RESEARCH ARTICLES





Ceropegia hookeri C.B. Clarke ex Hook.f. (Apocynaceae: Asclepiadoideae), an Endangered species new record for the flora of Western Himalaya, India

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Abstract

Ceropegia hookeri C.B. Clarke ex Hook.*f.* is being reported for the first time from the Western Himalaya. This contribution marks rediscovery of this taxon after a gap of nearly 140 years. Present collection of this species from Munsyari block of Eastern Uttarakhand (India) also marks its westernmost range of its global distribution. Detailed morphological features of aerial and underground parts are given to aid field identification. Based on IUCN Red List criteria, we suggest that this species be assigned the status of Endangered (EN) category. Further, surveys of populations from Nepal and Tibet would be required to confirm this status. The study presented first ever record on the western-most distribution of *Ceropegia hookeri*, a species rare in occurrence. The information given in this paper may provide opportunities for conserving the species in its natural habitats through appropriate management interventions and hence, it may be useful not only for the floristics but also from the aspects of conservation.

Keywords Ceropegia hookeri · Endangered · New record · Western Himalaya · Uttarakhand · India

Introduction

The genus *Ceropegia* L. (Apocynaceae: Asclepiadoideae-Ceropegieae) encompasses more than 240 species sparsely by widely distributed worldwide (Bruyns 2014; Kambale and Yadav 2019). This genus is characterized by presence of apical crown on corolla tube that separates it from other genera viz. *Brachystelma* R.Br. ex Sims and *Caralluma* R.Br. (Huber 1957; Hooker 1883; Ansari 1984; Li et al 1995; Meve 2009). It is distributed in the old world from South East Asia, India, Madagascar, Tropical Arabia, Canary Islands, and Africa except the Mediterranean region, New

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Guinea and Northern Australia (Hooker 1883; Huber 1957; Ansari 1984; Meve 2002; Sri Rama Murthy et al 2012). The genus exhibits highest diversity in South Africa, followed by Kenya, Madagascar and India (Sri Rama Murthy et al 2012). In India there are about 62 species, two subspecies and five varieties (Surveswaran et al 2009; Karthikeyan et al 2009; Kambale and Yadav 2019). Of these, 43 are endemic to the subcontinent, Western Ghats being the centre of the diversity. It is represented by only 15 species in the Indian Himalayan region (IHR). Of these, five species have been recorded from the state of Uttarakhand, viz. *C. angustifolia* Wight, *C. bulbosa* Roxb., *C. longifolia* Wallich, *C. macrantha* wight, and *C. wallichii* Wight (Uniyal et al 2007).

Though, the state of Uttarakhand has been well explored in terms of floral surveys by a large number of institutions and individuals, its eastern part remains underexplored. The authors have been conducting floristic surveys in the eastern part of Uttarakhand since 3–4 decades (Rawat 1984; Pangtey et al 1988; Samant 1987; Kishor 2015) updating the information on the flora of the state. In this communication we report occurrence of *C. hookeri* for the first time from the Western Himalaya from eastern Uttarakhand that makes it second population in the country. The paper also provides updated morphological features based on fresh specimens studied in the field, root morphology, population structure and remarks on threat status as per IUCN guidelines.

Material and methods

During the course of floristic inventory of Johar Valley, i.e. Munsyari block of Pithoragarh district, eastern Uttarakhand (2014 to 2018), the senior author (KK) collected a few specimens of Ceropegia species growing in temperate broadleaf forest of oak-rhododendron (Quercus semecarpifolia-Rhododendron arboreum). Detailed morphological examinations of flowering shoots as well as roots were done in the field. A few specimens were processed following the standard herbarium procedures (Vogel 1987; Rao and Sharma 1990; Forman and Bridson 1992) and deposited in the Herbarium of Botany Department, Kumaun University, Nainital, Uttarakhand, India. The specimens were further identified with the aid of relevant literature on the genus Ceropegia (Kambale and Yadav 2019) followed by close examination of herbarium sheets under the genus housed at the herbaria in Dehradun, viz. BSD (KK-853), DD (KK-2022) and WII



Fig. 1 Ceropegia hookeri A, B plant in habitat; C flowers; D fruit

(KK-2025). Identity of the species, its detailed description and illustrations are provided below to facilitate its authentic identity.

Result

After critical examination of collected specimens and careful consultation of the relevant literature, especially newly published species from Asia (Hooker 1883; Ansari 1984; Swarupanandan and Mangaly 1992; Bruyns 1995; Li et al 1995; Jagtap and Singh 1999; Albers and Meve 2002; Meve 2009; Kumar et al 2018; Kambale and Yadav 2019) the plant was identified as *Ceropegia hookeri* C.B. Clarke ex Hook.f.

Taxonomy

Ceropegia hookeri C.B. Clarke ex Hook.f., Fl. Brit. India. 4: 73. 1883; H. Huber, Mem. Soc. Broter. 12: 47. 1957; Ansari, Fasc. Fl. India 16: 17. 1984; M.P. Nayar & Sastry, Red Data Book Indian Pl. 2: 42. 1988; A.P. Jagtap & N.P. Singh, Fasc. Fl. India 24: 224. 1999; F. Albers & Meve, Ill. Handb. Succ. Pl. Asclepiadaceae 82. 2002; Karthik. et al., Fl. Pl. India 1: 162. 2009. Kambale & Yadav, Rheedea 29(1):01–115.2019.

Perennial, erect to decumbent herbs, upto 1 m tall. Rootstock shows a range of variations from elongated rhizomatous to cluster of fusiform, succulent roots which are often fascicled, 10-25 cm long, linear, white. Stem cylindrical, pubescent, and purplish when mature. Leaves simple, opposite with short (0.5-1.5 cm) petioles which are cylindrical, sparsely pubescent and channelled above. Leaf blade ovate or lanceolate, entire or undulate, apex acuminate, green above, dull green below, Ca. $3-10.5 \times 1.5-3.5$ cm, ciliate along margins, hairy above (hispid), glabrous below, mid vein sparsely hairy, lateral veins 3–5 pairs. Inflorescences shorter than the leaves, erect rarely drooping; Cymes few flowered (3-10), rarely solitary, commonly 4–5. Peduncle short ca. 5 mm, lightly reddish or purplish when mature, hairy, pedicels 1-1.5 cm long, glabrous, light green when young, purplish at maturity, sepals conical, persistent, ca. 5 cm long, acute, divergent. Corolla tube 2–2.5 cm long whitish, slightly curved, sparsely violet stripped, glabrous, slightly swollen at base, neck 3-5 mm in diameter, crown 1 cm long, lobes ca. 1 cm long convergent, forming an ovoid cage, crown tip beaked. Corolla tube violet or blue striped insight, neck violet, velutinous. Corona bi-seriate; outer of 5 entire, lobes ciliate, white at dilated base, violet bordered, inner of 5 erect linear lobes, violet, linear-oblong, convergent, ca. 5 mm long, fruit a pair of follicles, 5-8 cm long green with purple tinge (Figs. 1, 2, 3, 4).

Key to the identification of *Ceropegia* species in Western Himalaya, India

1a. Corolla lobes equal to the tubes...... C. macrantha.

1b.	Corolla	lobes	shorter	than	the
tubes.		2			
2a. Plants erect C. wallichii.					
2b. F	Plants twining				3
3a. Corolla tube glabrous within4					
4a. Corolla lobes form connate cageC. longifolia					
4b. Corolla lobes form ellipsoid cageC. bulbosa.					
3b. Corolla tube hairy within5					
5a. L	eaves ciliate	e along n	nargins		C.
hooke	eri.				
5h I	anyon alabras	a along ma	raine	C anoust	ifolia

5b. Leaves glabrous along margins.........*C. angustifolia.* Flowering and fruiting: June–September.

Distribution: India (Sikkim, Uttarakhand), Nepal, Bhutan and S. Tibet.

Habitat and Ecology: The plant was found growing as an understorey of temperate broadleaf oak-rhododendron (*Quercus semecarpifolia* Sm. and *Rhododendron arboreum* Sm.) forest between elevation of around 2700–2900 m above sea level in association with *Sarcococca saligna* (D.Don) Mull., *Bergenia ciliata* (Haw.) Sternb., *Anemone obtusiloba* D.Don, *Malaxis muscifera* (Lindl.) O. Kuntze, *Geranium nepalense* Sweet, *Roscoea procera* Wall., *Anaphalis contorta* (D.Don) Hook.f., *Viola canescens* Wall. Ex Roxb., and *Valeriana wallichii* DC., etc. This locality has coarse loamy soil with sandy loam surface texture. The area receives high rainfall during June to August and in winters this region receives high snowfall and remains snow covered from late December to mid March.

Specimens Examined: India, Uttarakhand, Pithoragarh, Munsyari, Thamrikund (Ele: 2910 m asl, N 30° 01' 56.0" E0 80°14' 57.0"), Kalamuni (Ele: 2716 m asl, N 30° 02' 01.0" E0 80° 12' 39.5") KK-853, 2022&2025. The two locations are about 5 km from each other.

Conservation status: Clarke reported *C. hookeri* in the Flora of British India (1883) based on the specimens collected by J.D. Hooker from Lachen valley, Sikkim. This species could not be relocated or collected from India for a long time until Nautiyal et al. (2009) revisited its type locality near Nyakha-Lachen village (North Sikkim) at an altitude of 2700 m and found 8–10 individuals on temperate grassy slope. These authors noted that the type locality of this species is severely degraded and the species is now critically endangered. In a recent revisionary study Kambale and Yadav (2019) included this species based on previous



Fig. 2 *Ceropegia hookeri* A habit; B rootstock; C, D flowers; E crown, F longitudinal section of flower; G, H corona; I fruit

reports as no live or herbarium specimens were available for examination to them. Though, Nayar and Sastry (1987) categorized the threat status to this species as Endangered but this was not based on the IUCN criteria. Based on a thorough search of the populations of this species in Munsyari only 50–60 mature individuals found in flowering stage at Thamrikund and Kalamuni only 15–20 individuals found. Following the latest IUCN Red List Criteria it can be stated that this species is has highly fragmented populations with known global locations. Moreover, its habitats are mostly disturbed due to anthropogenic activities including intensive grazing by domestic livestock and resultant degradation. Hence its current threat status is suggested as Endangered (EN).



Fig. 3 Ceropegia hookeri A-K Rootstock diversity

Conclusion

The species *C. hookeri* is a new addition to the flora of the Western Himalaya. This species is found growing in *Rho-dodendron-Quercus semecarpifolia* dominated hill slopes at the altitudinal range of 2700–2900 m.a.s.l. in moist habitats of two localities namely Thamrikund and Kalamuni in the

Uttarakhand Himalaya. At Thamrikund only 50–60 mature individuals were found in flowering stage while at Kalamuni only 15–20 individuals were found growing in rock crevices with stunted growth. This report provides the westward distributional limit of the species in the Himalaya and the westernmost distributional limit in Asia. This species has

Fig. 4 *Ceropegia hookeri* A habit; B rootstock; C, D flowers; E crown; F longitudinal section of flower; G fruit



not been reported westward beyond this limit in South Asia till date.

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Declarations

 $\ensuremath{\textit{Conflict}}$ of interest The author declare that they have no conflict of interest.

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