

The identity of *Impatiens graciliflora* Hook. f. from East Himalaya and a new record for Myanmar

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Abstract *Impatiens graciliflora* Hook. f. and *I. radiata* Hook. f. from the Sino-Himalayan region were examined morphologically. *Impatiens graciliflora*, regarded as a variety of *I. radiata*, is reported from Myanmar for the first time.

Key words: Balsaminaceae, Flora of Myanmar, Himalaya, *Impatiens*, taxonomy.

Introduction

Impatiens graciliflora, described by Hooker (1905) from Sikkim, occurs in Sikkim (Grey-Wilson, 1991; Vivekananthan *et al.*, 1997) and Nepal (Hara, 1979). When Hooker described *I. graciliflora* in his final paper on British Indian *Impatiens* (Hooker, 1905) he placed it in his subgroup 7 in series B among total 9 subgroups in the eastern Himalaya (subgroups 1 to 4 in series A and subgroups 5 to 9 in series B were divided mainly by the features of the inflorescences and bracts). Within subgroup 7 *I. graciliflora* was separated from other species, except *I. radiata* Hook. f., by the whorled or more or less fascicled pedicels.

Hooker (1905) cited the size of the lower sepal as the only difference between *I. graciliflora* and *I. radiata*; 1–1½ inch long in *I. graciliflora* against ¼–½ inch long in *I. radiata*, but the details of *I. graciliflora* were not mentioned. The length of the lower sepal in Hooker's paper actually refers to its depth (for measurements of the flower see Akiyama *et al.*, 1991).

To characterize the flowers of *I. graciliflora* and *I. radiata* I compared their morphological

features. Their taxonomic status, based on the morphological observations of living and herbarium materials deposited in A, BM, E, GH, K, and TI, including types and other authentic specimens, is discussed.

Observation and discussion

Impatiens radiata Hook. f.

a) Lectotype and syntype specimens

The lectotype specimen, collected in Sikkim (K000694747; Akiyama, 2017) has part of a dissected flower (lateral united petals, lateral sepal, stamens, and ovary) (Figs. 1, 2) and sketches by Hooker. A syntype specimen, also from Sikkim (K000694746; Akiyama, 2017), has a dissected fruit and seeds.

The lateral united petals are ca. 8 mm long; the upper lobe is broadly ovate, ca. 2 mm long and ca. 2 mm wide; the lower lobe is narrowly ovate, bilobed, ca. 7 mm long and ca. 2 mm wide (Fig. 2). The spur of flowers in full bloom on the lectotype and syntype specimens were not observable because the lower sepal of the dissected flower and flowers in full bloom were lacking. I was able to observe the spur in flower buds just before flowering on the lectotype. The spur is



Fig. 1. Lectotype of *Impatiens radiata* Hook. f. (J. D. Hooker s.n., K000694747 [branch on right]). © The Board of Trustees of the Royal Botanic Gardens, Kew.

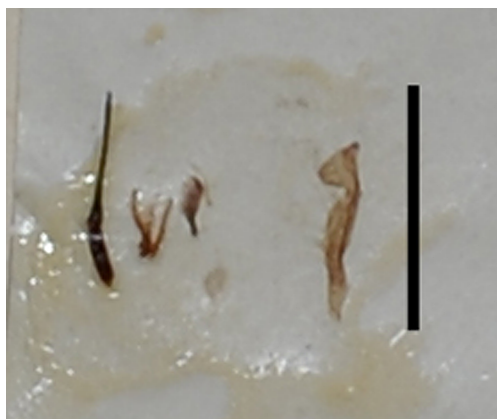


Fig. 2. Dissected flower in capsule on lectotype sheet of *Impatiens radiata*; lateral united petals, lateral sepal, stamens, and ovary (right to left). Bar indicates 10 mm.

straight and the depth of the lower sepal (including the spur) is ca. 10 mm long.

b) Variations in the flowers and leaves

For comparison with *I. graciliflora* I examined specimens of *I. radiata* from Nepal, Sikkim, Bhutan, and Khasia. In this study I did not see specimens of *I. radiata* from Myanmar.

The sepals and petals were measured in specimens with an asterisk in the Appendix and those cited in Akiyama *et al.* (1991). The lower sepal was navicular with a straight spur and 7–11 mm long (including the spur) in plants from Nepal, 9–10 mm long in plants from Sikkim and Bhutan (10 mm long in Grierson and Long 284 (E) annotated as *I. radiata* by Grey-Wilson), and 13–15 mm long in plants from Khasia. I could not confirm the data, i.e. 22–30 mm, in Grey-Wilson (1991), but from my observations the depth of the lower sepal in plants from the Himalaya and Khasia was 7–15 mm long. The shape of the lower sepal is reported as conical (Hooker, 1875), narrowly funnel-shaped (Grey-Wilson, 1991) or navicular (Akiyama *et al.*, 1991) (Fig. 3a). It is impossible to distinguish these shapes in herbarium specimens. In plants of *I. radiata* I observed in the field, the lower sepals were navicular.

The dorsal petal was reported to be orbicular

and neither winged, keeled nor spurred (Hooker, 1875); cucullate, 6–7 × 4–5 mm when flattened (Grey-Wilson, 1991); and cucullate, 3–4 × 3–5 mm when flattened (Akiyama *et al.*, 1991). It is cucullate, neither winged, keeled nor spurred, and orbicular when flattened as shown in Akiyama *et al.* (1991) (Fig. 3c). The length was 3–6 mm in plants from Nepal, 3–5 mm in plants from Sikkim and Bhutan, and ca. 4 mm in plants from Khasia.

The lower lobe of the lateral united petal was reported to be asymmetrically ovate, somewhat drawn out distally, and 7–8 mm long by 2.5–3.5 mm wide (Grey-Wilson, 1991) or bilobed and 8–11 mm long by ca. 3 mm wide (Akiyama *et al.*, 1991) (Fig. 3b). These data do not conflict with data, i.e. narrowly ovate, bilobed and ca. 7 mm long by ca. 2 mm side, in the lectotype.

The lateral sepal was reported to be small, lanceolate and long pointed (Hooker, 1875) and 1.5–2.5 mm long (Akiyama *et al.*, 1991). It is ovate to lanceolate with an awned apex, 1.5–2.5 mm long as shown in Akiyama *et al.* (1991) (Fig. 3d).

c) Partial conclusion

The floral data obtained in the present study is summarized as follows: The lower sepal is navicular with a straight spur, and 7–15 mm long in depth (including the spur). The dorsal petal is cucullate, neither winged, keeled nor spurred, and orbicular, 3–6 mm long, 3–5 mm wide when flattened. The lateral united petals are 8–14 mm long; the upper lobe is broadly ovate, 2–3 mm long and 2–3 mm wide; the lower lobe is asymmetrically narrowly ovate, bilobed, and 7–11 mm long, 2–3 mm wide. The leaves are alternate, somewhat aggregated at the apical part of the stem, and petiolate or almost sessile in the apical part of the stem. The petiole is 5–23 mm long and the blade is oblong-ovate to lanceolate to narrowly elliptic, 4.3–14 cm long and 1.3–6 cm wide with acuminate apex, attenuate base, and crenate to crenate-serrate margins.

***Impatiens graciliflora* Hook. f.**

a) Lectotype and syntype specimens

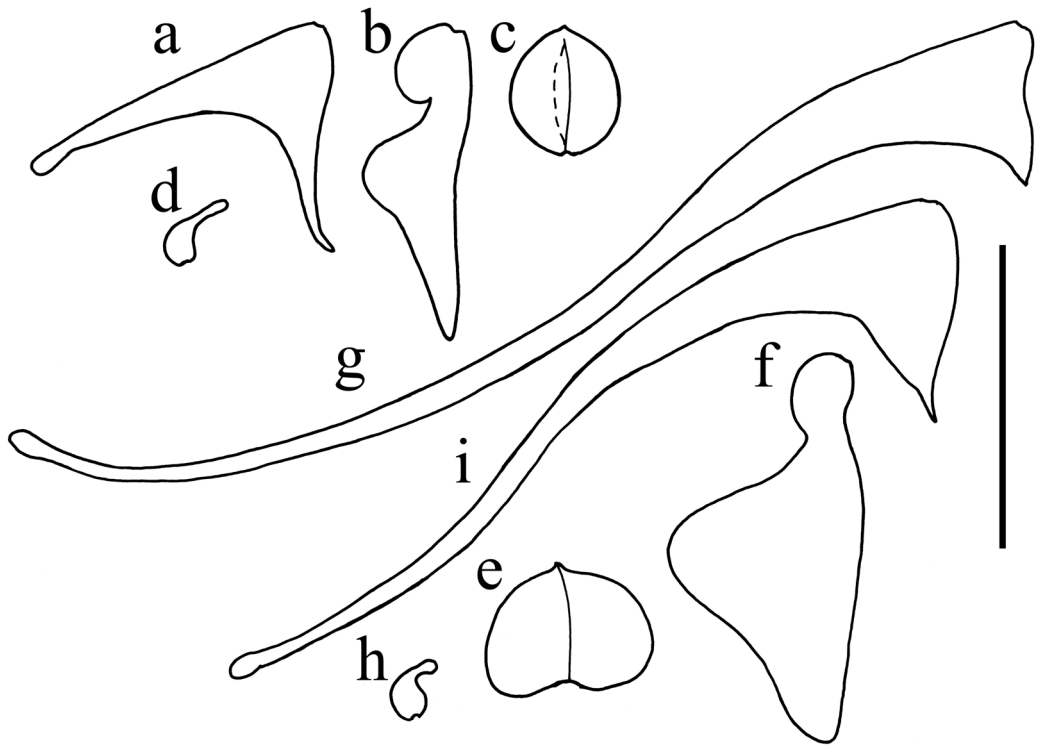


Fig. 3. *Impatiens radiata* (var. *radiata*) (a–d) and *I. radiata* var. *graciliflora* (= *I. graciliflora*) (e–i). a–d: Nepal (Ohba *et al.* 8530681, TI) (Akiyama *et al.*, 1991). e–h: Lectotype of *I. graciliflora* (Dr. Prain's Collector no. 64 I, in Aug. 1903, K000694665). i: Myanmar (J. H. Lace 6010, 25 Oct. 1912, E). a, g, i: Lower sepals. c, e: Dorsal petals. b, f: Lateral united petals. d, h: Lateral sepals. Bar indicates 10 mm.

The lectotype specimen collected in Sikkim (K000694665, Akiyama, 2017) has dissected flowers and sketches by Hooker (Fig. 4). The syntype specimen, also from Sikkim (without K barcode number; Akiyama, 2017), also has dissected flowers. I observed the dissected flowers of both the lectotype (Fig. 5) and syntype specimens and also the vegetative features.

The dissected flowers mounted on the lectotype specimen are as follows: The dorsal petal is ca. 4 mm long, ca. 5 mm wide, broadly ovate (Fig. 3e). The lateral united petals are ca. 13 mm long; the upper lobe is ca. 3 mm long, ca. 1.5 mm wide, ovate; the lower lobe is ca. 10 mm long, ca. 6 mm wide, broadly ovate and bilobed (Fig. 3f). The lower sepal is 34–36 mm long in depth (including the spur), navicular, spur slightly downwardly curved or slightly S-shaped (Fig. 3g). The lateral sepal is ovate and with an awned

apex, ca. 2 mm long (Fig. 3h). In other flowers of the lectotype the lower sepal varies from 22 to 34 mm long in depth (including the spur). The leaves are alternate, somewhat aggregated at the apical part of the stem, and petiolate or almost sessile in the apical part of the stem. The petiole ranges to 5 mm long and the blade is narrowly elliptic to lanceolate to ca. 10 cm long and to 3 cm wide with acuminate apex, attenuate base, and crenate to crenate-serrate margins.

The dissected flowers of the syntype specimen are as follows: The shape of the dorsal petal, lateral united petals, and lower sepal is same as on the lectotype. The lower sepal varies from 21 to 29 mm long in depth (including the spur). The leaves are similar to those of the lectotype. The petiole extends to 5 mm long and the blade to ca. 12 cm long and to ca. 4 cm wide.

Hooker (1905) reported the lower sepal to be



Fig. 4. Lectotype of *Impatiens graciliflora* Hook. f. (Dr. Prain's Collector no. 64 I, in Aug. 1903, K000694665).
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Fig. 5. Dissected flowers in capsule on lectotype sheet of *Impatiens graciliflora*. Bar indicates 10mm.

1–1½ inch long. I observed the lower sepal (including the spur) in the present study is 21–36 mm long, i.e. about 1–1½ inch long and in agreement with Hooker.

b) Variations in the flowers and leaves

In the list of specimens of *I. graciliflora* from Nepal including my own collection in TI (collected by Noshiro *et al.* [incl. Akiyama] in 1992), Sikkim, and Myanmar in BM, E and TI in the Appendix, the sepals and petals were measured in specimens with an asterisk. The width of the dorsal petal and the size of the lateral united petals were measured in my own collections at TI. I am aware that Noshiro *et al.* 9241094 from Nepal has a wide range of variation in the depth of the lower sepal, so it will be discussed in the next part. I also found a collection, Burkill 32096 (K, duplicate in E), determined as *I. radiata* by Hooker, of which some flowers have deeper lower sepals than does *I. radiata* as mentioned above.

Except for Noshiro *et al.* 9241094 and also Burkill 32096, the lower sepal is navicular with a slightly downwardly curved or slightly S-shaped

spur 30–36 mm long in depth (including the spur) in plants from Nepal, 30–38 mm in plants from Sikkim, and 24–28 mm in plants from Myanmar (Figs. 3i, 6).

The dorsal petal is cucullate, neither winged, keeled nor spurred, widely ovate to widely orbicular when flattened, 4–6 mm long, ca. 5 mm wide in plants from Nepal, ca. 5 mm long in plants from Sikkim, and 5–6 mm long in plants from Myanmar.

The lateral united petals are 11–13 mm long; the upper lobe is 2–3 mm long, 1–2 mm wide, ovate; a lower lobe is 9–11 mm long, 4.5–6 mm wide, broadly ovate and bilobed.

The lateral sepal is ca. 2 mm long, ovate to lanceolate with an awned apex.

The leaves are alternate, somewhat aggregated at the apical part of the stem, and petiolate or almost sessile in the apical part of the stem. The petiole ranges to 3.5 mm long and the blade is narrowly elliptic to lanceolate, 7.5–17 cm long and 2–6 cm wide with acuminate apex, attenuate base, and crenate to crenate-serrate margins.

Comparison between *I. graciliflora* and *I. radiata*

As compared with *I. radiata*, *I. graciliflora* has a wider lower lobe of the lateral united petals and a deeper lower sepal, i.e. 4–6 mm (broadly ovate) against 2–3 mm (narrowly ovate), and 21–38 mm against 7–15 mm. The spur of the lower sepal of *I. graciliflora* is curved downward slightly or slightly S-shaped against straight in *I. radiata*.

In East Nepal I observed a population of *I. graciliflora* (Noshiro *et al.* 9241094) in which the flowers have wide range of variation in depth of the lower sepal. The depth of the lower sepal including the spur at anthesis varies from 16 to 30 mm (Fig. 7a–c). The lower sepal is 16 mm deep including the straight spur (Fig. 7a) like the spur in the flower bud (Fig. 7d) and indistinguishable from the lower sepal of *I. radiata* (Fig. 3a). The lower sepal is 30 mm deep, including the slightly downwardly curved spur (Fig. 7c) and indistinguishable from the lower sepal of typical *I. graciliflora* (Fig. 3g). The lateral united



Fig. 6. *Impatiens radiata* var. *graciliflora* (= *I. graciliflora*). Myanmar. Ruby Mine District. Mogoke to Bernardumyo, 5–6000 ft. (J. H. Lacc 6010, 25 Oct. 1912, E).

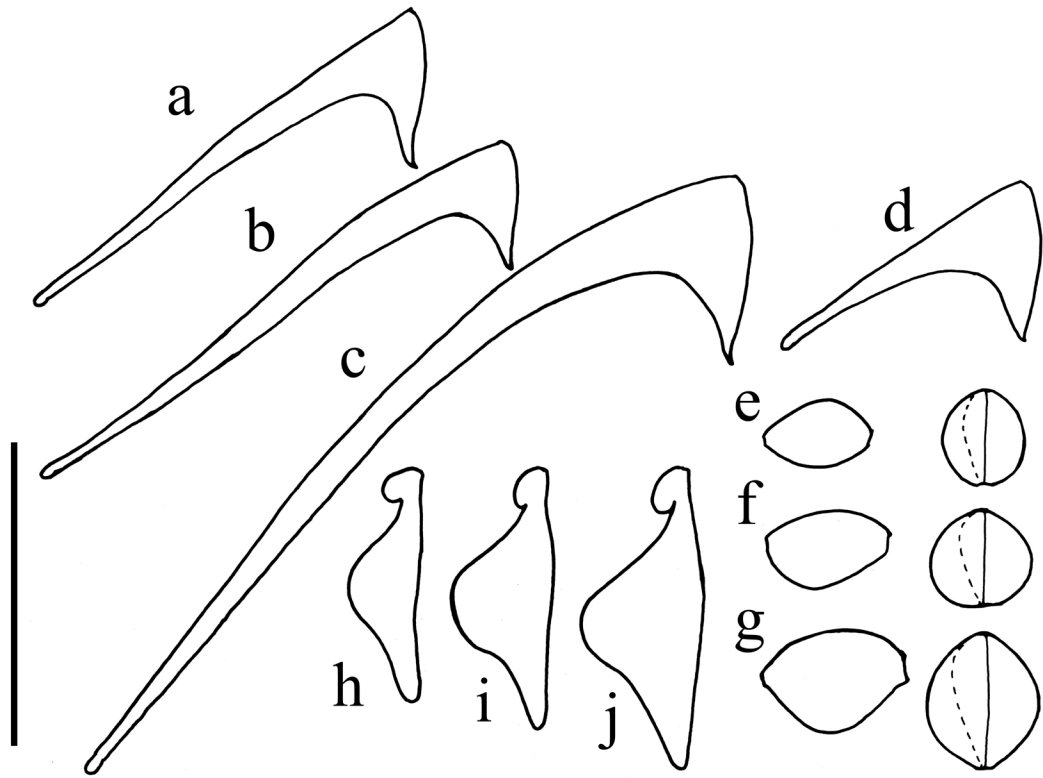


Fig. 7. Variation of lower sepals (a–d), dorsal petals (e–g; lateral view (folded) [left] and flattened [right]), and lateral united petals (h–j) in a population of *Impatiens radiata* var. *graciliflora* (= *I. graciliflora*) (S. Noshiro *et al.* 9241094, TI). Bar indicates 10 mm.

petals vary from 8 to 11 mm long. The upper lobe of the lateral united petals is ovate and ca. 2 mm long by ca. 1 mm wide. The variable lower lobe of the lateral united petals is narrowly ovate (7 mm long, 2.5 mm wide) (Fig. 7h) as *I. radiata* (Fig. 3b) to broadly ovate (9 mm long, 4 mm wide) (Fig. 7j), approaching that of typical *I. graciliflora* (Fig. 3f). The dorsal petal is cucullate, neither winged, keeled nor spurred, and broadly ovate to orbicular, 3–5 mm long by 3–5 mm wide (Fig. 7e–g). The collection, Noshiro *et al.* 9241094, is intermediate between typical *I. graciliflora* and *I. radiata*.

Burkill 32096 (K) (Fig. 8) has the lower sepal 11–17 mm deep. The spur of the lower sepal is straight or slightly curved. The sketches on the lower left side of the sheet by Hooker show two lateral united petals (Fig. 8a and b). Two lateral united petals remained on the small sheet (Fig.

9a and b). One of the sketches of the lateral united petals (Fig. 8a) and one of the lateral united petals (Fig. 9a) show the narrowly ovate lower lobe as in *I. radiata* (Fig. 3b), while the other sketch of the lateral united petals (Fig. 8b) and the other lateral united petals (Fig. 9b) show the broadly ovate lower lobe as in typical *I. graciliflora* (Fig. 3f). The collection, Burkill 32096, also represents an intermediate form between typical *I. graciliflora* and *I. radiata*.

The leaves of *I. graciliflora* are alternate, somewhat aggregated at the apical part of the stem, and petiolate or almost sessile in the apical part of the stem like *I. radiata*. The shape and size of leaves is overlap in both species.

In conclusion *I. graciliflora* is specifically indistinguishable from *I. radiata* in both floral (see Table 1) and vegetative characters. It is, however, reasonable to recognize a variety of *I.*



Fig. 8. *Impatiens radiata* var. *graciliflora* (= *I. graciliflora*) (I. H. Burkill 32096, 23 May 1909, K).

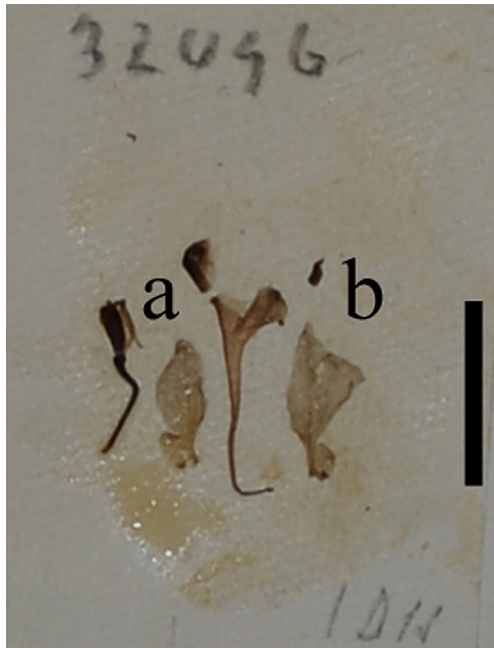


Fig. 9. Dissected flowers in capsule of *Impatiens radiata* var. *graciliflora* (= *I. graciliflora*) (I. H. Burkill 32096, 23 May 1909, K). Bar indicates 10 mm.

radiata, var. *graciliflora*, in having usually the deeper lower sepal including a slightly downwardly curved spur (17–36 mm in the largest flowers) and the wider lower lobe of the lateral united petals (4–6 mm in the largest flowers).

[Systematic treatment]

Impatiens radiata Hook. f. in Fl. Brit. India 1: 476 (1875); Rec. Bot. Surv. Ind. 4: 15, 20 (1905). Hara in Hara & Williams, Enum. Flow. Pl. Nepal 2: 80 (1979). Akiyama, Ohba & Wakabayashi in Himal. Pl. 2: 70 (1991). Grey-Wilson in Fl. Bhutan 2: 96 (1991). Chen, Akiyama & Ohba in Fl. China 12: 76 (2007).

Lectotype: Sikkim, Lachung, 9–10000 ft. (J. D. Hooker s.n., K000694747 [branch on right] [<http://specimens.kew.org/herbarium/K000694747>] [designated by Akiyama, 2017]). Syntypes: Sikkim, Regio temp., 6–12000 ft. (J. D. Hooker s.n., K000694746 [<http://specimens.kew.org/herbarium/K000694746>]). Khasia Mts., 5–7000 ft. (K?, not seen).

Table 1. Comparison between *Impatiens radiata* (var. *radiata*) and var. *graciliflora* (= *I. graciliflora*)

	<i>I. radiata</i> (Hooker, 1875, 1905)	<i>I. radiata</i> (Grey-Wilson, 1991)	<i>I. radiata</i> (Akiyama <i>et al.</i> , 1991)	<i>I. radiata</i> var. <i>radiata</i> (present study)	<i>I. graciliflora</i> (Hooker, 1905)	<i>I. graciliflora</i> (Grey-Wilson, 1991)	<i>I. radiata</i> var. <i>graciliflora</i> (present study)
Lateral sepal (including awn)	small, lanceolate with long points		1.5–2.5 mm	ovate to lanceolate with an awned apex, 1.5–2.5 mm long			ovate to lanceolate with an awned apex, ca. 2 mm long
Lower sepal	$\frac{1}{4}$ – $\frac{1}{2}$ inch long [deep] with spur, conical ending in a short straight spur with a swollen tip, much shorter than the pedicel	narrow funnel-shaped, 5–8 mm, tapering into a slender straight spur 22–30 mm [deep]	navicular, gradually tapering into a straight spur, 6–7 mm long, 10–11 mm deep (including the spur)	navicular with a straight spur, and 7–15 mm long in depth (including the spur)	1– $1\frac{1}{2}$ inch long with spur	shallowly navicular, 5–7 × 2–3 mm spur slightly curved or S-shaped, filiform, 28–38 mm	navicular with a slightly downwardly curved or slightly S-shaped spur, (11–)17–38 mm long in depth (including the spur)
Dorsal petal	orbicular, neither winged, keeled nor spurred	cucullate, 6–7 × 4–5 mm when flattened	cucullate, 3–4 mm × 3–5 mm when flattened	cucullate, neither winged, keeled nor spurred, orbicular, 3–6 × 3–5 mm when flattened		cucullate, 3–4 mm	cucullate, neither winged, keeled nor spurred, broadly ovate to orbicular when flattened, 4–6 mm long, ca. 5 mm wide
Lateral united petals		7–9 mm long	10–14 mm long	8–14 mm long		8–12 mm long	(8–)11–13 mm long
Upper lobe (petal)		suborbicular to squarish, ca. 3 × 3 mm	broadly ovate, 2–3 × 2–3 mm	broadly ovate, 2–3 × 2–3 mm		auricle-like, 1.5–2 mm	ovate, 2–3 × 1–2 mm
Lower lobe (petal)	elongate	asymmetrically ovate 7–8 × 2.5–3.5 mm, somewhat drawn out distally	bilobed, 8–11 mm × ca. 3 mm	asymmetrically narrowly ovate, bilobed, and 7–11 mm × 2–3 mm		asymmetrically bilobed, 8–10 × 5–5.5 mm	asymmetrically broadly (to narrowly) ovate, bilobed, (7–)9–11 × (2.5–)4–6 mm

Key to the varieties

- 1a. Lower sepal, including spur, 7–15 mm at maximum size var. *radiata*
 1b. Lower sepal, including spur, 17–38 mm at maximum size var. *graciliflora*

var. *radiata*

Distribution: East Himalaya (Nepal to Bhutan), Assam to Myanmar, Tibet, and SW China (Yunnan, Sichuan, Guizhou).

var. *graciliflora* (Hook. f.) S. Akiyama, comb. et stat. nov.

Impatiens graciliflora Hook. f. in Rec. Bot. Surv. India 4(2): 15, 21 (1905). Hara in Hara & Williams, Enum. Flow. Pl. Nepal 2: 79 (1979). Grey-Wilson in Fl. Bhutan 2: 96 (1991).

Lectotype: Sikkim, near Kurseong, 6000 ft. (Dr. Prain's Collector no. 64 I, in Aug. 1903, K000694665 [<http://specimens.kew.org/herbarium/K000694665>] [designated by Akiyama, 2017]). Syntype: Sikkim, Senchal, 7000 ft. (R. Pantling s.n., 25 Aug. 1901, K; Hort. Bot. Calcuta. Recd [received] 1903).

Distribution: East Himalaya (Nepal to Bhutan) and Myanmar.

For *Impatiens* in Myanmar Kress *et al.* (2003) enumerated 45 species but *I. graciliflora* was not included. Two specimens of *I. radiata* var. *graciliflora* (= *I. graciliflora*) collected by J. H. Lace in Ruby Mine District in Shan State (now Pyin Oo Iwin District, Mandalay Region) in Myanmar, both at E (Fig. 6) are the first records of *I. radiata* var. *graciliflora* from Myanmar.

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Appendix: A list of the specimens examined of *Impatiens radiata* var. *radiata* and var. *graciliflora*. In the specimens with an asterisk the sepals

and petals were measured.

Impatiens radiata Hook. f. var. *radiata*

Nepal (addition to Akiyama *et al.*, 1991). Arun Valley, Maghang Khola, E. of Num, 10000 ft. (J. D. A. Stainton 812, 1 July 1956, A, BM*, TI). Bhujji Khola, 2400m (Stainton *et al.* 9043, TI). Near Dunche, 7000 ft. (O. Polunin 092, 3 June 1949, BM). Near Gurjakhani, 2550m (Stainton *et al.* 3560, TI). North of Kalo Pani, c. 2500m (Grey-Wilson & Phillips 821, 9 Sept. 1973, K*). Kutumsang-Thodan Danda (Kanai & Malla 674958, TI). Lampokhari–Chitre, 9500 ft. (T. B. Shrestha & D. Joshi 533, 12 Aug. 1971, BM). Mugu Kamali Valley, between Lumsa and Mangri, 7000 ft. (Polunin, Sykes & Williams 5225, 15 Aug. 1952, E). Tamur Valley, Mewa Khola, Topke Gola, 10500 ft. (J. D. A. Stainton 981, 13 July 1956, A, BM*, TI). Tinjure Danda, 27°10'N, 87°29'E, 7500 ft. (Williams & Stainton 8390, 6 Sept. 1967, BM*, E). Thudam, 11300 ft. (L. W. Beer 9414, 20 July 1971, BM*). Wabak Khola, 1000 ft. (L. W. Beer 9482, 27 July 1971, BM*). Yamphodin, 27°27'N, 87°57'E, 7000 ft. (L. H. J. Williams 936, 25 June 1969, BM). Dhankuta District. Chitray (H. Kanai *et al.* s.n., TI); Shidua–Tute (H. Ohba *et al.* 9120016, TI); Tute–Tinjure Phedi (H. Ohba *et al.* 9120050, TI*). Gorkha District. Lungdang Gompa, 3100m (M. Suzuki *et al.* 9485211, TI). Raswa District. Sunchet Kharka–Lipchet Kharka, 2860m (F. Miyamoto *et al.* 9420278, TI); Thare–Trisuli Khola (H. Hara *et al.* 69882, TI). Sankhuwasawa District. Angare Kharka–Chhippon (Chhippon Pokhari) (H. Ohba *et al.* 9120079, TI*); Minchin Dhap–Mul Pokhari (H. Hara *et al.*, 29 Oct. 1963, TI). Sindhupalchok District. Kuri–Charikot, 3000m (H. Kanai *et al.* 674665, 674668, TI); Tingoang–Kalingchok, 3100m (H. Kanai *et al.* 675187, TI). Solukhumbu District. Pike Khop–Fera, 2400m (F. Miyamoto *et al.* 9584053, TI*); Ringmo–Jubing, 2820m (M. Wakabayashi 9715039, TI). Taplejung District. Taplejung–Garhi Danra (H. Hara *et al.*, 3 Nov. 1963, TI); Thakpa Bazaar–Ramsyang Pati (M. Suzuki *et al.* 9240275, TI*); Topke Gola–Shewaden (H. Kanai *et al.* 723219, TI; H. Ohashi *et al.* 770998, TI);

Shewaden–Papung (H. Kanai *et al.* 723221, TI). **Bhutan**. Bumthang District. Bumthang, 10000 ft. (Ludlow & Sherriff 278, 15 July 1933, E*). Punaka District. Wangdu Phodrang–Pele La, 25km E of Wangdu, c. 2000m (A. J. C. Grierson & D. G. Long 520, 19 June 1975, E). Tashigang District. Tashigang, Gamri Chu, 7020 ft. (S. Bowes Lyon 9130, 11 June 1985, E*). Thimphu District. Thimphu, 10000 ft. (R. E. Cooper 3210, 17 Aug. 1914, E); Bunakha Thimpu, 7000 ft. (R. E. Cooper 1326, 6 July 1914, BM; E; 2497, 30 July 1914, E); Dotena Thimpu, 8000 ft. (R. E. Cooper 2497, 20 July 1914, BM); Above Motithang, 2600m (J. R. I. Wood 5583, 12 Aug. 1987, E); Upper valley of Thimphu River, above Changri Monastery, 2600m (J. R. I. Wood 5556, 5557, 3 July 1987, E); Tributary of Wong Chu, 10km S of Thimphu, c. 2400m (A. J. C. Grierson & D. G. Long 284, 12 June 1975, E*). Tongsa District. 9km S of Tongsa, 27°29', 90°30', c. 2100m (A. J. C. Grierson & D. G. Long 1194, 20 May 1979, E*). Upper Mo Chu District. Gasa Dzong, 27°55', 89°46' c. 2800m (I. W. J. Sinclair & D. G. Long 4994, 14 Sept. 1984, E*). **India**. [West Bengal] **Sikkim**. Regio temp., 6–12000 ft. (J. D. Hooker s.n., BM, GH); Darjeeling, 7000 ft. (C. N. 285, 11 July 1874, E*). Tonglu, 9000 ft. (G. H. Cave on 1 Sept. 1919, A, E). Tongloo, 8–10000 ft. (T. Anderson 568, 3 Aug. 1862, E*, GH). Darjeeling, Tonglo, 10000 ft. (C. B. Clarke 27488B, 17 Sept. 1875, BM). Senchal, 7000 ft. (Dr. Prain's Collector 84 I, Aug. 1903, BM*). Yakla, 10000 ft. (C. B. Clarke 9840B, 15 Oct. 1869, BM). **Khasia**. Regio trop. 5–7000 ft. (J. D. Hooker & T. Thomson s.n., BM, GH*). Larlankote, 5000 ft. (C. B. Clarke 18383C, 14 Nov. 1872, BM); 5500 ft. (C. B. Clarke 45655A, 25 Sept. 1886, NA). Surareen, 5000 ft. (C. B. Clarke 40343J, 10 Sept. 1885, NA; 45574E, 22 Sept. 1886, BM*). **China**. **Tibet** [Xizang]. Gyala, 9300 ft. (Ludlow & Sherriff 5370, 23 July 1938, E). **Yunnan** (Addition to Akiyama *et al.*, 1995). Deqe, Sanchan He, 3200m, 29°09'N 99°16'E (Ohba *et al.* 9, 3 Aug. 1996, TI).

var. *graciliflora*

Nepal. North of Chula Chuli, 26°45'N, 87°37'E, 6000 ft. (Williams & Stainton 8526, 15 Sept. 1967, BM, TI). Ilam District. N. of Ilam, 6500 ft. (L. H. J. Williams 403, 6 June 1969, BM, TI); Goruwale Bhanjang (Bhanduke)-Mai Pokhari, 27°05'N, 87°56'E, 1900 m (S. Noshiro *et al.* 9241109, 26 June 1992, TI*); 2000 m (S. Noshiro *et al.* 9241093, 9241094, 26 June 1992, TI*). Panchthar District. Chyangthapu–Dabale Deurali, 27°15'N, 87°57'E, 1950 m, (S. Noshiro *et al.* 9241024, 23 June 1992, TI*); Prangbung–Goruwale Bhanjang (Bhanduke), 27°10'N, 87°54'E (S. Noshiro *et al.* 9241084, 25 June 1992, TI*). **India.** [West Bengal] **Sikkim.** Dentam, Kulhail-Valley, 4000 ft. (I. H. Burkill 32096, 23 May 1909, E, K*). Darjeeling District. Darjeeling, 2150 m (H. Hara 6300487, TI*); 2200 m (H. Hara & H. Ohba 723218, A, TI); Darjeeling–Lopchu, 800–2300 m (H. Kanai *et al.* 723216, TI); Palmajun–Batasi, 2100–2300 m (H. Kanai *et al.* 721549, TI*); Ratho Chu–Ramam, 2100–2400 m (H. Kanai *et al.* 723215, TI*); Lloyd Botanic Garden, Birch Hill, 2200 m (H. Hara *et al.* 69877, TI); Peshok Road–Ghum, 2250–2300 m (H. Hara *et al.* 69879, TI); East Birch Hill Road, 2100 m (H. Ohashi *et al.* 723217, TI; H. Hara & H. Ohba 723218, TI*); 2200 m (H. Hara *et al.* 69878, TI*); 'Ubayuridani' (H. Hara *et al.* 69880, TI*); Ghum–Kurseong, 2000 m (G. Murata *et al.* 2990, TI*). Darjeeling Town, 27°02'N, 88°16'E, 2150 m (D. G. Long *et al.* 26, 4 July 1992, E*); 12 km above Mungpoo, 26°59'N, 88°18'E, 1970 m (D. G. Long *et al.* 1065, 3 Aug. 1992, E*); Batasia, 7500 ft. (G. H. Cave, 14 July 1917, A, E). **Myanmar.** Ruby Mine District. Mogok to Bernardmyo, 5–6000 ft. (J. H. Lace 6010, 25 Oct. 1912, E*); Bernardmyo, 5500 ft. (J. H. Lace 6011, 25 Oct. 1912, E*).