

Studies of *Impatiens* (Balsaminaceae) of Nepal 3. *Impatiens scabrida* and Allied Species

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Abstract *Impatiens tricornis* (Balsaminaceae), often treated to be conspecific with *I. scabrida*, is distinguished by the shape of the lower sepal. After checking the type of *I. scabrida* it became clear that most of the plants referred to as *I. scabrida*, or *I. cristata*, are not true *I. scabrida*, but *I. tricornis*. Lectotypes for *I. calycina* and *I. tricornis* are designated.

Key words: Flora of Nepal, Himalaya, *Impatiens*, *Impatiens tricornis*, lectotype, Nepal.

Previously, Akiyama and Ohba (2015) treated the Nepalese species that were classified in Series BIII Axilliflorae by Hooker (1874·75). *Impatiens scabrida* DC. appears to differ from other species in the series, especially in characteristics of the inflorescence. *Impatiens scabrida* was described by de Candolle based on a Wallich specimen collected in Nepal in 1821 and deposited in G without Wallich's usual catalogue number (de Candolle, 1824). Although at that time we were unable to examine the type specimens, we defined *I. scabrida* as having a type 7 inflorescence (Akiyama and Ohba, 2000).

Hooker (1874·75) at first reduced *I. cristata* Wall., *I. calycina* Wall., *I. hamiltoniana* D. Don and *I. tricornis* Lindl. into the synonymy of *I. scabrida*, but later (Hooker, 1904) distinguished *I. scabrida* and *I. cristata* in the western Himalaya as follows: *I. scabrida* with sepals ovate, lip infundibular, spur $\frac{1}{2}$ – $1\frac{1}{2}$ in.[ches] vs. *I. cristata* with sepals orbicular, lip more or less saccate, spur $\frac{1}{2}$ in.[ches].

Hooker (1905) reported *I. cristata*, but not *I. scabrida*, as occurring in the eastern Himalaya, and reported the basal lobe of the wing to be

muticous in *I. cristata*. We examined the specimens determined as *I. cristata* by Hooker at K from the western and eastern Himalaya, but were unable to find specimens determined as *I. scabrida* by Hooker. Moreover, we found no specimen with a muticous basal lobe of the wing among those determined as *I. cristata* by Hooker. We were unable to confirm Hooker's recognition of the difference between these two species based on the specimens examined by him. As far as we can deduce, the specimens determined as *I. cristata* by Hooker (Fig. 1) are *I. scabrida* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)].

Hara reported *I. scabrida* from Nepal (Hara, 1966, 1971) and Bhutan (Hara, 1971). Hara (1979) followed the treatment of Hooker (1874·75) and added *I. praetermissa* Hook.f. to the synonymy of *I. scabrida* for the Nepal representatives.

We followed Hara's treatment in previous papers (Akiyama *et al.*, 1991, 1992), because we had not examine the Wallich specimens cited by Hara in 1979 as types of *I. scabrida*, *I. calycina* and *I. praetermissa*, or other authentic specimens of these species.

Grey-Wilson (1991) used *I. cristata* for *I.*

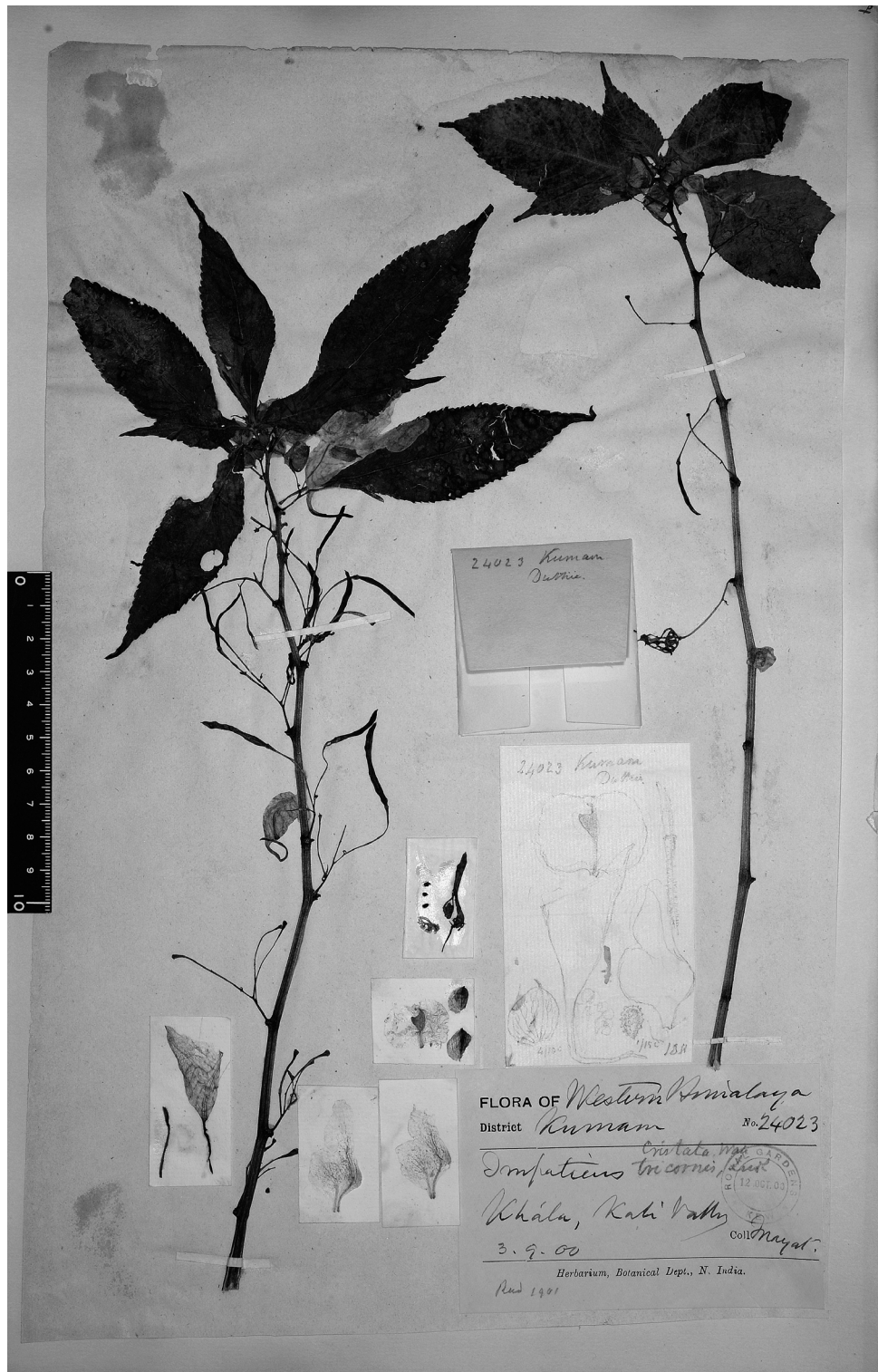


Fig. 1. Specimen determined as *I. cristata* Wall. by Hooker (Inayat 24023, K, det. *I. cristata* and also *I. tricornis* by Hook.f.).

scabrida [sensu Hara] in the *Flora of Bhutan*. He recognized *I. cristata* and *I. scabrida* as different, but did not comment on his basis for doing so. According to Grey-Wilson *I. scabrida* does not occur in Bhutan. For *I. cristata*, he (Grey-Wilson, 1991) mentioned the shape of lower sepal as being deeply navicular to navicular-saccate, but figure 12a in the *Flora of Bhutan* shows the lower sepal to be saccate (bucciniform). The shape of the lower sepal of *I. scabrida* [sensu Hara and Akiyama *et al.*] varies considerably, from bucciniform to infundibular in Nepal and Bhutan (Akiyama *et al.*, 1992). We examined the specimens identified as *I. cristata* by Grey-Wilson and confirmed that *I. cristata* [sensu Grey-Wilson (1991)] is *I. scabrida* [sensu Hara and Akiyama *et al.*].

There has thus been confusion in recognizing these species. This paper provides the results of our observations, particularly of the inflorescences and flowers, of the type and other authentic specimens, that will clarify the taxonomy of *I. scabrida* and allied species that were reduced to synonymy by Hooker (1874·75) and Hara (1979).

Examination of the types and other authentic specimens

Impatiens scabrida DC. was based on a collection by Wallich in Nepal in 1821 (de Candolle, 1824). At least three additional species, *I. cristata* Wall., *I. calycina* Wall. and *I. praetermissa* Hook.f. were also based on collections by Wallich. The type of *I. hamiltoniana* D.Don is a Hamilton's collection, also from Nepal, but the type of *I. tricornis* Lindl. is uncertain.

1. *Impatiens scabrida* DC.

De Candolle (1824) gave a short description of the lower sepal of *I. scabrida*, i.e. "calcare longissimo," however the shape of the lower sepal itself is uncertain from the protologue. Recently, we examined the type of *I. scabrida* DC. in Geneve (G) (Fig. 2).

The shape of the lower sepal of the type speci-

men is not infundibular, as reported by Hooker (1904), and also not bucciniform nor funnel shaped with an abruptly constricted spur as shown in the specimens determined by Hara (1966, 1971, 1979) (Fig. 3) and Akiyama *et al.* (1991, 1992) as *I. scabrida*. Thus we consider *I. scabrida* to be characterized by a navicular lower sepal and a long straight then upwardly (Fig. 4a) or downwardly (Fig. 4b) curved spur, although the upwardly curved spur in the type might be an artefact.

The inflorescence of the type specimen of *I. scabrida* is type 7 in the classification of inflorescence types by Akiyama and Ohba (2000). In Nepal, type 7 inflorescences occur in *I. scabrida* [sensu Hara and Akiyama *et al.*], *I. bajurensis*, and in *I. uncipectala*. Moreover, *I. falcifer*, *I. serrata* and *I. serratifolia* sometimes have the same type of inflorescence (Akiyama and Ohba, 2000). From these species the type specimen of *I. scabrida* is completely different in having a navicular lower sepal tapering into a long spur (Fig. 4a, b).

The application of the name *Impatiens scabrida* in our previous papers should be corrected because of the bucciniform to funnel shaped lower sepal abruptly constricted into the spur (Fig. 4c, d).

2. *Impatiens cristata* Wall.

Impatiens cristata Wall. was described by Wallich in 1824 based on plants cultivated in the Hon. Company's botanic garden that flowered in March 1818, one year after he received the seeds (Wallich, 1824). We found no specimen identified as *Impatiens cristata* by Wallich in either K or K-W.

In the protologue of *I. cristata* Wallich wrote: "nectary [= lower sepal] longer than the pedicel, infundibuliform, tapering into an incurved spur" and "nectary truncate, longer than the pedicel, ending gradually in a cylindrical, ascending spur." The meaning of the "ascending spur" is uncertain, but it may be same as the upwardly curved spur in *I. scabrida* [sensu DC.]. According to the protologue, the shape of the lower sepal of *I.*



Fig. 2. Holotype of *Impatiens scabrida* DC. (Wallich s.n., G00218814).



Fig. 3. Specimen determined as *I. scabrida* by Hara (Stainton *et al.* 7105, BM).

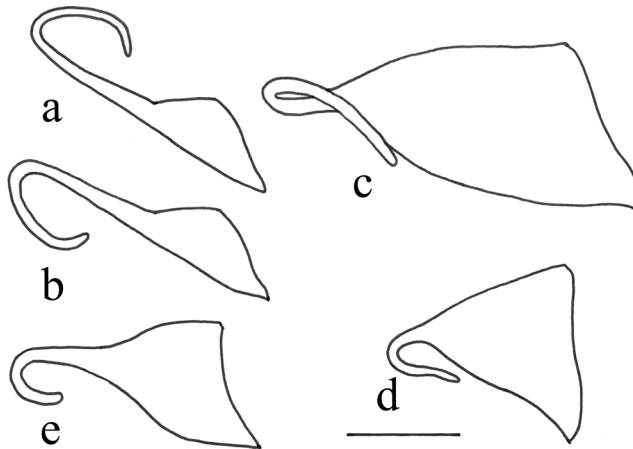


Fig. 4. Lower sepals of *Impatiens*. a & b: *I. scabrada* (Wallich s.n., G00218814, holotype). c: *I. scabrada* [sensu Akiyama *et al.*, 1991] (Ohba *et al.*, 8531382) (Akiyama *et al.*, 1991). d: *I. scabrada* [sensu Akiyama *et al.*, 1992] (Suzuki *et al.*, 9121005) (Akiyama *et al.*, 1992). e: *I. calycina* (Wallich 4769A, K001039859, lectotype). Bar indicates 10mm.

cristata Wall. is infundibuliform and tapering into the spur, which does not fit with the description of *I. scabrada* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)], i.e. bucciniform to funnel-shaped abruptly constricted into a spur.

Although we did not located the type specimen or any other authentic specimen of *I. cristata*, it is not suitable to use the name *I. cristata* for *I. scabrada* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)].

3. *Impatiens calycina* Wall.

Impatiens calycina Wall. was also described by Wallich in 1824. He wrote: "I have found this on Chitlong and on Chundrugiri in Nepal" (Wallich, 1824). Wallich 4769A (K001039859, K-W) has Wallich's identification, "*Impatiens calycina* Chandaghiry, Augusto 1821," (Fig. 5) which corresponds with "Chundrugiri [Chandragiri] in Nepal" in the protologue of *I. calycina* (Wallich, 1824). We regard this to be a syntype of *I. calycina*. We did not find the other syntype, "Chitlong," at K or K-W. Thus, the specimen (K001039859) on the left side of the sheet at K-W is here designated the lectotype of *I. calycina*. As mentioned above, Wallich cited 4769[A] as *I. scabrada*, not *I. calycina*. It is certain that Wallich recognized *I. calycina* as being conspe-

cific with *I. scabrada*. The inflorescence of the lectotype specimen of *I. calycina* is type 7 in the classification of inflorescence types by Akiyama and Ohba (2000).

According to the protologue of *Impatiens calycina* the lower sepal is "gradually narrowing into a cylindric ascending spur." We confirm that the lower sepal gradually narrows into the cylindric incurved spur, but the spur is not ascending in the lectotype specimen (Fig. 4e). Although we cannot understand the meaning of "ascending spur" in Wallich's protologue, the shape of the lower sepal of *I. calycina* Wall. is considered to be same as in *I. scabrada* [sensu DC. (1824)], but does not fit with *I. scabrada* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)]. It is therefore not suitable to use the name *I. calycina* for *I. scabrada* [sensu Hara and Akiyama *et al.*].

4. *Impatiens hamiltoniana* D.Don, Prodr. Fl. Nep.: 204 (1825).

Impatiens hamiltoniana D.Don was described by Don in 1825 based on a Hamilton collection from Nepal ("in Nepalia ad Narainhetty"). Don did not mention the shape of the lower sepal. Hara (1979) stated that he was unable to find the type at BM. We have been unable to examine the type or any other authentic specimens with this



Fig. 5. Lectotype of *Impatiens calycina* Wall. (Wallich 4769A, K001039859) (<http://specimens.kew.org/herbarium/K001039859>). © The board of Trustees of the Royal Botanic Gardens, Kew.

name, so it is uncertain whether it is conspecific with *I. scabrida* [sensu DC. (1824) or Hara (1979) and Akiyama *et al.* (1991, 1992)].

5. *Impatiens tricornis* Lindl. in Bot. Reg. 26: t. 7 (1840).

Impatiens tricornis Lindl. was described by Lindley in 1840 based on uncertain material, but accompanied by a colored illustration. The shape of the lower sepal is not described in the protologue. We have not examined the type or any other authentic specimens, but in the figure the shape of the lower sepal and the inflorescence corresponds well with *I. scabrida* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)].

6. *Impatiens praetermissa* Hook.f. in J. Linn. Soc. Bot. 37: 29 (1904).

Impatiens praetermissa Hook.f. was described by Hooker in 1904 based on a Wallich collection. We have not examined the type or any other authentic specimens of this species, but the shape of the lower sepal, "labio cum calcare incluso 1–1½ poll. longo late infundibulari in calcar gracile attenuato," given in the protologues corresponds with *I. scabrida* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)].

Conclusions

It is clear that the shape of the lower sepal of *I. scabrida* sensu DC. is navicular and tapers into a spur. In *I. cristata* and *I. calycina* it is clear that the lower sepal also gradually tapers into a spur. In contrast, the lower sepal of *I. scabrida* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)] is bucciniform to funnel-shaped and abruptly constricted into the spur, which corresponds with the features of *I. tricornis* and *I. praetermissa*. The shape of the lower sepal of *I. hamiltoniana* is still uncertain. The name *I. tricornis* should therefore be used for *I. scabrida* [sensu Hara (1979) and Akiyama *et al.* (1991, 1992)].

[Systematic treatment]

1. *Impatiens tricornis* Lindl. in Bot. Reg. 26: t.

7 (1840). Hook. in Bot. Mag. 70: t. 4051 (1844). Type: Illustration, t. 7 published in Bot. Reg. 26 (1840) (lectotype, designated here).

I. praetermissa Hook.f. in J. Linn. Soc. Bot. 37: 29 (1904). Type: Wallich s.n. (not found).

I. scabrida auct. non DC.: Wight, Icon. Pl. Ind. Orient. 2: t. 323 (1840). Hook.f., Fl. Brit. India 1: 472 (1875); in Rec. Bot. Serv. Ind. 4: 7 & 10 (1904). Hara in Fl. E. Him.: 196 (1966); 2nd rep.: 75 (1971); in Hara & Williams, Enum. Flow. Pl. Nepal 2: 80 (1979). Polunin & Stainton, Flow. Himal.: 70 (1984). Akiyama *et al.* in Ohba & Malla, Him. Pl. 2: 83, fig. 16, Pl. 6 a–c (1991); in J. Jap. Bot. 67: 192 (1992).

[Figs. 3, 4c, d]

I. cristata auct. non Wall.: Hook.f. in Rec. Bot. Serv. Ind. 4: 7 & 10 (1904); 4: 22 (1905). Grey-Wilson in Grierson & Long, Fl. Bhutan 2: 92, fig. 12a–c (1991). [Fig. 1]

Herbs, annual, erect, 30–80 cm tall, pubescent. Leaves alternate, evenly distributed along the stem, petiolate or nearly sessile in upper part of stem; petiole 5–25 mm long; blade herbaceous, broadly lanceolate to ovate or elliptic, 3–11.5 cm × 1.5–4.3 cm, base attenuate, margin serrate to crenate-serrate, apex acuminate or acute, scabrid on both surfaces. Inflorescences axillary, with 1–3 (or 4) flowers. Peduncle 8–15 mm long. Pedicels 10–20 mm long with a bract at the middle. Bracts narrowly ovate to linear, 3–6 mm long, apex acute. Flowers pale yellow or yellow with reddish brown dots, 2.5–3 cm long, 3–3.5 cm deep. Lateral sepals 2, nearly round, ca. 10 mm long, with an awn at apex. Lower sepal pale yellow shaded with dull orange, bucciniform, (9–)15–18 mm long, (13–)20–25 mm deep (excluding the spur), abruptly constricted into incurved spur; spur curved, (8–)15–23 mm in overall length. Dorsal petal pale yellow, 12–15(–18) mm long, 14–18(–24) mm wide when flattened, cucullate, dorsally with a keel-like crest; crest 3–5 mm high. Lateral united petals pale yellow, sometimes with brownish stripes, (18–)25–30 mm long; upper lobe oblong to ovate, (7–)13–15 mm long, (6–)7–10 mm wide, apex slightly retuse to truncate; lower lobe ovate to elliptic-ovate, (11–)

13–15(–17) mm long, (5–)6–8 mm wide, apex obtuse. Stamens 5, anthers without appendage. Fruit 3–4 cm long.

Specimens examined (in addition to those cited by Akiyama *et al.* 1991 and 1992 as *I. scabrida*): **Northwestern and Western Himalaya (Himal. Bor. Occ.)**. Regio temp., 3–6000 ped. (T.T. s.n., NY, det. *I. cristata* by Hook.f.) Kota Kullu, 7000 ft. (Watt 9634, E). Kumaun, Khala, Kali Valley (Inayat 24023, K, det. *I. cristata* and *I. tricornis* by Hook.f.). Mattiana Hill, 9500 ft. (Watt 10093, E). Madkoli, Goesi Valley (Inayat 24052, NY, det. *I. cristata* by Hook.f.). Mussorne, 6–7000 ft. (Duthie, Sept. 1898, K, det. *I. cristata* and *I. tricornis* by Hook.f.). Simla (Lace s.n. in 1900, K, det. *I. cristata* and *I. tricornis* by Hook.f.); 8000 ft. (Gamble 6405A, K, det. *I. cristata* and *I. tricornis* by Hook.f.). Simla, Mahasu ridge, 8000 ft. (Lace 2137, E). Tehri-Garhwal, Kangugash, 7000 ft. (Gamble 27342, K, det. *I. cristata* and *I. tricornis* by Hook.f.). **Kashmir**. Naranag, c. 7500 ft. (Polunin 9618, BM). Nara Nag. Wangat Nullah, 7400 ft. (Polunin 56/770, BM). **Himachal Pradesh**. Around Manali, 2250 m (Chadwell 329, A). **Nepal**. Nr. Balangra Pass, 12000 ft. (Polunin *et al.* 2628, BM). Bhadauri, East of Kusma, 5000 ft. (Stainton *et al.* 17, BM). Jumla, 8000 ft. (Polunin *et al.* 4402, BM). Kashi, near Pokhara, 4500 ft. (Stainton *et al.* 7105, BM, E). Lapha, Kamali Valley, 4000 ft. (Polunin *et al.* 3991, BM, E). Larjung (S. of Tukucha), Kali Gandaki, 8000 ft. (Stainton *et al.* 7860, E). Maharigaon, 10500 ft. (Polunin *et al.* 156, BM). Marma Khola, 3000 ft. (Polunin *et al.* 1823, BM). Below Mugu, Mugu Khola, 10500 ft. (Polunin *et al.* 5305, BM). Between Munigaon–Chulta, SE. of Jumla, 9500 ft. (Polunin *et al.* 4901, BM). Rohagaon, 9500 ft. (Polunin *et al.* 3358, BM, E). Sanela, 7000 ft. (Polunin *et al.* 5660, BM). Sattewati, 7000 ft. (Stainton *et al.* 8909, BM, E). Taglung (S. of Tukucha), Kali Gandaki, 9500 ft. (Stainton *et al.* 7928, E). Takumsibang, 5500 ft. (Stainton *et al.* 4247, BM, E). Tatopani (S. of Dana), Kali Gandaki, 4500 ft. (Stainton *et al.* 7672, BM, E). Bajhang Distr.,

Badigaon–Dantola–Talkot, 1800 m (Suzuki *et al.* 9170729, TI). Dolakha Distr., Jamune, 1040 m (Noshiro *et al.* 20710051, TI); Gungur Khpla – Jagat, 1120 m (Noshiro *et al.* 20710213, TI). **Sikkim**. Chumbi (Dungboo 4648, K, det. *I. cristata* by Hook.f.). **Bhutan**. (Griffith in 1849, K, det. *I. cristata* and *I. tricornis* by Hook.f.). Chelai La, Ha, 12500 ft. (Ludlow & Sherriff 19611, E). Dhur, near Bumthang, 10000 ft. (Ludlow & Sherriff 19514, E). Tsalimape, 7000 ft. (Ludlow & Sherriff 3563, E). Tslaimape, 7000 ft. (Ludlow & Sherriff 19596, E). **Tibet**. (Dr. King's Collector in 1882, K, det. *I. cristata* by Hook.f.). **India**. N.W. India. Rhotang Pass, 8000 ft. (Kirkpatrick 4, E).

2. *Impatiens scabrida* DC., Prodr. 1: 687 (Jan. 1824). Holotype: Nepal [Napauliâ]. Wallich s.n. (G00218814). [Figs. 2, 4a, b]

I. calycina Wall. in Roxb., Fl. Ind. 2: 463 (Mar.–June 1824). Type: Nepal. Chundrugiri [Chandragiri] [Chandaghiri on the label] Wallich [4769a], Aug. 1821 (designated here).

[Figs. 4e, 5]

I. cristata Wall. in Roxb., Fl. Ind. 2: 456 (Mar.–June 1824). Type: not designated. No authentic specimen is found.

Similar to *I. tricornis* but flowers smaller. Lower sepal navicular or infundibuliform, 9–12 mm long, 5.5–8 mm deep (excluding the spur), tapering into a long upwardly or downwardly curved spur; spur 17–25 mm in overall length.

Specimens examined: Known only from the types of *I. scabrida* and *I. calycina*.

Uncertain species

3. *Impatiens hamiltoniana* D. Don, Prodr. Fl. Nep.: 204 (1825). Type: not designated. No authentic specimens found.

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