

New taxa of *Impatiens* (Balsaminaceae) from Madagascar. IV

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ABSTRACT

In a fourth paper as precursor to a revision of Balsaminaceae in Madagascar and the Comoro Islands, 11 species from subgenus *Impatiens* (*I. bardotiae*, *I. barthlottii*, *I. ankaranensis*, *I. tsingycola*, *I. nicolliae*, *I. academiae-moguntiae*, *I. betsomangae*, *I. guillaumetii*, *I. nomenyae*, *I. nusbaumeri*, and *I. laurentii*) and 18 species from subgenus *Trimorphopetalum* (*I. georgei-schatzii*, *I. nosymangabensis*, *I. paranyi*, *I. haingosonii*, *I. mahalevonensis*, *I. ambatrensis*, *I. messmerae*, *I. andapensis*, *I. fianarantsoae*, *I. carlsoniae*, *I. rakotomalazana*, *I. druartii*, *I. ampokafoensis*, *I. rapanarivoi*, *I. befiananensis*, *I. tsararavina*, *I. maevae*, and *I. razanatsoa-charlei*) are described as new and illustrated.

KEY WORDS

Impatiens,
subgenus *Impatiens*,
subgenus
Trimorphopetalum,
Balsaminaceae,
Madagascar,
new species.

RESUMÉ

Nouveaux taxons dans le genre Impatiens (Balsaminaceae) à Madagascar IV.

Dans une quatrième publication effectuée dans le cadre de la préparation d'une révision des Balsaminaceae de Madagascar et des Comores, 11 espèces nouvelles du sous-genre *Impatiens* (*I. bardotiae*, *I. barthlottii*, *I. ankaranensis*, *I. tsingycola*, *I. nicolliae*, *I. academiae-moguntiae*, *I. betsomangae*, *I. guillaumetii*, *I. nomenyae*, *I. nusbaumeri*, et *I. laurentii*) et 18 espèces nouvelles du sous-genre *Trimorphopetalum* (*I. georgei-schatzii*, *I. nosymangabensis*, *I. paranyi*, *I. haingosonii*, *I. mahalevonensis*, *I. ambatrensis*, *I. messmerae*, *I. andapensis*, *I. fianarantsoae*, *I. carlsoniae*, *I. rakotomalazana*, *I. druartii*, *I. ampokafoensis*, *I. rapanarivoi*, *I. befiananensis*, *I. tsararavina*, *I. maevae*, et *I. razanatsoa-charlei*) sont décrites et illustrées.

MOTS CLÉS

Impatiens,
sous-genre *Impatiens*,
sous-genre
Trimorphopetalum,
Balsaminaceae,
Madagascar,
espèces nouvelles.

INTRODUCTION

Madagascar is one of the “hottest hotspots of biodiversity” (Ganzhorn *et al.* 2001) with a high percentage of endemism threatened by extinction. Numerous new plant species are described from the island every year and others still await description. During the revision of Balsaminaceae (Fischer & Rahelivololona 2002, 2004; Fischer *et al.* 2003) it became apparent that our knowledge of the diversity of *Impatiens* L. in Madagascar is far from satisfactory.

Perrier de la Bâthie (1934, 1948), Humbert & Perrier de la Bâthie (1955) and Humbert (1956) reported 105 species of *Impatiens* from Madagascar. Humbert also prepared, but never published a manuscript about the Balsaminaceae for *Flore de Madagascar et des Comores*, which remained unfinished at the time of Humbert's death in 1967. Since then, numerous new collections have been made, and 34 additional species have already been described by the present authors (Fischer & Rahelivololona 2002, 2004; Fischer *et al.* 2003). However, while studying collections from P, TAN, MO, NEU and G numerous previously undescribed taxa were detected, raising the total number of species to 231. *Impatiens* is thus the most species-rich genus of plants in Madagascar, followed by *Bulbophyllum* (Orchidaceae) with 197 species (G. Fischer pers. comm.), *Euphorbia* (Euphorbiaceae) with 170 species (Haevermans 2003), *Dypsis* (Arecaceae) with 140 species (Dransfield & Beentje 1995), *Gravesia* (Melastomataceae) with 107 species (Almeda 2003) and *Pandanus* (Pandanaceae) with about 100 species (Callmander & Laivao 2003).

In this paper we describe some peculiar taxa of spurred balsams, four of which are restricted to the tsingy of Ankarana. While most *Impatiens* are found in rainforests, some species have adapted to seasonal habitats like the “tsingy”. Tsingy massifs are limestones submitted to long periods of karst processes, giving rise to jigsaw or knife-edged pinnacles overlying extensive cave systems (Bardot-Vaucoulon 1997). Tsingy massifs are found at Namoroka, Ankarana, and Bemaraha, and only in the latter two areas species of *Impatiens* could be recorded. *Impatiens bemaharensis* Eb.Fisch. & Raheliv. is an annual while *I. tuberosa* H.Perrier is a geophyte with large

tubers. The four new taxa from the tsingy of Ankarana collected by M. Bardot-Vaucoulon comprise three annual herbs and one geophyte closely related to *I. tuberosa*. For a description of the vegetation of the Massif d'Ankarana see Bardot-Vaucoulon (1997). The remaining species of spurred balsams described in this paper are typical rainforest plants mainly from the Masoala Peninsula

The spurless *Impatiens* species of subgenus *Trimorphopetalum* represent a highly diverse group endemic to Madagascar. During the preparation of the account of *Impatiens* for the *Flore de Madagascar et des Comores*, the authors could distinguish 117 taxa, of which 18 are described here as new. *Trimorphopetalum* is thus more species-rich in Madagascar than Subgenus *Impatiens* where 114 species are recorded. Another characteristic feature of *Trimorphopetalum*, beside the complete lack of a spur on lower sepal is the complete lack of extrafloral nectaries on the petiole. These are abundant in subgenus *Impatiens*.

A short history of exploration of *Impatiens* in Madagascar as well as details on terminology and measurements were provided by Fischer & Rahelivololona (2002).

SYSTEMATICS

Genus *Impatiens* L.

Subgenus *Impatiens* L.

DIAGNOSTIC CHARACTERS

Lower sepal with spur, petiole usually with extrafloral nectaries (fimbriae).

Impatiens bardotiae

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 1)

Impatiens baroni *et I. majungensi affinis, sed floribus roseo-violaceis, calcare longiore et ovario glabro valde differt.*

TYPUS. — Madagascar. Province d'Antsiranana, district d'Ambilobe, Matsamorimanga, Réserve Spéciale d'Ankarana, 2^e canyon, bord de la rivière à l'entrée de

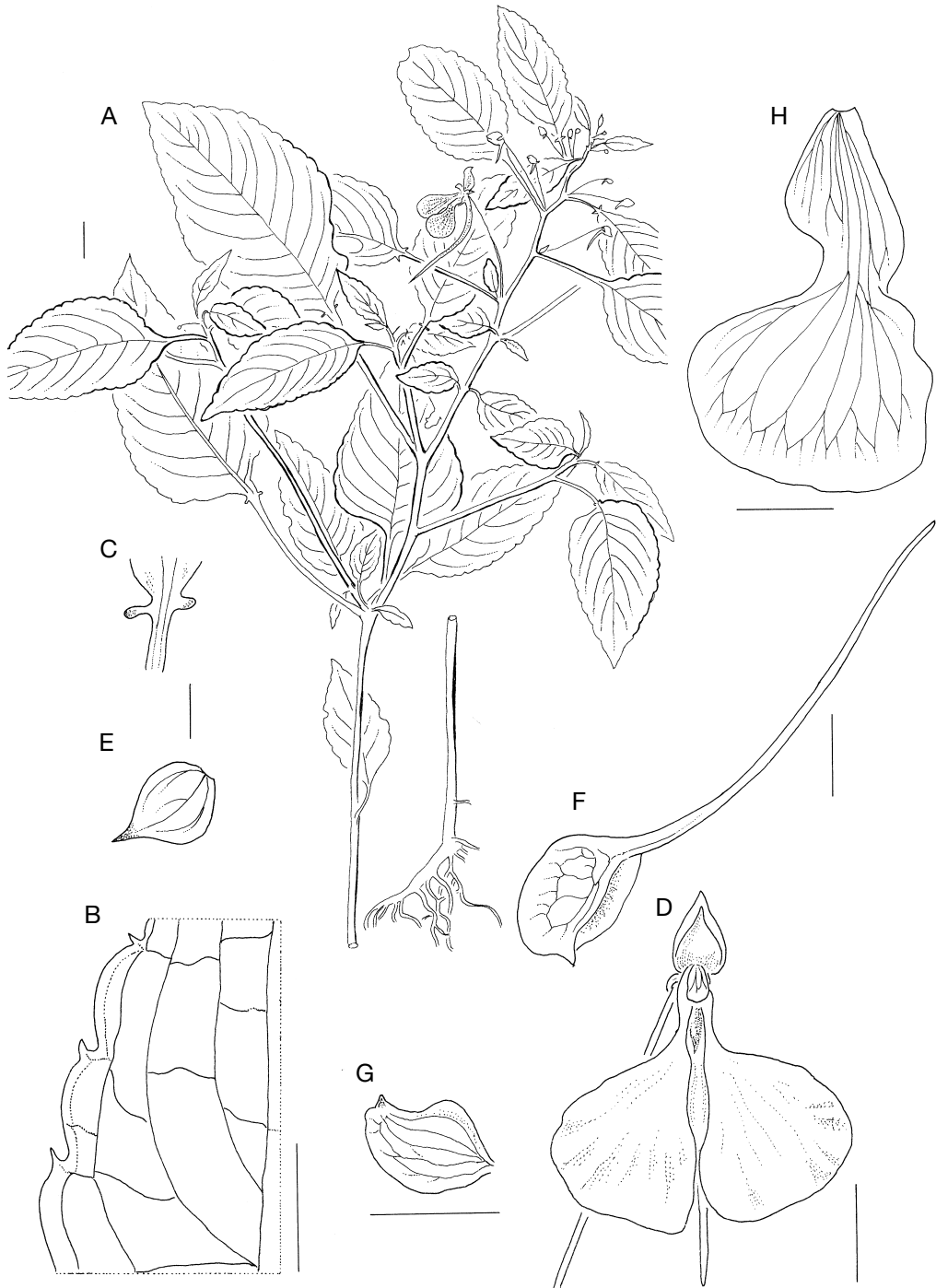


FIG. 1. — *Impatiens bardotiae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C**, extrafloral nectaries; **D**, flower; **E**, lateral sepal; **F**, lower sepal and spur; **G**, dorsal petal; **H**, lateral united petals. *Bardot-Vaucoulon, Andrianantoanina, Toly & Manesy 1141 (P)*. Scale bars: A, D, G, 1 cm; B, F, H, 5 mm; C, E, 1 mm.

la grotte de la cathédrale, 12°56'S, 49°3'E, 10.I.2003, *Bardot-Vaucoulon, Andrianantoanina, Toly & Manesy 1141* (holo-, P; iso-, MO, TAN).

PARATYPE. — **Madagascar.** Prov. de Diego Suarez, collines et plateaux calcaires de l'Ankarana du Nord, 30-350 m, 24.I-29.II.1960, *Humbert 32641* (P).

DESCRIPTION

Annual herb, erect, glabrous, richly branched. Stems reddish, up to 30 cm long. Leaves alternate, reddish, petiole 35-60 mm long, with 1 pair of extrafloral nectaries near base of lamina, lamina ovate, base rounded-attenuate, slightly decurrent, apex acuminate, 55-90 × 25-50 mm, margin dentate, with (14) 16-19 pairs of teeth with gland-tipped appendages. Inflorescence with solitary axillary flowers. Bracts filiform, 3 × 0.8 mm. Pedicels 35-40 mm long. Flowers pink-violet. Lateral sepals ovate, acuminate, 3.5 × 1 mm. Lower sepal 8 × 6-7 mm, with straight spur, 35-38 mm long. Dorsal petal cucullate, with short spur at apex, 8-9 × 5 mm. Lateral united petals 25 mm long, upper petal minute, 2 × 1-2 mm, lower petal rounded, 20-22 × 12 mm. Anthers 4-5 mm long. Ovary 4 mm long. Fruit not known.

REMARKS

Impatiens bardotiae is related to *I. baroni* and *I. majungensis*, but differs in the pink-violet flowers which are pale pink to white in *I. majungensis* and pink with yellow marks in *I. baroni*, the longer spur which is 10 to 12 mm long in the latter two species, and the smooth ovary, which is tuberculate in the latter two species. *Impatiens baroni* Baker occurs throughout Eastern Madagascar, often as a weedy species, and can also colonize temporary habitats on inselbergs or other rock outcrops. *Impatiens majungensis* H.Perrier is restricted to dry forest with calcareous rocks around Majunga.

HABITAT

Dry deciduous forest on Jurassic calcareous rocks, on alluvial loamy to sandy soils at bottom of a canyon in the tsingy.

DISTRIBUTION

Madagascar, Tsingy of Ankarana, only known from the type collection.

ETYMOLOGY

Named after Martine Bardot-Vaucoulon who collected the type specimen.

Impatiens barthlottii

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 2)

Impatiens tuberosae affinis sed tuberibus elongatis cum caule singulare, petiolo sine glandibus, floribus albo-luteaceis et calcare brevior differt.

TYPUS. — **Madagascar.** Province d'Antsiranana, district d'Ambilobe, Matsamorimanga, Réserve Spéciale d'Ankarana, grotte d'Ambohimalaza, 12°58'S, 49°5'E, 8.II.2003, *Bardot-Vaucoulon, Toly & Manesy 1397* (holo-, P; iso-, MO, TAN).

PARATYPES. — **Madagascar.** Tsingy Ankarana, lac Vert, 24.IV.1990, *Bardot-Vaucoulon 24* (P). — Province d'Antsiranana, district d'Ambilobe, Matsamorimanga, Réserve Spéciale d'Ankarana, premier canyon, zone de tsingy à droite avant la descente à la rivière, 12°56'20"S, 49°4'62"E, 160 m, 11.I.2003, *Bardot-Vaucoulon, Andrianantoanina, Toly & Manesy 1162* (P, TAN, MO). — Province d'Antsiranana, district d'Ambilobe, Matsamorimanga, Réserve Spéciale d'Ankarana, forêt de Manapisanga à l'ouest de la rivière Besaboba, 180 m, 12°54'625"S, 49°10'167"E, 11.II.2003, *Bardot-Vaucoulon & Manesy 1430* (P, TAN).

DESCRIPTION

Perennial herbs, erect, glabrous. Stems succulent, reddish, with elongated tuber at base, up to 20-70 cm long. Leaves alternate, petiole reddish, without extrafloral nectaries, up to 50 mm long, lamina ovate, elliptic-acute at base and apex, net of tertiary veins invisible, 50-110 × 25-52 mm, margin dentate, with up to 15 pairs of teeth with gland-tipped appendages. Inflorescence with 2 axillary flowers per leaf. Bracts lanceolate-filiform, membranaceous, 4 × 2 mm. Pedicels up to 55 mm long. Flowers white with yellow spot on lateral united petals. Lateral sepals 2, ovate, apiculate, cucullate, 6 × 6 mm. Lower sepal navicular, acuminate at apex, 11 × 4 mm, spur divided at apex into 2, obtuse, 2 mm long free parts, reddish at apex and striate with red veins, 4 × 1.5 mm. Dorsal petal cucullate, dorsal crest with 1 mm long spur at apex, 9 × 6 mm. Lateral united petals 15 mm long, upper petal rounded, 7 × 3 mm,

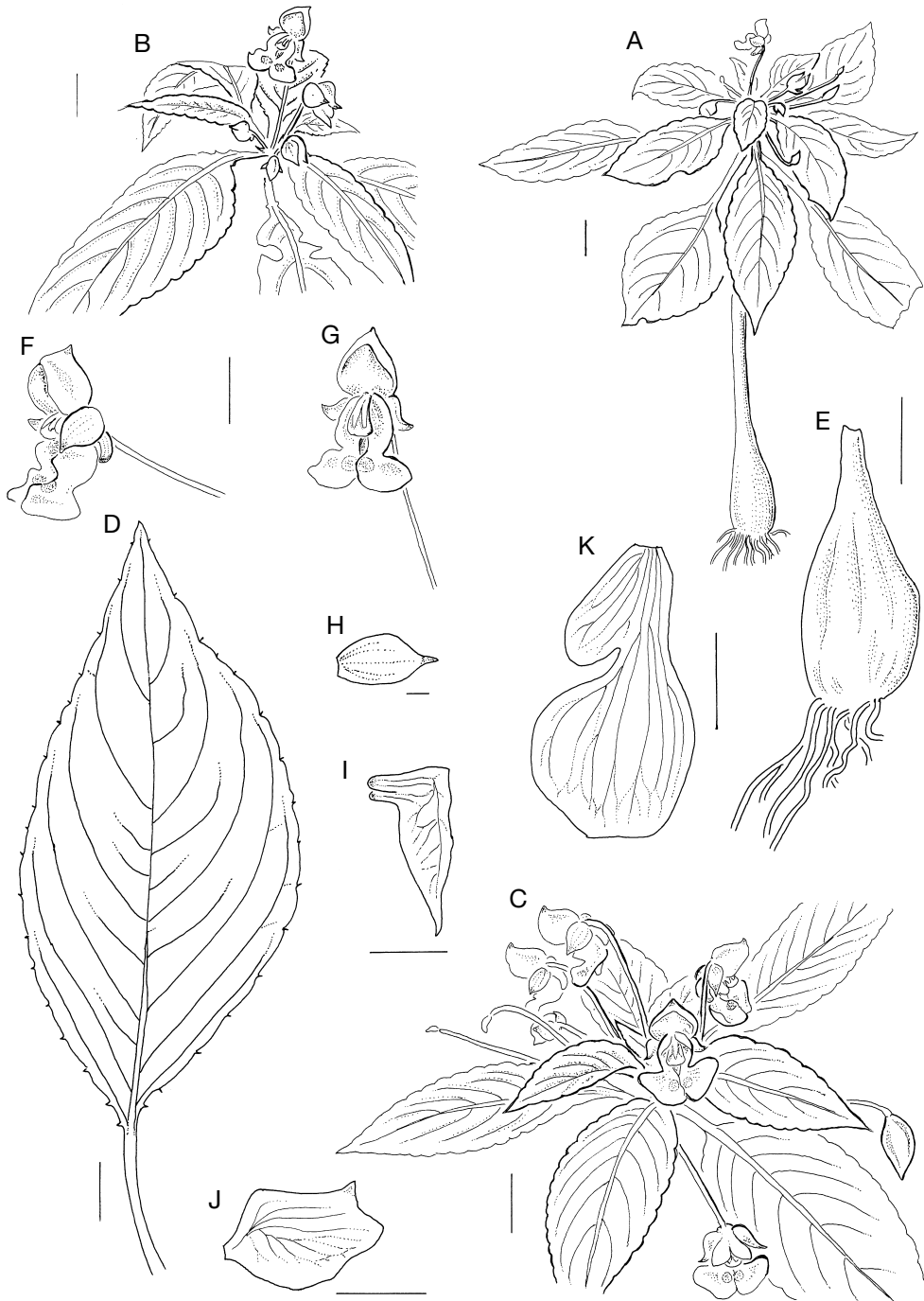


FIG. 2. — *Impatiens barthlottii* Eb.Fisch. & Raheliv.: **A**, habit; **B, C**, habit, detail; **D**, leaf; **E**, tuber in dry season; **F, G**, flower; **H**, lateral sepal; **I**, lower sepal and spur; **J**, dorsal petal; **K**, lateral united petals. *Bardot-Vaucoulon, Toly & Manesy 1397 (P)*. Scale bars: A-G, 1 cm; H, 1 mm; I-K, 5 mm.

lower petal rounded, 8 × 7 mm. Anthers 2-3 mm long. Ovary 3-4 mm long. Fruit not known.

REMARKS

Impatiens barthlottii is related to *I. tuberosa* H.Perrier which is endemic to the Montagne des Français near Antsiranana. It differs, however, in the elongated tuber which bears usually only one stem (numerous stems in *I. tuberosa*), the petiole without extrafloral nectaries, the whitish-cream colour of the flowers (pink with darker marks in *I. tuberosa*), the different length of spur (7-10 mm in *I. tuberosa*, 2 mm in *I. barthlottii*) and the lateral united petals (upper petal larger than lower petal in *I. tuberosa*, upper petal smaller than lower petal in *I. barthlottii*).

HABITAT

In fissures of Jurassic calcareous rocks, surviving the dry season with its tuber, while stem and leaves are decaying, in a deciduous dry forest. At the end of the flowering period, the leaves drop down and finally the stem dies down. Thus only the tuber survives the dry season (Bardot-Vaucoulon 1997).

DISTRIBUTION

Madagascar, Tsingy of Ankarana.

ETYMOLOGY

Named after Wilhelm Barthlott on occasion of his 60th birthday and for his outstanding research on biodiversity.

Impatiens ankaranensis

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 3)

Impatiens sacculiferae affinis sed habitu annuo, calcare inflato et callo petalorum inferiorum differt.

TYPUS. — **Madagascar.** Province d'Antsiranana, district d'Ambilobe, Matsamorimanga, Réserve Spéciale d'Ankarana, 2^e canyon, bord de la rivière à l'entrée de la grotte de la cathédrale, 12°56'S, 49°3'E, 10.I.2003, Bardot-Vaucoulon, Andrianantoanina, Toly & Manesy 1140 (holo-, P; iso-, TAN, MO, K).

PARATYPE. — **Madagascar.** Plateaux calcaires de l'Ankarana, nord d'Ambilobe, forêt trophophile sur calcaire jurassique, 200-250 m, 4-9.III.1951, Humbert 25532 (P).

DESCRIPTION

Annual herbs, erect, glabrous. Stems succulent, richly branched, up to 30 cm long. Leaves alternate, petiole up to 50 mm long, lamina attenuate, round at base, slightly decurrent, acuminate at apex, acumen up to 7 mm long, widest in lower third, 35-60 × 20-35 mm, margin dentate, with 10-14 pairs of teeth with gland-tipped appendages. Inflorescence with solitary axillary flowers. Pedicels up to 30 mm long. Flowers pale pink, lower sepal greenish with transversal red veins. Lateral sepals acuminate, 2 × 0.5 mm. Lower sepal navicular, 7 × 3 mm, spur curved at nearly right angle, inflated at middle to 1.5 mm of width, 2.8 mm long. Dorsal petal cucullate, dorsal crest with short spur at apex, 4 × 3.5-4 mm. Lateral united petals 8-10 mm long, upper petal rounded, 3.5 × 1.5 mm, lower petal rounded, 4.5-6 × 5 mm, with callus-like crest towards the interior. Anthers 2-3 mm long. Ovary 3 mm long. Fruit not known.

REMARKS

Impatiens ankaranensis is a unique plant that can readily be distinguished by its habitat in the tsingy and its annual habit. It resembles *I. sacculifera* H.Perrier, a perennial plant from rainforest around the Bay of Antongil, but differs in the longer inflated spur below apex (cylindric, gradually tapering towards apex, 1 × 0.8 mm in *I. sacculifera*) and the presence of a yellow callus-like crest on lateral united petals.

HABITAT

Clearings in dry deciduous forest with calcareous Jurassic rocks.

DISTRIBUTION

Madagascar, Tsingy of Ankarana.

Impatiens tsingycola

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 4)

Impatiens bisaccatae affinis sed floribus valde minoribus et apice saccato petalorum inferiorum differt.

TYPUS. — **Madagascar.** Province d'Antsiranana, district d'Ambilobe, Matsamorimanga, Réserve Spéciale d'Ankarana, Mahoro, sentier botanique, partie NE, 12°51'507"S,

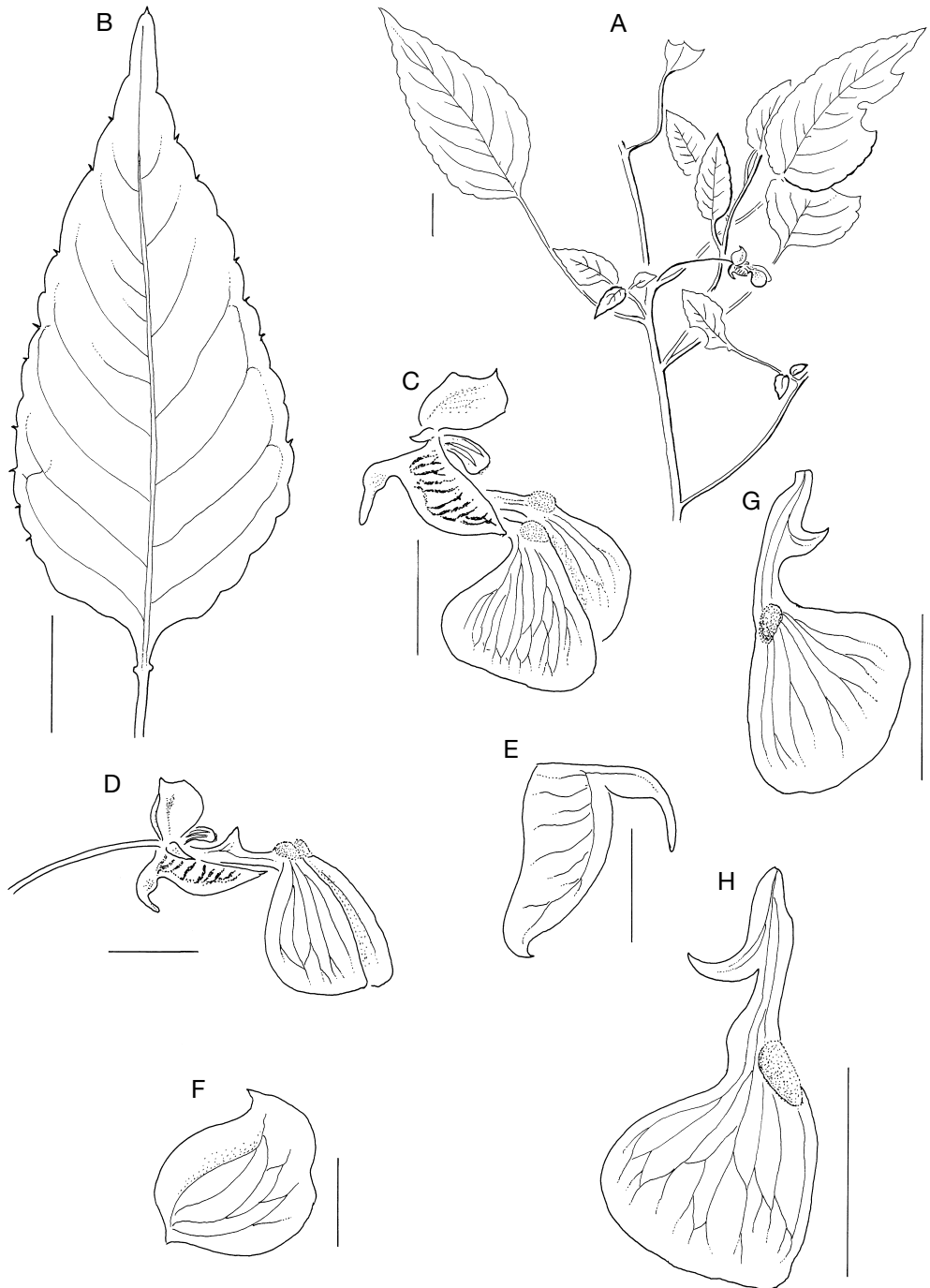


FIG. 3. — *Impatiens ankaranensis* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, **D**, flower; **E**, lower sepal and spur; **F**, dorsal petal; **G**, **H**, lateral united petals. A-D, G, *Humbert 25533* (P); E, F, H, *Bardot-Vaucoulon, Andrianantoanina, Toly & Manesy 1140* (P). Scale bars: A, B, 1 cm; C-E, G, H, 5 mm; F, 2 mm.

49°13'630"E, 22.I.2003, *Bardot-Vaucoulon, Andrianan-toanina, Toly & Manesy 1260* (holo-, MO; iso-, TAN).

DESCRIPTION

Annual herbs, erect, glabrous. Stems succulent, richly branched, up to 30 cm long. Leaves alternate, petiole up to 20 mm long, with 4 or 5 pairs of extrafloral nectaries, lamina attenuate at base, slightly decurrent, acuminate at apex, widest at middle, 55-81 × 25-30 mm, margin dentate, with 15-21 pairs of teeth with gland-tipped appendages. Inflorescence with 2 or 3 axillary flowers. Pedicels up to 20 mm long. Flowers pale pink, lower sepal greenish with transversal red veins. Lateral sepals acuminate, 2.5 × 1-1.5 mm. Lower sepal navicular, 7 × 3 mm, with 1.8-2 mm long, deeply bifid and recurved spur. Dorsal petal cucullate, dorsal crest with short, 1 mm long spur at apex, 6 × 3.5-4 mm. Lateral united petals 8-10 mm long, upper petal rounded, 4 × 4-5 mm, lower petal rounded, 3-3.5 × 5 mm, with short saccate spur-like projection at apex of lower petal. Anthers 3-4 mm long. Ovary 4 mm long. Fruit 10 × 4.5 mm.

REMARKS

Impatiens tsingycola is related to *I. bisaccata* Warb., an endemic rainforest plant from Montagne d'Ambre, but differs in the much smaller flowers (e.g., lower sepal 12-15 mm long in *I. bisaccata*, 7 mm in *I. tsingycola*, lateral sepals 5-7 × 3-5 mm in *I. bisaccata*, 2.5 × 1-1.5 mm in *I. tsingycola*, lateral united petals 25 mm long in *I. bisaccata*, 9 mm in *I. tsingycola*) and the unique saccate spur at apex of lower petal.

HABITAT

Clearings in dry deciduous forest with calcareous Jurassic rocks, in rock fissures.

DISTRIBUTION

Madagascar, Tsingy of Ankarana.

Impatiens nicolliae

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 5)

Impatiens mindiae affinis sed foliis ovatis nervibus tertiariis distinctis et calcare petali dorsalis brevior differt. Ab *I. vellela*

differt forma petali dorsalis haud crenulata sicut caput Medusae.

TYPUS. — **Madagascar.** Masoala peninsula, Ambanizana, on beach path leading south, several individuals growing in small damp valley. Eastern lowland coastal rainforest, 25 m, 15°37'S, 49°57'E, 12.IV.1987, *Nicoll, Rakotozafy, Schatz & Suzon 540* (holo-, MO; iso-, BR, TAN).

DESCRIPTION

Perennial herb, glabrous. Stem up to 30 cm tall, semi-succulent. Leaves with red-tinged petioles and light green lamina, petiole 14-27 mm long, with 3 or 4 pairs of extrafloral nectaries, lamina broadly ovate, attenuate at base and acuminate at apex, 82-95 × 43-48 mm, margin with 7-9 pairs of teeth with gland-tipped appendages. Inflorescence with solitary axillary flowers. Bracts linear-lanceolate, 3.5 × 1 mm. Pedicel up to 55 mm long. Flowers with greenish white dorsal petal, lateral petals pink and white with red dot, lower sepal ochre yellow inside. Lateral sepals 2, linear-lanceolate, 5 × 1.5 mm. Lower sepal 7-8 mm long and 3-4 mm deep, spur obtuse, straight, 1.3-1.5 mm long. Dorsal petal cucullate, with distinct dorsal crest and spur, 12 × 7 mm. Lateral united petals 18-20 mm long, upper petal slightly bifid, 8-9 × 7 mm, lower petal 12 × 7-8 mm. Anthers 2-3 mm long. Ovary 3 mm long. Fruit unknown.

REMARKS

Impatiens nicolliae is related to *I. mindiae* Eb.Fisch., Wohlh. & Raheliv. and *I. vellela* Eb.Fisch. & Raheliv., both endemics from Masoala Peninsula, but differs from *I. mindiae* in the leaves which are broadly ovate (lanceolate-ovate, 50-70 × 23-27 mm in *I. mindiae*, 82-95 × 43-48 mm in *I. nicolliae*) and show a distinct net of tertiary veins (tertiary veins nearly invisible in *I. mindiae*), in the number of the secondary veins (4 or 5 in *I. mindiae*, 8-10 in *I. nicolliae*), the number of extrafloral nectaries on petiole (0 or 1 in *I. mindiae*, 3 or 4 pairs in *I. nicolliae*), the much shorter spur on dorsal petal, and the much shorter spur on lower sepal (5 mm long in *I. mindiae*, 1.3-1.5 mm in *I. nicolliae*). It differs from *I. vellela* in the shape of the dorsal petal which is crenulated, resembling a jelly-fish, the shorter spur on lower sepal (7-8 mm in *I. vellela*), and the lack of a peduncle (short peduncle of 3-4 mm length in *I. vellela*).

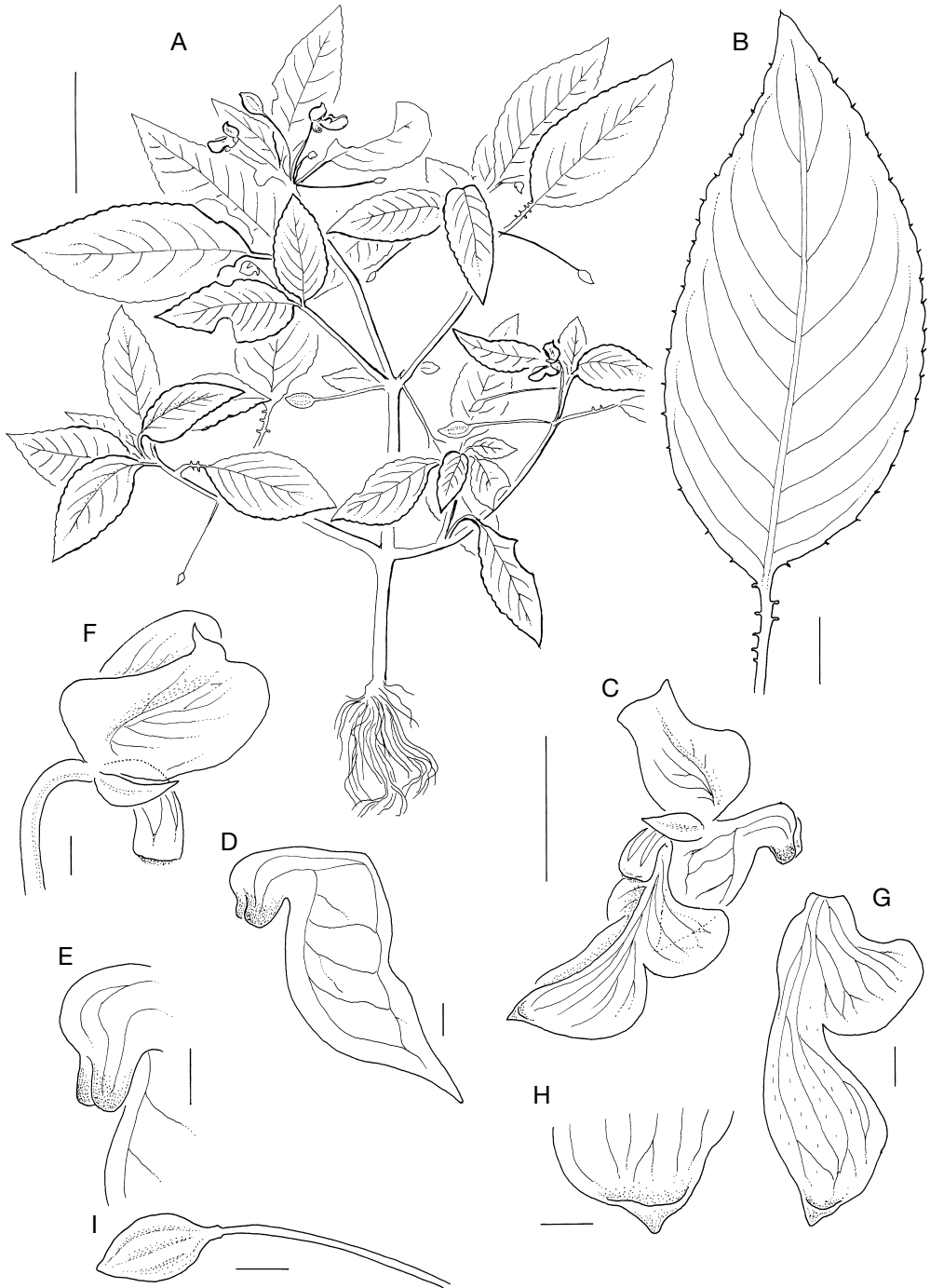


FIG. 4. — *Impatiens tsingycola* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, flower, lateral view; **D**, lower sepal and spur; **E**, spur; **F**, dorsal petal with pedicel, lateral sepal and androecium; **G**, lateral united petals; **H**, apex of lower petal; **I**, fruit. *Bardot-Vaucoulon, Andrianantoanina, Toly & Manesy 1260 (P)*. Scale bars: A, 5 cm; B, 1 cm; C, I, 5 mm; D-H, 1 mm.

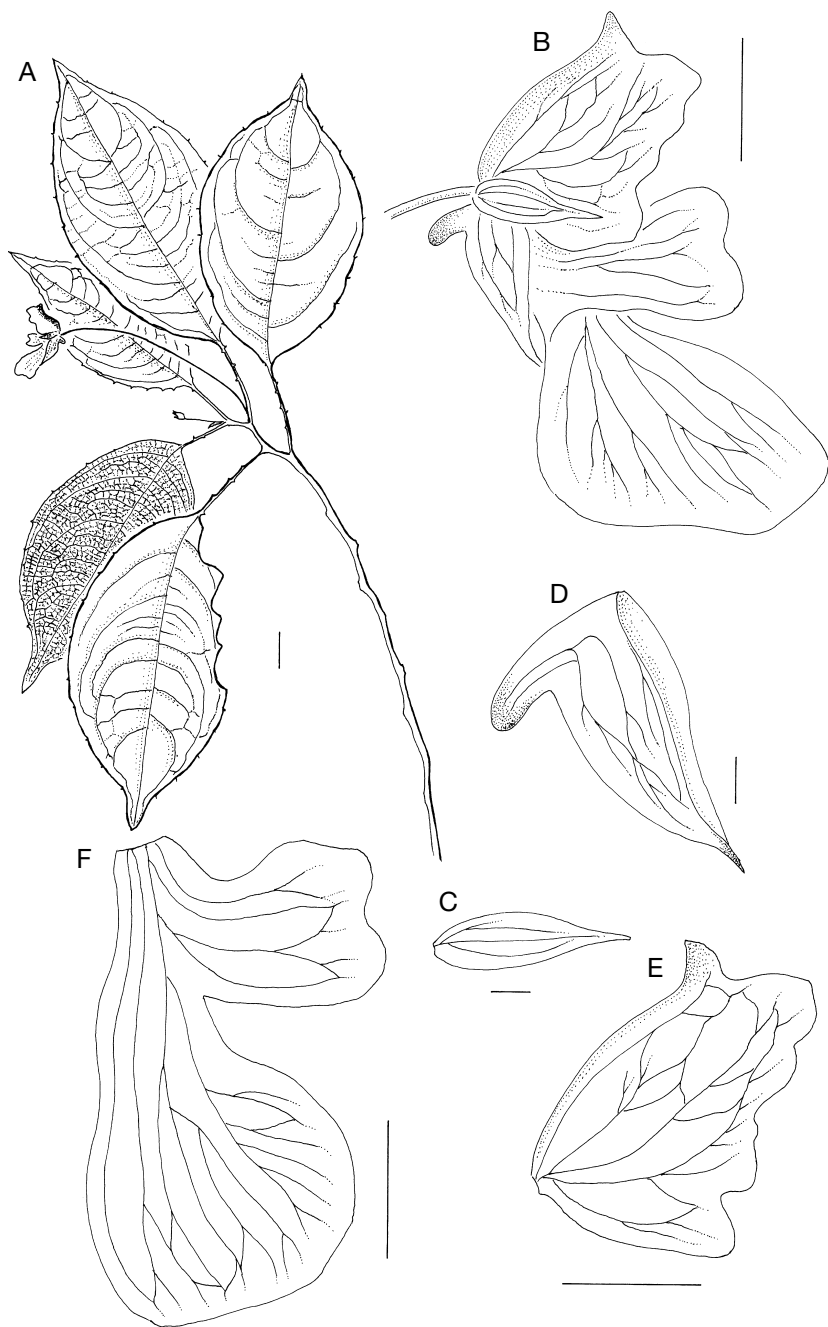


FIG. 5. — *Impatiens nicolliae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, flower, lateral view; **C**, lateral sepal; **D**, lower sepal and spur; **E**, dorsal petal; **F**, lateral united petals. *Nicoll, Rakotozafy, Schatz & Suzon 540 (BR)*. Scale bars: A, 1 cm; B, E, F, 5 mm; C, D, 1 mm.

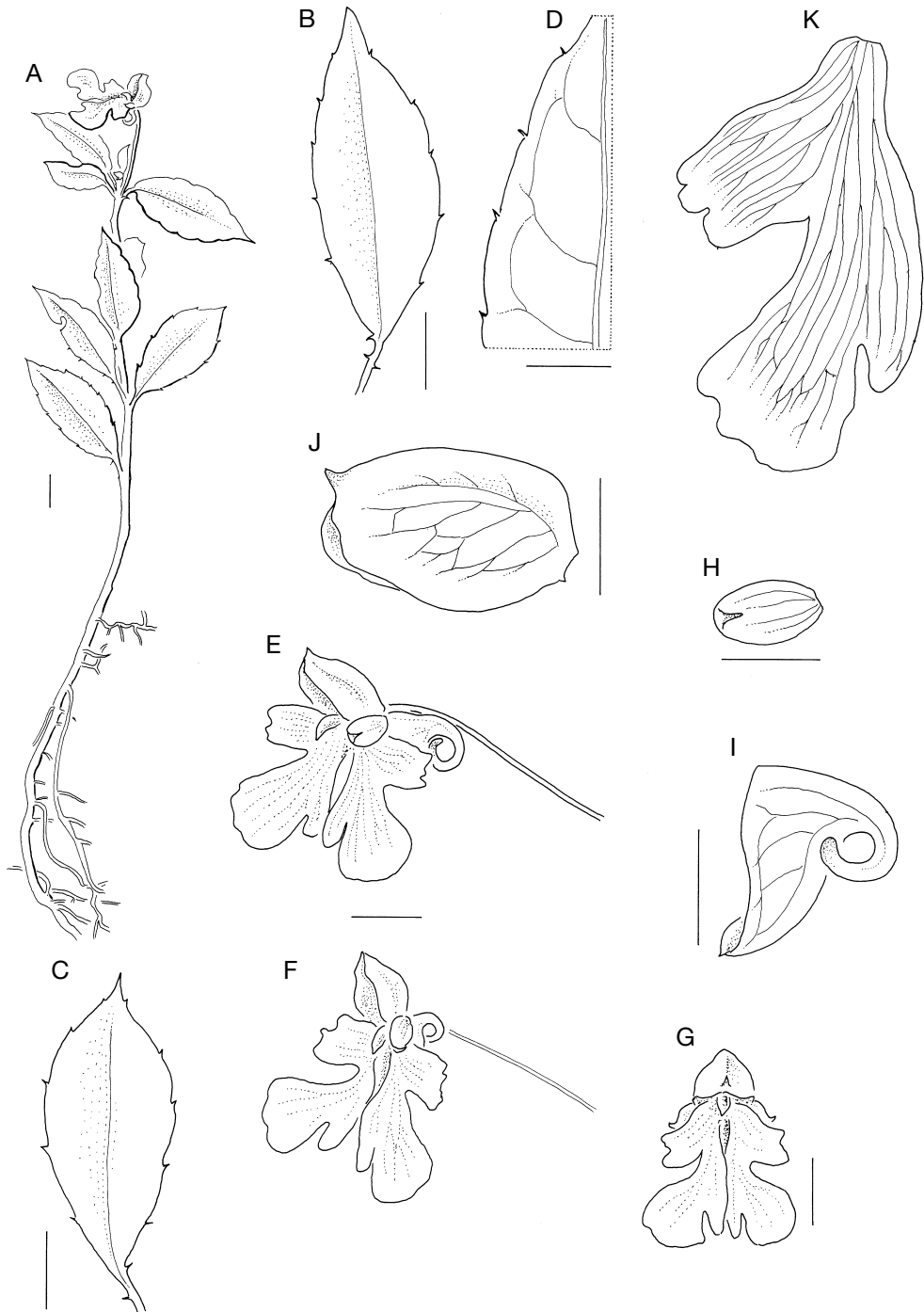


FIG. 6. — *Impatiens academiæ-moguntiae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, **C**, leaves; **D**, detail of leaf margin; **E-G**, flower; **H**, lateral sepal; **I**, lower sepal and spur; **J**, dorsal petal; **K**, lateral united petals. Rabenantroandro, Amdriamparany, Aridy & Tôto 221 (P). Scale bars: A-C, E-G, 1 cm; D, H-K, 5 mm.

HABITAT

Lowland coastal rainforest, 25 m.

DISTRIBUTION

Madagascar, Masoala Peninsula, only known from the type collection.

ETYMOLOGY

Named after Marion Nicoll who collected the type specimen.

Impatiens academiae-moguntiae

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 6)

Impatiens mindiae affinis sed habitu epiphytico repente, floribus albis et calcare petali dorsalis brevior differt.

TYPUS. — **Madagascar.** Toamasina, Parc National de Masoala, Maroantsetra, Anjahana, Ambanizana, piste d'Analambolo, à 10 km au nord-est d'Ambanizana, suivant la rivière Ambanizana, vers l'ancien relais d'Ambohitsidondrona, forêt sclérophylle de montagne, 1090 m, 15°34'27"S, 50°00'35"E, 24.VII.2000, *Rabenantroandro, Amdriamparany, Aridy & Toto* 221 (holo-, P; iso-, TAN, MO).

DESCRIPTION

Perennial epiphytic herb, glabrous except for sparse whitish scales. Stem climbing, up to 30 cm long, semi-succulent. Leaves with lamina dark green on upper face and light green on lower face, petiole up to 10 mm long, with 1, 2 pairs of extrafloral nectaries, partly on base of lamina, lamina ovate, attenuate-acute at base and acuminate at apex, 48-55 × 20-21 mm, margin with 5 pairs of teeth with gland-tipped appendages. Inflorescence with solitary axillary flowers. Pedicel up to 35 mm long. Flowers white with pink. Lateral sepals 2, ovate, 6 × 4 mm. Lower sepal 9 mm long and 3-4 mm deep, spur obtuse, curved, 7-8 mm long. Dorsal petal cucullate, with distinct dorsal crest and spur, 11 × 6 mm. Lateral united petals 25-28 mm long, upper petal slightly bifid, 11-12 × 7-8 mm, lower petal bilobed, obtuse, 18 × 13-14 mm, inner lobe with free part 5 × 3-4 mm. Anthers 3-4 mm long. Ovary 3 mm long. Fruit unknown.

REMARKS

The new species is a climbing epiphyte which is related to *Impatiens mindiae*. It differs, however, in the growth form, the nearly entirely white flowers (rose with yellow and white in *I. mindiae*), the smaller lower sepal (13 mm long in *I. mindiae*, 9 × 3-4 mm in *I. academiae-moguntiae*) and the much shorter spur on dorsal petal.

HABITAT

Climbing epiphyte in montane rainforest, at 1090 m.

DISTRIBUTION

Madagascar, Masoala Peninsula, only known from the type collection.

ETYMOLOGY

Named after the Academy of Science and Literature, Mainz who supported the first author's research on the diversity of *Impatiens*.

Impatiens betsomangae

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 7)

Impatiens manaharensis affinis sed pilis et squamulis fuscis valde instructa et quoque calcare brevior differt.

TYPUS. — **Madagascar.** Antsiranana, Andapa, Doany, Betsomanga, à environ 11,2 km à vol d'oiseau au sud-est de Doany et à 7,5 km au nord-est d'Ambalamanasy II, entre la rivière d'Ampandrana et Betsomanga, au nord de Marojejy, 14°27'S, 49°34'E, 920-1040 m, 15-29.V.1995, *Rasoavimbahoaka* 705 (holo-, P; iso-, TAN, MO).

DESCRIPTION

Perennial herb, densely covered with brownish multicellular hairs. Stem 30-50 cm tall. Leaves alternate, lanceolate, dentate, petiole 28-40 mm long, with 4-6 pairs of obtuse extrafloral nectaries, lamina oblong to elliptic, 85-120 × 25-40 mm, attenuate at base, acuminate at apex, margin with 16-20 teeth with gland-tipped appendages. Inflorescence axillary with 2-4 clustered flowers. Pedicel 20-35 mm long, bract filiform, pilose, 4 mm long. Flowers violet-whitish. Lateral sepals 2, lanceolate, densely pubescent, 9.5 × 2-2.5 mm. Lower sepal

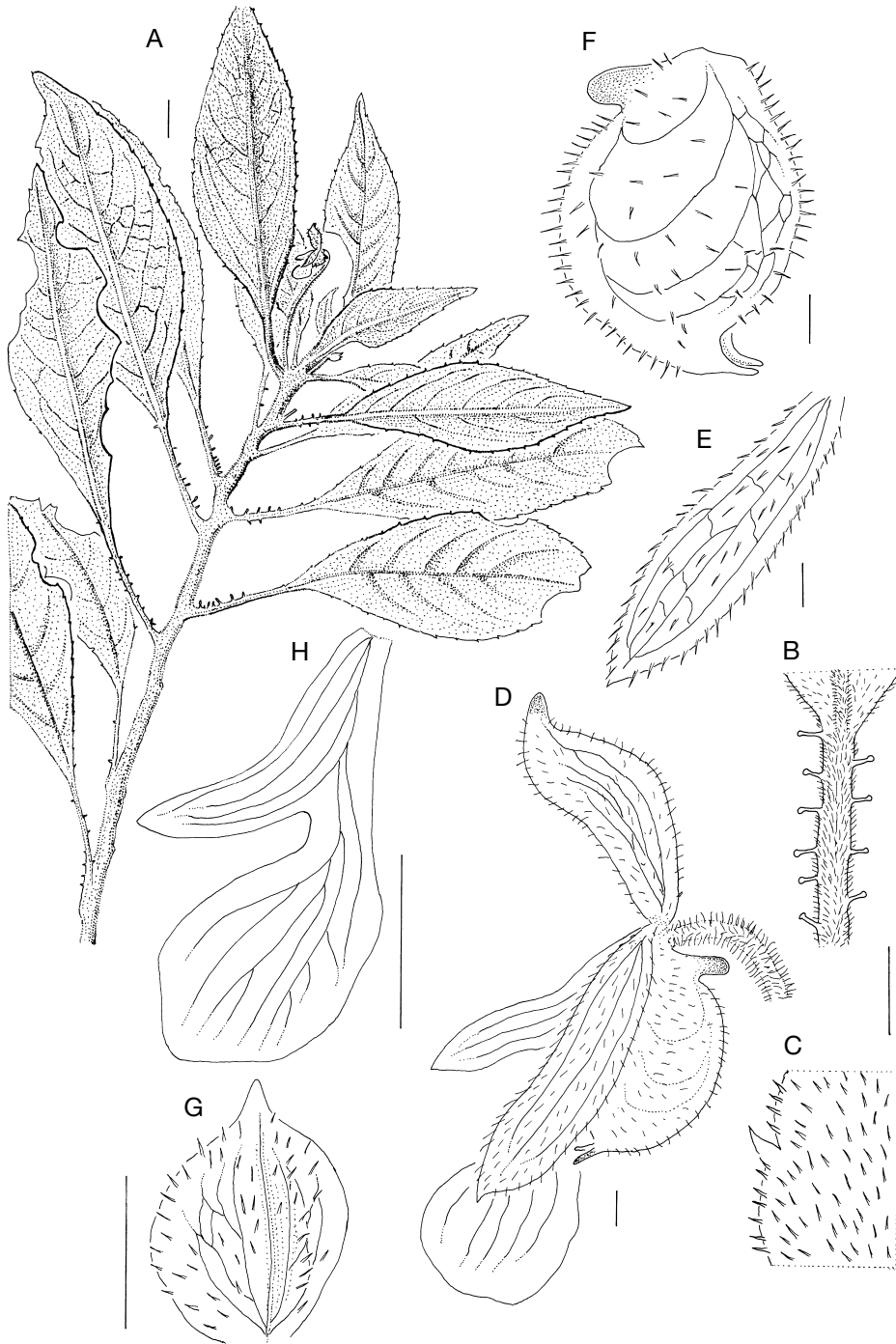


FIG. 7. — *Impatiens betsomangae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, petiole with extrafloral nectaries; **C**, detail of leaf margin; **D**, flower, lateral view; **E**, lateral sepal; **F**, lower sepal and spur; **G**, dorsal petal; **H**, lateral united petals. *Rasoavimbahoaka* 705 (P). Scale bars: A, 1 cm; B, C, G, H, 5 mm; D-F, 1 mm.

pilose outside, 7 × 4.5 mm, with darker violet, short and obtuse, 1.5 mm long spur. Dorsal petal pilose, crest indistinct, 9 × 6 mm. Lateral united petals 12-13 mm long, upper petal acuminate, 6 × 1-1.5 mm, lower petal 6-7 × 5 mm. Anthers 3-4 mm long. Ovary 4 mm long. Fruit unknown.

REMARKS

Impatiens betsomangae is related to *I. manaharensis* Baill. from North-Eastern Madagascar or *I. guillaumetii* from Mananara, but differs distinctly in the very short spur (9 mm long in *I. manaharensis*, 4-6 × 1.5 mm in *I. guillaumetii*) the lack of a peduncle (1 mm long peduncle in *I. guillaumetii*) and the brownish scale-like hairs.

HABITAT

Montane rainforest, at 920-1040 m.

DISTRIBUTION

Madagascar, Marojejy area, only known from the type collection.

Impatiens guillaumetii

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 8)

Impatiens lachnospermae affinis sed nectaribus extrafloralibus distinctis et calcare sub angulum rectum curvato differt.

TYPUS. — Madagascar. Forêt de Manomba 20 km S de Mananara, forêt dense humide de basse altitude, 1.VI.1969, *Guillaumet 3008bis* (holo-, P).

DESCRIPTION

Robust perennial erect herb, entirely glabrous. Stem woody at base, up to 30-40 cm tall. Leaves alternate, dark green above, light green below, petiole 10-30 mm long, with 3-6 pairs of extrafloral nectaries, lamina oblong, attenuate at base and acuminate-attenuate at apex, 95-130 × 30-35 mm, margin with 7-10 pairs of teeth with gland-tipped appendages. Inflorescence axillary, umbellate, with 6 flowers, peduncle short, up to 1 mm long. Bracts linear-lanceolate, 5-6 × 1-1.5(-3) mm. Pedicels 39-42 mm long. Flowers with dorsal petal white with rose margin, lateral

petal purple, lower petal with white spot and dark pink apex. Lateral sepals 2, ovate, acuminate, 5-6 × 1.8-2(-3) mm. Lower sepal 11-12 mm long and 4-5(-6) mm deep, spur curved forward through 90° and obtuse with darker apex, 4-6 × 1.5 mm. Dorsal petal cucullate, with distinct apical spur, 8-11 mm long and 4-6 mm high, spur 1 mm long. Lateral united petals 14-20 mm long, upper petal 5-9 × 5-6 mm, shortly mucronate at apex, lower petal 8-14 × 4-5 mm. Anthers 3-4(-6) mm long. Ovary 4 mm long. Young fruit 10-11 × 3 mm.

REMARKS

Impatiens guillaumetii is related to *I. lachnosperma* H.Perrier from Manongarivo, but differs in the distinct extrafloral nectaries on petiole (absent or only 1 or 2 in the latter species) and the longer spur which is curved forward at an angle of 90° (2.5 × 1 mm, slightly curved in *I. lachnosperma*).

HABITAT

Lowland rainforest, at 270 m.

DISTRIBUTION

Madagascar, Mananara region.

ETYMOLOGY

Named after Jean-Louis B. Guillaumet who collected the type specimen.

Impatiens nomenyae

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 9)

Impatiens benitae affinis sed forma petali dorsalis, petalo superiore valde minore et fructu squamulis albis instructa valde differt.

TYPUS. — Madagascar. Réserve Nationale 12 Marojejy, sentier qui mène au 2^e camp, au-dessus du village de Manantenina, 300-760 m, 24.III.1990, *Randrianasolo 54* (holo-, P; iso-, MO, TAN).

DESCRIPTION

Perennial herb, glabrous. Stem slightly succulent, up to 17 cm tall. Leaves alternate, petiole 16-19 mm long, with 4 pairs of linear, 1 mm long fimbriae,

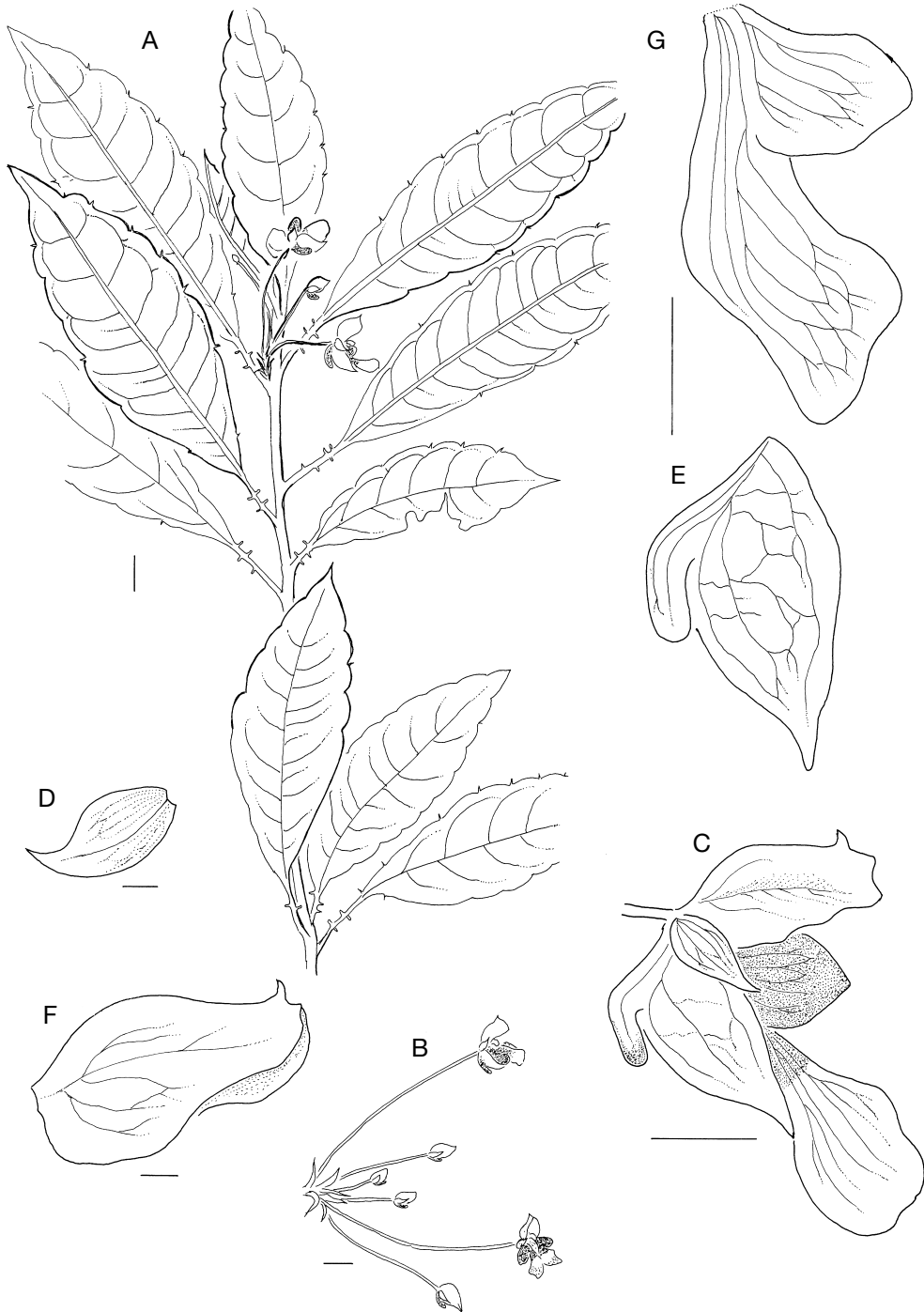


FIG. 8. — *Impatiens guillaumetii* Eb.Fisch. & Raheliv.: **A**, habit; **B**, axillary inflorescence; **C**, flower, lateral view; **D**, lateral sepal; **E**, lower sepal and spur; **F**, dorsal petal; **G**, lateral united petals. *Guillaumet 3008bis* (P). Scale bars: A, B, 1 cm; C, E, G, 5 mm; D, F, 1 mm.

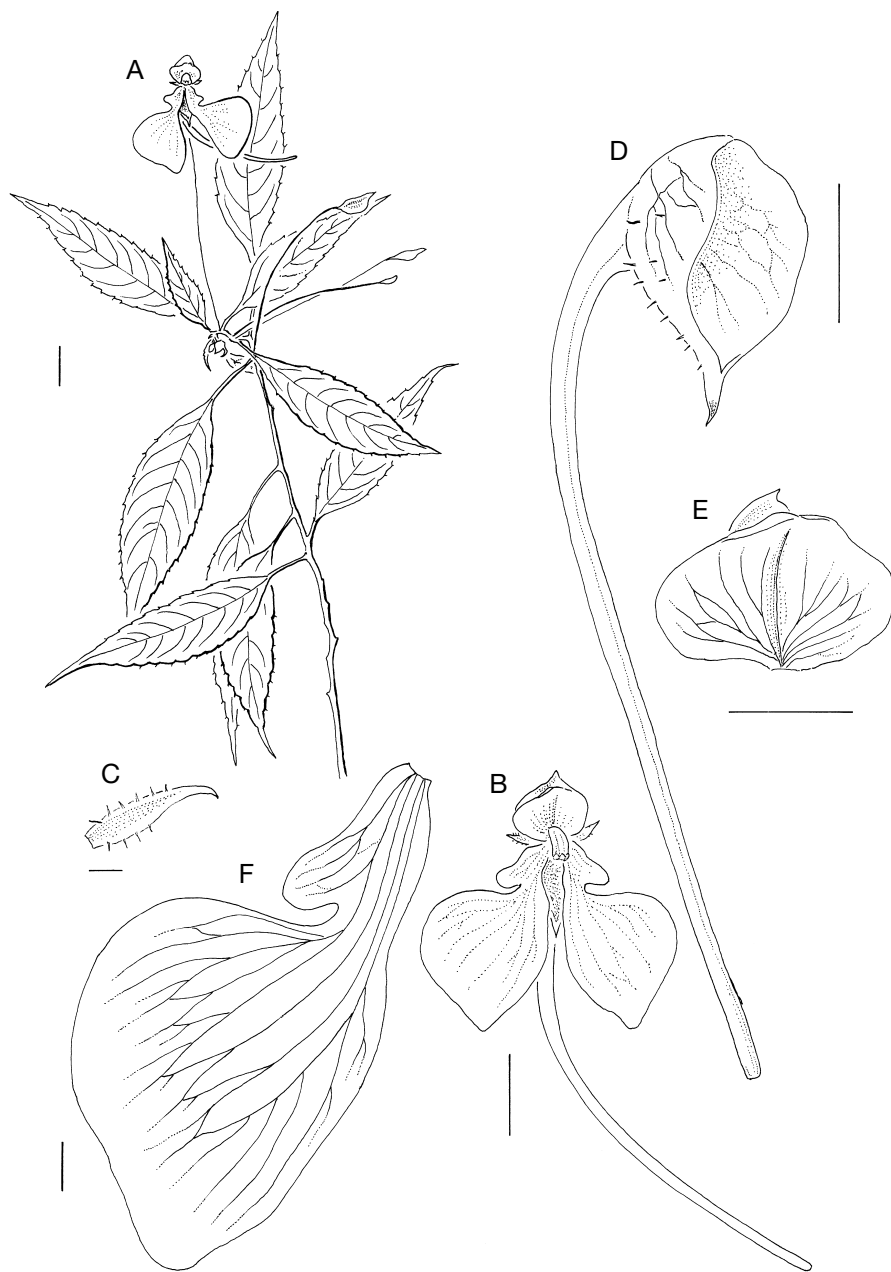


FIG. 9. — *Impatiens nomenyae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, flower; **C**, lateral sepal; **D**, lower sepal and spur; **E**, dorsal petal; **F**, lateral united petals. *Randrianasolo 54* (P). Scale bars: A, 1 cm; B, D, E, 5 mm; C, F, 1 mm.

lamina with sparse whitish hairs, oblong-lanceolate, attenuate-acuminate at base and acuminate at apex, 60-75(-130) × 16-20(-50) mm, margin with

13-17(-30) pairs of teeth with gland-tipped appendages. Inflorescence with 1 or 2 axillary flowers per leaf, peduncle up to 1 mm long. Bracts filiform,

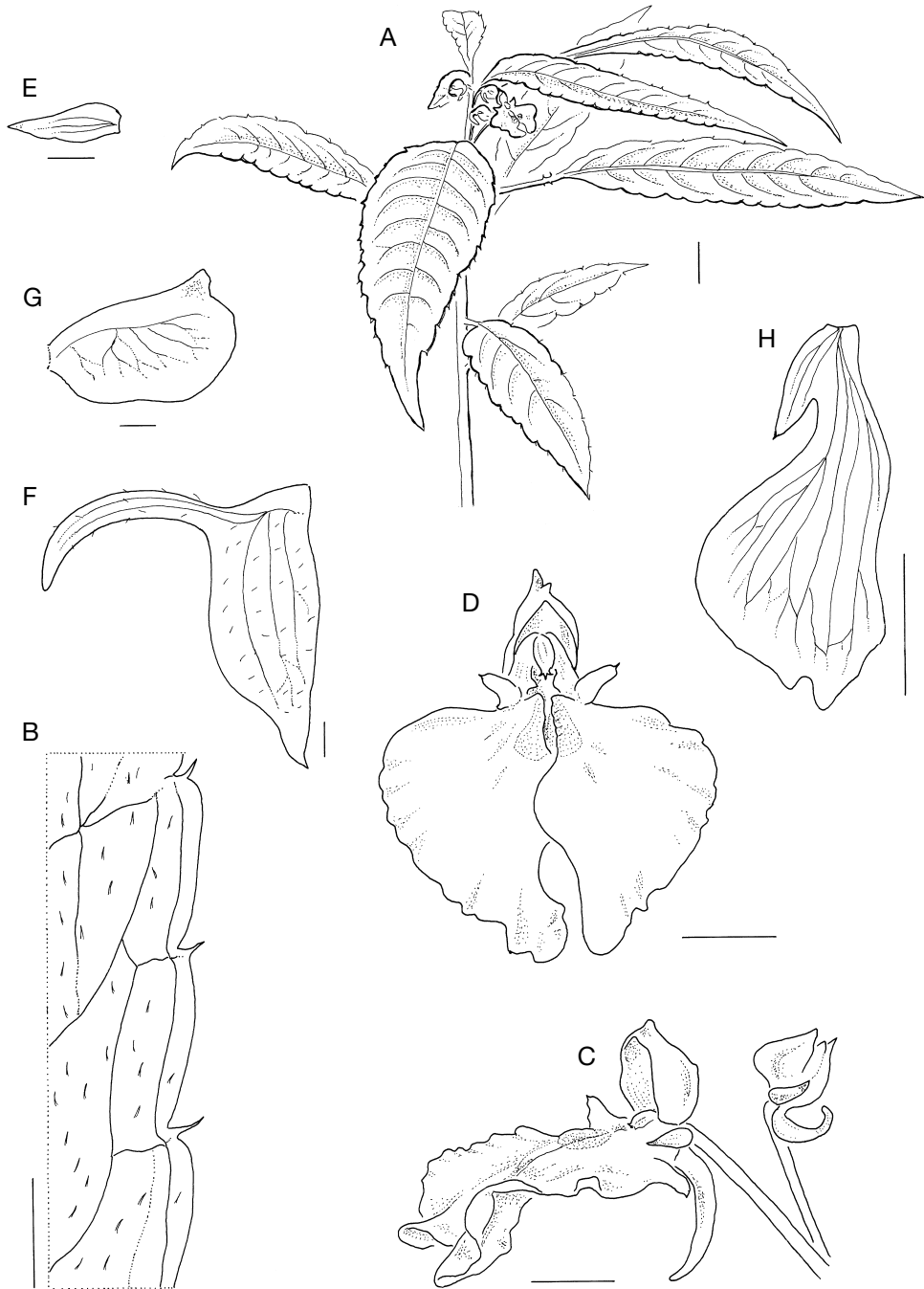


FIG. 10. — *Impatiens nusbaumeri* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C, D**, flower; **E**, lateral sepal and spur; **F**, lower sepal and spur; **G**, dorsal petal; **H**, lateral united petals. Nusbaumer & Ranirison LN 1761 (G). Scale bars: A, 1 cm; B-D, H, 5 mm; E-G, 1 mm.

2 × 0.4 mm. Pedicels 45-60 mm long. Flowers with dorsal petal white with greenish crest, lower sepal with spur white, lateral united petals with upper petal white and lower petal pink. Lateral sepals 2, linear-lanceolate, pilose, 4 × 1 mm. Lower sepal acuminate, sparsely pubescent, 10 mm long and 4-5 mm broad, with 39-40 mm long, filiform spur. Dorsal petal with distinct crest and short apicule, 7 mm long and 8-9 mm broad. Lateral united petals 25 mm long, upper petal 2-3 × 2-3 mm, lower petal 18 × 13 mm. Anthers 4-6 mm long. Ovary 5-6 mm long. Fruit 11-18 × 6-8 mm, with whitish scales.

REMARKS

Impatiens nomenyae resembles *I. benitae* Eb.Fisch., Wohlh. & Raheliv. from Masoala and Marojejy, but differs clearly in the shape of the dorsal petal (9 × 6 mm in *I. benitae*, 7 × 8-9 mm in *I. nomenyae*), the upper petals which are much smaller than the lower petals (upper petal 2-3 × 2-3 mm, lower petal 18 × 13 mm in *I. nomenyae*, upper petal 10 × 6-7 mm, lower petal 10-11 × 6-7 mm in *I. benitae*), the longer spur (39-40 mm in *I. nomenyae*, 25 mm in *I. benitae*) the fruits with whitish scales (smooth and glabrous in *I. benitae*).

HABITAT

Montane rainforest.

DISTRIBUTION

Madagascar, Marojejy, only known from the type locality.

VERNACULAR NAME

“Benja marokely”.

ETYMOLOGY

Named after Nomeny, the late daughter of the second author.

Impatiens nusbaumeri
Eb.Fisch. & Raheliv., sp. nov.
(Fig. 10)

Impatiens nomenyae affinis sed floribus albis et calcare valde brevior differt.

TYPUS. — Madagascar. Province de Diego-Suarez/Ant-siranana, sous-préfecture de Voehemar, commune rurale de Daraina, forêt de Binara, 13°13.96'S, 49°35.34'E, 1100 m, 10.XII.2005, Nusbaumer & Ranirison LN 1761 (holo-, G; iso-, TAN).

DESCRIPTION

Perennial herb, erect, glabrous except for upper surface of lamina. Stems erect, up to 50 cm long. Leaves alternate, upper surface dark green, with sparse hairs, lower surface light green, glabrous, petiole 20-33 mm long, with 2 (3) pairs of extrafloral nectaries, lamina lanceolate, attenuate-acute at base, slightly decurrent, attenuate-acuminate at apex, 90-150 × 20-24 mm, margin dentate, with 12-15 pairs of teeth with gland-tipped appendages. Inflorescence with 2 or 3 axillary flowers. Bracts filiform, 3-4 × 0.5 mm. Pedicels 40-48 mm long. Flowers white, with yellow spot on lower petal. Lateral sepals ovate, acuminate, 2 × 1 mm. Lower sepal navicular, 13-14 mm long and 2-3 mm deep, spur curved, obtuse at apex, 6-8 mm long. Dorsal petal cucullate, with short spur at apex, 6-7 × 4 mm. Lateral united petals 13-14 mm long, upper petal acute, 3 × 1 mm, lower petal rounded, 11 × 5 mm. Anthers 3 mm long. Ovary 2-3 mm long. Fruit 8 × 3 mm in immature stage.

REMARKS

Impatiens nusbaumeri resembles *I. nomenyae* Eb.Fisch. & Raheliv. from Marojejy, but differs in the entirely white flowers with yellow spots (white with pink lateral petals in *I. nomenyae*), the much shorter spur (6-8 mm in *I. nusbaumeri*, 39-40 mm in *I. nomenyae*), and the shorter lateral united petals (13-14 mm long in *I. nusbaumeri*, 25 mm long in *I. nomenyae*).

HABITAT

Montane rainforest, 1100 m.

DISTRIBUTION

Madagascar, Daraina region, only known from the type collection.

ETYMOLOGY

Named after Louis Nusbaumer, Geneva, who collected the type specimen.

Impatiens laurentii

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 11)

Ab omnibus speciebus madagascariensibus forma petali superioris valde differt.

TYPUS. — **Madagascar.** Province de Diego-Suarez/Antiranana, sous-préfecture de Voahem, commune rurale de Daraina, forêt de Binara, camp I, 13°15'S, 49°37'E, 1,3 km WSW du camp, 700 m, 8.XI.2001, *Gautier & Ravelonarivo LG 4122* (holo-, G; iso-, TAN).

PARATYPE. — **Madagascar.** Province de Diego-Suarez/Antiranana, sous-préfecture de Voahem, commune rurale de Daraina, forêt d'Antsahabe, 13°13'S, 49°33'E, rivière Antsahabe, 460 m, 9.III.2003, *Gautier, Wohlhauser & Nusbaumer LG 4285* (G, TAN).

DESCRIPTION

Perennial herb, erect, glabrous throughout. Stems succulent, branched, up to 100-150 cm long. Leaves alternate, petiole with 3 or 4 pairs of *c.* 2 mm long extrafloral nectaries, up to 50 mm long, lamina coriaceous, obovate, elliptic, acute, acuminate and slightly decurrent at base and attenuate-acute at apex, net of tertiary veins nearly invisible, 85-150 × 25-55 mm, margin with 24 pairs of gland-tipped teeth. Inflorescence with solitary axillary flowers. Bracts ovate, 2 × 1 mm. Pedicels up to 75 mm long. Flowers with lower sepal white with red veins, dorsal petal magenta with green spur at apex, lateral united petals magenta except internal part which is white with red veins. Lateral sepals broadly ovate, distinctly acuminate, 8 × 7 mm. Lower sepal acuminate, 15 mm long and 7 mm broad, with 30-40 mm long, filiform and curved spur. Dorsal petal with distinct crest and short, 1 mm long apicule, 16 mm long and 18-19 mm broad. Lateral united petals 20-23 mm long, upper petal ovate, obtuse, 15 × 15-16 mm, lower petal 20 × 13-14 mm. Anthers 7 mm long. Ovary 6-7 mm long. Fruit 10 × 3 mm.

REMARKS

Impatiens laurentii is a very showy species. It looks superficially similar to *I. lyallii* Baker, but differs in the number of extrafloral nectaries (0-2 in *I. lyallii*, 3 or 4 in *I. laurentii*), the longer spur (25-30 mm in *I. lyallii*, 30-40 mm in *I. laurentii*), and the distinct

reticulate pattern on lower sepal. It differs from all Malagasy *Impatiens* in the upper lateral petals which are triangular at apex.

HABITAT

Dense evergreen rainforest, in ravines with large rocks, 460-700 m.

DISTRIBUTION

Madagascar, region of Daraina.

ETYMOLOGY

Named after Laurent Gautier, Geneva, who collected the type specimen.

Subgenus *Trimorphopetalum* (Baker) Eb.Fisch.

DIAGNOSTIC CHARACTERS

Lower sepal without spur, extrafloral nectaries on petiole lacking.

Impatiens georgei-schatzii

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 12)

Impatiens perfercundae affinis sed indumento denso valde differt. Ab *I. alborpurpurea* et *I. rivulari* petalo superiore longiore vel aequilongo differt.

TYPUS. — **Madagascar.** Toamasina, Masoala Peninsula, *c.* 3 km NE of Antalavia, along Antalavia River, 15°47'S, 50°02'E, 200-380 m, 13-16.XI.1989, *Schatz, Dransfield & Du Puy 2797* (holo-, MO; iso-, P, TAN).

DESCRIPTION

Perennial herbs, ascending to erect with creeping rhizome, densely hairy throughout. Stems 4-6(-8) cm long. Leaves medium green above, whitish below, densely covered with whitish hairs, petiole up to 10 mm long, lamina narrow lanceolate, attenuate-acute at base and attenuate-acuminate at apex, net of tertiary veins visible on lower surface, 35-50 × 8-10 mm, margin dentate, with 6 or 7 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Pedicels medium green, up to 14 mm long. Flowers with sepals clear

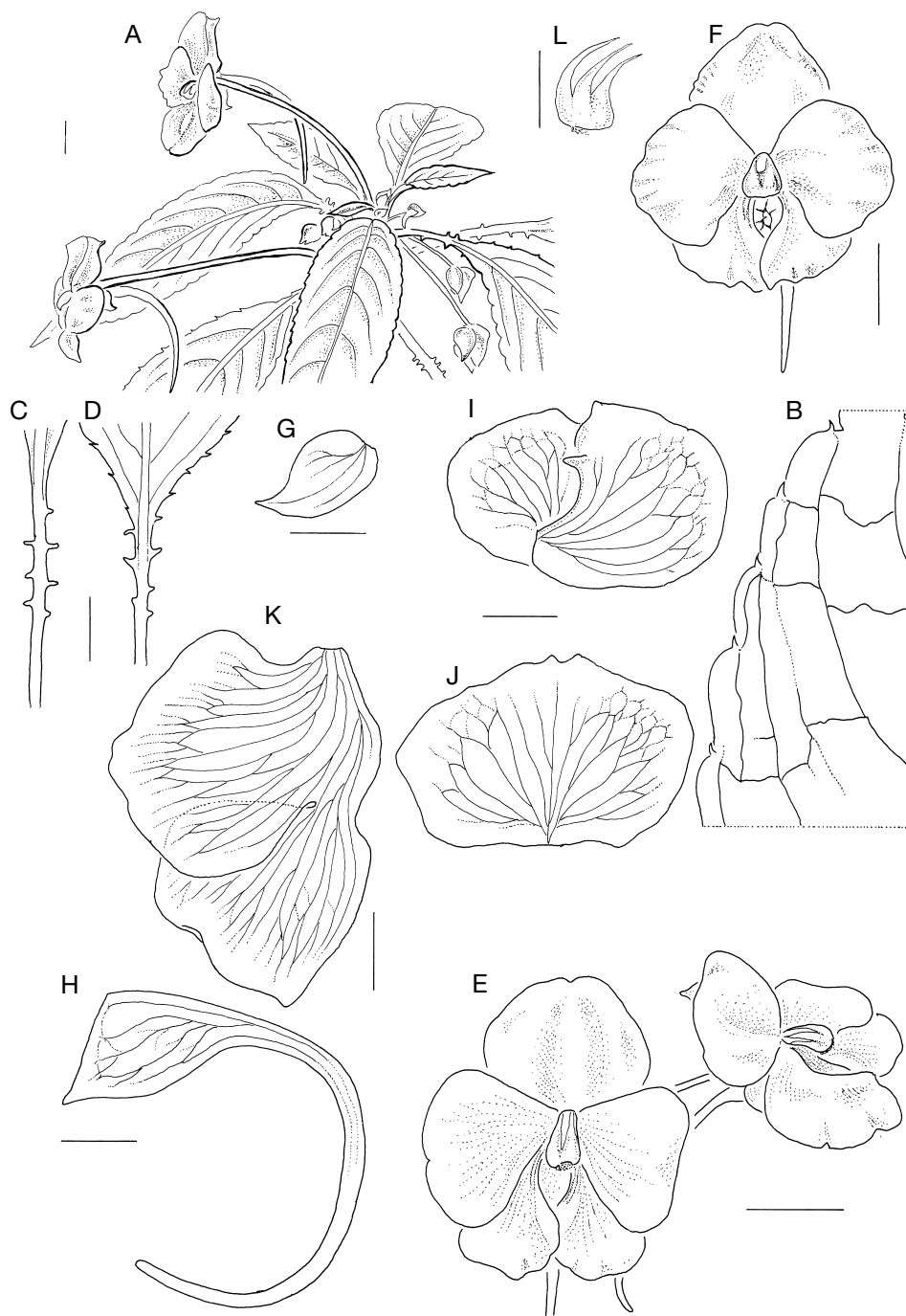


FIG. 11. — *Impatiens laurentii* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C, D**, petiole; **E, F**, flowers in different pollination stages; **G**, lateral sepal; **H**, lower sepal and spur; **I**, dorsal petal, dorsal view; **J**, dorsal petal, ventral view; **K**, lateral united petals; **L**, androecium. A-E, G-L, *Gautier & Ravelonarivo* LG 4122 (G); F, *Gautier, Wohlhauser & Nusbaumer* LG 4285 (G). Scale bars: A, C-F, 1 cm; B, G-L, 5 mm.

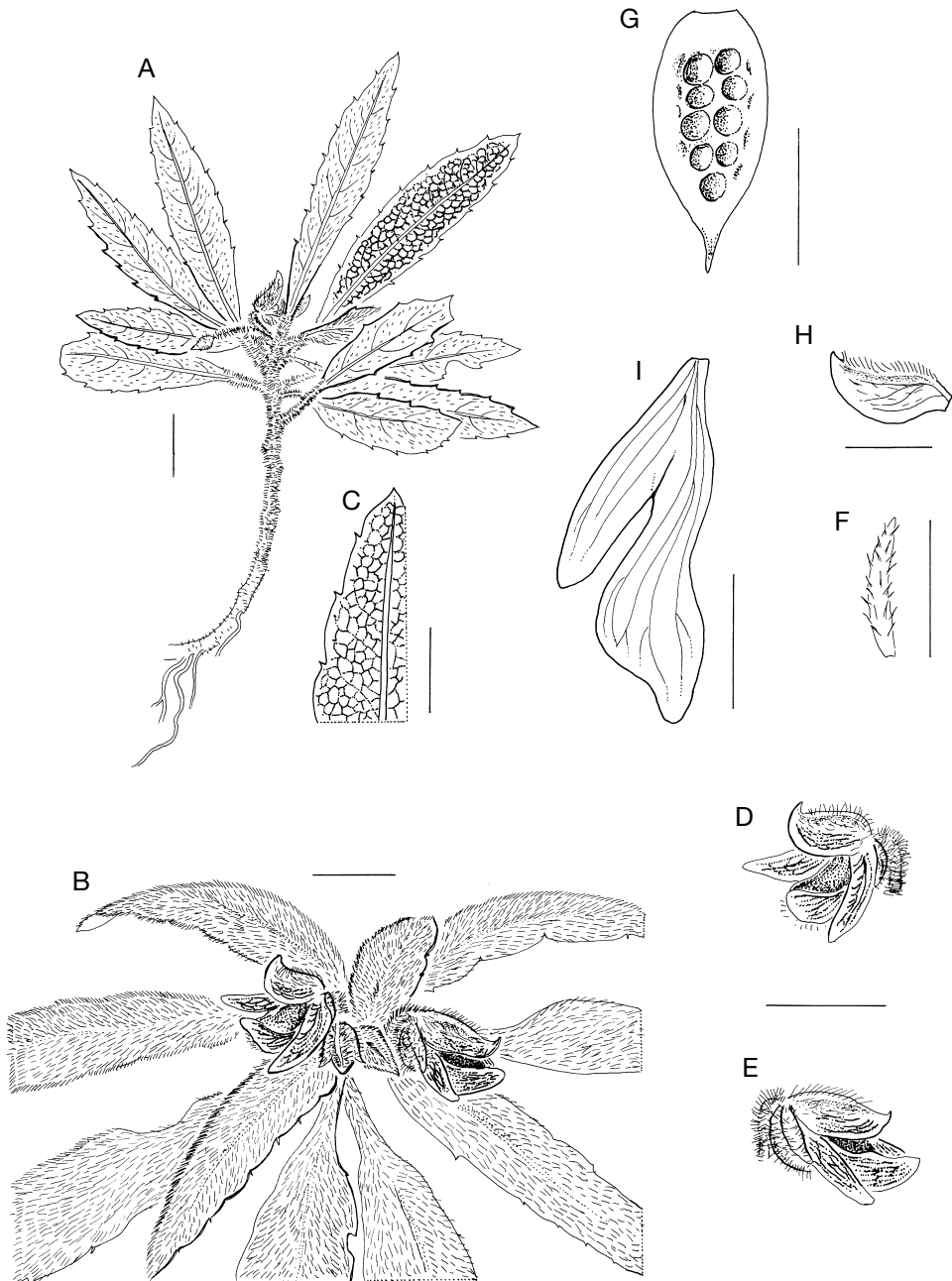


FIG. 12. — *Impatiens georgei-schatzii* Eb.Fisch. & Raheliv.: **A, B**, habit; **C**, detail of leaf margin; **D, E**, flower; **F**, lateral sepal; **G**, lower sepal; **H**, dorsal petal; **I**, lateral united petals. *Schatz, Dransfield & Du Puy 2797* (MO). Scale bars: A-E, 1 cm; F-I, 5 mm.

translucent, petals light green translucent but with dense dark purple reticulations thus appearing nearly black (in living specimens). Lateral sepals linear-filiform, hairy, 5×0.5 mm. Lower sepal ovate with distinct acumen at apex, with “bee-nest”-like reticulations comprising a net of holes, glabrous at upper surface, densely hairy at lower surface, $9 \times 3-4$ mm. Dorsal petal helmet-like, dorsal crest with short, 3 mm long spur, hairy outside, 8×4 mm. Lateral united petals 16-17 mm long, upper petal acute at apex, 11×2 mm, lower petal 13×2.5 mm. Anthers 2 mm long. Ovary 2-3 mm long. Fruit 7×3.5 mm, densely hairy.

REMARKS

Impatiens georgei-schatzii is related to *I. albopurpurea* Eb.Fisch. & Raheliv., *I. rivularis* Eb.Fisch., Wohlh. & Raheliv. from Masoala Peninsula and *I. perfecunda* H.Perrier from the Bay of Antongil. It differs from *I. perfecunda* in the densely hairy indumentum, the translucent-purple flowers (white-yellowish in *I. perfecunda*), the lanceolate lateral sepals (5×0.5 mm in *I. georgei-schatzii*, $3-4.5 \times 1.4-1.8$ mm in *I. perfecunda*), the longer dorsal petal (9 mm in *I. georgei-schatzii*, 5 mm in *I. perfecunda*), and the longer lateral united petals (16-17 mm in *I. georgei-schatzii*, 10 mm in *I. perfecunda*). It differs from *I. albopurpurea* and *I. rivularis* in the longer lateral united petals (10-11 mm in *I. albopurpurea*, 7 mm in *I. rivularis*), and the upper petal which is equaling or larger than lower petal (upper petal 11×2 mm and lower petal 13×2.5 mm in *I. georgei-schatzii*, smaller than lower petal in *I. albopurpurea* with upper petal 4×1.5 mm and lower petal $6 \times 2.5-3$ mm, and *I. rivularis* with upper petal 1×0.5 mm and lower petal 4×3 mm).

HABITAT

Rocks in river bed in lowland rainforest at 200-380 m.

DISTRIBUTION

Madagascar, Masoala Peninsula, only known from the type collection.

ETYMOLOGY

Named after the collector George Schatz, St. Louis.

Impatiens nosymangabensis

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 13)

Impatiens carlsoniae affinis sed nervibus prominentibus sepali inferioris, colore petalorum et forma petali dorsalis differt.

TYPUS. — **Madagascar.** Tamatave, Nosy Mangabe, a 520 ha island 5 km from Maroantsetra in the Bay of Antongil, $15^{\circ}30'S$, $49^{\circ}46'E$, 0-330 m, 12.X.1987, Schatz 1640 (holo-, MO; iso-, TAN).

DESCRIPTION

Perennial herb, creeping to ascending and erect. Stems succulent, branched, up to 20 cm long, young part covered with white hairs, later glabrescent. Leaves alternate, medium green above, lighter whitish green below, the venation below darker green evident, petiole hairy, up to 10 mm long, lamina ovate-lanceolate, attenuate at base and obtuse at apex, $30-45 \times 15$ mm, margin dentate, with 8 pairs of teeth with a short gland-tipped appendage. Inflorescence with 1 or 2 axillary flowers per leaf. Pedicels up to 10 mm long, hairy. Flowers with sepals green, translucent with purple markings, petals greenish bronze, translucent. Lateral sepals linear-lanceolate, up to 2 mm long. Lower sepal lanceolate, distinctly acuminate, with “bee-nest”-like prominent ornamentation of dark purple midrib and 6 or 7 pairs of rib-like structures surrounding holes, 6×2.5 mm. Dorsal petal helmet like, dorsal crest with short spur at apex, 6×2 mm. Lateral united petals 7 mm long, upper petal obtuse at apex, $2.5-3 \times 1.3$ mm, free part 0.5×0.8 mm, lower petal rounded at apex, $4.5-5 \times 5$ mm. Anthers 2 mm long. Ovary 2-3 mm long. Fruit not known.

REMARKS

Impatiens nosymangabensis is related to *I. carlsoniae* Eb.Fisch. & Raheliv., also restricted to the island of Nosy Mangabe. It differs in the prominent ornamentation on lower sepal (non prominent veins in *I. carlsoniae*), the greenish bronze petals (translucent in *I. carlsoniae*), the shape of the dorsal petal with shorter spur (0.1 mm in *I. nosymangabensis*, 0.5 mm in *I. carlsoniae*), and the shorter upper

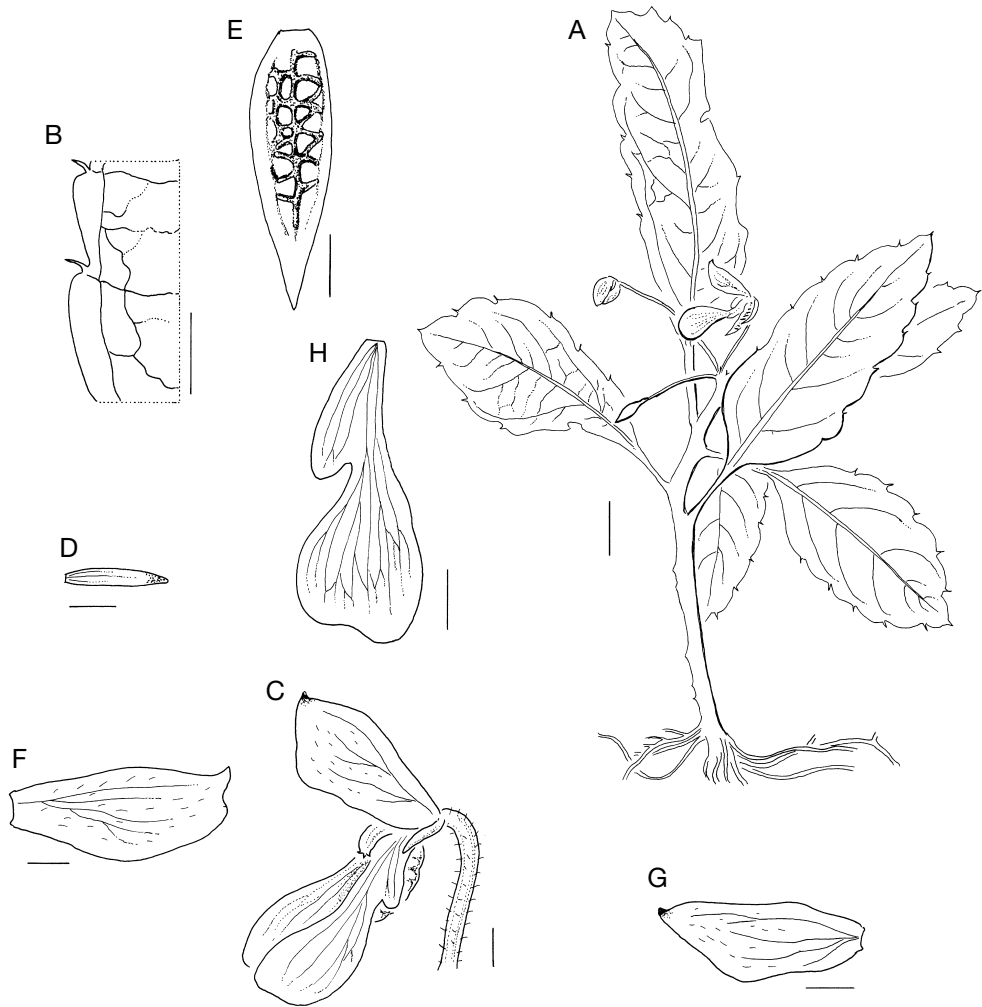


FIG. 13. — *Impatiens nosymangabensis* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C**, flower; **D**, lateral sepal; **E**, lower sepal; **F**, **G**, dorsal petal; **H**, lateral united petals. Schatz 1640 (MO). Scale bars: A, 5 mm; B-H, 1 mm.

petal (2.5-3 × 1.3 mm in *I. nosymangabensis*, 3.5 × 1.5 mm in *I. carlsoniae*).

HABITAT

On rocks in streams in lowland rainforest at 0-330 m.

DISTRIBUTION

Madagascar, Nosy Mangabe, only known from the type collection.

Impatiens paranyi

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 14)

Impatiens naviculae affinis sed foliis lanceolatis, tuberculis petali inferioris, margine petali inferioris non recurvato et ornamento sepali inferioris differt.

TYPUS. — Madagascar. Province de Diego-Suarez/Ant-siranana, sous-préfecture d'Andapa, commune rurale de Doany, fokontany de Betsomanga, Marojejy, NW, camp II, 14°26'S, 49°37'E, c. 0.5 km à l'est du point coté

1349, 1150 m, 29. X. 2001, *Gautier, Andriamparany & Ravelomantsoa LG 3967* (holo-, G; iso-, TAN).

PARATYPE. — **Madagascar.** Partie occidentale du massif de Marojejy (Nord-Est), de la vallée de l'Ambatoharanana au bassin supérieur de l'Antsahaberoka, 800-1200 m, forêt ombrophile sur argile latéritique de gneiss et granite, 9.XI-2.XII.1959, *Humbert & Saboureau 31430* (P).

DESCRIPTION

Perennial herb, ascending to erect. Stems hairy, semi-succulent, 5-10(-15) cm long. Leaves alternate, petiole with sparse hairs, up to 20 mm long, lamina subglabrous, hairy in young stage, later glabrescent, ovate-elliptic, obtuse-rounded at base and acute at apex, net of darker tertiary veins visible on lower surface, 35-50 × 15-20 mm, margin dentate, with 7 or 8 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Bracts linear-filiform, up to 0.5 mm long. Pedicels with dense whitish hairs, up to 7 mm long. Flowers dark purple. Lateral sepals lanceolate, 3 × 1 mm. Lower sepal ovate-lanceolate, with "bee-nest"-like prominent dark purple ornamentation surrounding *c.* 5 pairs of holes, 6 × 3 mm. Dorsal petal helmet-like, 5 × 2.5 mm. Lateral united petals 8 mm long, upper petal obtuse, 2.5 × 0.5 mm, lower petal obtuse-rounded, with tubercle-like crests along the veins, 5.5 × 2.5 mm. Anthers 2 mm long. Ovary 2 mm long. Fruit glabrous, 5 × 3 mm.

REMARKS

Impatiens paranyi differs from *I. navicula* Eb.Fisch. & Raheliv. also from Marojejy in the lanceolate leaves (35-50 × 15-20 mm in *I. paranyi*, 18-19 × 18 mm in *I. navicula*), the tubercle-like crests on veins of lower petal (absent in *I. navicula*), the non recurved margin of lower petal (recurved in *I. navicula*), and the different ornamentation pattern on lower sepal.

HABITAT

On wet rocks in ravine of a montane rainforest at 800-1200 m.

DISTRIBUTION

Madagascar, Marojejy.

ETYMOLOGY

Named after the second collector Andriamparany.

Impatiens haingosonii

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 15)

Impatiens naviculae affinis sed basi foliorum acuminato et ornamento sepali inferioris differt. Ab I. paranyi differt margine petali inferioris non recurvato et ornamento sepali inferioris.

TYPUS. — **Madagascar.** Partie occidentale du massif de Marojejy (Nord-Est), de la vallée de l'Ambatoharanana au bassin supérieur de l'Antsahaberoka, 1400 m, forêt ombrophile sur latérite de gneiss et granite, 9.XI-2.XII.1959, *Humbert & Saboureau 31448* (holo-, P).

DESCRIPTION

Perennial herb, erect to ascending with creeping rhizome, densely hairy throughout. Stems up to 6 cm long, slightly woody at base. Leaves alternate, petiole up to 10 mm long, lamina slightly obtuse to acuminate at base and acute at apex, hairs on upper surface more dense than on lower surface, upper surface dark green and lower surface light green to whitish, margin crenate-dentate with 6 or 7 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Bracts linear-lanceolate, hairy, up to 1.5 mm long. Pedicels up to 10 mm long, hairy. Flowers dark red to brownish-red. Lateral sepals linear-filiform, hairy up to 2 mm long. Lower sepal ovate, dark red, with "bee-nest"-like ornamentation forming deep holes, surrounded by a membranaceous margin, 6 × 5 mm, hairy on lower surface. Dorsal petal helmet-like, hairy, 5 × 3 mm. Lateral united petals 11 mm long, upper petal rounded, 4 × 2 mm, free part 2 × 2 mm, lower petal 9 × 6 mm, acuminate at apex and bearing a short curved sinus towards the centre of the flower, margin of lower petal folded upwards thus resembling a leguminose navicule. Anthers 1 mm long. Ovary 1-2 mm long, hairy. Fruit 3 × 2 mm in young stage, hairy.

REMARKS

Impatiens haingosonii is related to *I. navicula* and *I. paranyi*, both restricted to the Marojejy massif. It differs from *I. navicula* in the acuminate leaf-base, the more lanceolate leaves (18-26 × 8-10 mm in *I. haingosonii*, 18-19 × 18 mm in *I. navicula*), the rib-like ornamentation on lower sepal, and the shorter lateral united petals (11 mm long in *I. haingosonii*, 8-9 mm in *I. navicula*), and from *I. paranyi* in the more lanceolate leaves (35-50 × 15-20 mm

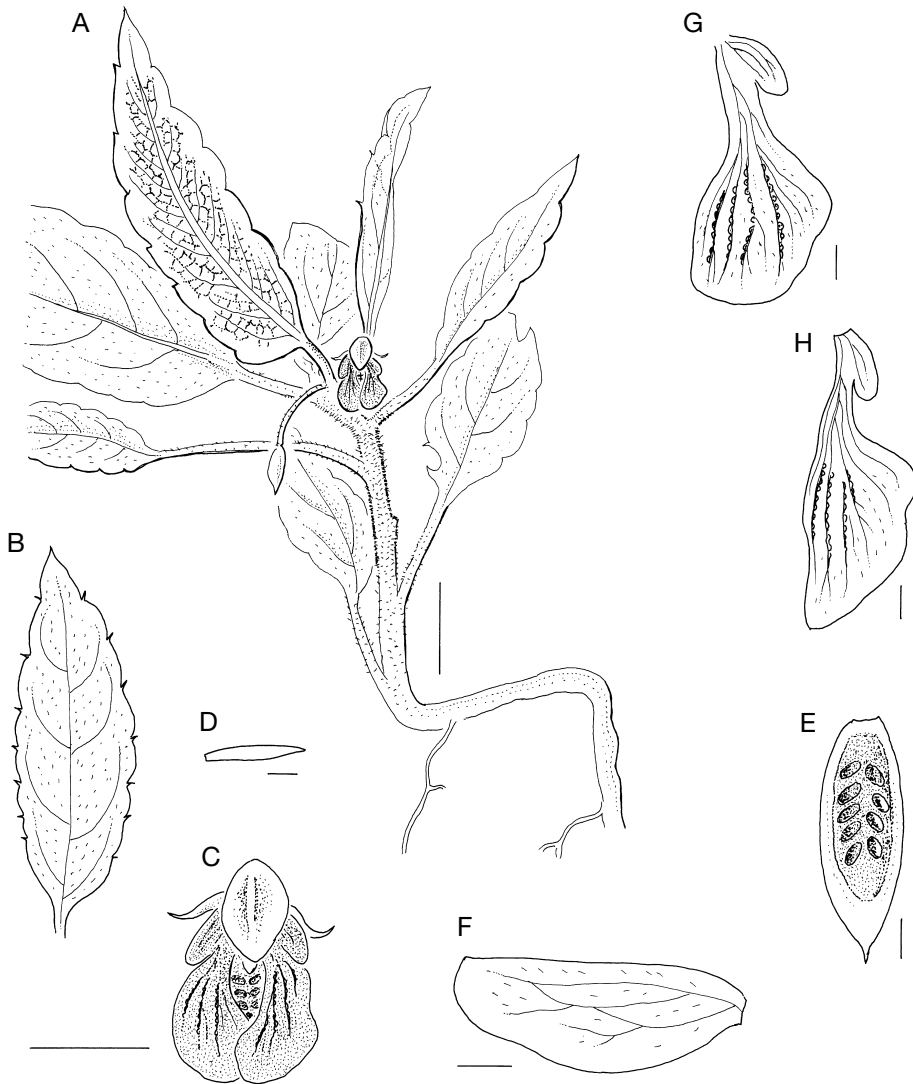


FIG. 14. — *Impatiens paranyi* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, flower; **D**, lateral sepal; **E**, lower sepal; **F**, dorsal petal; **G**, **H**, lateral united petals. Gautier, Andriamparany & Ravelomantsoa LG 3967 (G). Scale bars: A, B, 1 cm; C, 5 mm; D-H, 1 mm.

in *I. paranyi*), the shorter lateral sepals (2 mm in *I. haingosonii*, 3 × 1 mm in *I. paranyi*), the longer lateral united petals (11 mm in *I. haingosonii*, 8 mm in *I. paranyi*), the non-recurred margin of the lower petal, and the ornamentation of the lower sepal.

HABITAT

Montane rainforest at 1400 m.

DISTRIBUTION

Madagascar, Marojejy, only known from the type collection.

ETYMOLOGY

Named after Dr Andriamialison Haingoson, Director of the Parc botanique et zoologique de Tsimbazaza.

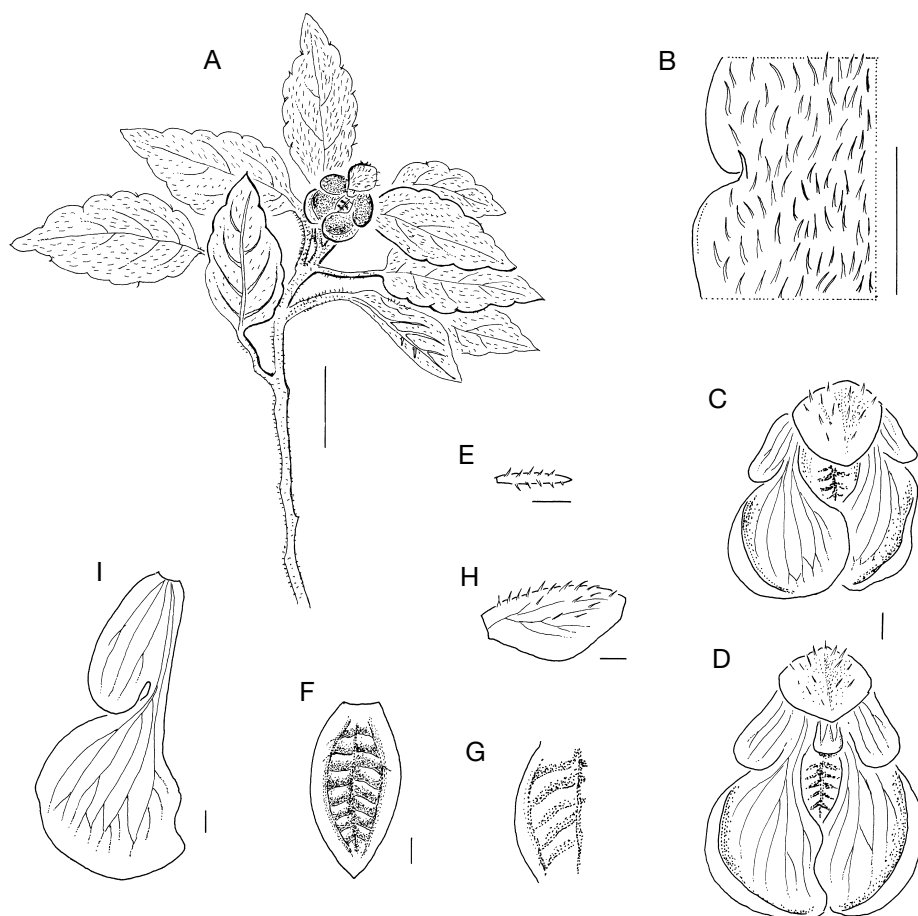


FIG. 15. — *Impatiens haingosonii* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C, D**, flower; **E**, lateral sepal; **F**, lower sepal; **G**, detail of lower sepal; **H**, dorsal petal; **I**, lateral united petals. *Humbert & Saboureaux 31448* (P). Scale bars: **A**, 1 cm; **B**, 5 mm; **C-I**, 1 mm.

Impatiens mahalevonensis
Eb.Fisch. & Raheliv., sp. nov.
(Fig. 16)

Impatiens urticoides et *I. furcatae* affinis sed *petalis lateralibus aequo longo differt. Ab I. scripta differt petiolo longiore, petalo inferiore atro-violaceo et indumento foliorum.*

TYPUS. — **Madagascar.** Toamasina, Masoala National Park, E slope of Ambohitsitondroinan' Mahalevona, ESE of village of Mahalevona, perhumid forest along small creek, 15°26'09"S, 49°57'29"E, 1160 m, 24.II.2003, *Lowry, Schatz & Be 6154* (holo-, MO; iso-, TAN).

PARATYPE. — **Madagascar.** Masoala Peninsula Réserve Intégrale, 200 m before the Ambohitsitondroina sum-

mit, 15°25'956"S, 49°57'563"E, 1100 m, 22.IX.1996, *Purro & Wohlhauser 1011* (NEU, TAN).

DESCRIPTION

Perennial herb, erect with creeping rhizome, densely hairy throughout. Stems with dense whitish hairs, up to 15 cm long. Leaves alternate, reddish to dark green, tinged pink below, with hairs in dense tufts on upper surface, lower surface densely hairy but without tufts, petiole 15-20 mm long, lamina ovate, rounded at base and acute at apex, 30-35 × 15-20 mm, margin dentate with 12 pairs of teeth with a short gland-tipped appendage. Inflorescence

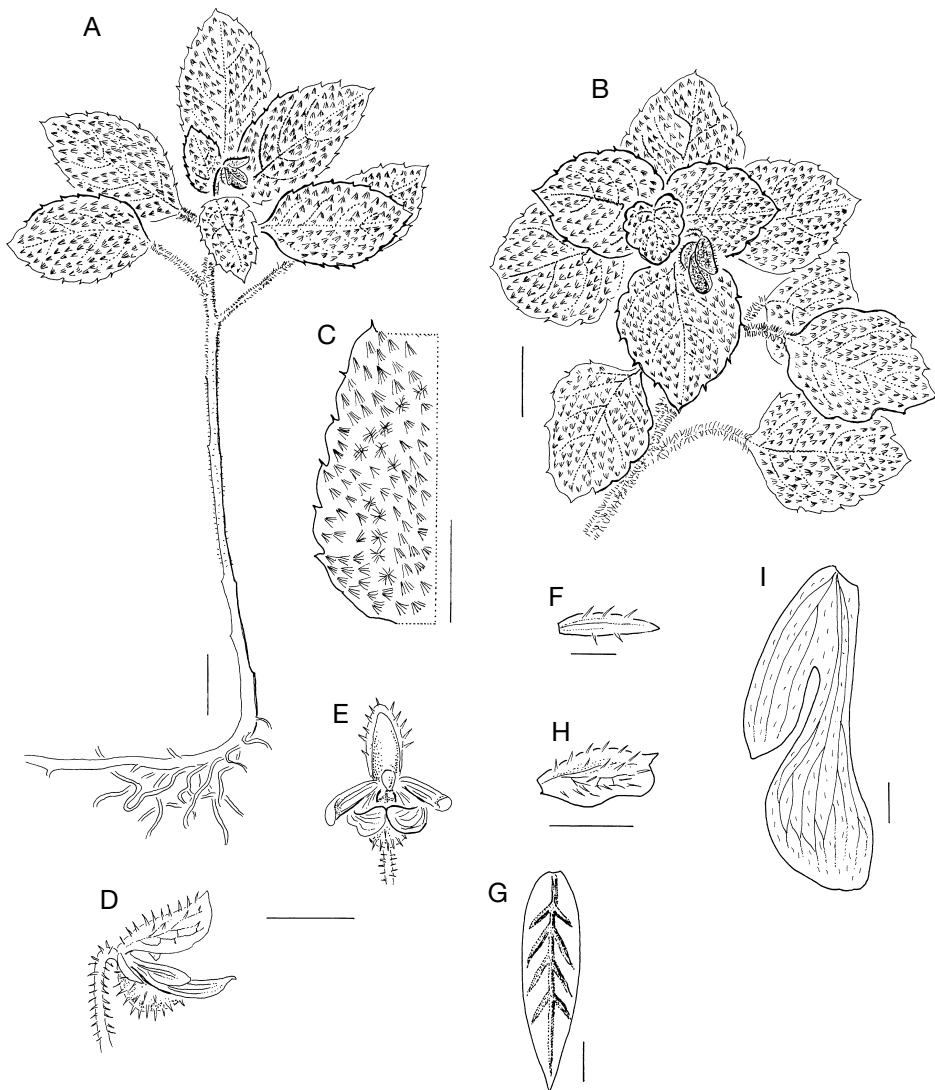


FIG. 16. — *Impatiens mahalevonensis* Eb.Fisch. & Raheliv.: **A, B**, habit; **C**, detail of leaf margin; **D, E**, flower; **F**, lateral sepal; **G**, lower sepal; **H**, dorsal petal; **I**, lateral united petals. A, C, F-I, Lowry, Schatz & Be 6154 (MO); B, D, E, Purro & Wohlhauser 1011 (NEU). Scale bars: A, B, 1 cm; C-E, H, 5 mm; F, G, I, 1 mm.

with 1 or 2 axillary flowers per leaf. Pedicels up to 5-10 mm long, densely hairy. Flowers reddish-brown, vinous to deep brownish purple. Lateral sepals linear-lanceolate, hairy, with dark brown apex, 2.5 × 1 mm. Lower sepal lanceolate, acuminate at apex, with prominent dark red midrib and 4 pairs of rib-like prominent ridges, 7 × 3 mm, glabrous

on upper surface and with whitish hairs on lower surface. Dorsal petal helmet-like, with whitish hairs, 6 × 2 mm. Lateral united petals 9.5 mm long, upper petal 6.5 × 1.5 mm, acuminate to obtuse at apex, lower petal 6.5 × 3 mm, obtuse at apex. Anthers *c.* 1 mm long. Ovary *c.* 2 mm long. Fruit not known.

REMARKS

Impatiens mahalevonensis is related to *I. furcata* H.Perrier, *I. urticoides* H.Perrier and *I. scripta* H.Perrier from North-Eastern Madagascar. It differs from *I. urticoides* and *I. furcata* in the lateral united petals which are of equal length (upper petal shorter than lower petal in *I. urticoides*, upper petal longer than lower petal in *I. furcata*), and from *I. scripta* in the longer petiole (15-20 mm versus 3-12 mm in *I. scripta*) and the brownish-purple lower petal (vivid yellow in *I. scripta*) and the hairs on leaves, forming a whitish script-like pattern in *I. scripta* (dense regular tufts in *I. mahalevonensis*).

HABITAT

Montane rainforest at c. 1100 m.

DISTRIBUTION

Madagascar, Masoala Peninsula.

Impatiens ambahatrensis

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 17)

Ab omnibus speciebus madagascariensibus subgeneris Trimorphopetali cum laminis lanceolatis atque ornamento prominente sepali inferioris differt foliis subsessilibus.

TYPUS. — Madagascar. Antsiranana, Réserve Spéciale de Manongarivo, Ambahatra, cours supérieur, 13°59'S, 48°26'E, bassin de l'Ambahatra (bras gauche, à l'ouest d'Andetryfotsy), 450 m, tombant suintant couvert de mousses, 9.VI.2000, Wohlhauser & Gautier SW 60300 (holo-, G; iso-, TAN).

PARATYPE. — Madagascar. Antsiranana, Masoala Peninsula Réserve Intégrale, between camp 3 and Ilampy, in the Andranomaloto basin, 23.IX.1996, Purro & Wohlhauser 1020 (NEU, TAN).

DESCRIPTION

Perennial (?) herb, ascending to erect with creeping rhizome, glabrous throughout. Stems simple, 20-40 cm long. Leaves alternate, petiole not exceeding 5 mm, lamina ovate-lanceolate, attenuate-acute and decurrent at base, attenuate-obtuse at apex, net of tertiary veins invisible, 40-55 × 10-14 mm, margin dentate with 6 or 7 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary

axillary flowers. Bracts ovate-lanceolate, 1 mm long. Pedicels up to 20 mm long. Flowers yellowish translucent with dark vinous-purple veins. Lateral sepals lanceolate, 3 × 1 mm. Lower sepal ovate-lanceolate, acute at apex, with prominent "bee-nest"-like dark purple ornamentation with midrib and rib-like structures surrounding holes, 7 × 3 mm. Dorsal petal helmet-like, with short spur at apex of dorsal crest, 5 × 2 mm. Lateral united petals 9 mm long, upper petal 3.2 × 1-1.5 mm, free part 1.2 × 1 mm, lower petal obtuse, slightly emarginated, with tubercle-like crests along the veins, 7 × 3 mm. Anthers 2-3 mm long. Ovary 2-3 mm long. Fruit 7 × 3 mm.

REMARKS

Impatiens ambahatrensis differs from all members of subgenus *Trimorphopetalum* with lanceolate leaves and prominent ornamentation on lower sepal in the nearly sessile leaves with petioles not exceeding 5 mm in length.

HABITAT

Mossy rainforest at 450 m, in streams stuck to stones.

DISTRIBUTION

Madagascar, Manongarivo and Masoala Peninsula.

Impatiens messmerae

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 18)

Impatiens silvianae et I. luisae-echterae affinis sed sepalo inferiore sine ornamento valde differt.

TYPUS. — Madagascar. Antsiranana, Marombihy, Mandena, Parc National de Marojejy, le long d'un affluent de la rivière de Manantenina, 10 km NW du village Manantenina, Campement Nr. 2, 750 m, 14°26.0'S, 49°45.7'E, 22.X.1996, Messmer, Rakotomalaza, Ravelonarivo NM 256 (holo-, G; iso-, TAN).

DESCRIPTION

Perennial herb, erect, glabrous except for small whitish scales. Stems up to 60 cm long.

Leaves alternate, petiole up to 30 mm long, lamina elliptic, attenuate-acute at base and attenuate acute

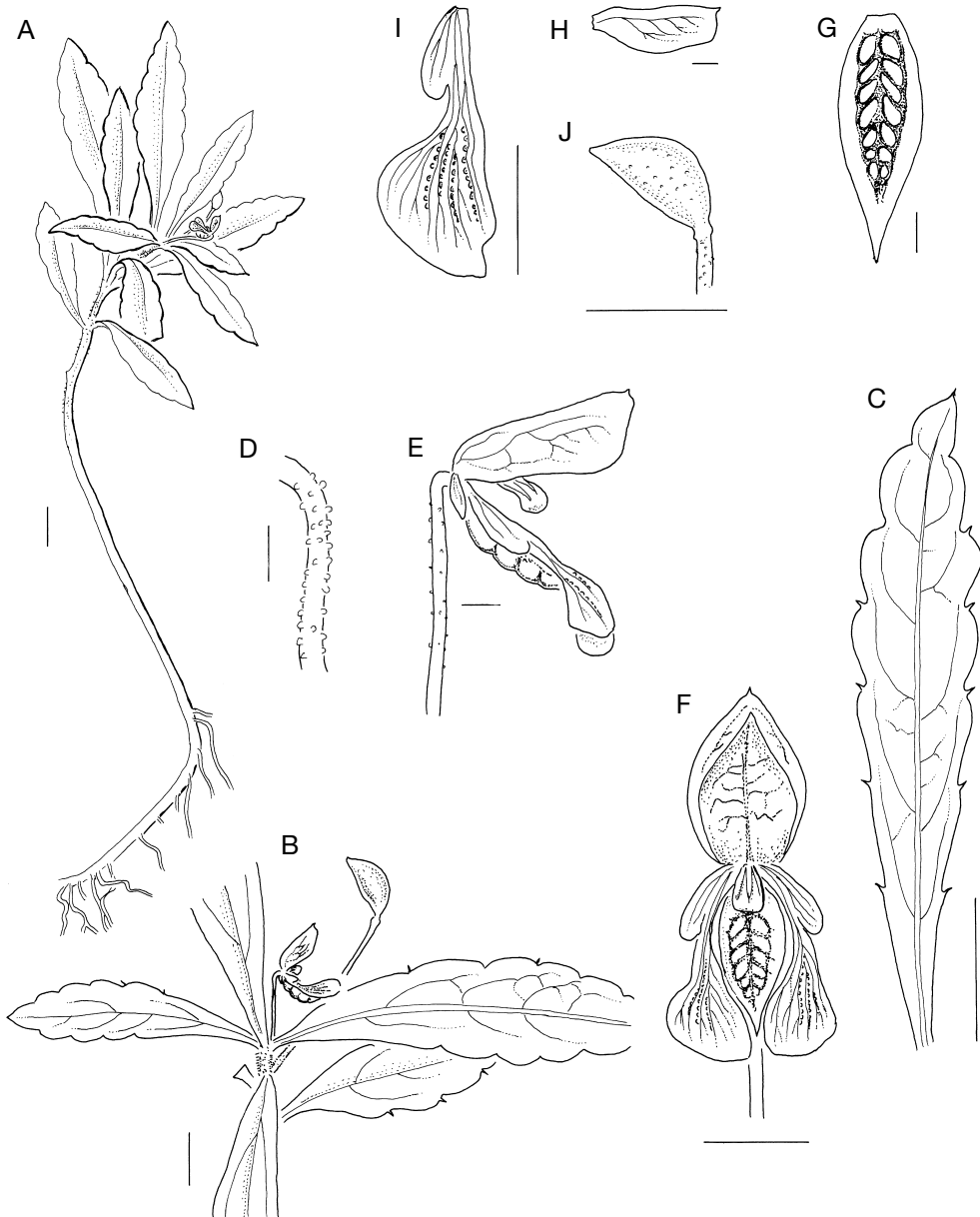


FIG. 17. — *Impatiens ambahatrensis* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of habit; **C**, leaf; **D**, detail of pedicel showing white scales; **E**, **F**, flower; **G**, lower sepal; **H**, dorsal petal; **I**, lateral united petals; **J**, fruit. *Wohlhauser & Gautier SW 60300* (G). Scale bars: A, C, 1 cm; B, F, I, J, 5 mm; D, E, G, H, 1 mm.

at apex, ending in a short mucro, net of tertiary veins visible, 100-145 × 35-45 mm, margin dentate, with 12 pairs of teeth with a short gland-tipped

appendage. Inflorescence with 1-3 axillary flowers, peduncle short, flattened. Bracts linear, with white hairs, 2.5 mm long. Pedicels up to 50 mm long.

Flowers whitish-greenish, lateral united petals white with orange line. Lateral sepals linear-filiform, glabrous, 5 × 1 mm. Lower sepal lanceolate, acuminate, without ornamentation, 18 × 5 mm. Dorsal petal helmet-like, dorsal crest with 3 mm long spur at apex, dilated to a triangle at middle, 15 × 7.5 mm. Lateral united petals 20 mm long, upper petal rectangular, 8 × 3 mm, lower petal obtuse, 14 × 8 mm. Anthers 3 mm long. Ovary 3-4 mm long. Fruit with whitish scales, 15 × 2.5 mm.

REMARKS

Impatiens messmerae resembles *I. silviana* Eb.Fisch. & Raheliv. and *I. luisae-echterae* Eb.Fisch., Wohlh. & Raheliv. from Masoala Peninsula or *I. lemuriana* Eb.Fisch. & Raheliv. from Tsaratanana, but differs in the lower sepal completely lacking any ornamentation (distinct and prominent ornaments in the other species), the flower colour (whitish-greenish in *I. messmerae*, translucent with yellow and purple in *I. silviana* and *I. luisae-echterae*), the size of the dorsal petal (15 × 7.5 mm in *I. messmerae*, 17 × 6 mm in *I. silviana*, 26 × 7-8 mm in *I. luisae-echterae*, 8 × 4 mm in *I. lemuriana*), and the length of the lateral united petals (20 mm in *I. messmerae*, 24 mm in *I. silviana*, 12 mm in *I. lemuriana*).

HABITAT

Montane rainforest at 750 m.

DISTRIBUTION

Madagascar, Marojejy, only known from the type collection.

ETYMOLOGY

Named after the collector Nicole Messmer.

Impatiens andapensis

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 19)

Impatiens callmanderi, *I. luisae-echterae* et *I. ivohibensis affinis sed ornamento sepalis inferioris nidu-apis simile differt.*

TYPUS. — Madagascar. Pentes occidentales du massif de Marojejy (Nord-Est), bassin de la Lokoho à l'est

d'Ambalamanasy II, district d'Andapa, forêt ombrophile sur latérite de gneiss, 800-1000 m, 30.XI-4.XII.1948 *Humbert & Capuron 22192* (holo-, P).

DESCRIPTION

Perennial robust erect herb, glabrous throughout. Stems succulent, simple, up to 30 cm long. Leaves alternate, petiole up to 25 mm long, lamina obovate, attenuate-acute at base and attenuate-acute to acuminate at apex, net of tertiary veins hardly visible, 85-150 × 30-55 mm, margin dentate, with 9 or 10 pairs of teeth with a short gland-tipped appendage. Inflorescence with 1 or 2 axillary flowers per leaf. Bracts filiform, 2 mm long. Pedicels up to 20 mm long. Flowers with dorsal petal green with purple veins, lateral united petals green-yellowish with purple veins and spots. Lateral sepals filiform, 7 × 1 mm. Lower sepal lanceolate, distinctly acuminate, with dark purple midrib and 6 (7) prominent rib-like structures, margin membranaceous, 13 × 6 mm. Dorsal petal helmet-like, dorsal crest with short spur at apex, dilated to a triangle at middle, 13 × 6.5 mm. Lateral united petals 16 mm long, upper petal 5 × 2.5 mm, lower petal 11 × 8 mm. Anthers *c.* 2 mm long. Ovary *c.* 3-4 mm long. Fruit not known.

REMARKS

Impatiens andapensis is related to *I. callmanderi* Eb.Fisch., Wohlh. & Raheliv., *I. luisae-echterae* Eb.Fisch., Wohlh. & Raheliv. and *I. ivohibensis* H.Perrier but differs in the prominent "bee-nest"-like ornamentation of the lower sepal, the size of the dorsal petal (13 × 6.5 mm in *I. andapensis*, 15 × 10 mm in *I. callmanderi*, 26 × 7-8 mm in *I. luisae-echterae*, 8 × 3 mm in *I. ivohibensis*), and the length of the lateral united petals (16 mm in *I. andapensis*, 19 mm in *I. callmanderi*, 20 mm in *I. luisae-echterae*, and 12 mm in *I. ivohibensis*). The specimen had been misidentified by H. Humbert as *Impatiens decaryana* H.Perrier.

HABITAT

Montane rainforest at 800-1000 m.

DISTRIBUTION

Madagascar, Marojejy, only known from the type collection.

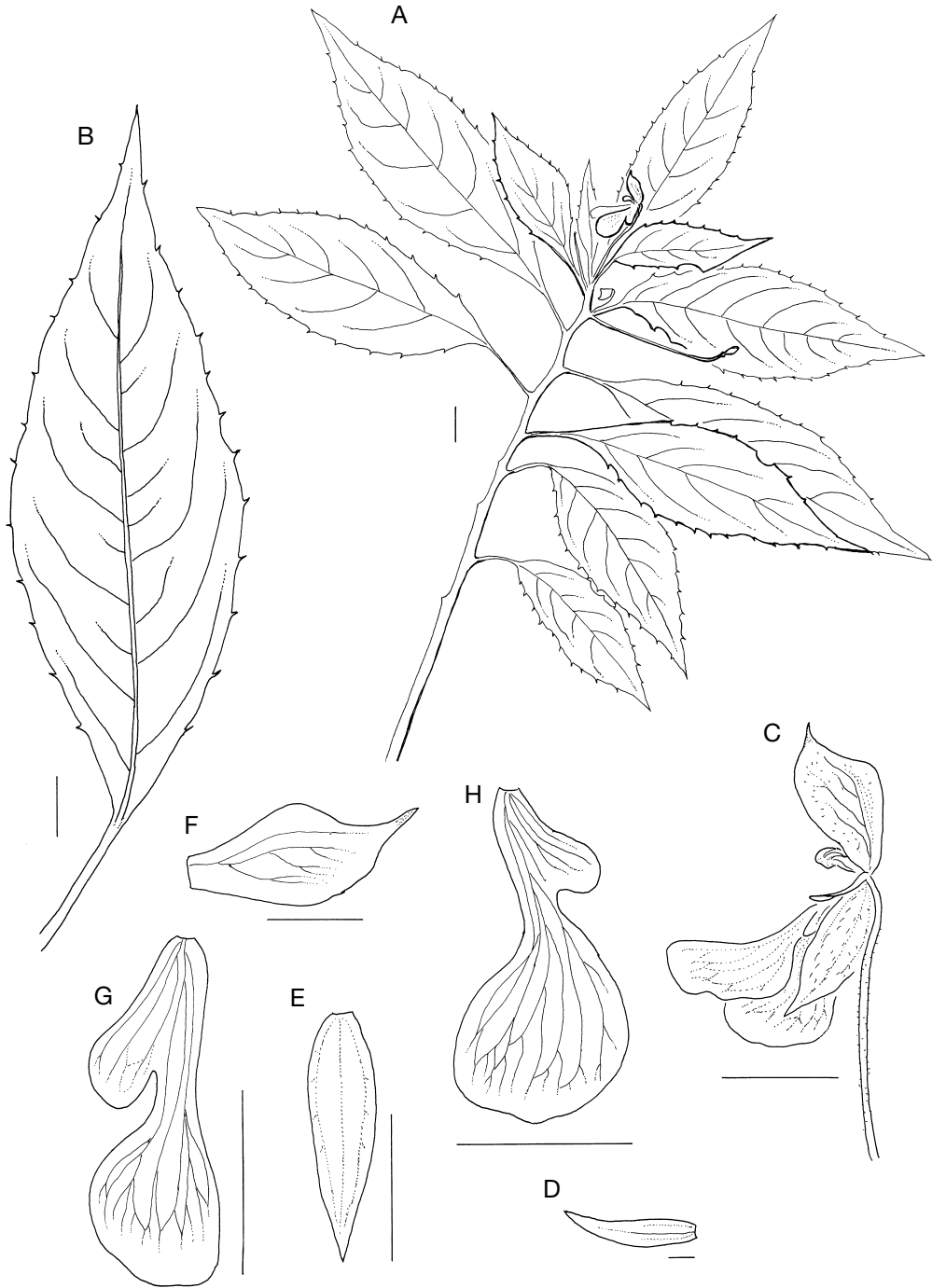


FIG. 18. — *Impatiens messmerae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, flower; **D**, lateral sepal; **E**, lower sepal; **F**, dorsal petal; **G, H**, lateral united petals. Messmer, Rakotomalaza, Ravelonarivo NM 256 (G). Scale bars: A-C, E, G, H, 1 cm; D, 1 mm; F, 5 mm.

Impatiens fianarantsoae
Eb.Fisch. & Raheliv., sp. nov.
(Fig. 20)

Impatienti biophytoidi *affinis sed indumento sparse-hirsuto, foliis sublobatis, sepalo inferiore cum nervibus atro-violaceis, petalo superiore distincto et acuminato fructibusque cum 7-10 seminibus differt.*

TYPUS. — Madagascar. Fianarantsoa, Parc National de Ranomafana, Parcelle III, Vatoharanana, 21°16'S, 47°26'E, 900-1100 m, VII.1992, *Rakoto 113* (holo-, TAN; iso-, P, MO).

PARATYPE. — Madagascar. Fianarantsoa, Parc National de Ranomafana, X.2001, *Rahelivololona RNM 9* (TAN).

DESCRIPTION

Annual (?) herb, erect, glabrous except for sparse whitish hairs on upper surface of the lamina. Stems simple, up to 20-30 cm long. Leaves alternate, petiole up to 15 mm long, lamina lanceolate, acute to rounded-decurrent at base and acuminate to acute at apex, net of tertiary veins visible, 40-70 × 12-20 mm, margin broadly dentate-sinuate, with 8-16 pairs of teeth with a short gland-tipped appendage. Inflorescence with 1 or 2 axillary flowers per leaf. Bracts triangular, acute, 1 mm long. Pedicels up to 15 mm long. Flowers yellow, with dark red veins. Lateral sepals linear-lanceolate, 2 × 1 mm. Lower sepal lanceolate, acuminate, with dark red midrib and 7 pairs of hardly visible dark red ribs, 5-7 × 2-2.5 mm. Dorsal petal helmet-like, with short apicule at apex of crest, and small triangle at lower third of the dorsal crest 4-5 × 1.5-2.5 mm. Lateral united petals 6-7(-10) mm long, upper petal 1 × 0.5 mm, shortly acute or obtuse, lower petal 4-5 × 2 mm, obtuse. Anthers 1-2 mm. Fruit glabrous, 4-5 × 2-3 mm, with 7-10 smooth seeds.

REMARKS

Impatiens fianarantsoae is related to *I. biophytoides* H.Perrier from Anjanaharibe and Maroantsetra, but differs in the size of the leaves (40-70 × 12-20 mm in *I. fianarantsoae*, 15-36 × 4-9 mm in *I. biophytoides*), in the sparse hairs, the only slightly lobed leaves, the lower sepal with dark rib-like veins (veins not prominent in *I. biophytoides*), the upper petal distinct and acuminate (slightly emarginate

in *I. biophytoides*), and the fruit with 7-10 seeds (2 or 3 seeds in *I. biophytoides*).

HABITAT

Montane rainforest at 900-1000 m.

DISTRIBUTION

Madagascar, Ranomafana.

Impatiens carlsoniae
Eb.Fisch. & Raheliv., sp. nov.
(Fig. 21)

Impatienti nosymangabensi *affinis sed ornamento non-prominente sepali inferioris, petalis lateralibus luteis-translucentibus et forma petali dorsalis cum calcare longiore differt.*

TYPUS. — Madagascar. Toamasina, island of Nosy Mangabe, 5 km S of Maroantsetra in the bay of Antongil, 15°29'S, 49°45'E, 14.VI.1990, *Carlson 331* (holo-, MO; iso-, TAN).

DESCRIPTION

Perennial herb, erect to ascending. Stems hairy, up to 5-10 cm long, slightly suffrutescent. Leaves alternate, petiole hairy, up to 10 mm long, lamina ovate, acute at base and apex, sometimes obtuse at apex, pubescent on veins of lower surface, upper surface glabrous, net of tertiary veins visible, 25-35 × 10-15 mm, margin dentate, with 8 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Pedicels hairy, up to 10-mm long. Flowers with lateral united petals transparent, centre with fine garnet stripes across lobe, small hook bends down from midpoint under lower petal, hood folded, also translucent. Lateral sepals lanceolate, obtuse at apex, 2.5 × 1 mm. Lower sepal ovate, distinctly acuminate at apex, net of darker veins not prominent, 5 × 2.5 mm. Dorsal petal helmet-like, dorsal crest with 0.5 mm long spur at apex, 5 × 2.5 mm. Lateral united petals 6.5 mm long, upper petal obtuse, 3.5 × 1.5 mm, free part 1 × 1 mm, lower petal 4 × 3 mm, obtuse. Anthers 2 mm long. Ovary 2-3 mm long. Fruit not known.

REMARKS

Impatiens carlsoniae is related to *I. nosymangabensis* Eb.Fisch. & Raheliv., also restricted to

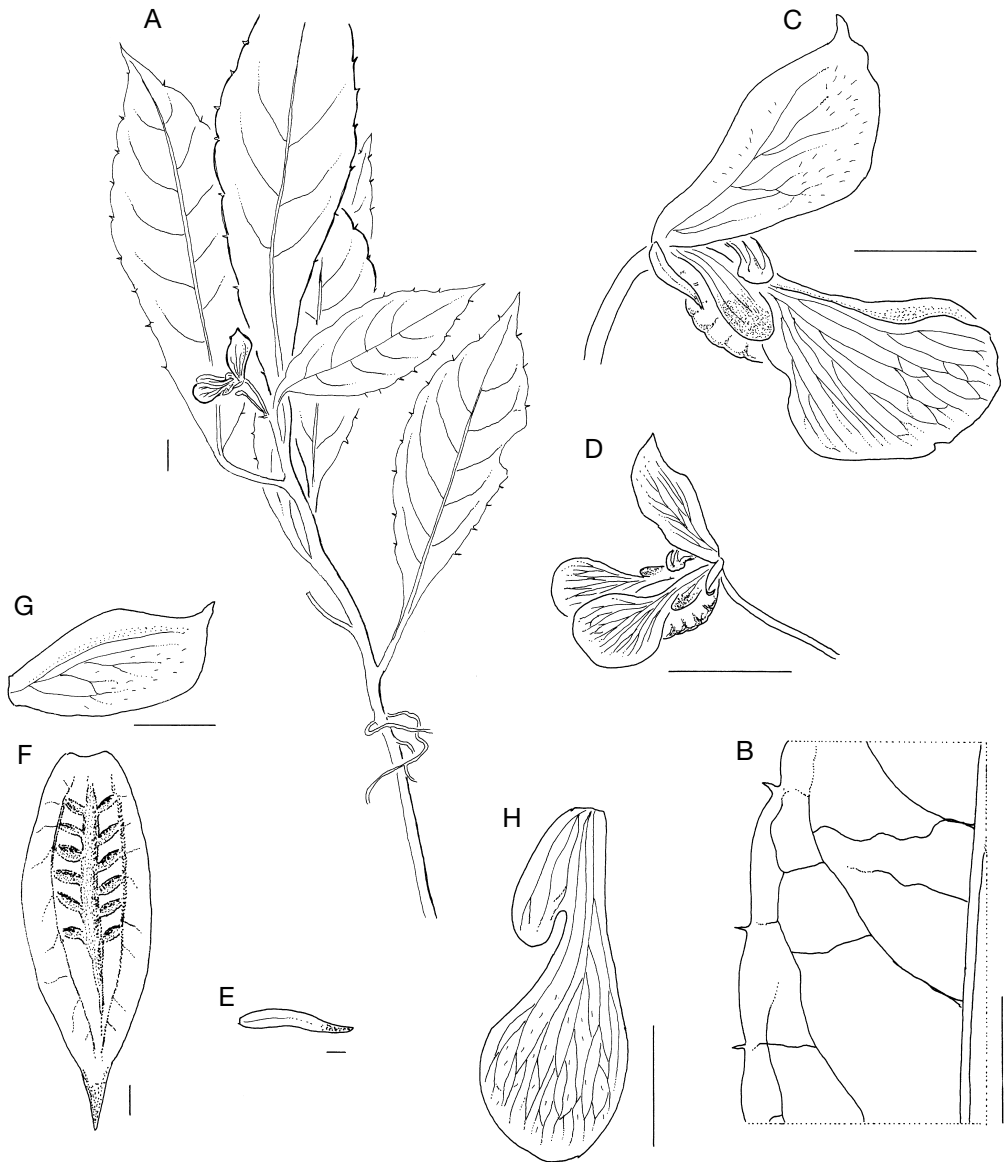


FIG. 19. — *Impatiens andapensis* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C**, **D**, flower; **E**, lateral sepal; **F**, lower sepal; **G**, dorsal petal; **H**, lateral united petals. *Humbert & Capuron 22192* (P). Scale bars: A, B, D, 1 cm; C, G, H, 5 mm; E, F, 1 mm.

the island of Nosy Mangabe. It differs in the non-prominent ornamentation on lower sepal (prominent veins in *Impatiens carlsoniae*), the yellowish-translucent petals (greenish bronze in *I. nosymangabensis*), the shape of the dorsal petal with longer spur (0.5 mm in *I. carlsoniae*, 0.1 mm

in *I. nosymangabensis*), and the longer upper petal (3.5 × 1.5 mm in *I. carlsoniae*, 2.5–3 × 1.3 mm in *I. nosymangabensis*).

HABITAT

Lowland rainforest, on rocks in wet stream bed.

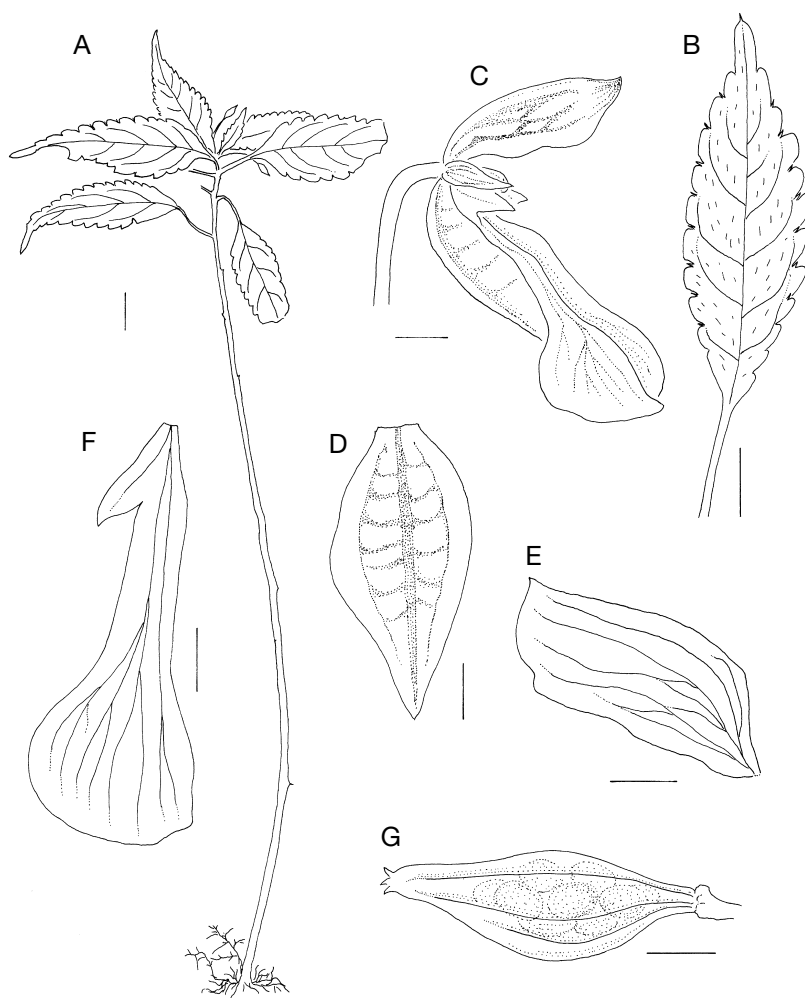


FIG. 20. — *Impatiens fianarantsoae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C** flower; **D**, lower sepal; **E**, dorsal petal; **F**, lateral united petals; **G**, fruit. *Rahelivololona RNM 9* (TAN). Scale bars: A, B, 1 cm; C-G, 1 mm.

DISTRIBUTION

Madagascar, Nosy Mangabe, only known from the type collection.

ETYMOLOGY

Named after the collector Elisabeth “Betsy” Carlson.

Impatiens rakotomalazana

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 22)

Impatiens humbertii affinis sed lamina basi rotundata,

marginè profunde lobato et petalo superiore mucronato differt.

TYPUS. — Madagascar. Fianarantsoa, Réserve Spéciale d’Ivohibe, 8 km NE d’Ivohibe, 5.5 km SE d’Angodongodona, camp 4, dans le corridor de la forêt, 22°25’18”S, 46°53’54”E, 1260 m, s.dat., *Rakotomalaza, Messmer & Rakotovo* 1520 (holo-, MO; iso-, TAN).

DESCRIPTION

Perennial herb, erect with creeping rhizome, glabrous throughout. Stems up to 25 cm long. Leaves alternate, petiole up to 30-40 mm long, lamina

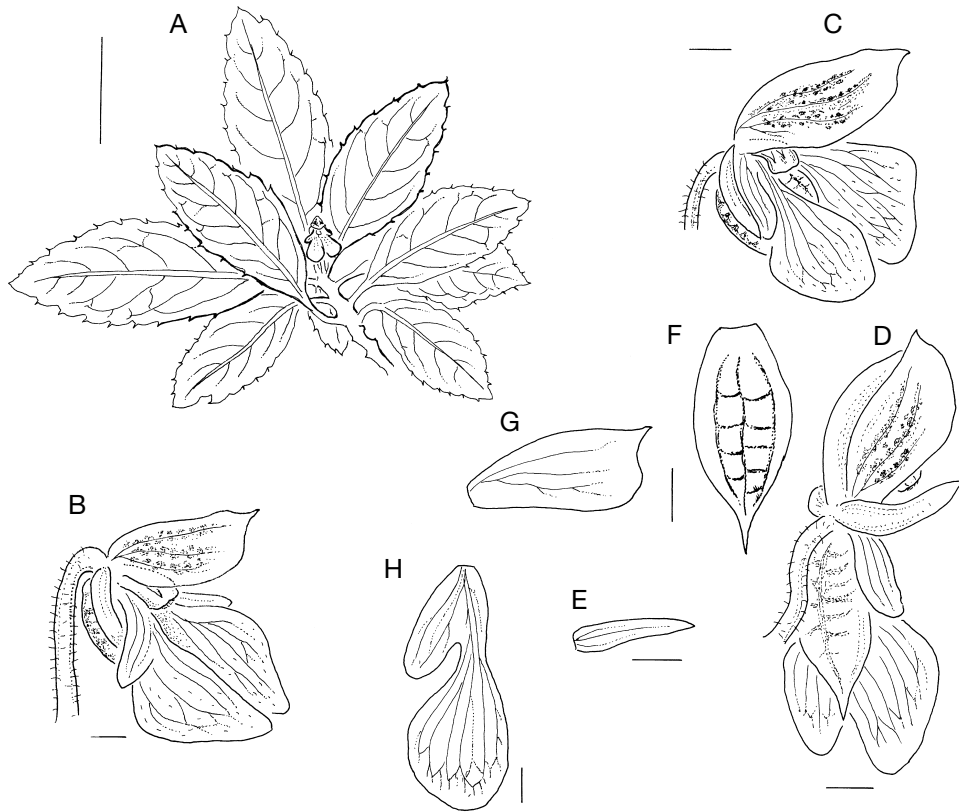


FIG. 21. — *Impatiens carlsoniae* Eb.Fisch. & Raheliv.: **A**, habit; **B-D**, flower; **E**, lateral sepal; **F**, lower sepal; **G**, dorsal petal; **H**, lateral united petals. *Carlson 331* (MO). Scale bars: A, 1 cm; B-H, 1 mm.

rounded-orbicular at base and attenuate-acute at apex with distinct acumen, tertiary veins slightly visible, $65 \times 17\text{--}25$ mm, margin dentate-crenate with 8 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Bracts filiform, up to 3 mm long. Pedicels not exceeding 20 mm. Flowers green-translucent with purple venation. Lateral sepals filiform, purple at apex, up to 3×0.5 mm. Lower sepal ovate, 6 (excl. spur) $\times 3$ mm, with distinct, 2.5 mm long filiform spur, net of dark purple non-prominent veins on upper surface. Dorsal petal helmet-like, 12 (excl. spur) $\times 3$ mm, distinctly spurred at apex, spur filiform and up to 10 mm long. Lateral united petals 11 mm long, upper petal 3×1.5 mm, apiculate with short filiform mucro, lower petal 8×6 mm, obtuse-rounded. Anthers 2 mm long. Ovary 2-3 mm long. Fruit not known.

REMARKS

Impatiens rakotomalazana is related to *Impatiens humbertii* H.Perrier, which is also restricted to the Pic d'Ivohibe. It differs in the leaf lamina rounded at base, the margin deeply lobate, with lobes nearly rectangular (not lobate in *I. humbertii*), the flower colour (green-translucent with purple veins in *I. rakotomalazana*, yellow with purple veins in *I. humbertii*), the dorsal petal larger with longer spur (12×3 mm, with 10 mm long spur in *I. rakotomalazana*, 10×3 mm, with 5-8 mm long spur in *I. humbertii*), and the lateral united petals with mucronate upper petal (not mucronate in *I. humbertii*).

HABITAT

Montane rainforest at 1260 m.

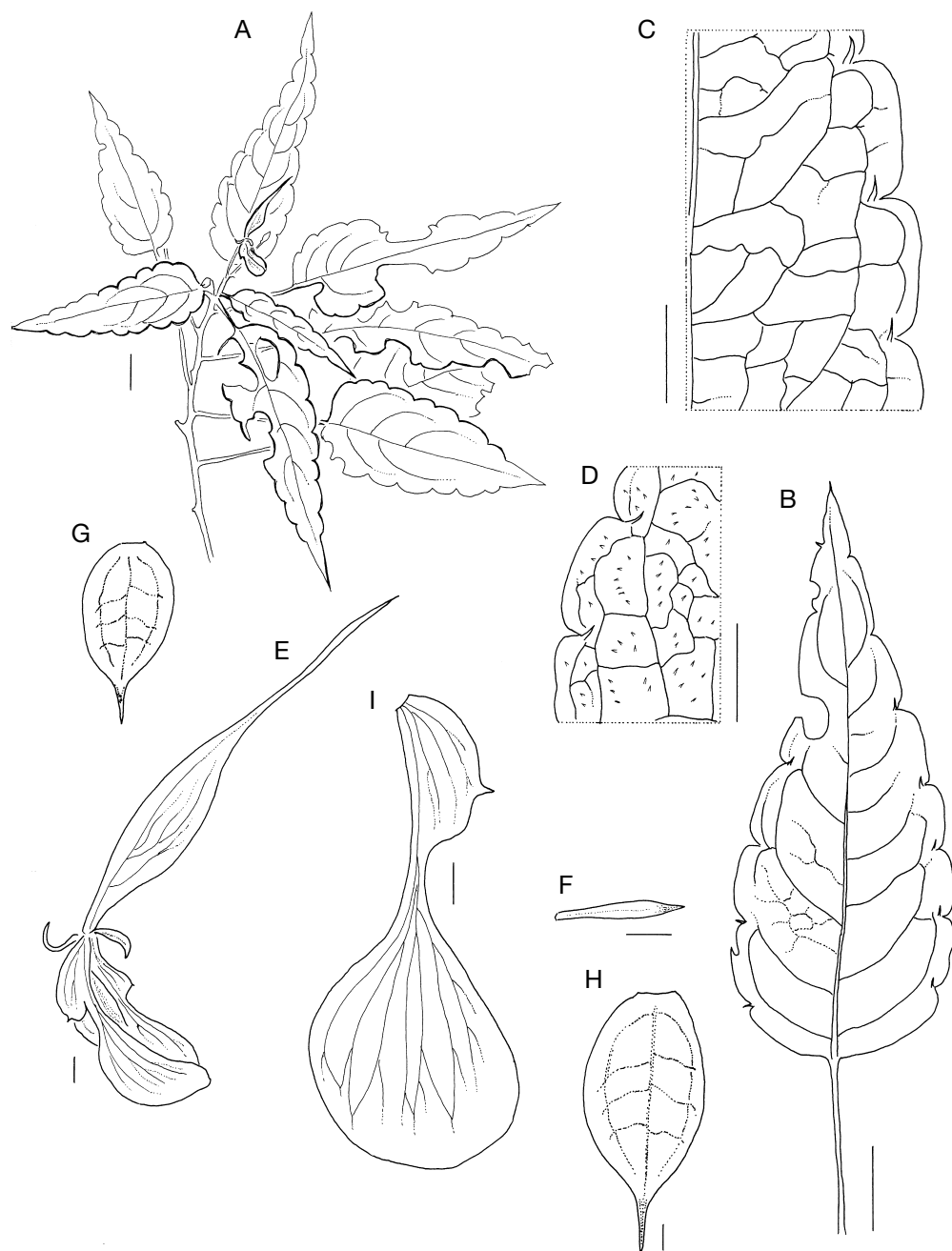


FIG. 22. — *Impatiens rakotomalazana* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, **D**, detail of leaf margin; **E**, flower; **F**, lateral sepal; **G**, **H**, lower sepal; **I**, lateral united petals. *Rakotomalaza*, Messmer & Rakotovao 1520 (MO). Scale bars: A, B, 1 cm; C, D, 5 mm; E-I, 1 mm.

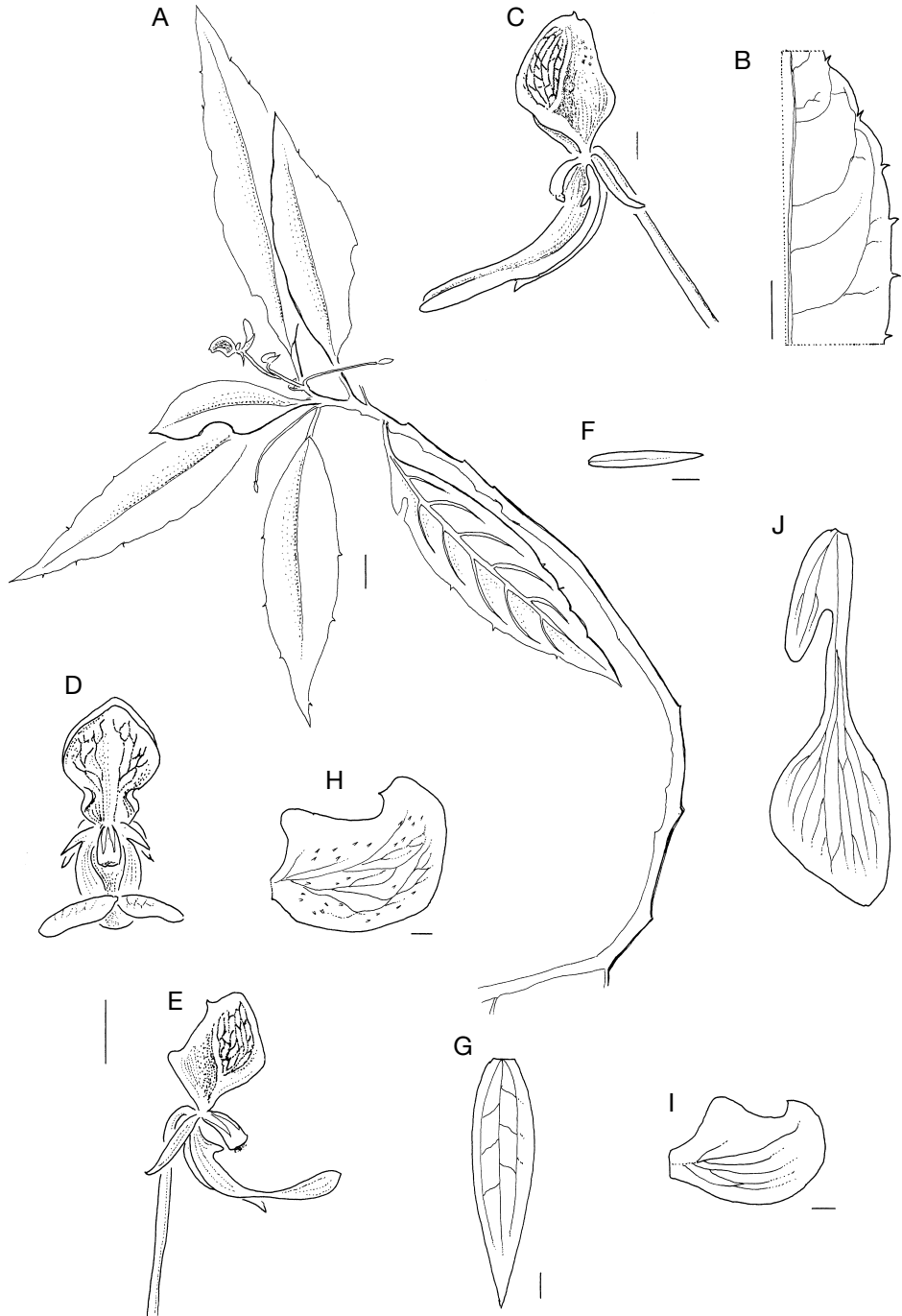


FIG. 23. — *Impatiens druartii* Eb.Fisch. & Raheliv.: **A**, habit; **B**, detail of leaf margin; **C-E**, flower; **F**, lateral sepal; **G**, lower sepal; **H**, **I**, dorsal petal; **J**, lateral united petals. *Purro & Wohlhauser 1010* (NEU). Scale bars: **A**, **B**, 1 cm; **C**, **F-J**, 1 mm; **D**, **E**, 5 mm.

DISTRIBUTION

Madagascar, Ivohibe, only known from the type collection.

ETYMOLOGY

Named after the collector Rakotomalaza.

Impatiens druartii

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 23)

Impatiens lemuriاناe affinis sed sepalo inferiore luteo et petalis lateralibus angustioribus valde differt.

TYPUS. — Madagascar. Antsiranana, Masoala Peninsula Réserve Intégrale, camp 2, épiphyte, 15°25'956"S, 49°57'563"E, 1100 m, 22.IX.1996, Purro & Wohlhauser 1010 (holo-, NEU; iso-TAN).

DESCRIPTION

Perennial herb, erect to ascending with creeping rhizome, glabrous except for slightly pubescent stem and sparse whitish scales on leaves. Stems succulent, up to 40 cm long, branched. Leaves alternate, dark green on upper surface and light green on lower surface, petiole up to 20 mm long, lamina elliptic, attenuate-acute at base and attenuate-acute to acuminate at apex, 80-120 × 24-30 mm, margin dentate, with 8-10 pairs of teeth with a short gland-tipped appendage. Inflorescence with 1 or 2 axillary flowers per leaf. Bracts linear, 2 × 0.5 mm. Pedicels up to 30 mm long. Flowers orange-yellow, red-veined. Lateral sepals linear-filiform, 5 × 1 mm. Lower sepal lanceolate, distinctly acute at apex, without ornamentation or darker veins, 12 × 3 mm. Dorsal petal helmet-like, dorsal crest with apical spur of 1-3 mm of length and distinctly dilated to a triangle at lower third, with net of bordeaux-red veins, 9 × 6 mm. Lateral united petals 16 mm long, orange, upper petal obtuse, 4.2 × 1 mm, free part 2.2 × 1 mm, lower petal 14 × 5 mm, obtuse. Anthers c. 2-3 mm long. Ovary c. 3 mm long. Fruit not known.

REMARKS

Impatiens druartii is related to *I. lemuriانا* from Tsaratanana, but differs immediately in the larger yellow to orange lower sepal (12 × 3 mm in *I. druartii*,

10 × 5 mm and yellow greenish in *I. lemuriانا*), and the longer and narrow lateral united petals (16 mm in *I. druartii*, 12 mm in *I. lemuriانا*).

HABITAT

Montane rainforest at 1100 m, growing as epiphyte.

DISTRIBUTION

Madagascar, Masoala Peninsula, only known from the type collection.

ETYMOLOGY

Named after P. Druart, Neuchâtel, who collected *Impatiens* with the second author.

Impatiens ampokafoensis

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 24)

Ab omnibus speciebus madagascariensis subgeneris Trimorphopetali differt foliis subrhombicis distantibus, petalo dorsali cum triangulo distincte et petalis lateralibus angustibus.

TYPUS. — Madagascar. Antsiranana, Masoala Peninsula Réserve Intégrale, W of Ampokafo, before the hard descent on Ampokafo valley, c. 900 m, 15°19'300"S, 50°02'300"E, transition between moss altitudinal and humid rainforest, 25.IX.1996, Purro & Wohlhauser 1023 (holo-, NEU; iso-TAN).

PARATYPE. — Antsiranana, Masoala Peninsula Réserve Intégrale, W of camp 3, 1174 m, 15°25'900"S, 49°58'140"E, on small ridge, moss forest, 23.IX.1996, Purro & Wohlhauser 1017 (NEU, TAN).

DESCRIPTION

Perennial herb, ascending to erect with creeping rhizome, rooting at the nodes, glabrous throughout. Stems up to 15-20 cm long. Leaves alternate, petiole up to 4 mm long, lamina ovate, attenuate at base at apex, tertiary veins indistinct, 28-30 × 12-16 mm, margin dentate with 4 pairs of teeth with a short gland-tipped appendage. Inflorescence with 1 or 2 axillary flowers per leaf. Pedicels up to 12 mm long. Flowers dark yellow, purple-blackish spots and veins on dorsal petal and lateral united petals. Lateral sepals lanceolate, acuminate, 1.2 mm long. Lower

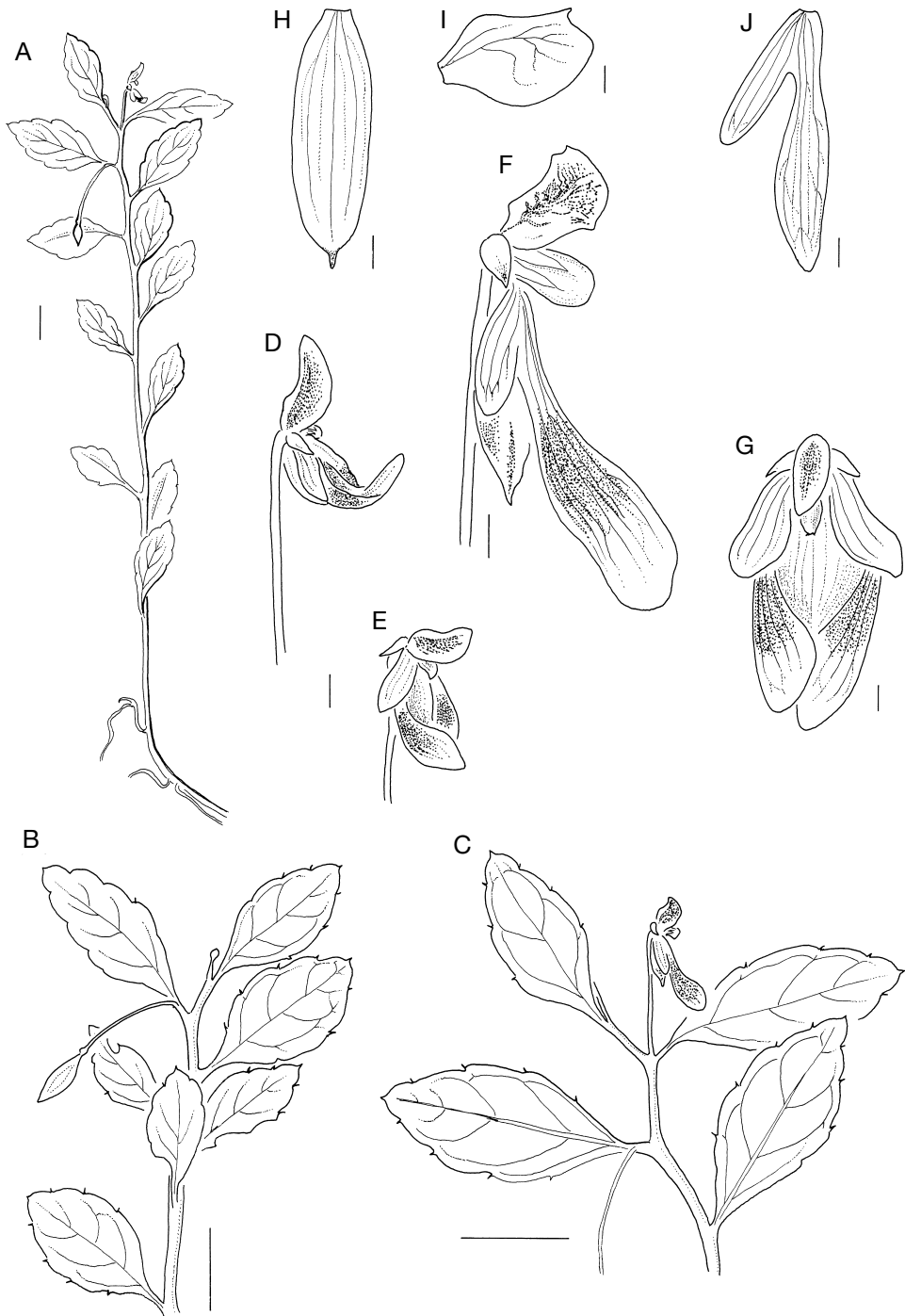


FIG. 24. — *Impatiens ampokafensis* Eb.Fisch. & Raheliv.: **A**, habit; **B**, **C**, habit, details; **D-G**, flower; **H**, lower sepal; **I**, dorsal petal; **J**, lateral united petals. *Purro & Wohlhauser 1023* (NEU). Scale bars: **A-C**, 1 cm; **D-J**, 1 mm.

sepal lanceolate, acute-mucronate at apex, entirely yellow, 7 × 3 mm. Dorsal petal helmet-like, with short apicule, crest dilated to small triangle in lower third, 3 × 4 mm. Lateral united petals 9 mm long, upper petal obtuse at apex, 4 × 1 mm, free part 3 × 1 mm, lower petal obtuse at apex, 7 × 1-1.5 mm. Anthers 1-2 mm. Fruit 3-4 × 1-2 mm.

REMARKS

Impatiens ampokafoensis has a unique set of characters with the small, nearly rhombic leaves dispersed on the stem, the dorsal crest of the dorsal petal dilated to a distinct triangle and the narrow lateral united petals. There is apparently no close relative except for a species already identified by H. Humbert (*Impatiens capuroniana* Humbert ex Eb. Fisch. & Raheliv. ined.) on Marojeje but never published. That species will be validated in a future paper. It differs from *I. ampokafoensis* especially in the lack of a dilated triangle on dorsal petal.

HABITAT

Transition between moss altitudinal and humid rainforest at 900-1174 m.

DISTRIBUTION

Madagascar, Masoala Peninsula.

Impatiens rapanarivoi

Eb. Fisch. & Raheliv., sp. nov.

(Fig. 25)

Impatiens spathuliferae et *I. justicioides affinis sed sepalis inferiore sine nervibus rubris, forma petali dorsalis et petalo superiore distincte differt.*

TYPUS. — Madagascar. Fianarantsoa, disturbed natural forest on E side of hills, 1 hour walking from Antoetra, 20°45'48"S, 47°20'30"E, 1710 m, 13.V.1993, *Jongkind & Rapanarivo* 882 (holo-, P; iso-, MO, TAN).

DESCRIPTION

Perennial herb, glabrous throughout. Stems prostrate to ascending, richly branched, up to 15-20 cm long. Leaves alternate, petiole up to 7 mm long, lamina elliptic, attenuate-acute at base and acute at apex, upper surface darker than lower surface which is covered

with small whitish scales, 18-22 × 5-8 mm, tertiary veins indistinct, margin with 6 pairs of teeth with a short gland-tipped appendage. Inflorescence with 1 or 2 flowers per leaf axill. Bracts linear-filiform, c. 0.5 mm long, with red apex. Pedicels up to 8 mm long. Flowers green. Lateral sepals linear-filiform, with red apex, up to 1 mm long. Lower sepal ovate, without any ornamentation, with 0.5 mm long red filiform mucro, 3 × 1.5 mm. Dorsal petal cucullate, with distinct keel, apex with 0.3 mm long filiform apicule, 2 × 0.8 mm. Lateral united petals 4 mm long, upper petal acute, 1.5-2 × 0.5 mm, free part 1 × 0.5 mm, lower petal obtuse, 2.5 × 1.5 mm. Anthers c. 1 mm long. Fruit green to red, c. 3 × 1.5 mm.

REMARKS

Impatiens rapanarivoi is related to *I. spathulifera* H. Perrier from the basin of the Mangoro and *I. justicioides* H. Perrier from Analamazoatra and Beforona. It differs in the absence of red veins on the lower sepal, the smaller lower sepal (3 × 1.5 mm in *I. rapanarivoi*, 4 × 1.6 mm in *I. spathulifera*, 4 × 2 mm in *I. justicioides*), the smaller dorsal petal (2 × 0.8 mm in *I. rapanarivoi*, 5 × 2 mm in *I. spathulifera*, 4 × 3 mm in *I. justicioides*), the shape of the dorsal petal with apical spur and the distinct upper petal (indistinct in the two other species).

HABITAT

Montane rainforest at 1710 m, in bamboo dominated part of forest.

DISTRIBUTION

Madagascar, Fianarantsoa region, only known from the type collection.

ETYMOLOGY

Named after Dr Solo Rapanarivo, Tsimbazaza, who collected the type specimen.

Impatiens befiananensis

Eb. Fisch. & Raheliv., sp. nov.

(Fig. 26)

Impatiens pauciseminae affinis sed calcare brevior sepalis inferioris differt. Ab I. celatiflora differt petiolo longiore et petalo dorsali majore.

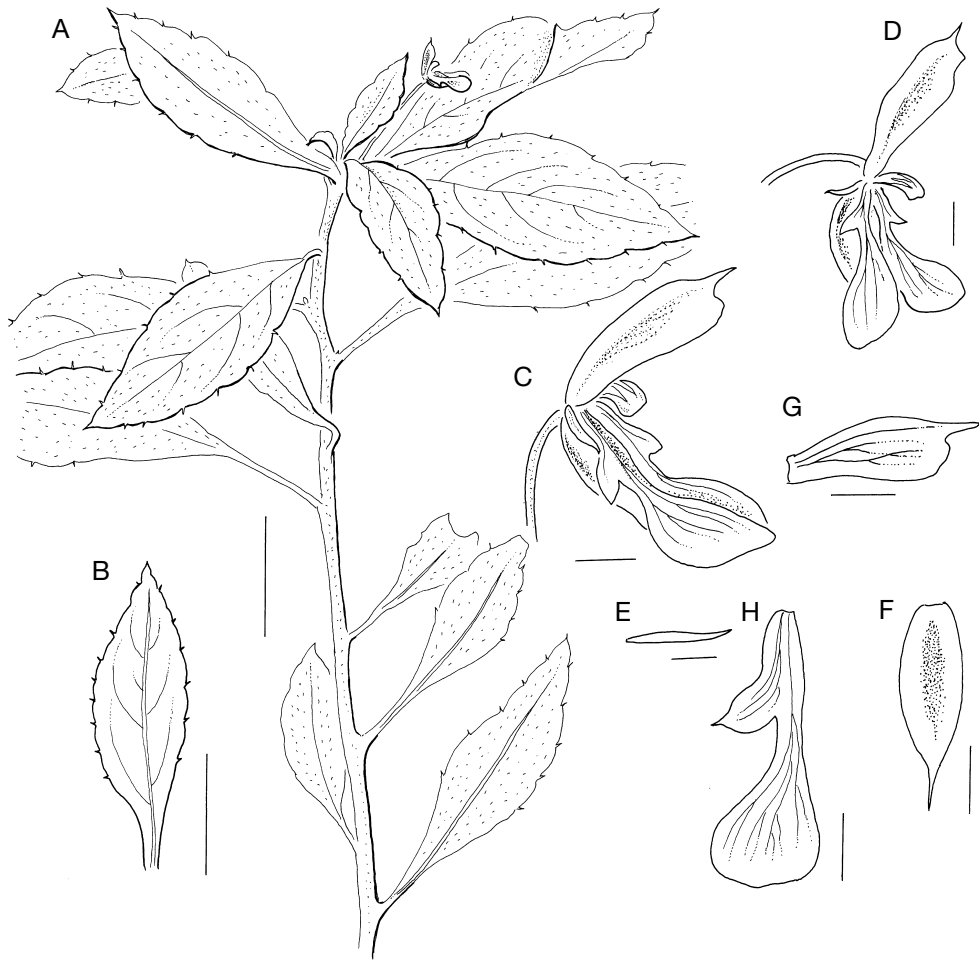


FIG. 25. — *Impatiens rapanarivoi* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, **D**, flower; **E**, lateral sepal; **F**, lower sepal; **G**, dorsal petal; **H**, lateral united petals. *Jongkind & Rapanarivo 882* (P). Scale bars: A, B, 1 cm; C, D, F-H, 1 mm; E, 0.5 mm.

TYPUS. — Madagascar. Antsiranana, Masoala Peninsula Réserve Intégrale, Massif de Bevontsira, Antsahabefiana basin, 28.IX.1996, *Purro & Wohlhauser 1030* (holo-, NEU; iso-, TAN).

DESCRIPTION

Perennial herb, erect to ascending with creeping rhizome, glabrous throughout except for scattered whitish scales. Stems succulent, branched, up to 30 cm long. Leaves alternate, petiole up to 25–35 mm long, lamina ovate, widest at base, rounded at base and acute at apex, net of tertiary veins visible, 35–47 × 18–25 mm, margin dentate

with 9 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Bracts linear-filiform, up to 2 mm long. Pedicels not exceeding 7 mm. Flowers translucent, greenish. Lateral sepals linear-filiform, up to 1.5 mm long. Lower sepal ovate, acute at apex, without ornamentation, 3.5 × 2.2 mm. Dorsal petal not plicate, lanceolate, with 0.5 mm long spur at apex, 4.5 × 2 mm. Lateral united petals 4 mm long, upper petal 3 × 1–1.5 mm, obtuse, lower petal 2 × 1 mm, obtuse. Anthers *c.* 1 mm long. Ovary *c.* 1.5 mm long. Fruit not known.

REMARKS

Impatiens befananensis is related to *I. paucisemina* H.Perrier from Tsaratanana and *I. celatiflora* H.Perrier from Betampona. It differs from *I. paucisemina* in the shorter spur at apex of lower sepal, the smaller lower sepal (3.5 × 2.2 mm in *I. befananensis*, 5 × 4 mm in *I. paucisemina*), and the shorter lateral sepal (1.5 mm in *I. befananensis*, 4.5 mm in *I. paucisemina*), and from *I. celatiflora* in the longer petiole (25-35 mm in *I. befananensis* and not exceeding 20 mm in *I. celatiflora*) and the larger dorsal petal (4.5 mm long in *I. befananensis* and 1.5-2 mm in *I. celatiflora*).

HABITAT

Montane rainforest.

DISTRIBUTION

Madagascar, Masoala Peninsula, only known from the type collection.

Impatiens tsararavina

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 27)

Differt ab *Impatiens alveolata* *foliis distantibus apice rotundato-obtusis*. *Impatiens coursiana* *affinis sed petalo superiore valde majore differt*.

TYPUS. — Madagascar. Antsiranana, Réserve Spéciale de Manongarivo, Andranomalaza, crête séparant le bassin versant d'Ambahatra de celui de l'Andranomalaza, 600 m au NW du point coté 1728, 1660 m, 8.VI.1998, *Gautier, Messmer & Wohlhauser LG 3340* (holo-, G; iso-, TAN).

DESCRIPTION

Perennial herb, prostrate to ascending, glabrous throughout. Stems up to 30-40 cm long, branched. Leaves alternate, petiole up to 15-20 mm long, lamina acute at base and rounded-obtuse at apex, net of tertiary veins nearly invisible, 25-28 × 20-25 mm, margin dentate, with 5 or 6 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Bracts linear-filiform, up to 3 mm long. Pedicels up to 17 mm long. Flowers entirely green-translucent. Lateral sepals linear-lanceolate, 5 × 0.6 mm. Lower sepal ovate, acute at apex, without

ornamentation, 7 × 4 mm. Dorsal petal not plicate, with dorsal keel and short spur at apex, 6.5 × 3.5 mm. Lateral united petals 6.5 mm long, upper petal ovate, with short spur-like mucro at apex, 2.5 × 2 mm, lower petal emarginated, 3.5 × 2.2 mm. Anthers 2 mm long. Ovary 2 mm long. Fruit not known.

REMARKS

Impatiens tsararavina is related to *I. alveolata* H.Perrier from Ankaizina and *I. coursiana* H.Perrier from Zahamena. It differs from *I. alveolata* in the leaves that are rounded-obtuse at apex and dispersed on the stem (acute at apex and condensed at stem apex in *I. alveolata*), and the shorter lateral united petals (6.5 mm in *I. tsararavina*, 10 mm in *I. alveolata*), and from *I. coursiana* in the lateral united petals with upper petal 2.5 × 2 mm (lateral united petals with upper petal very small and reduced to 0.5 × 0.3 mm in *I. coursiana*).

HABITAT

Montane rainforest at 1660 m.

DISTRIBUTION

Madagascar, Manongarivo, only known from the type collection.

ETYMOLOGY

Tsararavina is the Malagasy word for beautiful leaf.

Impatiens maevae

Eb.Fisch. & Raheliv., sp. nov.
(Fig. 28)

Impatiens subabortivae *affinis sed callo obscuro sepalis inferioris deficiente differt*.

TYPUS. — Madagascar. Diego-Suarez, Réserve Spéciale de Manongarivo, Massif de Manongarivo, 14°03,617'S, 48°24,567'E, crête bordant la cuvette d'Antsahakolana, 1719 m, 26.XI.2000, *Wohlhauser, Callmander, Rakotomamonjy & Andrianjaka SW 395* (holo-, G; iso-, TAN).

DESCRIPTION

Annual (?) herb, glabrous throughout. Stems creeping to ascending and erect, branched, up to 20 cm

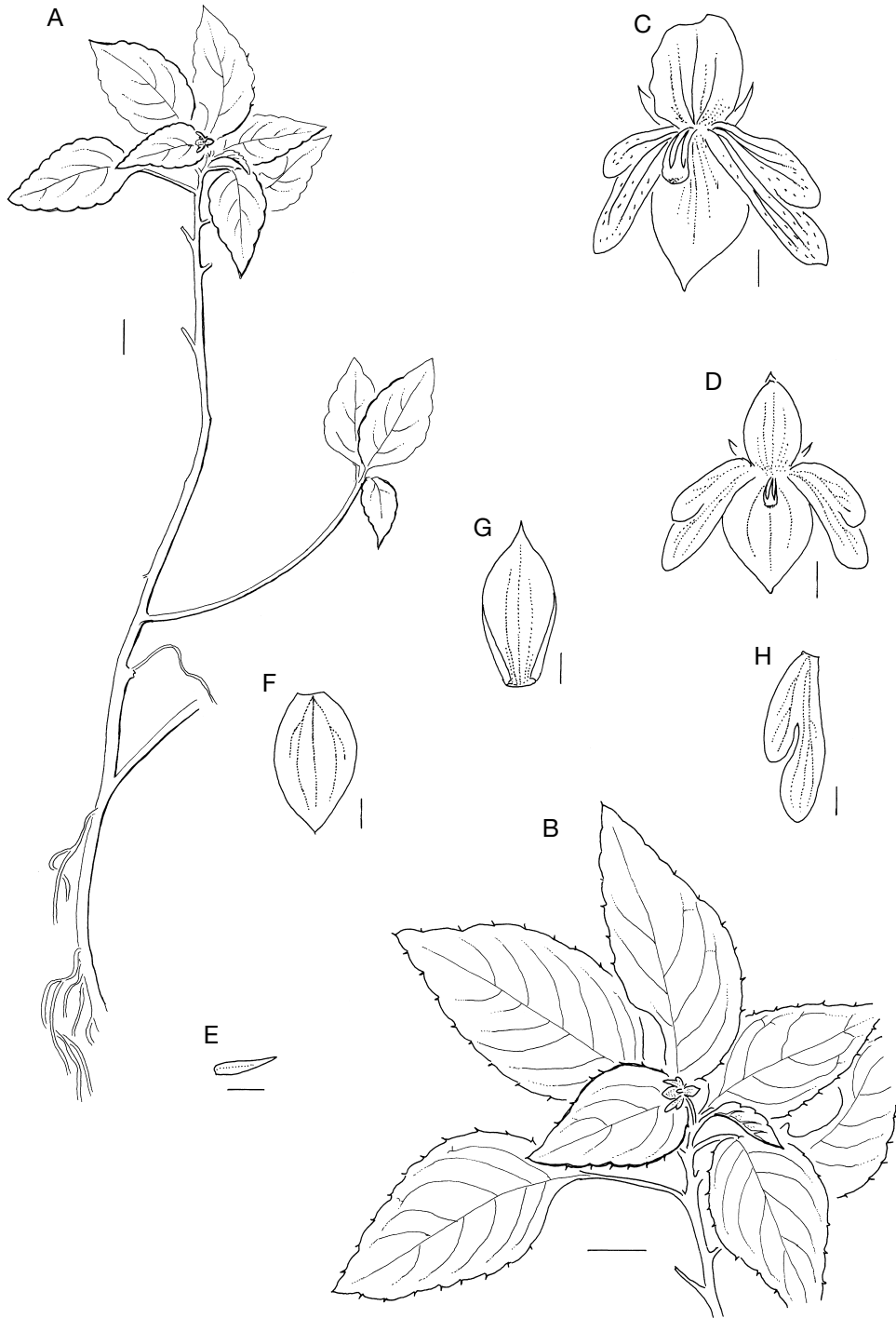


FIG. 26. — *Impatiens befiananensis* Eb.Fisch. & Raheliv.: **A**, habit; **B**, habit, detail; **C**, **D**, flower; **E**, lateral sepal; **F**, lower sepal; **G**, dorsal petal; **H**, lateral united petals. *Purro & Wohlhauser 1030* (NEU). Scale bars: A, B, 1 cm; C-H, 1 mm.

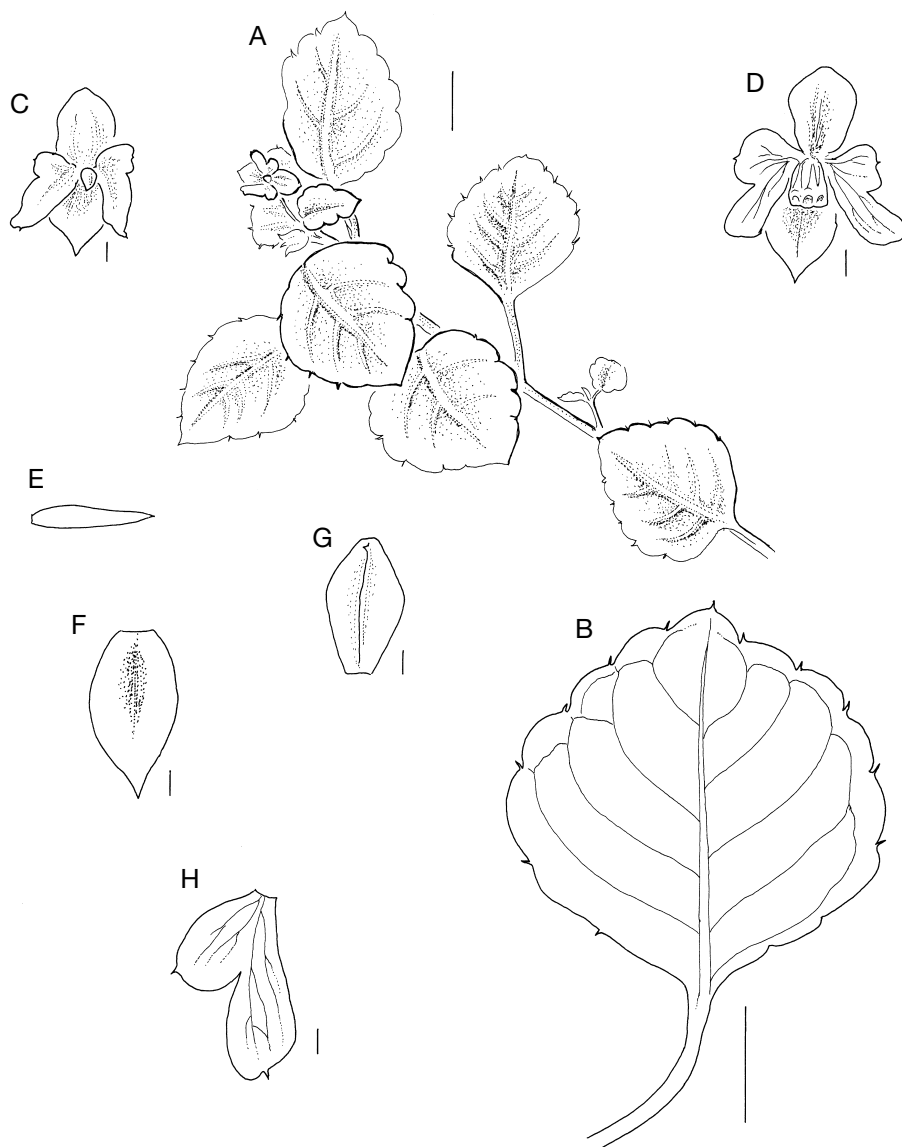


FIG. 27. — *Impatiens tsararavina* Eb.Fisch. & Raheliv.: **A**, habit; **B**, leaf; **C**, **D**, flower; **E**, lateral sepal; **F**, lower sepal; **G**, dorsal petal; **H**, lateral united petals. *Gautier, Messmer & Wohlhauser LG 3340* (G). Scale bars: A, B, 1 cm; C-H, 1 mm.

long. Leaves alternate, petiole up to 20 mm long, lamina rounded to acute at base and obtuse at apex, 30-35 × 20-25 mm, widest towards base, margin crenate with 7 or 8 pairs of teeth with a short gland-tipped appendage. Inflorescence with solitary axillary flowers. Bracts linear-lanceolate, up

to 2 mm long. Pedicels up to 15 mm long. Flowers greenish, transparent, entirely glabrous. Lateral sepals linear-lanceolate, 4.5 × 0.5 mm. Lower sepal ovate, 7 × 4 mm, at apex with 1 mm long apicule. Dorsal petal lanceolate, acute at apex, 7 × 3 mm. Lateral united petals 7 mm long, upper petal rounded at

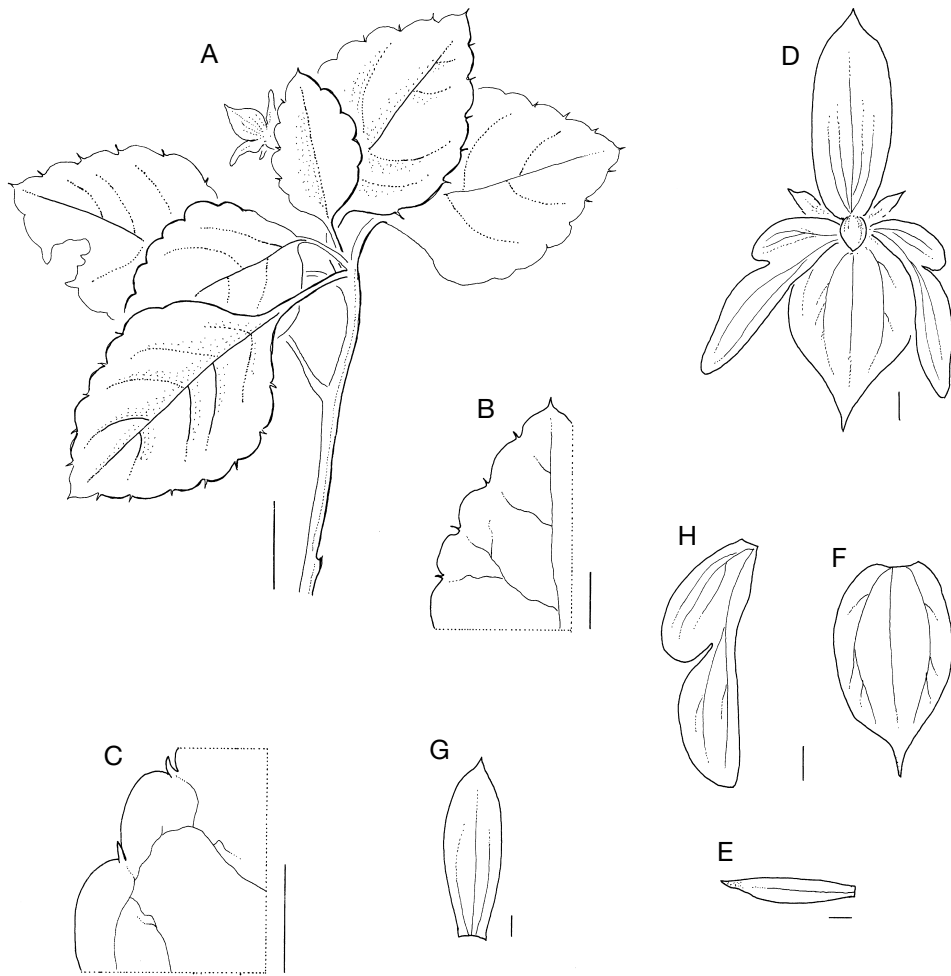


FIG. 28. — *Impatiens maevae* Eb.Fisch. & Raheliv.: **A**, habit; **B**, **C**, details of leaf margin; **D**, flower, lateral view; **E**, lateral sepal; **F**, lower sepal; **G**, dorsal petal; **H**, lateral united petals. *Wohlhauser*, *Callmander*, *Rakotomamonjy* & *Andrianjaka* SW 395 (G). Scale bars: A, 1 cm; B, C, 5 mm; D-H, 1 mm.

apex, 3.5×1.5 mm, lower petal 4.5×2 mm. Ovary 1-2 mm long. Fruit not known.

REMARKS

Impatiens maevae is related to *I. subabortiva* H.Perrier from Tsaratanana but differs in the larger lower sepal lacking a dark callus (7×4 mm in *I. maevae*, 5.5×2 mm in *I. subabortiva*), and the larger dorsal petal (7×3 mm in *I. maevae*, 4×2.5 in *I. subabortiva*).

HABITAT

Montane bamboo rainforest at 1719 m.

DISTRIBUTION

Madagascar, Manongarivo, only known from the type collection.

ETYMOLOGY

Named after Ms. Maeva who collected with the second author.

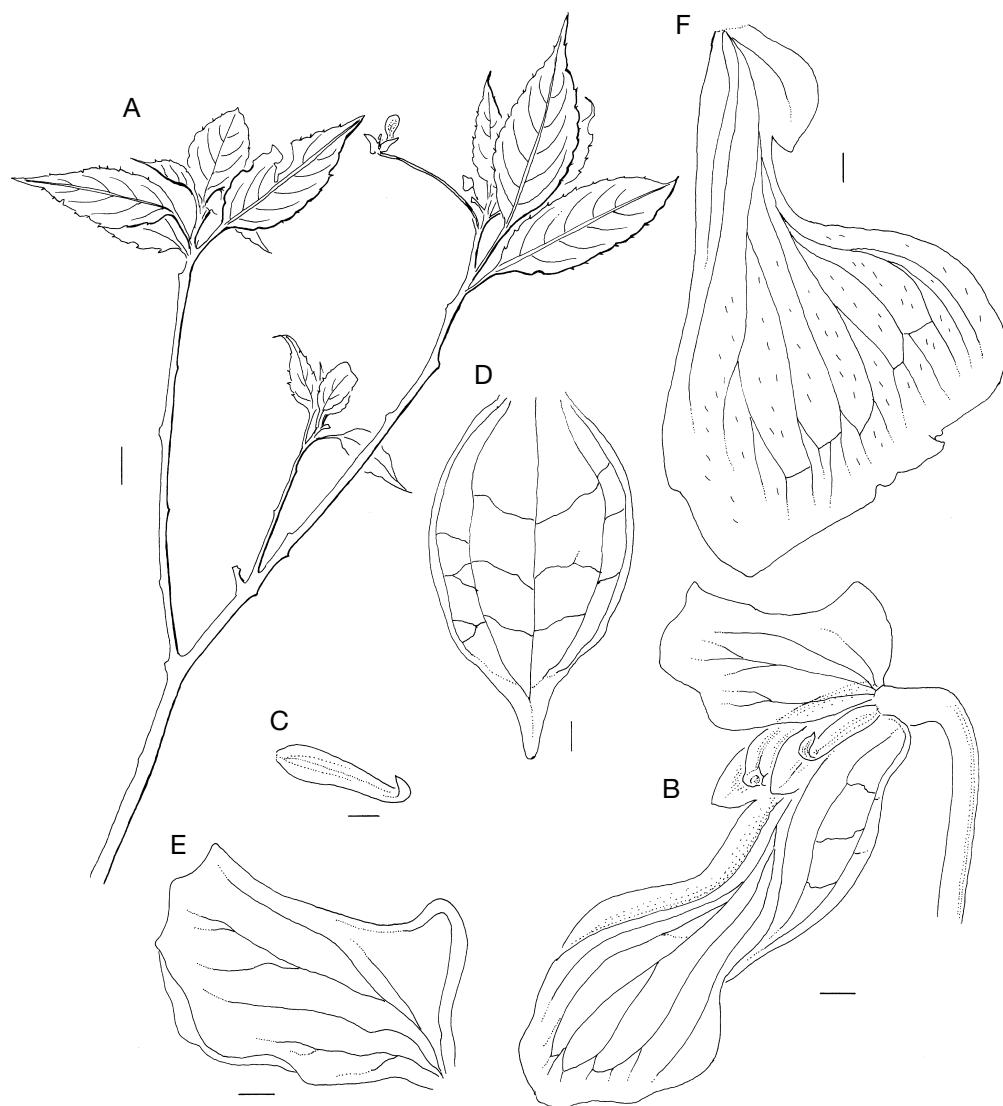


FIG. 29. — *Impatiens razanatsoa-charlei* Eb.Fisch. & Raheliv.: **A**, habit; **B**, flower; **C**, lateral sepal; **D**, lower sepal; **E**, dorsal petal; **F**, lateral united petals. *Rahelivololona T9* (TAN). Scale bars: A, 1 cm; B-F, 1 mm.

Impatiens razanatsoa-charlei

Eb.Fisch. & Raheliv., sp. nov.

(Fig. 29)

Impatienti lemurianae affinis sed sepalo inferiore luteo sine ornamento differt. Ab I. druartii differt foliis latioribus et petalibus lateralibus longioribus.

TYPUS. — Madagascar. Tsaratanana, fond de ruisseau, vers 1850 m, IX.2001, *Rahelivololona T9* (holo-, TAN).

DESCRIPTION

Perennial herb, erect, glabrous except for small whitish scales. Stems branched, up to 30-40 cm long. Leaves alternate, petiole up to 13-16 mm long, lamina ovate, attenuate-acute at base at apex, with distinct acumen at apex, net of tertiary veins indistinct, 53-64 × 20-23 mm, margin dentate, with 7-9 pairs of teeth with a short

gland-tipped appendage. Inflorescence with 1 or 2 axillary flowers on short peduncle. Bracts filiform, up to 0.5 mm long. Pedicels up to 36–40 mm long. Flowers greenish-yellowish, with darker veins. Lateral sepals linear-filiform, 6 × 1 mm. Lower sepal ovate, with distinct acumen at apex, without ornamentation, 12–13 × 5 mm. Dorsal petal helmet-like, dorsal crest with short spur at apex, dilated to a triangle at lower third, 8–9 × 4–5 mm. Lateral united petals 19 mm long, upper petal acute, 5–6 × 3–4 mm, lower petal obtuse to shortly acute, 10 × 7 mm. Anthers up to 5 mm long. Ovary up to 5 mm long. Fruit not known.

REMARKS

Impatiens razanatsoa-charlei is related to *I. lemuriana* from Tsaratanana and *I. druartii* from Masoala, sharing the distinct dilated triangle on the crest of the dorsal petal. It differs, however, from *I. lemuriana* in the yellow lower sepal without ornamentation, the longer lateral united petals (19 mm in *I. razanatsoa-charlei*, 12 mm in *I. emuriana*), the larger lower sepal (12–13 × 5 mm in *I. razanatsoa-charlei*, 10 × 5 mm in *I. lemuriana*), and from *I. druartii* in the narrower leaves (53–64 × 20–23 mm in *I. razanatsoa-charlei*, 80–120 × 24–30 mm in *I. druartii*), and the longer lateral united petals (16 mm in *I. druartii*). *Impatiens druartii* is an epiphyte while *I. razanatsoa-charlei* is growing as a terrestrial herb,

HABITAT

Montane rainforest at 1850 m, growing along stream.

DISTRIBUTION

Madagascar, only known from the type collection.

ETYMOLOGY

Named after the parents of the second author.

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REFERENCES

- ALMEDA F. 2003. — Melastomataceae, Princess Flowers, in GOODMAN S. M. & BENSTEAD J. P. (eds), *The Natural History of Madagascar*. The University of Chicago Press, Chicago: 375–379.
- BARDOT-VAUCOULON M. 1997. — Observations sur le milieu et la végétation du Massif de l'Ankarana (Nord de Madagascar) et description de trois nouvelles espèces de *Chlorophytum* (Liliaceae), *Tacca* (Taccaceae) et *Adenia* (Passifloraceae). *Adansonia*, sér. 3, 19 (1): 139–163.
- CALLMANDER M. W. & LAIVAO M. O. 2003. — Pandanaceae, *Pandanus*, in GOODMAN S. M. & BENSTEAD J. P. (eds), *The Natural History of Madagascar*. The University of Chicago Press, Chicago: 460–467.
- DRANSFIELD J. & BEENTJE H. 1995. — *The Palms of Madagascar*. Royal Botanic Gardens, Kew; the International Palm Society, Kew, 475 p.
- FISCHER E. & RAHELIVOLOLONA M. É. 2002. — New taxa of *Impatiens* (Balsaminaceae) from Madagascar. I. *Adansonia*, sér. 3, 24 (2): 271–294.
- FISCHER E. & RAHELIVOLOLONA M. É. 2004. — New taxa of *Impatiens* (Balsaminaceae) from Madagascar. III. *Adansonia*, sér. 3, 26 (1): 37–52.
- FISCHER E., WOHLHAUSER S. & RAHELIVOLOLONA M. É. 2003. — New taxa of *Impatiens* (Balsaminaceae) from Madagascar. II. A collection from Masoala Peninsula *Adansonia*, sér. 3, 25 (1): 17–31.
- GANZHORN J. U., LOWRY P. P. II, SCHATZ G. & SOMMER S. 2001. — The biodiversity of Madagascar: one of the world's hottest hotspots on its way out. *Oryx* 35: 346–348.
- HAEVERMANS T. 2003. — Euphorbia, in GOODMAN S. M. & BENSTEAD J. P. (eds), *The Natural History of Madagascar*. The University of Chicago Press, Chicago: 385–391.

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