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Swertia pseudohookeri (Gentianaceae): a new record for India

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Abstract: *Swertia pseudohookeri* Harry Sm. is a species endemic to the eastern Himalayas, was previously known only from Bhutan and Nepal. Here, we report this species for the first time in India from the high-altitude regions of Arunachal Pradesh. A detailed taxonomic description, colour photographs, and a distribution map are provided.

Keywords: Arunachal Pradesh, Eastern Himalaya, Gentianales, *Swertia*.

Introduction

Swertia L., one of the major genera of Gentianaceae contains approximately 170 species (Struwe *et al.*, 2002; Chen *et al.*, 2008; Ho & Liu, 2015). About 86 species have been recorded from the Sino-Himalayan region, establishing this region as a major hub of diversity for the genus (Ho *et al.*, 1994; Ho & Liu, 2015; Nampy *et al.*, 2015). So far, around 36 species have been reported from India (Nampy *et al.*, 2015; Singh, 2021; Wani *et al.*, 2022; Islam *et al.*, 2022; Banoo *et al.*, 2022). The genus is characterized by a rotate corolla and deep corolla lobes with conspicuous nectariferous glands (Hagen & Kadereit, 2002; Nampy *et al.*, 2015). The nature and shape of these glands are one of the primary diagnostic characteristics for species delimitation within the genus (Favre *et al.*, 2014).

The first account of *Swertia* from Arunachal Pradesh was published by Giri *et al.* (2008), who reported nine species. Subsequent studies contributed more number of species, resulting in a total of 19 species (*S. alata* (D.Don ex G.Don) Royle ex C.B.Clarke, *S. angustifolia* Buch.-Ham. ex D.Don, *S. assamensis* Harry Sm., *S. bimaculata* (Siebold & Zucc.) Hook.f. & Thomson ex C.B.Clarke, *S. chirayita* (Roxb.) H.Karst., *S. cincta* Burkill, *S. cordata* (G.Don) Wall. ex C.B.Clarke, *S. grandiflora* Harry Sm., *S. handeliana* Harry Sm., *S. hookeri* C.B.Clarke, *S. kingii* Hook.f., *S. nana* ined. (Lidén, M., Bharali, P. & Favre, A.), *S. paniculata* Wall., *S. purpurascens* (D.Don) C.B.Clarke, *S. splendens* Harry Sm., *S. teres* (G.Don) J.Shah, *S. tetragona* Edgew., *S. tibetica* Batalin, *S. verticillifolia* T.N.Ho & S.W.Liu) from this region (Giri *et al.*, 2008; Bharali *et al.*, 2018; Lidén & Adhikari, 2019; Singh *et al.*, 2019; Lidén & Bharali, 2020).

While exploring the floristic diversity of alpine and sub-alpine areas (Se La, Nagula, Panga Teng Tso lake, Shungetsar lake, Bangajaan and others) of Tawang and West Kameng districts of Arunachal Pradesh in July 2023, three species of *Swertia*: *S. grandiflora*, *S. splendens*, and *S. pseudohookeri* Harry Sm. were observed among the collected specimens. While the former two species were previously documented in India, *S. pseudohookeri* is known only from Bhutan and Nepal (Smith, 1970). Hence, *S. pseudohookeri* is reported here as a new addition to the flora of India. A detailed description, colour images, photo-plate and distribution map are presented.

Materials and Methods

The specimens were collected and processed for herbarium specimens using standard methods (Jain & Rao, 1976). Voucher specimens were deposited at CSIRNEIST. The geo-coordinates

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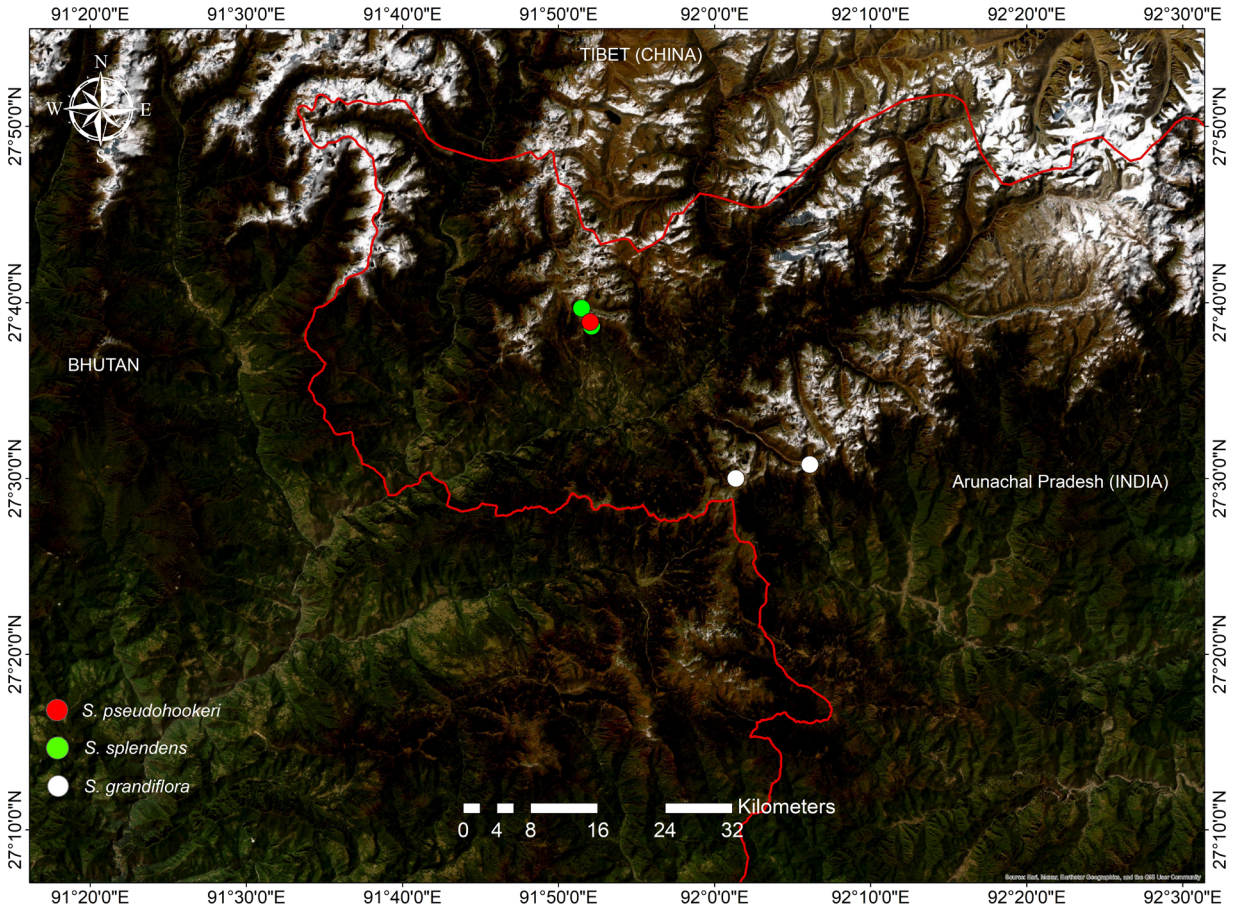

Fig. 1. Distribution map of *Swertia pseudohookeri* Harry Sm., *S. splendens* Harry Sm., and *S. grandiflora* Harry Sm. in Tawang and West Kameng districts of Arunachal Pradesh, India (map created in ArcGIS).

were recorded with an eTrex 20x global positioning system (Garmin, New Taipei City, Taiwan). For identification of specimens, we dissected and studied the characters, and compared the collections (*B. Hajong* 12898, 12899 CSIRNEIST) with digital images of the holotype of *S. pseudohookeri* at BM (BM001014596) and images of live plants (https://www.gbif.org/species/5595522) as well as consulted with experts. A distribution map was created using ArcGIS 10.3 version software (Schaller & Mattos, 2010).

Taxonomic Treatment

Swertia pseudohookeri Harry Sm., Bull. Brit. Mus. (Nat. Hist.), Bot. 4: 246. 1970; Ohba & Akiyama, Alp. Fl. Jalijale Himal. 51. 1992. *Type*: BHUTAN, **Marlung**, Tsampa, 4400 m, 12.07.1949, *F. Ludlow, G. Sherriff & J.H. Hicks* 19414 (holo BM [BM001014596] digital image!; iso UPS [UPS BOT V-139957] digital image!). **Figs. 2 & 3**

Perennial herbs to 60 cm tall. Roots tuberous, yellow. Stems erect, firm, hollow, terete, smooth, green. Basal leaves rosette, many, membranous; petiole *c.* 6 cm long; blade elliptical, subacute, 8–16 × 6–8 cm, gradually reduced on the enlarged petiole, margins entire; upper leaves smaller than basal leaves, ovate, sessile, membranous, subacute, 6–10 × 4–7 cm, decreasing upwards, opposite in pairs at nodes. Inflorescences narrowly pyramidal, loose, green, branched from base node up to middle part of stem; upper part not branched, flowers in whorls as well as one flower in solitary position. Flowers tetramerous, *c.* 2 cm in diam., white-green with purple-stripes denser towards margins; pedicel 1.5–5 cm long, glabrous, slightly winged, green; calyx tube *c.* 2 mm long, pale green, lobes obtuse-ovate, *c.* 11 × 7 mm, margins entire; corolla tube *c.* 4 mm, lobes wedged, apex truncate and slightly erose, *c.* 2 × 0.8 cm; nectary 4, one per petal at the base with long greenish-white fimbriate in between

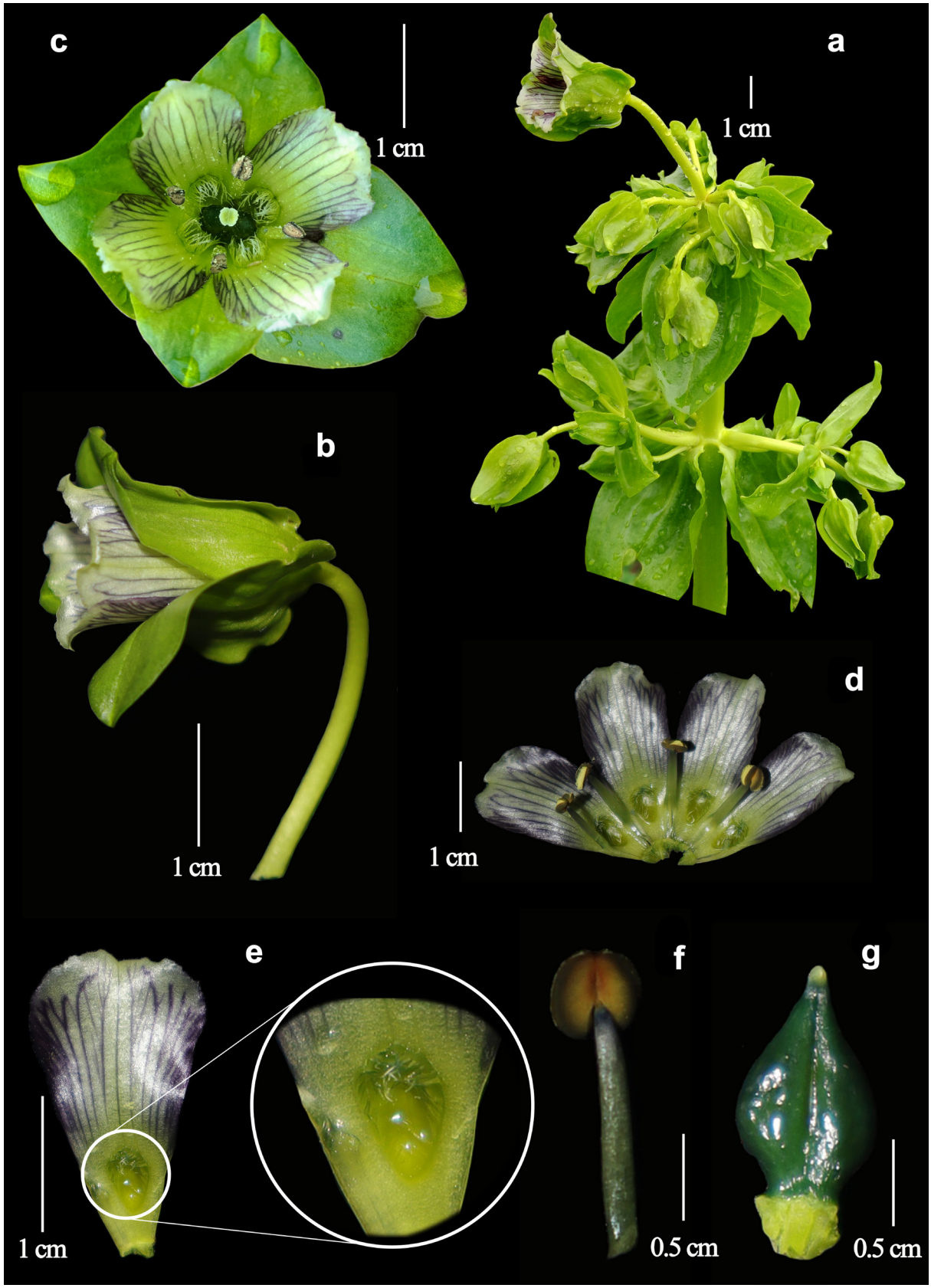

Fig. 2. *Swertia pseudohookeri* Harry Sm.: **a**. Habit; **b**. Flower-side view; **c**. Flower-front view; **d**. Corolla cut open showing androecium and nectaries; **e**. Dissected petal with one nectary, enlarged nectary in the inset; **f**. Stamen; **g**. Pistil (from *B. Hajong* BAR-003; photos by B. Hajong).

insertion of filaments, oval or rhomboid, *c.* 3 mm. Stamens attached to corolla tube, filaments free, *c.* 7 mm long, dark green, anthers *c.* 2 mm long. Ovary ovoid, glabrous; style indistinct; stigma round, small, white. Capsule not seen.

Flowering & fruiting: Flowering from July to August and fruiting from September to October.

Habitat: This species is predominantly found in grazing meadows or scrubs of alpine regions in association with *Primula* spp. (Primulaceae), *Rhododendron* spp. (Ericaceae), *Pedicularis* sp. (Orobanchaceae), *Potentilla* sp. (Rosaceae), and others.

Distribution: Bhutan, Nepal and now in India.

Specimen examined: INDIA, **Arunachal Pradesh**, Tawang, 4103 m, N 27°38'54.1026", E 91°52'1.686", 15.07.2023, *B. Hajong* BAR-003 (12898, 12899 CSIRNEIST).

Notes: This species is endemic to the central and eastern Himalayas, displaying distinctive characters such as an erect, perennial herbaceous habit, cymose inflorescence, large greenish-white purple-striped corollas and rhomboidal or oval nectaries with raised fimbriae surrounding the small adaxial opening of the nectaries. Notably, the presence of fimbriae is a feature shared with *Swertia splendens,* which also is found in Arunachal Pradesh. However, *S. pseudohookeri* can be easily distinguished from *S. splendens*, by its ovate leaves (*vs.* spatulate to obovate), green stems (*vs.* brick red), greenish-white and purple-striped flowers (*vs.* brick red, when drying yellow-green) and nectary with long fimbriae (*vs.* short) (Fig. 4a). Another species, *S. grandiflora*, has been sighted in two localities, Se La and Bangajaan, and was first documented in India in 2020 (Bharali *et al.*, 2018; Liden & Bharali, 2020). *S. pseudohookeri*

Fig. 3. Habitat of *Swertia pseudohookeri* Harry Sm. near Panga Teng Tso lake; Insect top view of flower (photos by B. Hajong).

shares some similarities with *S. grandiflora* such as the perennial erect habit with single robust stem, large tetramerous flowers (3–4 cm in diam.) with one nectary per corolla lobe, but can be easily distinguished by its green stems (*vs.* brick red), greenish-white and purple-striped flowers (*vs.* reddish-green) and nectary with long fimbriae (*vs.* short) (Fig. 4b).

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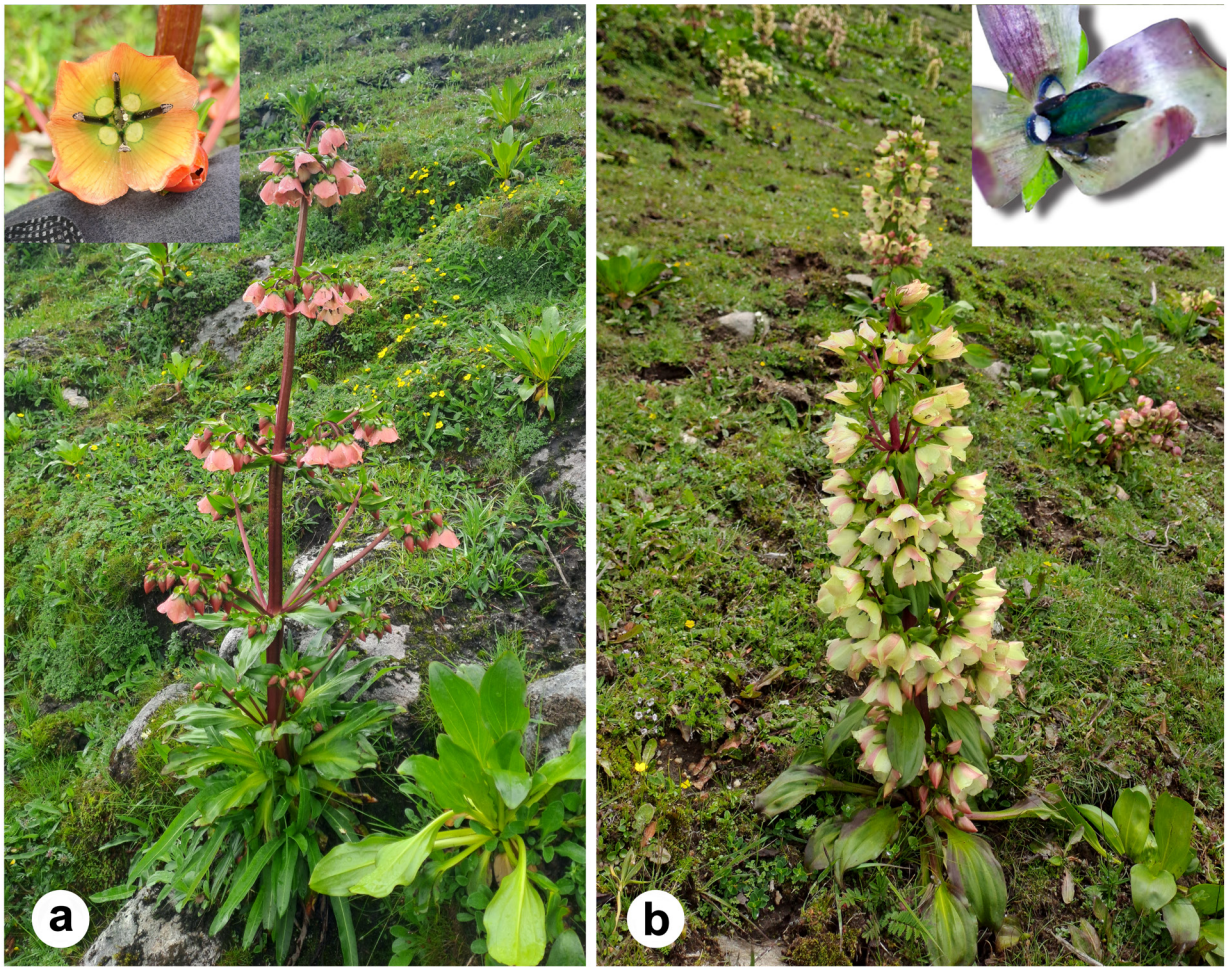

Fig. 4 a. *Swertia splendens* Harry Sm. at Pass; **b**. *Swertia grandiflora* Harry Sm. in Se La (photos by B. Hajong except the close-up flower of S. grandiflora Harry Sm. from the book of Liden & Bharali, 2020).

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