palpa district, Nisdi khola, at 800 m a.s.l. at the margins of broad-leaved forest; 5 July 2009, *Bhakta B. Raskoti 20107*; holotype: KATH.

**Diagnosis:** *Habenaria pubescens* var. *nepalensis* is close to typical *Habenaria pubescens* Lindl., but the former differs by having a more vigorous stature, a spur equal to or longer than the ovary (including pedicel), and deeply bifurcated (vs. slightly notched) lateral lobes of the lip.



**Fig. 1.** *Habenaria pubescens* var. *nepalensis*. A, Flowering plant; B, Flower (side view); C, Flower (front view); D, Floral bract; E, Spur; F, Petal; G, Dorsal sepal; H, Lateral sepal; I, Lip; J, Column (front view); K, Column (side view); L, Pollinia (all drawn by Neera Joshi Pradhan from the holotype).

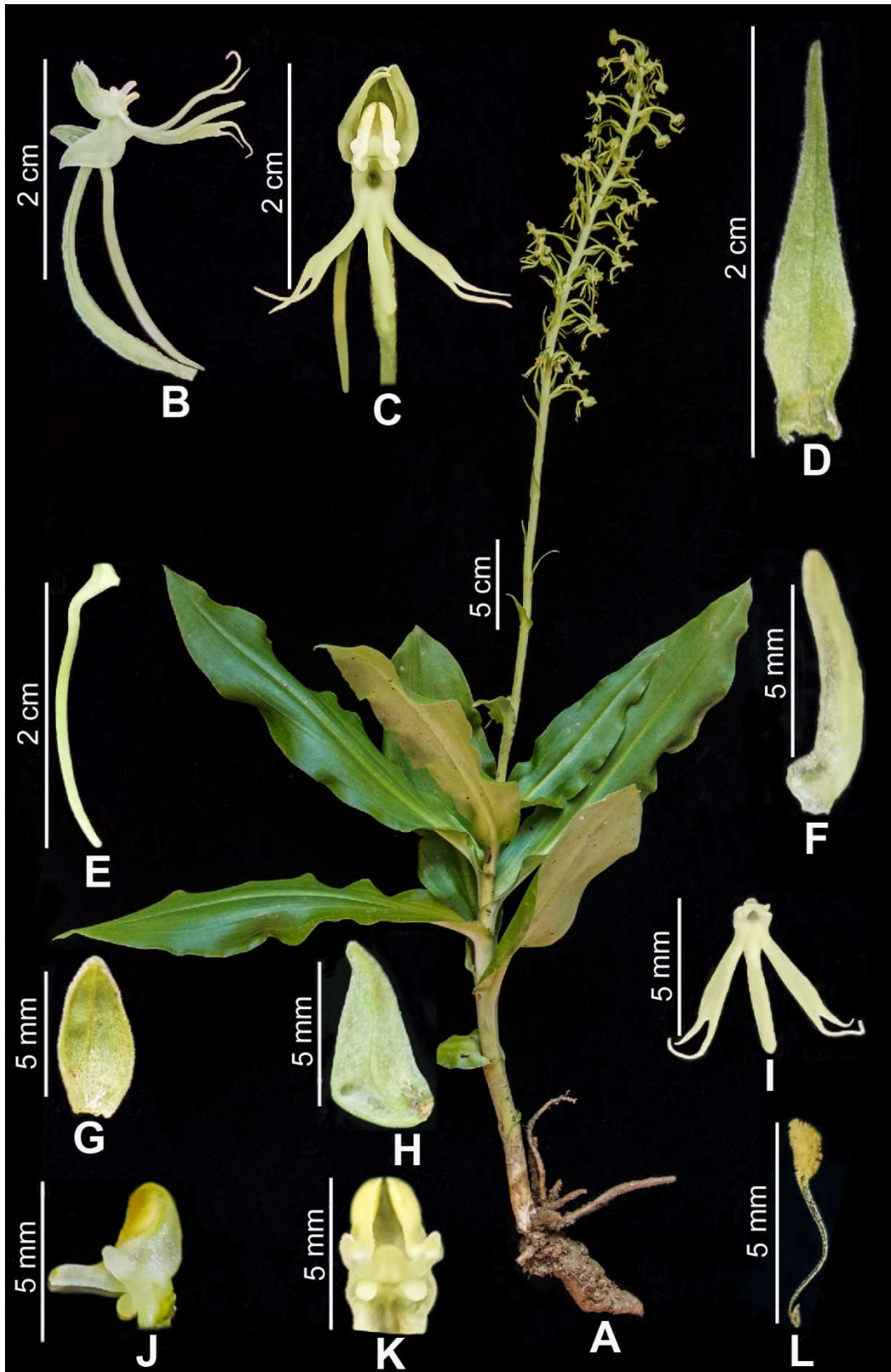


Fig. 2. *Habenaria pubescens* var. *nepalensis*. A, Flowering plant; B, Flower (side view); C, Flower (front view); D, Floral bract; E, Spur; F, Petal; G, Dorsal sepal; H, Lateral sepal; I, Lip; J, Column (side view); K, Column (front view); L, Pollinia (dissected from the type specimen and all photographs by the first author).



**Description:** Plants terrestrial herbs, 45–70 cm tall. Tuber undivided, fleshy, ovoid or oblong, 2–7 × 2 cm, neck with 4–6 slender roots. Stems terete, 15–25 cm long with 1–2 cataphylls at base, with cluster of 7 leaves nearly at middle part and 6–12 bract-like leaves above middle. Cataphylls ovate, 3 × 3 cm, tubular, sheathing, enveloping the stem base to 3–6 cm long, apex obtuse. Leaves oblong-ovate, 15–26 × 4–6.5 cm, base tapering, apex acute. Bract-like leaves erect, narrowly lanceolate, 2–4 × 0.5–1.5 cm, apex acuminate, lower one 3–5 × 1–1.5 cm, margins sparsely ciliate. Inflorescences lax or semi-dense, many-flowered (40–100 flowers); raceme 20–40 cm long, ridged and grooved, sparsely papillate; floral bracts lanceolate, 15–20 × 3–4 mm, apex acuminate, margins sparsely ciliate, shorter than ovary and pedicel. Flowers 1–2 cm across; pale-green. Ovary and pedicel arching, slightly twisted, cylindric-fusiform, pubescent, ridged and grooved, greenish, 1.5–2 cm long, apex beaked. Dorsal sepal erect, ovate-lanceolate to broadly elliptic, 5–6 × 2–2.5 mm, pubescent, concave, apex obtuse; lateral sepals reflexed, obliquely ovate-lanceolate, 5–6 × 2.5–3 mm, apex subobtuse, often adnate with each other covering the ovary. Petals erect, forming a hood with the dorsal sepal, oblong, 6–7 × 1 mm, apex obtuse. Lip 3-lobed from 2 mm above the base, 10–12 × 2 mm; mid-lobe oblong to ligulate, 8–10 × 1 mm, apex obtuse; lateral lobes linear, wider than mid-lobe, 9–10 × 1–1.5 mm, bifurcated from 6 mm, lobes filiform, 4 mm long; spur cylindric, 20–24 mm long, equal to or longer than the ovary (including pedicel), somewhat geniculate near base, apical portion slender, apex obtuse. Column 4–5 × 2 mm long, anther loculi erect, 1.5 mm long; auricles 1.5 × 1 mm, placed laterally at base of the anther; pollinia oblong-ovoid, 1–1.5 mm long, granular-farinaceous, sectile, caudicles 3 mm long, viscidia clavate, 0.5 mm long. Central lobe of rostellum nearly globose, 1 mm wide, lateral lobes oblong, 2 mm long. Stigmas elongate, clavate to suboblong, 2 mm long.

**Phenology:** Flowering occurs in July and fruiting in September.

**Distribution and habitat:** *Habenaria pubescens* var. *nepalensis* is a terrestrial orchid on grassland slopes or at the margins of broad-leaved forest. It grows in shaded and moist areas having humus-rich soil at an elevation of around 800 m.

**Etymology:** The epithet '*nepalensis*' is derived from the name of the country Nepal where the type specimen was collected.

**Conservation status:** *Habenaria pubescens* var. *nepalensis* is endemic to Nepal, and its distribution is limited to two populations within an area of ca. 2 km<sup>2</sup>. In 2009, more than 100 individual plants were observed and two plants were collected for herbarium specimens. Its population size was found to be similar during fieldworks in 2011 to 2013 and 2020. According to this preliminary information, *Habenaria pubescens* var. *nepalensis* is

valuated as Data deficient (DD) following the IUCN Red List Categories and Criteria (IUCN Standard and Petitions Subcommittee 2022). The major threat for this taxon is habitat disturbance from anthropogenic activities such as random construction of roads and over-grazing.

**Taxonomic notes:** *Habenaria pubescens* var. *nepalensis* is allied to *H. crassilabia* Kraenzl., *H. ciliolaris* Kraenzl., *H. furcifera* Lindl., *H. lucida* Wall. ex Lindl., *H. pubescens*, *H. reflexa* Blume and *H. shweliensis* W.W. Sm. & Banerji by having clustered and spreading leaves. It is close to typical *H. pubescens* with which it shares the pubescent stem and inflorescence but the new variety can be distinguished from the latter by having a more vigorous stature with up to 100 flowers in a rachis, the spur equal or longer than the ovary and pedicel (vs. shorter than or as long as ovary in *H. pubescens*), and the lateral lobes of the lip deeply bifurcated (vs. not lobed, as observed in the type specimen of *H. pubescens* Royle JF s.n, K, K000247444 and mentioned in Lindley, 1830–1840; Duthie, 1906; Jalal *et al.*, 2009). *Habenaria pubescens* var. *nepalensis* is also superficially similar to *H. ciliolaris*, but the latter has a much more ciliate stem and a curved spur (Chen and Cribb, 2009; Kurzweil, 2009).

#### Key to the taxa of *Habenaria* having clustered and spreading leaves

- 1a. Stem, sterile bracts, rachis, floral bracts and flower glabrous ..... 2
- 1b. Stem, sterile bracts, rachis, floral bracts and flower pubescent ..... 5
- 2a. Floral bracts equal or longer than ovary and pedicel .....  
..... *H. crassilabia* Kraenzl.
- 2b. Floral bracts shorter than ovary and pedicel ..... 3
- 3a. Mid-lobe of lip not fleshy, spur longer than the ovary and pedicel ..... *H. furcifera* Lindl.
- 3b. Mid-lobe of lip fleshy, spur shorter than the ovary and pedicel .... 4
- 4a. Lateral sepals reflexed, mid-lobe of lip upcurved and adnate to the median sepal/petals hood; side-lobes curved ... *H. lucida* Wall. ex Lindl.
- 4b. Lateral sepals spreading, mid-lobe of lip not upcurved and free from sepal/petals; side-lobes not curved ... *H. shweliensis* W.W.Sm. & Banerji
- 5a. Plants with densely pubescent, spur curved ..... 6
- 5b. Plants with sparsely pubescent, spur not curved ..... 7
- 6a. Spur strongly curved forwards, lateral sepals recurved, petals broadly triangular ..... *H. reflexa* Blume
- 6b. Spur not curved very strongly, lateral sepals not recurved, petals narrowly triangular ..... *H. ciliolaris* Kraenzl.
- 7a. Lateral lobes of lip not bifurcated, spur equal or shorter than ovary and pedicel ..... *H. pubescens* Lindl. var. *pubescens*
- 7b. Lateral lobes of lip deeply bifurcated, spur equal or longer than ovary and pedicel ..... *H. pubescens* var. *nepalensis* Raskoti.

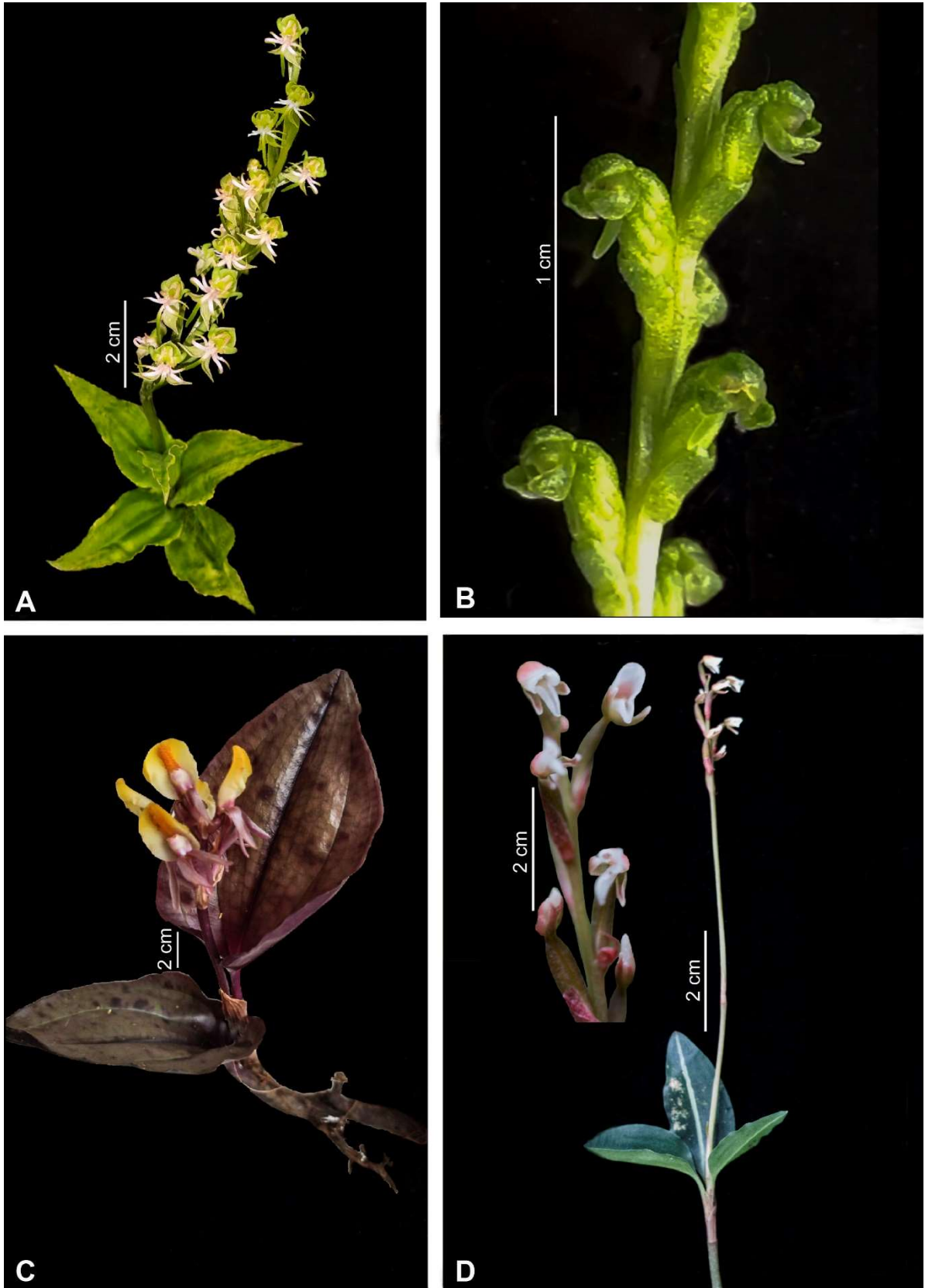
#### New addition of orchids for Nepal

This work recorded the following species of orchids for the first time for orchid flora of Nepal (Fig. 3).

*Habenaria gibsonii* Hook.f

Fig. 3A

**Specimen examined:** Central Nepal, Lumibini, Palpa district, Archale khola, at 800 m, 28 May, 2011, Raskoti Bhakta B. 201150 (KATH).



**Fig. 3.** New addition of orchids for Nepal. **A,** *Habenaria gibsonii*; **B,** *Herminium gracile*; **C,** *Nephelaphyllum pulchrum*; **D,** *Zeuxine integrilabella* flowering plant; rachis. (All photographs by the first author).



**Habitat:** Terrestrial on grassland slopes and forest margins.

**Distribution:** Nepal, Bhutan, Cambodia, India, Laos, Thailand and Vietnam.

*Herminium gracile* King & Pantl. **Fig. 3B**

**Specimen examined:** Central Nepal, Gandaki, Kaski district, on the way to Bayeli at 3500 m, 08 July, 2009, *Raskoti Bhakta B. 2009078* (KATH).

**Habitat:** Terrestrial on grassland slopes.

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

*Nephelaphyllum pulchrum* Blume **Fig. 3C**

**Specimen examined:** Central Nepal, Gandaki Province, Kaski district, Hemja, at 900 m, 18 August, 2014, *Raskoti Bhakta 20127* (KATH).

**Habitat:** Terrestrial in litter-covered shaded areas.

**Distribution:** Nepal, Bhutan, Cambodia, India, Indonesia, Malaysia, Philippines, Laos, Myanmar, Philippines, Thailand and Vietnam

**Note:** *Nephelaphyllum* is a new generic record for the flora of Nepal.

*Zeuxine integrilabella* C.S. Leou **Fig. 3D**

**Specimen examined:** East Nepal, Ilam district, near Maipokhari at 2000 m, 09 September, 2010, *Raskoti Bhakta and Ale Rita 201089* (KATH).

**Habitat:** Terrestrial in litter-covered shaded areas.

**Distribution:** Nepal and China.

**Note:** *Zeuxine integrilabella* is very close to *Zeuxine goodyeroides* but the notable difference is that the former has an entire lip and later has a lobed lip.

## DISCUSSION

In Nepal, *Habenaria* comprises 24 species and two varieties (Rokaya *et al.*, 2013; Raskoti and Ale, 2019a, 2019b), distributed in tropical, subtropical, temperate and alpine habitats. The highest number of species is found in the central part of the country (Rokaya *et al.*, 2013). Most of the species are terrestrial in forest, forest margins, grassland slopes, damp places, rock crevices, alpine meadows and scrub. In very rare cases *Habenaria* species in Nepal are epiphytic (for example, *Habenaria sandiegensis* Raskoti). Distribution areas of Nepalese *Habenaria* species are extend to different countries in Asia (for example, *Habenaria marginata* Colebr., *H. furcifera* Lindl., *H. stenopetala* Lindl., *H. pantlingiana* Kraenzl. are highly widespread). But some species are restricted to the neighbouring countries Bhutan, China and India (for example, *Habenaria pubescens*, *Habenaria davidii* Franch.). Four taxa of *Habenaria* (including the newly described variety) are currently endemic to Nepal.

This work has also added four new additional records for the orchid flora of Nepal. Summarizing the data of published literature from 2018–2022 (Raskoti and Ale,

2019a-b; Bhandari *et al.*, 2020; Paudel, 2020), the number of orchid taxa of Nepal has increased from 502 to 510.

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