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A new species of *Panisea* (Orchidaceae) from central Nepal

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A new species *Panisea panchaseensis* Subedi, sp. nov. (Orchidaceae), is described from Nepal. The distinguishing characters, a description, detailed illustrations and photographs are provided. The species was genetically compared to *P. tricallosa*, and a diagnostic key based on morphology to all species of *Panisea* is provided.

Key words: Endemic orchids, Nepal, *Panisea panchaseensis* sp. nov.

Introduction

The genus *Panisea* (Lindl.) Lindl. (Orchidaceae, Epidendroideae, Coelogyninae) consists of 10 species (Lindley, 1830; Lindley, 1854; Chen, 1980; Lund, 1987; Gravendeel et al., 2005; Averyanov and Averyanova, 2006). These species are distributed from the Indian subcontinent to southeast Asia. The genus is easily recognized by the pseudobulbs consisting of a single internode, convolute or duplicate leaves, terminal inflorescence often produced before growth of the pseudobulbs, resupinate flowers, lip with more or less sigmoidly curved base with completely absent or only small side lobes (this character is its main diagnostic feature within the Coelogyninae), a 'petaloid' apex of the column hooded over the anther, and entire stigma.

In 2002, the first author came across an interesting specimen of *Panisea* which was collected from the Panchase forest in central Nepal. This species was found in the same habitat where *Panisea demissa* Lindl. occurs as common species. The specimens looked very different in plant habit and flower morphology as compared with *P. demissa*. However, due to limited flowering material, it was impossible to properly investigate the taxonomic identity. In 2007, additional explorations were carried out in the same area and more flowering specimens were located. A study of herbarium specimens of similar species of *Panisea*, a detailed literature review and DNA sequencing were carried out to investigate whether the specimens from the Panchase forest represented an hitherto undescribed species.

Materials and Methods

Morphology

Herbarium specimens were examined from the following herbaria: CAL, L, K, KATH, P and TUCH. Fieldwork was carried out from 2007-2009 in central and eastern Nepal and India (Sikkim, Darjeeling) by the first author.

DNA sequencing

Total genomic DNA of the new species was extracted from 20 mg of silicagel dried leaf material vouchered as Subedi 1780 (TUCH), using the DNeasy Plant extraction kit and protocols of QIAGEN. PCR products of the nrITS1-5.8S-ITS2 region were collected using the primers described in White et al. (1990). DNA sequences were obtained using an ABI 377 automated sequencer (Applied Biosystems) with the manufacturer's protocols, and submitted to NCBI GenBank under accession number HQ130501. The sequences obtained were compared with those of *Panisea tricallosa* Rolfe, vouchered as Leiden cult. 970828 (L), which is the only other available *Panisea* species of which DNA sequences are currently available at NCBI GenBank (AF302736).

Results

Morphology

After comparison with living and herbarium material of other species of *Panisea* and consultation of all available literature (Don, 1825; Lindley, 1830; Lindley, 1854;

Reichenbach, 1861; Rolfe, 1901; Pfitzer and Kraenzlin, 1907; Ridley, 1921; Schlechter, 1924; Tang and Wang, 1951; Seidenfaden, 1975; Chen, 1980; Lund, 1987; Averyanov, 1988; Averyanov and Averyanova, 2006), an overview of the main differences in macromorphological characters could be constructed for all species of *Panisea* currently recognized (Appendix IV). The unique combination of heteranthous inflorescence, nodding flowers and acute tip of the epichile of the lip made us conclude that the specimens from the Panchase region represented a hitherto undescribed species.

DNA sequences

The nrITS1-5.8S-ITS2 alignment constructed for this study contained 660 positions of which 58 nucleotides differed between both species of *Panisea* analysed (8.8% sequence divergence). A total of 9 gaps were found ranging in size between 1 and 12 nucleotides. Despite the fact that not yet all species of *Panisea* have been analysed genetically, this amount of variation is quite high when compared with other Coelogyninae sequenced (Gravendeel et al., 2005), indicating sufficient variation to warrant description of a new taxon.

Description of the species

Panisea panchaseensis Subedi, sp.nov. (Figure 3.1; 3.2C)

Type: Nepal: Kaski district, Panchase forest, 2200-2450 m, epiphyte on tree trunks, 12 November 2007, Subedi, A. 1780 (holotype, KATH; isotype, TUCH).

Paniseae albiflorae similis labelli hypochilio carinis duabus brevibus aequiformibus columna brevissima (0.4-0.5 cm longa), sed inflorescentia heterantha, floribus cernuis, epichilii apice acuto differt.

Diagnosis: Pseudobulbs 2-leafed, leaf blade elliptic, 1.5-3 by 0.6-0.8 cm. Inflorescence heteranthous, 1-3-flowered; flowers pure white, nodding. Lip lacking any side lobes, three short keels present at base of hypochilum, lip adaxially convex, margin undulate. Column curved, 0.4-0.42 cm long.

Description: Perennial epiphytic herb. *Roots* 0.05-0.1 cm diam. *Rhizome* short-creeping, 0.2 by 0.25 cm diam., with 6-10 imbricate scales on young shoot. *Pseudobulbs* close together or distant, up to 0.5-0.8 cm apart, oblique, ovoid to ellipsoid, 1.4-1.8 by 0.8-1.1 cm, sparsely wrinkled when mature, 2-leafed. *Leaves* petiole 0.1-0.3 cm; blade elliptic, 1.5-3 by 0.6-0.8 cm, index (length/width) 2.5-3.8, tip sub-acute, main veins 3-5; sub-coriaceous. *Inflorescence* heteranthous, 1-3-flowered. *Peduncle* covered by the rhizome scales during anthesis, ellipsoid, 0.4-0.8 by 0.05-0.1 cm, not elongating after anthesis. *Rhachis* if present, sub-erect, 0.3-0.6 cm long; internodes 0.3-0.35 cm long. *Floral bract* ovate, 0.55-0.6 by 0.2-0.25 cm, tip acute; many veined. *Pedicel* 0.6-0.7 cm long, straight. *Ovary* 0.5-0.6 cm long. *Median sepal* ovate, 1.2-1.3 by 0.4-0.5 cm, index 2.6-3, tip obtuse, main veins 5, conspicuously reticulated. *Lateral sepals* ovate, clawed, 1.2-1.25 by 0.4-0.45 cm, index 2.9-3, tip acute; otherwise as median sepal. *Petals* narrowly elliptic or obovate, near the base slightly notched along the lower margin, or shortly to distinctly

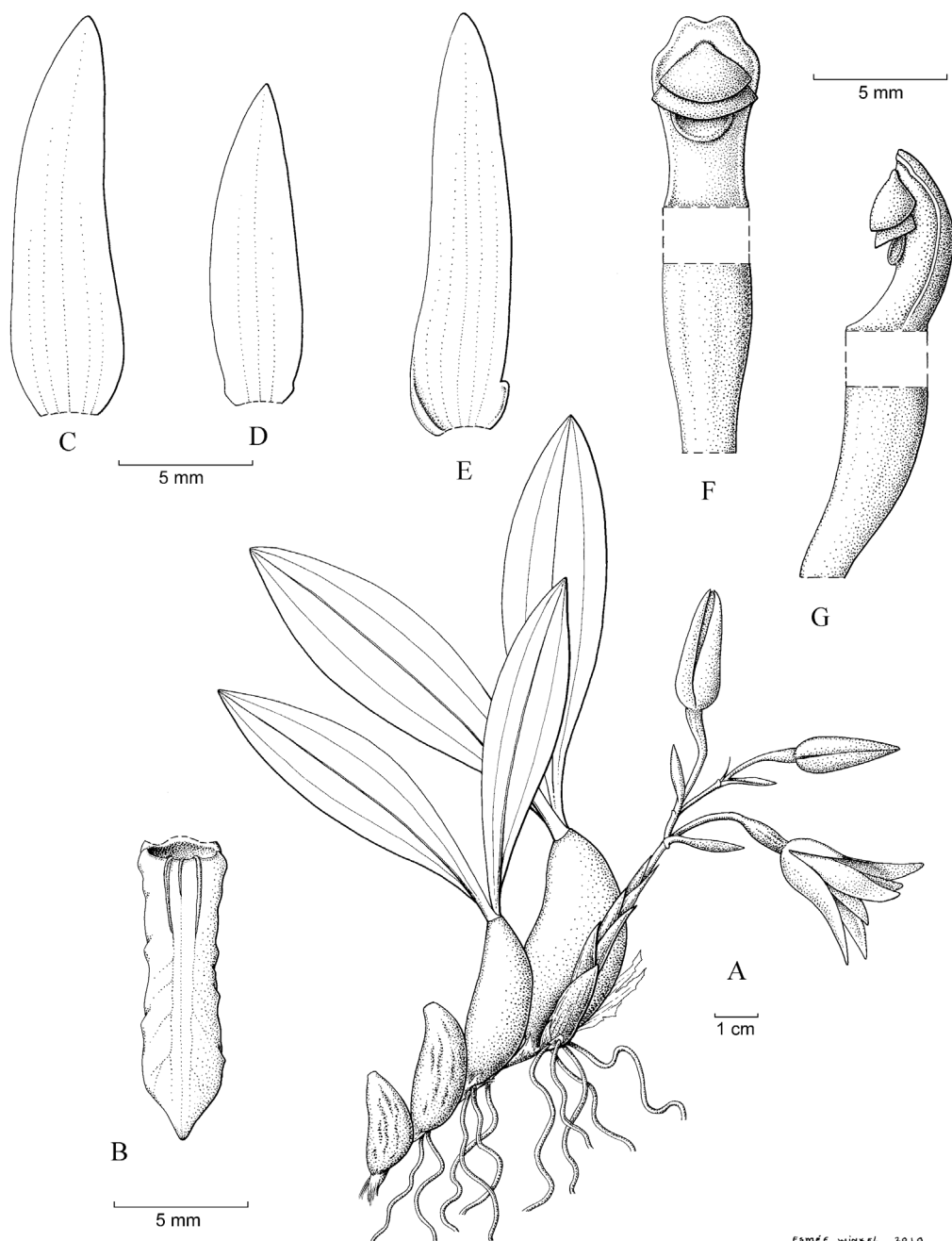


Fig. 3.1. *Panisea panchaseensis* Subedi. A. Habit. B. Lip. C. Dorsal sepal. D. Petal. E. Lateral sepal. F. Gynostemium front view. G. Gynostemium lateral view. Drawn from A. Subedi 1780 (TUCH), Panchase region, Nepal.

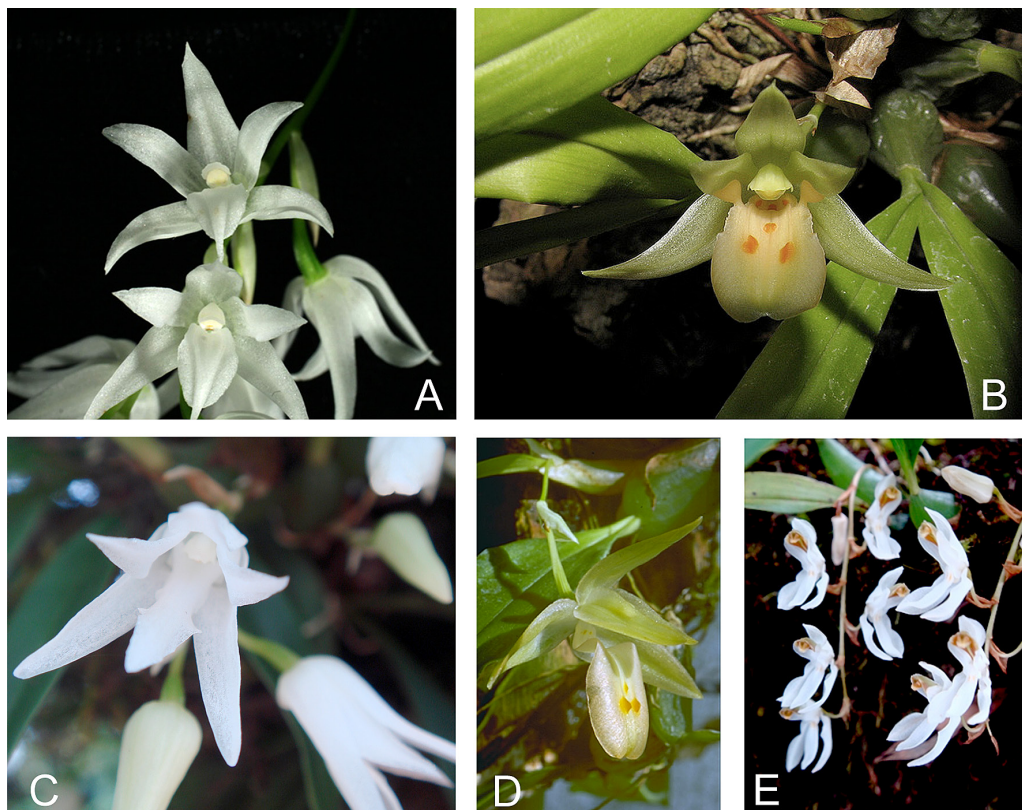


Fig. 3.2. A. *Panisea albiflora* (Ridl.) Seidenfaden (photograph: M. Allen). B. *Panisea uniflora* Lindl. (photograph: P. Markiewicz). C. *Panisea panchaseensis* Subedi (photograph: A. Subedi). D. *Panisea tricallosa* (photograph: C.G. Koops). E. *Panisea demissa* Pfitzer (photograph: A. Subedi).

clawed, 1.1-1.2 by 0.3-0.35 cm, index 3.4-3.7, tip acute; main veins 5. *Lip* adaxially convex except near the base, obovate in outline when flattened, 1.1-1.3 by 0.35-0.4 cm, index 3.1-3.3. *Hypochile* sigmoid in profile, base attached over 0.1-0.17 cm, when flattened 0.25-0.32 cm long. *Epichile* elliptic to oblong, 0.9-1.1 by 0.35-0.4 cm, index 2.6-2.8, tip acute, margin undulate, 3-veined, the two outermost veins conspicuously reticulated. *Keels* 3, rod-shaped, thickened, 0.35-0.4 cm long, middle one shorter than laterals. *Column* curved, 0.4-0.42 by 0.2-0.21 cm, margins glabrous; the lateral lobules short, subacute, the median notched. *Anther* broadly flattened, 0.08-0.09 by 0.1-0.12 cm. *Pollinia* 0.07-0.08 by 0.06-0.07 cm; caudicle oblong. *Stigma* semi-circular, 0.1-0.11 by 0.07-0.08 cm, proximally rounded; rostellum broadly elliptic, 0.12-0.14 by 0.05-0.1 cm. *Fruit* stalk 0.6-0.8 cm long, body ellipsoid, 0.9-1.1 by 0.6-0.75 cm, approx. triangular in section.

Colour and scent: Rhizome scales grey-brown, floral bracts grey-brown and flowers white. Flowers with sweet fragrance.

Distribution, habitat, and phenology: *Panisea panchaseensis* is endemic to lower temperate forest in the Panchase area, Kaski district, central Nepal. The species has a narrow distribution range limited to an area of one square km. The total population is estimated to contain less than 250 mature individuals. This species is found on north-facing forest slopes in lower temperate forest at 2400-2500 m elevation. It is found as epiphyte on moss covered tree trunks in evergreen forest with main tree species consisting of *Daphniphyllum himalayense* Müll.Arg. (Euphorbiaceae), *Quercus semecarpifolia* Sm. (Fagaceae) and *Rhododendron arboreum* Sm. (Ericaceae). Flowering from November to December.

Etymology: The epithet '*panchaseensis*' refers to the Panchase area of central Nepal where the type specimen was collected.

Diagnostic key to the species of *Panisea* ¹

1. Lateral lobes of hypochilium of lip present.....2
1. Lateral lobes of hypochilium of lip absent6
2. Column with stelidia.....*P. distelidia* I.D. Lund
2. Column without stelidia..... 3
3. Inflorescence hysteroanthous ², inflorescence 3-6-flowered..... *P. vinhii* Aver. & Averyanova
3. Inflorescence proteranthous ³ or heteranthous ⁴, inflorescence 1-2-flowered4
4. Petals linear. Lateral lobes of lip more than 0.6 cm long....*P. zeylanica* (Hook.f.) Aver.
4. Petals elliptic. Lateral lobes of lip less than 0.3 cm long.....5
5. Lip lateral lobes triangular, straight. Tip of midlobe of epichile of lip apiculate...
P. apiculata Lindl.
5. Lip lateral lobes linear, falcate. Tip of midlobe of epichile of lip blunt.....
P. uniflora Lindl. (Fig. 2B)
6. Keels on lip present.....7
6. Keels on lip absent.....9
7. Lip oblong-spathulate in outline, keels present both on hypochile and epichile of lip..... *P. tricallosa* Rolfe (Fig. 2D)
7. Lip obovate-rhombic in outline, keels present on hypochile of lip only.....8
8. Leaves 4-5.7 cm long. Flowers 5-6, keels on lip 2.....
P. albiflora (Ridl.) Seidenfaden (Fig. 2A)
8. Leaves 1.5-3 cm long. Flowers 1-3, keels on lip 3.....
P. panchaseensis Subedi (Fig. 2C)

9. Keels on sepals present. Lip as long as column.....*P. demissa* Pfitzer (Fig. 2E)
9. Keels on sepals absent. Lip twice as long as column.....
P. yunnanensis S.C. Chen & Z.H. Tsi

¹ The species in this key are described by Chen (1980), Lund (1987), Averyanov and Averyanova (2006) and Subedi (this publication).

² In proteranthous species, the leaves from the immature pseudobulbs are still hidden in the scales of the inflorescence-bearing shoot during anthesis.

³ In heteranthous species, the vegetative shoot from which the inflorescence sprouts never develops leaves, and its basal internodes never develop into a pseudobulb.

⁴ In hysteranthous species, the inflorescence develops on top of a full-grown pseudobulb with fully developed leaves.

