

Rediscovery, reinstatement and lectotypification of *Impatiens serrulata* (Balsaminaceae) from Kumaon Himalaya, India

Sharma A.^{1*}, Adamowski W.² & N. Begum¹

¹FRLH Herbarium, The University of Trans-Disciplinary Health Sciences and Technology (TDU), Post Attur via Yelahanka, Bengaluru, Karnataka – 560 064, India

²Białowieża Geobotanical Station, Faculty of Biology, University of Warsaw, Sportowa 19, 17-230 Białowieża, Poland

*E-mail: ashutosh.sharma@tdu.edu.in

Abstract: *Impatiens serrulata* Hook.f. (Balsaminaceae), a rare and poorly known spurless species described from the Kumaon Himalaya, is rediscovered after a gap of 125 years from the type locality. The name *I. serrulata* was considered conspecific with *I. serrata* Benth. ex Hook.f. & Thomson but based on our recent collection from the type locality we confirmed that *I. serrulata* is morphologically distinct from *I. serrata*, thus here we reinstate the name *I. serrulata* along with its lectotypification. Also, detailed augmented morphological description, information on habitat, associated species, distribution, morphological variations and color photographs of this species are provided for its easy identification.

Keywords: Balsam, Flora of Western Himalaya, Inayat Khan, Kumaon, Plant Rediscovery.

Introduction

Impatiens L., with more than 1,167 known species, is a megadiverse genus belonging to the family Balsaminaceae (POWO, 2025). The Western Himalaya harbour about 30 species of this genus including several taxonomically unresolved taxa that are known only from old, poorly preserved, or only type collections (Sharma *et al.*, 2025). *Impatiens serrulata* Hook.f. was first collected by Inayat Khan, one of the collectors of Duthie, in August 1900 from “Saba Udyar” in Ralam valley, Kumaon and described by Hooker (1904). Later, this species was only collected again by C.M. Arora from

“Babri Udyar” in Kumaon on 8th and 13th August 1972 (CAL0000046808, CAL0000046807). Hara (1975) treated *I. serrulata* as conspecific to *Impatiens serrata* Benth. ex Hook.f. & Thomson and the same was followed by subsequent workers (Vivekananthan *et al.*, 1997; Chen *et al.*, 2007; Pusalkar & Srivastava, 2018; Gogoi *et al.*, 2020; Akiyama, 2021; Singh *et al.*, 2021). As part of the doctoral research of the first author on the taxonomic revision of the genus *Impatiens* L. in the Western Himalaya, targeted field investigations were conducted in and around the type locality of *Impatiens serrulata*. These surveys led to the successful recollection of *I. serrulata* and, through detailed examination of living populations, herbarium specimens and relevant literature review revealed that *I. serrulata* is morphologically distinct from *I. serrata*, contrary to the treatment of Hara (1975). The species is known only by the protologue lacking description and from two other collections, of which the last collection was made 53 years ago in 1972. Thus, here we reinstate the species and present the first photographic evidence of this species based on our recollection made from its type locality. Also, detailed morphological description, differences with closely allied species, information on distribution, habitat and associated species are provided. Furthermore, lectotypification of the name *I. serrulata* Hook.f. is discussed here for future references and uses.

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Material and Methods

This study includes a combination of literature survey, herbarium specimens examination and fieldwork. A comprehensive study of existing herbarium material at K, E, L, CAL, WII, DD & FRLH (acronyms of herbaria follow Thiers, 2025–continuously updated) was conducted to facilitate taxonomic comparison and typification. Typification presented in this article follow the current guidelines of the *Madrid Code* of International Code of Nomenclature for Algae, Fungi, and Plants (ICN) (Turland *et al.*, 2025). The circumscription of the species was assessed by comparing the observed features of the newly collected specimens from the type locality and published descriptions of allied species. A field expedition to the type locality of *Impatiens serrulata* Hook.f. was carried out by AS in August 2025 and detailed field notes regarding morphological characteristics of this species including flower colour, shape, size, and plant growth habit, habitat type, associated plant species, and precise location data were recorded. Photographs of the living plants and their floral dissections were taken using a Nikon D5600 camera. Plant names were verified using Plants of the World Online (POWO, 2025) managed by the Royal Botanic Gardens, Kew. The terms applied for each part of the flower in the morphological description of species follows Akiyama *et al.* (1991).

Taxonomic Treatment

Impatiens serrulata Hook.f., Rec. Bot. Surv. India 4(1): 7, 10. 1904. *Lectotype* (designated here): INDIA, **Uttarakhand**, Pithoragarh district, Ralam valley, Saba Udyar, 19.08.1900, *Inayat Khan* 24042 (K [K006366996] digital image!); *isolecto* DD [DD157569; DD5559 digital images!]). **Figs. 1–3**

Annual herbs, glabrous, highly variable in size, 2–60 cm tall. Stems branched, round, lower nodes swollen, stem colour light purple to green. Leaves glabrous, alternate, petiolate; petiole 2–3 mm long, small glands at the base of petiole 0.5–1 mm long; lamina broadly lanceolate to ovate,

variable in size, usually 25–80 mm long and 10–35 mm wide (much smaller in small morphs); base acute, margin serrate to serrulate, acute–acuminate at apex, 8–11 veins. Inflorescence 1–3-flowered; peduncle 5–10 mm long, green and glabrous. Bracts two, unequal, borne at the top of peduncle, subulate to acicular, 2–2.5 mm long. Flowers creamy white with red streaks and spots around the throat of lateral united petals, spurless, 11–15 mm long and 6–8 mm wide. Lateral sepals lanceolate, acute at apex, 3–4 × 2–2.5 mm; lower sepal navicular, 6–7 × 3–4 mm, 2–3 mm deep, spurless, with c. 1 mm acute apex. Dorsal petal cucullate, c. 5 × 4–5 mm, creamy white, with a small, 1–1.5 mm high acute greenish crest; lateral petals united, 8–11 × 3–4 mm; upper lobe with round base, c. 3 × 3 mm; lower lobe c. 4 × 2.5 mm, auricle inconspicuous. Stamens five; column c. 3 mm; anthers with appendage enclosing ovary; stigma five lobed. Capsules linear, 18–45 mm long, glabrous, hanging. Seeds 3–6 per capsule, obovoid, 2–3 mm long, tuberculate, black at maturity.

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

Habitat: This species was found in sub-alpine forest margins of *Quercus semecarpifolia* Sm. (Fagaceae), *Rhododendron campanulatum* D.Don (Ericaceae) & *Syringa emodi* Wall. ex Royle (Oleaceae) and in meadows from 3100–3500 m elevation. Smaller plants grow as lithophytes on moist mossy rocks, unbranched while tall individuals grow on soil, upto 60 cm height. Associated species include *Agrostis micrantha* Steud. (Poaceae), *Circaeaster agrestis* Maxim. (Circaeasteraceae), *Impatiens amphorata* Edgew., *I. racemosa* DC. (Balsaminaceae), *Lecanthus obtusus* (Royle) Hand.-Mazz. (Urticaceae), *Koenigia nepalensis* D.Don (Polygonaceae), *Lepisorus* sp. (Polypodiaceae), *Persicaria nepalensis* (Meisn.) H.Gross (Polygonaceae), *Saxifraga* sp. (Saxifragaceae) & *Sedum* sp. (Crassulaceae) etc.

Distribution: India, Western Himalaya (Pithoragarh district, Kumaon, Uttarakhand).

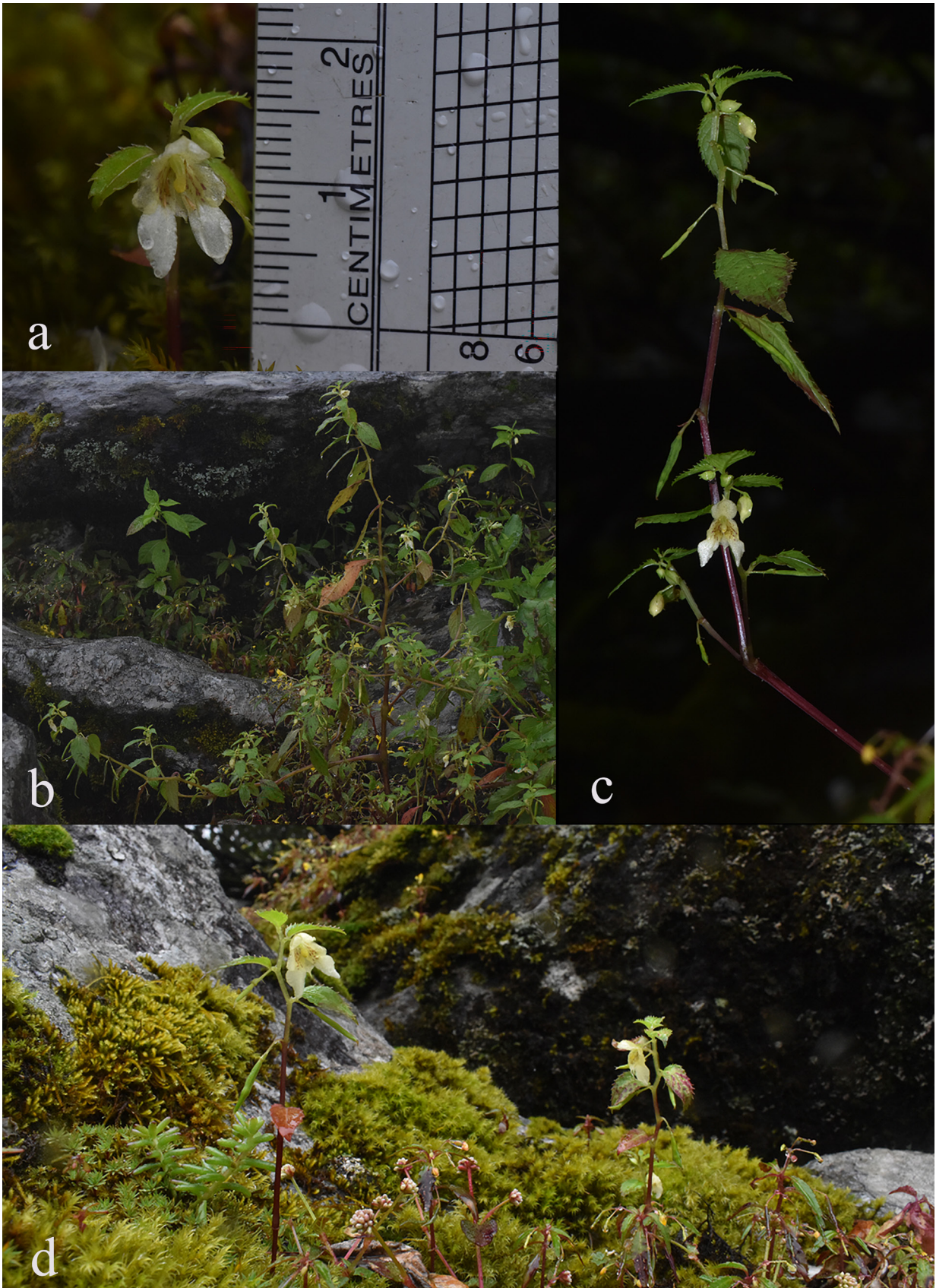


Fig. 1. *Impatiens serrulata* Hook.f. a. Small individual with a flower; b. Two feet tall and branched individual growing in the soil; c & d. Plants in flowering grow as lithophytes on a mossy rock surface with associated species (photographs by Ashutosh Sharma).

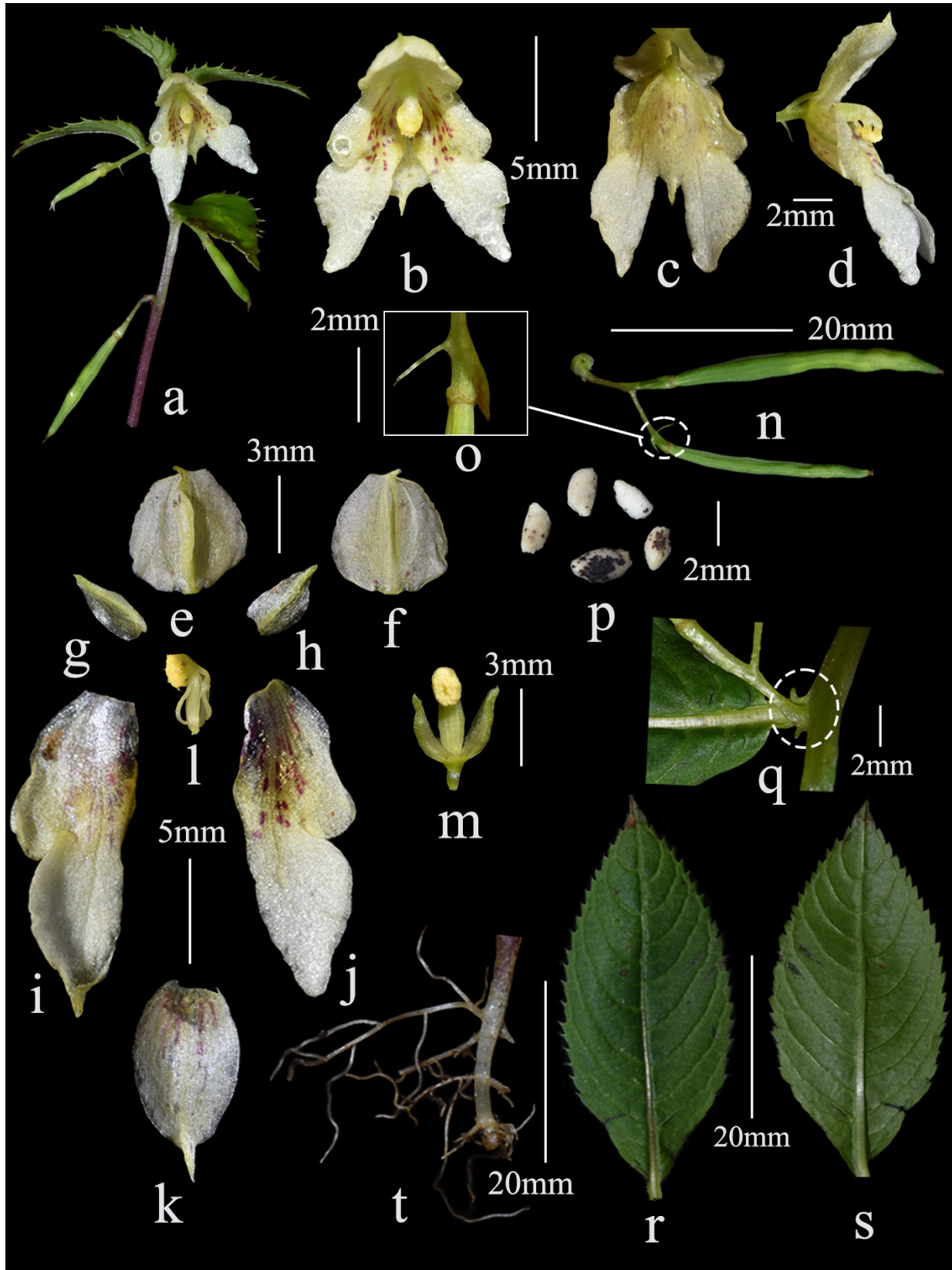


Fig. 2. *Impatiens serrulata* Hook.f. **a.** Twig with frontal view of flower; **b.** Flower—front view; **c.** Flower—back view; **d.** Flower—side view showing spurless lower sepal; **e.** Dorsal petal—abaxial view; **f.** Dorsal petal—adaxial view; **g.** Lateral sepal—adaxial view; **h.** Lateral sepal—abaxial view; **i.** Lateral united petals—abaxial view; **j.** Lateral united petals—adaxial view; **k.** Lower sepal; **l.** Androecium covering gynoecium; **m.** Column with attached pair of lateral sepals; **n.** Capsules; **o.** Bracts; **p.** Seeds; **q.** Glands at the base of petiole; **r.** Leaf—adaxial side; **s.** Leaf—abaxial side; **t.** Roots (photographs by Ashutosh Sharma).

Specimens examined: INDIA, **Uttarakhand**, Pithoragarh district, Ralam valley, Shafaudyar (Saba Udyar), 19.08.1900, *Inayat Khan* 24042 (K [K006366996]; DD [DD157569, DD5559]); Uttarakhand, Pithoragarh district, Gori Valley, Rilkote, 11.08.1900, *Inayat Khan* 23964 (K006366998); Uttarakhand, Kumaon, Babri Udyar, 3300 m, 08.08.1972, *C.M. Arora* 49735 (CAL0000046808); Uttarakhand, Kumaon, Over Babri Udyar, 3500 m, 13.08.1972, *C.M. Arora* 49929 (CAL0000046807); Uttarakhand, Pithoragarh district, on way to Ralam glacier, opposite to Sabha Udyar), 30°14'1" N, 80°16'45" E, 3030 m, 29.08.2025, *Ashutosh Sharma & Veeresh Ari* 25055 (FRLH); Uttarakhand, Pithoragarh district, on way to Ralam glacier (opposite to Sabha Udyar), 30°14'1" N, 80°16'45" E, 3030 m, 29.08.2025, *Ashutosh Sharma & Veeresh Ari* 25056 (FRLH).

Typification: *Impatiens serrulata* was described by Hooker (1904) based on collections from Saba

Udyar of Kumaon Himalayas, in present day Uttarakhand, India. In the protologue there is no mention of collector's name, collection number and herbarium where the materials of *I. serrulata* were deposited. However, Hooker mentioned Inayat Khan as one of the major collectors at the initiation of enumeration of the *Impatiens* species of "Western Himalaya, from the Nepal frontier to Chitral" stating "*To the latter botanist (referring to J.F. Duthie) I am especially indebted for having despatched from the Botanical Department, Saharanpore, a very able collector, Mr. Inayat, into Kumaon, Kashmir and Hazara to collect and preserve specimen of Balsams...*". Through a detailed search across major herbaria (K, E, L, CAL, WII & DD) (acronyms after Thiers, 2025), we came across three sheets (one at K and two at DD) collected by Inayat Khan from dates (1900) preceding the description of species (1904), which were collected from the type locality (Saba Udyar) with collection number 24042. Furthermore, all the herbarium specimens bear Hooker's original handwriting (Burdet, 1975), especially the name *Impatiens serrulata* that he subsequently published. These annotations provide compelling evidence that all of the specimens were examined by Hooker while preparing the protologue of the species, thus confirming Inayat Khan's collections at DD and K as the original materials. Also, out of these three sheets K006366996 is well preserved with line drawings of floral dissection. Thus, we designate K006366996 as lectotype and the other two sheets at DD as isolectotypes (DD5559, DD157569) in accordance with the *Madrid Code* of ICN Art. 9.3 (Turland et al., 2025).

Conservation status: *Impatiens serrulata* is endemic to the Kumaon Himalaya, India, and is known from only a few collections, including the present collection, made in 1900, 1972, and 2025. These sparse records confirm its rarity in the wild. However, as the species has been recorded not only from its type locality but also from Babri Udyar, it is likely to occur in other subalpine areas of Pithoragarh District and in far western



Fig. 3. Lectotype of *Impatiens serrulata* Hook.f. [K006366996]. Available at <http://specimens.kew.org/herbarium/K006366996> © The Board of Trustees of the RBG, Kew.

Table 1. Morphological comparison between *Impatiens serrulata*, *I. serrata* and *I. kharensis* [data for allied species is taken from the protologues and Akiyama *et al.* (1991)].

Characters	<i>Impatiens serrulata</i> Hook.f.	<i>Impatiens serrata</i> Benth. ex Hook.f. & Thomson	<i>Impatiens kharensis</i> S.Akiyama, H.Ohba & Wakab.
Plant length	2–60 cm	20–70 cm	8–20 cm
Number of flowers in inflorescence	1–3	1–2	1 (solitary)
Flowers size	11–15 mm long	30–45 mm long	15–18 mm long
Flower colour	Creamy white with red streaks & spots at throat of lateral united petals	White or pale purple, central part of lateral united petals with deep purple or red purple streaks	White or pale yellow lacking red streaks or spots
Bracts	2 (unequal), subulate to acicular	1, narrowly ovate	1, narrowly ovate
Dorsal petal	Cucullate, creamy white, c. 5 mm long & 4–5 mm wide, with 1–1.5 mm crest	Cucullate, white, 10–13 mm long, 12–15 mm wide, without crest	Cucullate, white, c. 8 mm long, c. 8 mm wide, without crest
Lateral united petals	8–11 mm long, 3–4 mm wide	25–28 mm long, 10–12 mm wide	15 mm long, 5 mm wide
Lower sepal	Navicular, spurless, 6–7 mm long, 3–4 mm wide	Navicular, spurless, 10–13 mm long, 12–15 mm wide	Navicular, spurless, 8 mm long, 3 mm wide
Distribution	Western Himalaya (Kumaon)	Nepal (Western, Central & Eastern), Tibet (China), possibly Kumaon	Central Nepal

Nepal, particularly along the Nepal–Kumaon border region. So, for the time being we have assessed this species as Data Deficient (DD) following the IUCN (2024) guidelines with need for further explorations in suitable habitats in the neighbouring areas around type locality to get more information on its Area of Occupancy (AOO), Extent of Occurrence (EOO) and population size of this species.

Discussion

Impatiens serrata Benth. ex Hook.f. & Thomson was erroneously reported from Himachal Pradesh (Chowdhery & Wadhwa, 1984) from Chamba, citing a specimen from DD for which no collection

number was provided. Our examination of the relevant herbarium collections confirmed that there are no specimens of *I. serrata* at DD, CAL, K and E that are collected from Chamba or elsewhere in Himachal Pradesh. Furthermore, the record of *I. serrata* in Uttarakhand (Pusalkar & Srivastava, 2018) based on the specimen at DD (Inayat Khan 24042) actually represents *I. serrulata*. A specimen identified as *I. serrulata*, collected by J.D. Hooker from Sikkim [L2326886!] housed at Naturalis Biodiversity Center, Netherlands (<https://www.gbif.org/occurrence/2516159195>), is likely a misidentification of *I. serratifolia* Hook.f. However, we are unable to confirm its identity because the herbarium specimen lacks fully mature flowers.

Hooker (1904) reported *I. serrata* from the Western Himalaya based on Inayat Khan's collection [K006366998!] from Rilkote, Gori Valley (Kumaon, Uttarakhand). This record requires recollection and confirmation, as there are no other records of *I. serrata* from the Western Himalaya.

Hooker (1904) also placed *I. serrata* and *I. tricornis* Lindl. (= *I. scabrida* DC.) in the same group, characterized by elongate capsules, bracts between the pedicels, and the rare or absence of bract at the base of the pedicel. Akiyama et al. (1991) described a closely allied spurless species *Impatiens kharensis* S.Akiyama, H.Ohba & Wakab. from central Nepal. The three spurless species viz. *Impatiens serrata*, *Impatiens serrulata* & *Impatiens kharensis* are morphologically closely allied (Table 1) and require molecular phylogenetic studies to better understand their relationship with one another and with the *I. tricornis* complex. Chromosomal studies are also required for *I. serrulata*, while *I. serrata* is reported to have $2n=14$ and *I. kharensis* $2n=18$ (Akiyama et al., 1991).

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