

This article has been accepted for publication and undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process.

Please cite this article as:

Ritonga Y. E., Mustaqim W. A. (forthcoming). *Impatiens tanahkaro* (Balsaminaceae), a new species from northern Sumatra, Indonesia. *Webbia*, *Just Accepted*. DOI: <https://doi.org/10.36253/jopt-20674>

***Impatiens tanahkaroensis* (Balsaminaceae), a new species from northern Sumatra, Indonesia**

YUSRAN E. RITONGA^{1,2} & WENDY A. MUSTAQIM^{2,3,*}

1. *Biologi Pencinta Alam Sumatera Utara, Jl. Prof. H. M. Yamin Gg. Obat II No.14, Sei Kera Hilir II, Medan Perjuangan, Medan, North Sumatra 20233, Indonesia*

2. *Tumbuhan Asli Nusantara Foundation, BTN Korpri Blok C1 No 96, Kawatuna, Mantikulore, Palu, Sulawesi Tengah 94233, Indonesia*

3. *Program Studi Biologi, Fakultas Sains dan Teknologi, Universitas Samudra, Jl. Prof. Dr. Syarief Thayeb, Meurandeh, Langsa Lama, Langsa, Aceh 24416, Indonesia*

*Corresponding author. Email: wendyachmmadm@gmail.com

Abstract. *Impatiens tanahkaroensis* is described here as a new species known from the mountainous regions north of the Lake Toba area, northern Sumatra, Indonesia. It is a rheophytic species growing on a small stream, which is potentially threatened by flash floods. A detailed description, discussion, and photographs of living plants are given.

Keywords:

Balsaminaceae, *Impatiens*, new species, rheophytic, taxonomy, northern Sumatra, Indonesia

Running title: New *Impatiens* Sumatra Indonesia

INTRODUCTION

Impatiens L. is one of the most species-rich genera in the world, belonging to the Balsaminaceae family with over 1,000 species (Janssens et al. 2009; Yu et al. 2015). Most species of this genus are distributed in the Old World tropics (Yu et al. 2015) and some of them also in the Neotropics (Jeevith et al. 2022). *Impatiens* is one of the fastest-growing genera in the world characterised by the presence of many narrow endemic species (e.g., Yong et al. 2025).

Sumatra is center of diversity and has the highest rate of speciation in insular Southeast Asia for the genus *Impatiens* (Grey-Wilson 1989). In the first island revision, Grey-Wilson (1989)

described 29 species pointing out that there will be many more species unknown to science. Since then, many explorations have been carried out and more species have been described (Utami 2005, 2006, 2009, 2011, 2012a, b, 2014, 2020, 2021; Shimizu and Utami 1997; Mustaqim, Arico et al. 2024; Mustaqim, Mahardhika et al. 2024; Mustaqim 2025). This brings a total number of 46 species with 42 (91.3%) of them endemics (Mustaqim et al. 2021–onwards).

Further explorations of the genus in many parts of Sumatra have been conducted since 2015 by both authors. This resulted in many new specimens, some of which represent new species that were recently published (Mustaqim, Arico et al. 2024; Mustaqim, Mahardhika et al. 2024; Mustaqim 2025). Additionally, a population of rheophytic *Impatiens* was collected from the southwest side of Mount Sibuatan in northern part of Sumatra. The specimen displays characters of section *Monocentron*, i.e. alternate leaves, 2–5 flowers per inflorescence, and lower sepals with long spurs (Utami and Shimizu 2005). Further literature, specimens, and photographs studies showed that the species displays morphological differences warranting recognition as a new species.

MATERIAL AND METHODS

Morphological characters were described based on fresh materials, herbarium, material preserved in 70% ethanol and associated photographs. The herbarium was made following the standardised guidelines from Davies et al. (2023). To verify the status of the specimen, identification was done using specimen comparison in LGS and digital herbaria through GBIF (GBIF continuously updated) as well as type specimens in JSTOR Global Plants ([JSTOR](#) continuously updated) and literature review (Shimizu 1970; Grey-Wilson 1989; Utami and Shimizu 1998; Utami 2005, 2006, 2009, 2011, 2012a, 2012b, 2014, 2020, 2021; Kiew 2016; Ruchisansakun et al. 2018; Utami and Damayanto 2023). Photograph comparison was also made in the Balsaminaceae of Indonesia list (Mustaqim et al. 2021). Besides that, we also compared the plants to all *Impatiens* we recorded from fieldwork data conducted in northern to Central Sumatra since 2015, with particular focus on Aceh and Sumatera Utara Province (Map 1), showing that plants with similar morphological characteristics were not found. Preliminary conservation status assessment was done following IUCN Red List guidelines (IUCN Standards and Petitions Committee 2024) against categories and criteria in the IUCN (2012). Extent of Occurrence (EOO) and Area of Occupancy (AOO) were calculated using GeoCAT (Bachman et al. 2011).

TAXONOMIC TREATMENT

Impatiens tanahkaroensis Y.E.Ritonga & Mustaqim, **sp. nov.** (Figure 1)

Type: Indonesia: Sumatra: Sumatera Utara Province, Karo Regency, Merek Subdistrict, southwest of Mount Sibuatan (2°52'19.39" N 98°29'24.00"E), 1731 m asl., 5 Oct 2025, *Ritonga 118* (holotype: MEDA; isotype: UIDEP).

Diagnosis

The new species is similar to *Impatiens junghuhnii* Miq. but differs by the narrower leaves (1.1–2.5 vs 2.6–4.2 cm wide) and flowers with lateral sepals with a gland at the tips (vs eglandular) and shallower lower sepal (6–8 vs 11–13 mm deep) with longer spur (22–28 vs 10–16 mm), as well as upper pair of lateral united petals slightly broader than long (vs longer than broad). The new species is also similar to *Impatiens tapanuliensis* Grey–Wilson but differs by narrower leaves (1.1–2.5 vs 3–6.5 cm) with fewer lateral veins (4–6 vs 6–13), lateral sepals with glandular tip (vs eglandular), shallower lower sepals (6–8 vs 11–12 mm deep) and longer spur (22–28 vs 7–10 mm), as well as upper pair of lateral united petals slightly broader than long (vs longer than broad).

Description

Perennial, lithophytic herb, stoloniferous, forming clumps, up to 43 cm tall. **Stem** decumbent, green, fleshy, 5.2–6.8 cm in diameter, internodes 0.2–1.8 cm long; glabrous. **Leaves** spirally arranged; petiole greenish white, 0.9–3.5 cm long, 2–4 mm wide, with 2–4 elevated or stalked glands on each side, up to 0.5 mm high, glabrous; lamina elliptic–lanceolate, 3.2–9.6 × 1.1–2.5 cm, apex acute, base cuneate, margin serrate, ended with glandular teeth, glabrous; lateral veins 4–6 on each side of the midrib. **Inflorescence** axillary raceme, 1–2-flowered; peduncle 1.8–2.6 cm long, 1.6–1.9 mm in diameter, green, puberulous; bracts ovate, up to ca. 7 × 3.5 mm; acuminate, persistent at anthesis. **Pedicels** ascending, slightly declinate, ca. 16 mm long, ca. 1 mm in diameter, hairy, light green. **Lateral sepals** 2, light green with transparent margin, ovate, 6–8 mm long including 1–1.2 mm long apical mucro, 5–6 mm wide, apex abruptly acuminate, tip glandular; glabrous. **Lower sepals** navicular, yellow, inside with red veins, 14–16 mm long, 8–12 mm wide, 6–8 mm deep, apex mucronate, dorsal side mucronulate, constricted into 22–28 mm long, curved spur; tip rounded, green; glabrous. **Dorsal petal** yellow, ovate, 11–12 × 9–10 mm, slightly hooded, apex obtuse in outline, shallowly retuse, with small but prominent light green crest, raised 1.2–1.5 mm high, ventrally with a central red tinge just below the middle, glabrous on both sides. **Lateral united petals** 2, 21–22 mm long, yellow with a transparent connate base; upper petals of each pair broadly cuneiform, ca. 11 × 12 mm, broadly retuse with short appendix in the middle; lower petals of each pair yellow, obliquely obovate, ca. 14 × 12 mm, apex obtuse, inner basal margin curved upward, developed into short lobes, glabrous. **Androecium** ca. 7 mm long, staminal head ca. 3 mm long, anthers ca. 1 mm long, yellow. **Ovary** glabrous, 4-loculed. **Fruit** fusiform, 4-lobed, mature green, ca. 17 × 6 mm, fleshy.

Etymology

The epithet refers to the local geographic name, Tanah Karo, which includes the mountainous regions of Mount Sibuatan and surrounding areas.

Distribution

Endemic to Sumatra: only known from the type locality in Merek, Karo Regency, North Sumatra (Map 1).

Habitat and ecology

Mountain forests, sandy and rocky river streams or on the rock walls of river banks, at an elevation of 1731 m asl. Its habitat is always dynamic due to the occurrence of routine flash flooding.

Phenology

Flowering and fruiting recorded in October.

Preliminary IUCN Conservation status

This species, apart from serial exploration of plants in the type locality and the surrounding area, is only known from a small fragment of habitat in Mount Sibuatan. Its habitat is not a formal conservation area and is potentially affected by the occurrence of routine flash floods, a common event in the area. With less than 32 individuals known from a single location and the narrow AOO and EOO (4 km²), this species reaches the Critically Endangered (CR) status due to the presence of flash flooding that makes the mature individuals fluctuate. Therefore, the species is provisionally assessed here as Critically Endangered (CR B1+B2ac(iv)).

Notes

Impatiens tanahkaroensis belongs to the sect. *Megalocentoron* characterised by the spirally arranged leaves, cluster-shaped inflorescences and long lips with spurs, but this species is distinct in having narrow leaf lamina, few lateral veins (4–6) and number of flowers in inflorescence 1–2, shallow lower sepals (6–8 mm), and relatively long spurs (22–28 mm). This species is imperfectly keyed out as *I. junghuhnii* or *I. tapanuliensis* in the Sumatran revision by Grey–Wilson (1989), with the differences warranting recognition as a new species (see further differences in Table 1).

This species is restricted to streams and rock walls at stream edge. Combined with morphology, i.e. narrow leaf lamina, this species is apparently a rheophytic. Thus, *I. tanahkaroensis* becomes the second species of *Impatiens* displaying true characters of rheophytic plants after *I. hukaungensis* J. Murata & Nob. Tanaka from Myanmar (Tanaka et al. 2018). In Sumatra, there is also a stream species recently described from Gayo Plateau (*I. bungerara* Mustaqim, Mustaqim 2025), an area north of the *I. tanahkaroensis* type locality. However, the status of *I.*

bungerara as a rheophytic remains uncertain due to its morphology, which does not display rheophytic characteristics, especially due to the non-narrow leaf blades (Kato and Imaichi 1992a, Mustaqim 2025). However, together with *I. tanahkaroensis*, it warrants further studies using other aspects, such as anatomy, which is useful for determining the rheophytic status (e.g., Kato and Imaichi 1992b; Ueda et al. 2012) since rheophytes sometimes produce broad leaves (e.g., Kato and Imaichi 1992a).

ACKNOWLEDGEMENTS

The first author thanks Dadang Hardiansyah and Muammar for their invaluable fieldwork help during the expedition, in which the specimen used in this study was collected.

REFERENCES

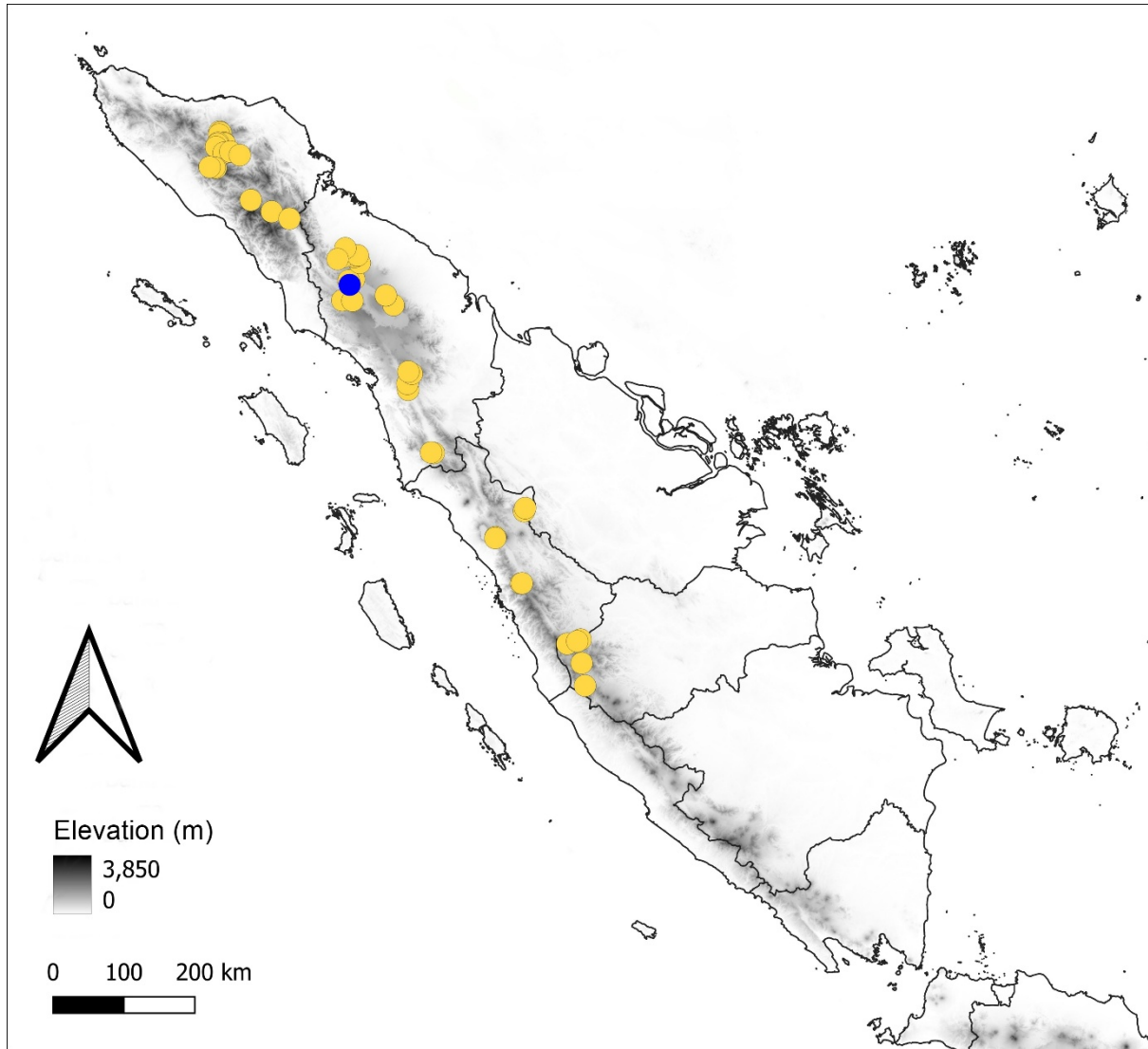
- Bachman S, Moat J, Hill AW, De La Torre J, Scott B. 2011. Supporting Red List threat assessments with GeoCAT: geospatial conservation assessment tool. ZooKeys. 150:117–126. <https://doi.org/10.3897/zookeys.150.2109>
- Davies NMJ, Drinkell C, Utteridge TMA. 2023. The Herbarium Handbook. Royal Botanic Gardens Kew.
- [GBIF] GBIF.org. (continuously updated). The Global Biodiversity Information Facility Home Page. Available from: <https://www.gbif.org> [accessed 2026-02-15]
- Grey-Wilson C. 1989. A revision of Sumatran *Impatiens*. Kew Bulletin. 44(1):67–106.
- [IUCN] IUCN Red List Categories and Criteria. 2012. Version 3.1. IUCN. Gland & Cambridge: IUCN Species Survival Commission.
- IUCN Standards and Petitions Committee. 2024. Guidelines for using the IUCN Red List Categories and Criteria. Version 16. Prepared by the Standards and Petitions Subcommittee, 122 pp. Available from: <http://www.iucnredlist.org/documents/RedListGuidelines.pdf>
- Janssen SB, Knox EB, Huysmans S, Smets EF, Merckx VSFT. 2009. Rapid radiation of *Impatiens* (Balsaminaceae) during Pliocene and Pleistocene: Result of a global climate change. Molecular Phylogeny and Evolution. 52(3):806–824. <https://doi.org/10.1016/j.ympev.2009.04.013>
- Jeevith S, Arigela RK, Singh RK, Kabeer KAA, Rajasekar C, Kunhikannan C. 2022. The checklist of *Impatiens* Riv. ex L. (Balsaminaceae) in Nilgiri and Palani Hills of southern Western Ghats (India). Annales Universitatis Paedagogicae Cracoviensis Studia Naturae. 1915:9–22. <https://doi.org/10.24917/25438832.7.1>
- [JSTOR] JSTOR Global Plants. (continuously updated). [Database]. Ithaka. <https://plants.jstor.org/> [accessed 2026-02-03]

- Kato M, Imaichi R. 1992a. A broad-leaved variant of the fern rheophyte, *Tectaria lobbii*. International Journal of Plant Sciences. 153(2):212–216.
- Kato M, Imaichi R. 1992b. Leaf anatomy of tropical fern rheophytes, with its evolutionary and ecological implications. Canadian Journal of Botany. 70(1):165–174
<https://doi.org/10.1139/b92-022>
- Kiew R. 2016. *Impatiens* (Balsaminaceae) species from karst limestone in Kelantan, Malaysia, including three new species. Gardens' Bulletin Singapore. 68(2):225–238.
<https://doi.org/10.3850/S2382581216000181>
- Monzalvo R, Escorcía-Guerrero DL, García-Montes, MA, Rewicz A, Rewicz T, Manríquez-Morán NL. 2024. The Mexican balsam, *Impatiens mexicana* Rydb: A redescription based on morphological and phylogenetic studies, with an update of the current geographical range of the species. Diversity. 16(2):1–35.
<https://doi.org/10.3390/d16020087>
- Mustaqim WA. 2025. Flora of Gayo Plateau I: A new *Impatiens* (Balsaminaceae) species with flame-coloured flowers from Sumatra, Indonesia. Telopea. 29:173–176.
<https://doi.org/10.7751/telopea20712>
- Mustaqim WA, Arico Z, Jayanthi S, Andini WR, Pratiwi D, Ruchisansakun S. 2024. *Impatiens bungeusing* (Balsaminaceae), a new species from the Northern Gayo Plateau, Sumatra, Indonesia. Taiwaniana. 69(4):554–559.
<https://doi.org/10.6165/tai.2024.69.554>
- Mustaqim WA, Mahardhika AY, Fauzan YSA, Arico Z, Primananda E, Robiansyah I. 2024. A new species of *Impatiens* (Balsaminaceae) from northern Gayo Plateau, northern Sumatra. Taiwaniana. 69(1):57–61. <https://doi.org/10.6165/tai.2024.69.57>
- Mustaqim WA, Saputra R, Al Farishy DD, Tianara A, Ahmad RPP, Kartonegoro A, Ritonga YE, Zainudin, Randi A, Ardi WH. 2021 onwards. Digital Flora of Indonesia. Facilitated by Tumbuhan Asli Nusantara Foundation. www.indonesiaplants.org
- Ruchisansakun S, Suksathan P, van der Niet T, Smets EF, Saw-Lwin, Janssens SB. 2018. Balsaminaceae of Myanmar. Blumea. 63:199–267.
<https://doi.org/10.3767/blumea.2018.63.03.01>
- Shimizu T. 1970. Contributions to the flora of Southeast Asia II. *Impatiens* of Thailand and Malaya. The Southeast Asian Studies. 8(2):187–217.
- Shimizu T, Utami N. 1997. Three new species of *Impatiens* (Balsaminaceae) added to Flora Malesiana. Kew Bulletin. 52(2):435–442. <http://www.jstor.org/stable/4110390>
- Ueda R, Minamiya Y, Hirata A, Muramatsu Y, Saito M, Fukuda T. 2012. Morphological and anatomical analyses of rheophytic *Rhododendron ripense* Makino (Ericaceae). Plant Species Biology. 27:233–240. <https://doi.org/10.1111/j.1442-1984.2011.00345.x>

- Utami N. 2005. Two new species of *Impatiens* (Balsaminaceae) from Batang Gadis National Park, North Sumatra, Indonesia. *Blumea*. 50:443–446.
<https://doi.org/doi.org/10.3767/000651905X622680>
- Utami N. 2006. Endemic species of *Impatiens* spp. (Balsaminaceae) in Sumatra and its possibility as an ornamental plants. *Biodiversitas*. 7(2):135–138.
<https://doi.org/10.13057/biodiv/d070209>
- Utami N. 2009. *Impatiens rubricaulis* (Balsaminaceae), a new species of *Impatiens* from West Sumatra. *Reinwardtia*. 13(1):93–94.
- Utami N. 2011. *Impatiens kunyitensis* (Balsaminaceae), a new species from Sumatra, Indonesia. *Kew Bulletin*. 66:187–190.
- Utami N. 2012a. *Impatiens talakmauensis* (Balsaminaceae) a New Species from Western Sumatra, Indonesia. *Acta Phytotaxonomica et Geobotanica*. 63(1):51–54.
<https://doi.org/10.18942/apg.KJ00008328281>
- Utami N. 2012b. Three new species of *Impatiens* (Balsaminaceae) from Sumatra, Indonesia. *Kew Bulletin*. 67(4):731–737.
- Utami N. 2014. Balsaminaceae in Java: Taxonomy and their conservation status. *Berita Biologi*. 13(1):49–55.
- Utami N. 2020. *Impatiens marroninus*, a new species of *Impatiens* (Balsaminaceae) from Sumatra, Indonesia. *Blumea*. 65(1):10–11.
<https://doi.org/10.3767/blumea.2020.65.01.02>
- Utami N. 2021. *Impatiens dairiensis* (Balsaminaceae), a new species from Sumatra, Indonesia. *Nordic Journal of Botany*. 2022(2):e03397, 1–5.
<https://doi.org/10.1111/njb.03397>
- Utami N, Damayanto IGP. 2023. Annotated checklist of Indonesian *Impatiens* (Balsaminaceae). *Nordic Journal of Botany*. 2023(12):e04088, 1–19.
<https://doi.org/10.1111/njb.04088>
- Utami N, Shimizu T. 1998. A taxonomical study of *Impatiens albo-flava* Miq. (Balsaminaceae) from Sumatra. *Jurnal Biologi Indonesia*. 2(2):95–103.
- Utami N, Shimizu T. 2005. Seed morphology and classification of *Impatiens* (Balsaminaceae). *Blumea*. 50(3):447–456.
<https://doi.org/10.3767/000651905X622699>
- Utami N, Tihurua EF. 2021. *Impatiens* (Balsaminaceae) diversity and conservation status in Mount Singgalang, West Sumatra. *Buletin Kebun Raya*. 24(3):136–140.
<https://doi.org/https://doi.org/10.14203/bkr.v23i3.631>
- Utami N, Wiriadinata H. 2010. *Impatiens mamasensis* (Balsaminaceae), a new species from West Celebes, Indonesia. *Reinwardtia*. 13(2):211–212.

- Wang M, Lin J, Li B, Li J, Jin X, Li P. 2026. *Impatiens tainingensis* (Balsaminaceae), a new species from southeastern China. *PhytoKeys*. 252:235–252. <https://doi.org/10.3897/phytokeys.269.173115>
- Yong Q, Li M, Li Z, Luo C, Zhang Z, Bai X. 2025. Complete chloroplast genomes of 13 species of the *Impatiens* genus for genomic features and phylogenetic relationships studies. *Scientific Reports*. 15:art. 4258. <https://doi.org/10.1038/s41598-025-87254-7>
- Yu SX, Janssens SB, Zhu XY, Lidén M, Gao TG, Wang W. 2015. Phylogeny of *Impatiens* (Balsaminaceae): integrating molecular and morphological evidence into a new classification. *Cladistics*. 32(2):179–197. doi: <https://doi.org/10.1111/cla.12119>

FIGURES



Map 1

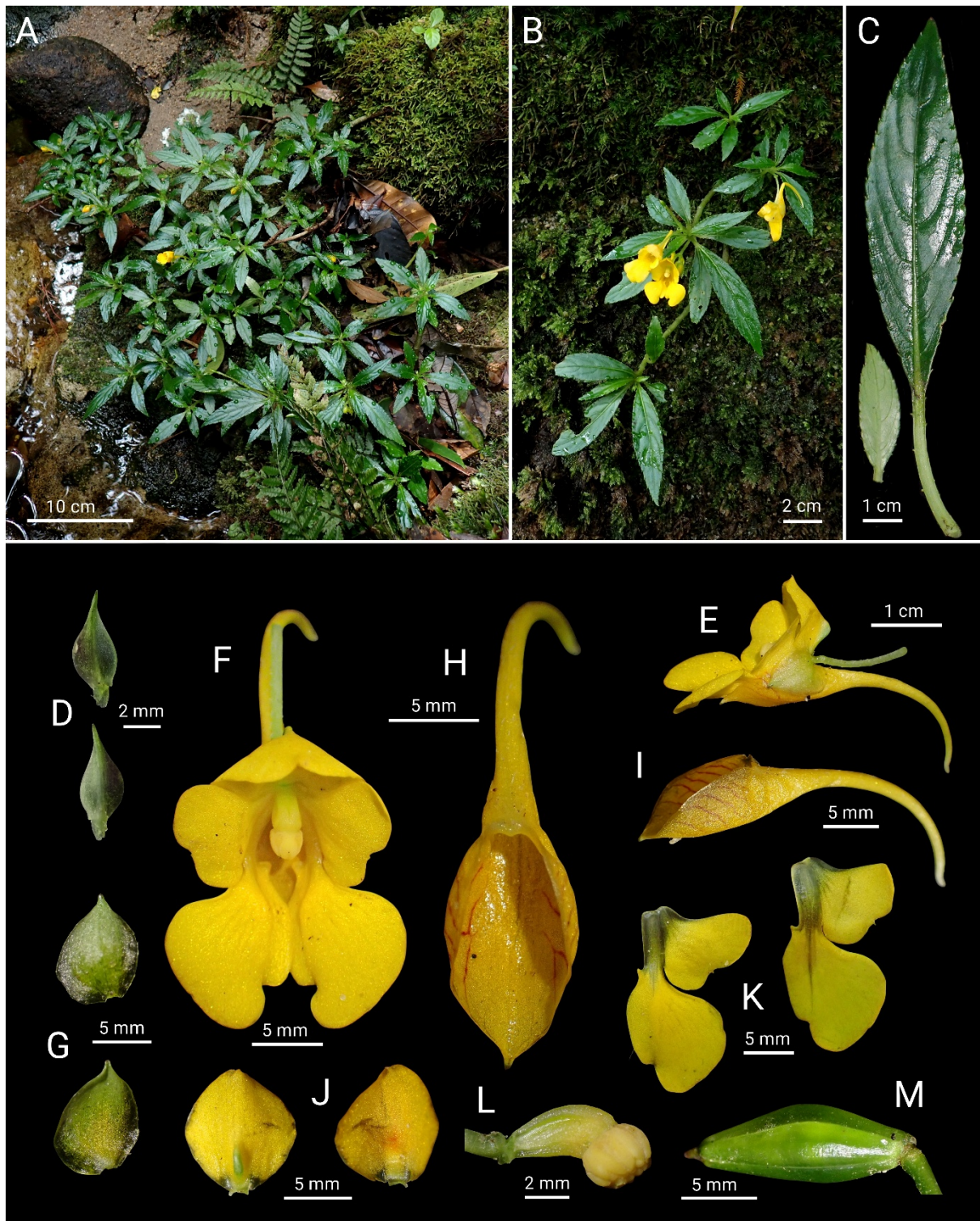


Figure 1

FIGURE CAPTIONS

Map 1. Map of *Impatiens* explorations in Sumatra conducted since 2015 (yellow circle) and distribution of *Impatiens tanahkaroensis* (blue circle). Map created using QGIS (2026).

Figure 1. *Impatiens tanahkaroensis*. **A–B.** Living plants. **C.** Leaf, adaxial and abaxial surfaces. **D.** Floral bracts. **E.** Flower, lateral view. **F.** Flower, front-view. **G.** Lateral sepals. **H.** Lower sepals, upper view. **I.** Lower sepal, lateral view. **J.** Dorsal petal. **K.** Lateral united petals. **L.** Stamens and ovary (mostly hidden). **M.** Capsule. Photographs by Yusran E. Ritonga.

TABLE

Table 1

Characters	<i>I. tanahkaroensis</i>	<i>I. junghuhnii</i>	<i>I. tapanuliensis</i>
Height (cm)	17.2–43.3	10–40	60
Leaves			
Leaf shape	elliptic–lanceolate	elliptic–lanceolate	elliptic to elliptic–oblanceolate
Lamina length (cm)	3.2–9.6	3.5–10.5	4.6–19
Lamina width (cm)	1.1–2.5	2.6–4.2	3–6.5
Leaf apex	Attenuate	Acuminate	Acuminate
Leaf margin	serrulate to crenulate	shallowly serrate or serrate–crenate	shallowly crenate
Lateral vein	4–6	4–9	6–13
Inflorescence			
Number of flowers	1–2	1–3	2–6
Lateral sepals			
Shape	Ovate	ovate to suborbicular	ovate
Length (cm)	6–8	8–10	7–9
Apex	Acuminate	Apiculate	apiculate
Lower sepals			
Depth (mm)	6–8	11–13	11–12
Spur curvature	Curved	Curved	± straight
Spur length (mm)	22–28	11–16	7–10
Reference/Data source	—	Grey–Wilson (1989)	Grey–Wilson (1989)

TABLE CAPTION

Table 1. Key morphological comparison of *I. tanahkaroensis*, *I. junghuhnii* and *I. tapanuliensis*.

Just Accepted