

# Circumscription of *Gentiana harwanensis* (Gentianaceae) and its addition to the flora of Eastern Himalaya

Debabrata Maity\*, Mrinmoy Midday & Jayanta Ghosh

Taxonomy and Biosystematics Laboratory, Department of Botany, University of Calcutta, Ballygunge Circular Road, Kolkata, West Bengal – 700 019, India.

\*E-mail: debmaity@yahoo.com

**Abstract:** *Gentiana harwanensis* G.Singh is reported for the first time from Eastern Himalaya. This taxon has been treated earlier as a subspecies of *Gentiana capitata*. It is reinstated here as a distinct species. A detailed description, photo plate, notes on distribution and habitat are provided for easy identification.

**Keywords:** *Gentiana harwanensis*, Gentianaceae, New Record, Sikkim, Status.

## Introduction

*Gentiana* L. *s.l.* (Gentianaceae–Gentianeae) consisting of about 365 species is widely distributed in the temperate and alpine regions of North-West Africa (Morocco), America, Asia, eastern Australia and Europe (Garg, 1987; Ho & Pringle, 1995; Maity, 2014; Anilkumar *et al.*, 2015; Mabberley, 2017; Maity *et al.*, 2018a, b). India harbours *c.* 69 species and most of them are distributed in the Himalayas.

During a plant collection trip to Lachung and its surrounding areas of north Sikkim, the authors collected a few specimens of *Gentiana* from subalpine grassy slopes. After comprehensive literature search (Clarke, 1883; Agarwal *et al.*, 1981; Agarwal & Bhattacharyya, 1982; Ubolcholaket, 1987; Garg, 1987; Ho & Pringle, 1995; Aitken, 1999; Ho & Liu, 2001; Hul, 2003), critical examination of specimens in consultation with the type and protologue and comparison of *Gentiana*

species of the Himalaya (India, Nepal, Bhutan, Tibet), the specimens were identified as *Gentiana harwanensis* G.Singh, which became a new record for Eastern Himalaya. Detailed description and photo plate are provided for easy identification. The circumscription of the species is also discussed and species status of *Gentiana harwanensis* is retained.

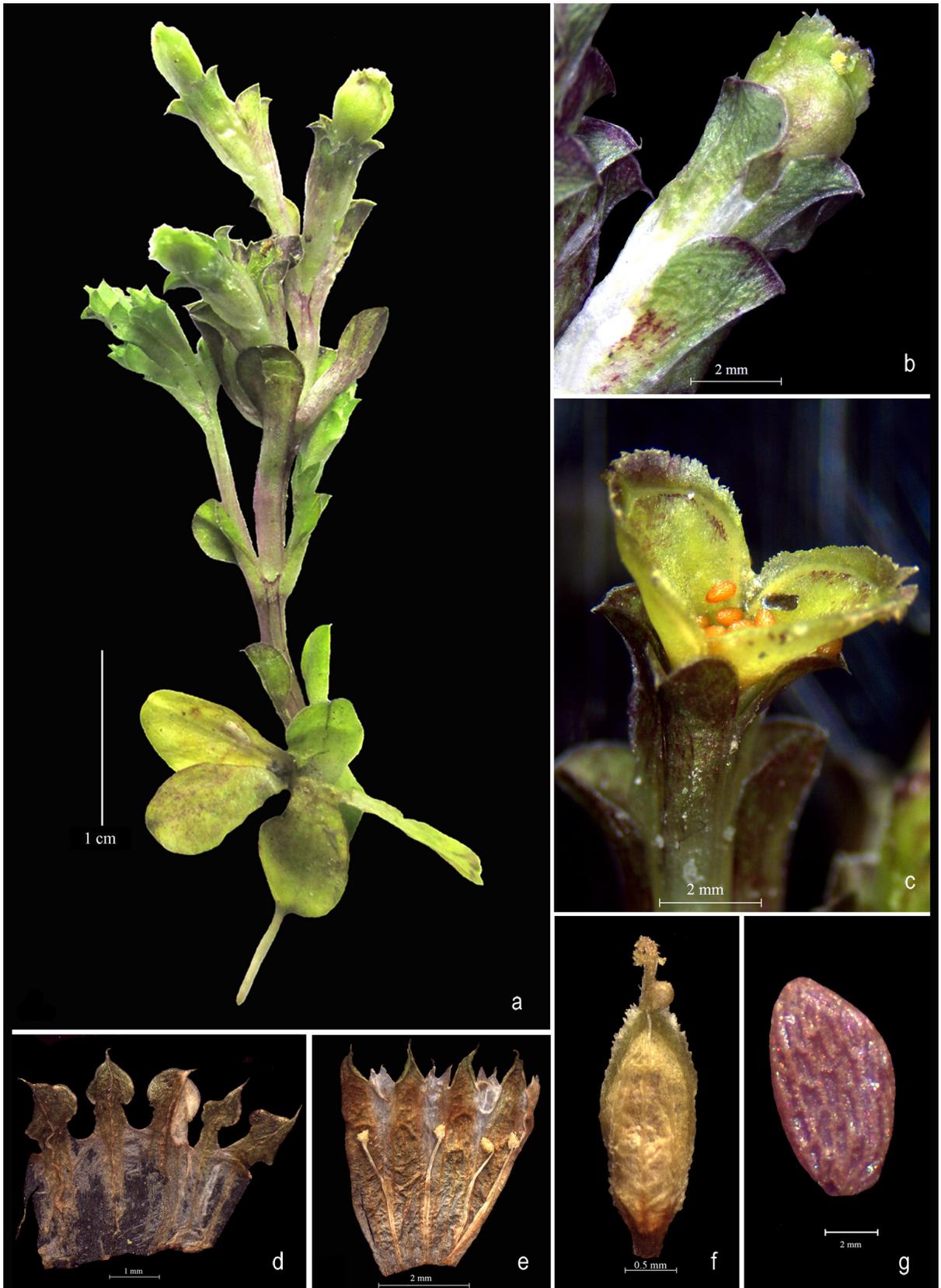
## Materials and Methods

Plant specimens were collected from grassy slopes of Lachung Valley, North Sikkim at an elevation of about 2800 m. Habit and habitat photographs were taken and voucher specimens were deposited at CUH. Measurements of vegetative and floral parts were taken with a Leica EZ4E stereo microscope. Type (images) and protologue, and other authentic specimens deposited in CAL, KASH, K and NY were also examined.

## Taxonomic treatment

*Gentiana harwanensis* G.Singh in G.Singh & P.Kachroo, Forest Fl. Srinagar 126, t. 5. 1976; Agarwal *et al.*, Indian J. For. 4 (3): 236. 1981; Agarwal & Bhattacharyya, J. Econ. Taxon. Bot. 3: 999. 1982; Garg, Gent. N.E. Himal. 106. 1987. *Ciminalis harwanensis* (G.Singh) Omer, Edinb. J. Bot. 50(1): 67. 1993. *Gentiana capitata* Buch.-Ham. ex D.Don subsp. *harwanensis* (G.Singh) Halda, Acta Mus. Richnov. Sect. Nat. 3: 36. 1995; Shabir *et al.*, Check List 15(1): 107. 2019. *Type*: INDIA, **Kashmir**, Harwan, 25.04.1969, 1700 m, Gurucharan Singh 1524 (holo KASH digital image!; iso NY digital image!).

Fig. 1



**Fig. 1.** *Gentiana harwanensis* G.Singh: **a.** Habit; **b.** Mature capsule; **c.** Dehiscent capsule; **d.** Calyx - split open; **e.** Calyx - split open showing stamens; **f.** Gynoecium; **g.** Seed.

Erect annual herbs, 2–8 cm tall; taproot cylindrical, *c.* 3 cm long, *c.* 0.4 mm diam.; stems simple or with few a branches above, angular often with fine purple lines, glabrous. Rosette leaves a few, present during anthesis; leaf blades spatulate, obovate or broadly elliptic 5–1 × 3–4(–9) mm, acute or rounded, mucronate, mucro cartilaginous, recurved, margins entire, smooth, cartilaginous; petioles short, *c.* 0.2 mm long, base fused to *c.* 0.15 mm long sheath, glabrous, midvein prominent, cartilaginous. Cauline leaves dense to lax, 3–4 pairs, shorter than internodes; leaf blade spatulate or oblanceolate 4–7(–1) × 3–4(–8) mm, smooth, apex acute, often purplish tinged, mucronate, mucro cartilaginous, recurved, margins entire, cartilaginous, midvein cartilaginous; petioles fused, forming a sheath 0.25–0.5 mm long, smooth. Flowers terminal, solitary or a few, often in dichotomous pattern, sometimes condensed, 4(–5)-merous; pedicels *c.* 1 mm long, often surrounded by upper most pair of leaves, glabrous. Calyx campanulate, 3.3–5.5 × 1.5–2.2 mm; tube 2–3.5 mm long; lobes 4 or 5, broadly obovate or oblong, 1.3–3 × 0.7–1.2(–2) mm, subequal, margins cartilaginous, apex acute, mucronate, often purplish, 1-veined, moderately reflexed; midvein cartilaginous, sinus between lobes rounded or obtuse. Corolla campanulate, 4.8–7 mm long, bluish; tube 4–6 mm long; lobes 4 or 5, broadly ovate, 0.8–1.5(–3) × 0.8–1(–3) mm, apex acute; plicae ovate, 0.5–0.7 × 0.5–0.8 mm, bifid. Stamens 4 or 5, inserted below middle of corolla tube, 2.1–2.3 mm above corolla base; filaments 1–1.2(–4) mm long, white, slightly flattened towards base; anthers 0.5–1 mm long, yellow. Ovary ellipsoid, 2–3 × 1–2 mm, narrowly winged along ventral suture towards apex; stipe 0.5–0.7 mm long; style 0.4–1 mm long; stigma lobes oblong, 0.5–0.7 mm. Capsules obovoid to club-shaped, 4.5–5 × 2–3 mm; ventral suture winged, crested at apex, partially exerted, many-seeded; fruiting pedicel *c.* 3.5 mm long; seeds ellipsoid, *c.* 0.75 × 0.4 mm, reddish brown, reticulate.

*Distribution:* India.

*Habitat:* On rocks, grassy slopes and loose soil in open temperate to sub-alpine forests above 1700 to 4000 m elevation.

*Flowering:* February–May; *fruiting:* April–June.

*Specimen examined:* INDIA, **Sikkim**, below Lachung Valley, 2800 m, 10.03.2017, *Dey, Ghosh & Midday* 20127, 20134 (CUH).

## Discussion

Singh (1976) described *Gentiana harwanensis* and considered *G. aquatica* L. as its morphologically allied species. Agrawal *et al.* (1981) reassessed the relationship of the species and stated that “*G. harwanensis* is more closely allied to *G. riparia* Kar. *et Kir.*, *G. albicalyx* Burkill, *G. capitata* Buch.-Ham. *ex D. Don* rather than to *G. aquatica* L. and amended the description of the former species. Agrawal and Bhattacharyya (1982) subsequently considered *G. capitata* as more close to *G. harwanensis*. Phenologically *G. harwanensis* is more close to *G. capitata* than to *G. aquatica* as they flower early in the season (April–May), whereas latter species starts flowering in June. Garg (1987) in his revisionary account of the family Gentianaceae of the North West Himalaya retained *G. harwanensis* as a distinct species. However, Halda (1995) reduced *G. harwanensis* as a subspecies of *G. capitata*. Recently, Shabir *et al.* (2019) recorded it from Suru Valley in Kargil district of Ladakh and followed Halda (1995).

*Gentiana capitata* is characterized by stems being leafless in lower half, leaves congested into a dense head towards apex and plicae rounded and denticulate (rarely entire or with 2–3 dentate, thus sometimes appears as emarginate). However, the stems of *G. harwanensis* are leafy throughout with prominent basal rosettes. The basal rosette leaves are a few and present during anthesis. The plicae in *G. harwanensis*, is distinctly bifid and the inflorescence is much lax and never appears as congested head as in *G. capitata* (Table 1). Hence *G. harwanensis*, is treated as a distinct species following Singh (1976), Agrawal *et al.* (1981), Agrawal and Bhattacharyya (1982) and Garg (1987).

*Gentiana harwanensis* was described as endemic to Jammu and Kashmir by Singh (1976). Later, its occurrence in Uttarakhand state was confirmed by Agrawal *et al.* (1981), Agrawal and Bhattacharyya

**Table 1.** Comparison of the diagnostic traits of *G. harwanensis* and *G. capitata*

Characters		<i>G. harwanensis</i>	<i>G. capitata</i>
Stem		angular, leafy throughout	terete, leafless in lower half
Basal rosette		present	absent
Cauline leaves	arrangement	distributed throughout the stem, not aggregated or congested	aggregated and congested below a dense head towards apex
	shape	spathulate or oblanceolate	oblong, ovate, elliptic or spathulate
Inflorescence		flower solitary or a few, often in lax dichotomous cymes	flowers several to many, in congested heads
Plicae		ovate, bi-fid	orbicular, semiorbicular or oblong, entire or denticulate
Capsule		crested at apex and winged along ventral suture	crested at apex only

(1982) and Garg (1987). In a recent enumeration, Gupta *et al.* (2012) claimed the existence of this taxon in Himachal Pradesh, however, they did not cite any representative specimens. Shabir *et al.* (2017) mentioned Jammu and Kashmir as the only distribution locality of the species. However, both Agrawal *et al.* (1981), Agrawal and Bhattacharyya (1982) and Garg (1987) provided representative specimens from Uttarakhand (the then part of Uttar Pradesh). Even though, Agrawal and Bhattacharyya (1982) included Sikkim as one of the growing localities of the species, however they did not cite any specimen to justify their observation.

### Acknowledgements

Authors are thankful to the Ministry of Environment, Forest & Climate Change, Govt. of India, New Delhi for financial assistance; the Forests, Environment and Wildlife Management Department, Govt. of Sikkim, Home Department, Govt. of Sikkim, Superintendent of Police, Gangtok and Indo-Tibetan Border Police and 17<sup>th</sup> Mtn. Division, Indian Army for permission and support for field visit. Authors are grateful to Dr. K.N. Gandhi (GH) for his comment on *Gentiana amblyophylla* and to the Director, Botanical Survey of India, Kolkata for giving permission to consult herbarium (CAL). Authors are thankful to S.K. Dey for help in field collection. Thanks are due to Dr. Anzar A. Khuroo

(University of Kashmir) for providing valuable literature.

### Literature Cited

- AGRAWAL S., BHATTACHARYYA U.C. & B.K. GUPTA 1981. A note on *Gentiana harwanensis* (Gentianaceae). *Indian Journal of Forestry* 4(3): 236–238.
- AGRAWAL S. & U.C. BHATTACHARYYA 1982. Studies on *Gentiana capitata* Buch.-Ham. ex D. Don and its allies (Gentianaceae). *Journal of Economic Taxonomic Botany* 3: 995–1000.
- AITKEN E. 1999. Gentianaceae. In: LONG D.G. (ed.), *Flora of Bhutan*. Volume 2(2). Royal Botanic Garden Edinburgh, Edinburgh. pp. 632–656.
- ANILKUMAR K.A., PRABHU KUMAR K.M. & P.S. UDAYAN 2015. *Gentiana kurumbae*, a new species of Gentianaceae from the Western Ghats of Kerala, India. *Taiwania* 60(2): 81–85.
- CLARKE C.B. 1883. Gentianaceae. In: HOOKER J.D. (ed.), *The Flora of British India*. Volume 4. L. Reeve & Co., London. pp. 108–119.
- GARG S. 1987. *Gentianaceae of the North West Himalaya (A Revision)*. Today & Tomorrow's Printers and Publishers, New Delhi. pp. 80–122.
- GUPTA S., MUKHERJEE A. & M. MONDAL 2012. A census of *Gentiana* L. in India, Systematics of Flowering Plants, In: MAITI G. & S.K. MUKHERJEE (eds.), *Multidisciplinary Approaches in Angiosperm Systematics.*, Volume 1. University of Kalyani, Kalyani. pp. 53–58.
- HALDA J.J. 1995. Synopsis of the new system of the genus *Gentiana*. *Acta Musei Richnoviensis* 3: 33–49.
- HO T.N. & S.W. LIU 2001. *A worldwide monograph of Gentiana*. Science Press, Beijing. pp. 1–694.

- HO T.N. & J.S. PRINGLE 1995. Gentianaceae. In: WU Z.Y. & P.H. RAVEN (Eds.), *Flora of China. (Gentianaceae through Boraginaceae)*. Volume 16. Science Press, Beijing, and Missouri Botanical Garden Press, St. Louis. pp. 15–97.
- HUL S. 2003. *Flore du Cambodge, du Laos et du Vietnam*. Volume 31. Gentianaceae. Muséum National d'Histoire Naturelle, Paris. pp. 1–97.
- MABBERLEY D.J. 2017. *Mabberley's plant-book, A portable dictionary of plants, their classification and uses*. Fourth Edition. Cambridge University Press, Cambridge. p. 382.
- MAITY D. 2014. A new species of *Gentiana* (Gentianaceae) from the Sikkim Himalaya. *Edinburgh Journal of Botany* 71(3): 289–296.
- MAITY D., MAITI G.G. & A.S. CHAUHAN 2018. *Flora of Kanchenjunga Biosphere Reserve, Sikkim*. Botanical Survey of India, Kolkata. pp. 287–309.
- MAITY D., DEY S.K., GHOSH J. & M. MIDDAY 2018. *Gentiana arunii* sp. nov.: tiny remarkable *Gentiana* from Sikkim Himalaya. *Edinburgh Journal of Botany* 75(1): 117–125.
- SHABIR M., AGNIHOTRI P., HUSAIN D., TIWARI J.K. & T. HUSAIN 2017. On the current status of the genus *Gentiana* L. (Gentianaceae) in India. *Pleione* 11(1): 16–24.
- SHABIR M., KHUROO A. A., AGNIHOTRI P., TIWARI J.K. & T. HUSAIN 2019. A range extension of *Gentiana capitata* Buch.-Ham. ex D. Don subsp. *harwanensis* (G. Singh) Halda (Gentianaceae) to Ladakh Trans-Himalaya, India. *Check List* 15(1): 105–108.
- SINGH G. 1976. *Gentiana harwanensis*. In: SINGH G. & P. KACHROO (eds.), *Forest Flora of Srinagar and Plants of Neighbourhood*. Bishen Singh Mahendra Pal Singh, Dehradun. pp. 126–127.
- UBOLCHOLAKET A. 1987. Gentianaceae. In: SMITINAND T. & K. LARSEN (eds.), *Flora of Thailand*. Volume 5(1). The Forest Herbarium, Royal Forest Department, Bangkok. pp. 72–92.