

New records of naturalised *Impatiens* (Balsaminaceae) in Brazil

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Abstract: We present here the first account of the naturalised (spontaneous) occurrence of *Impatiens balsamina* in Brazil, and of *I. walleriana* in Ceará state, northeastern Brazil. These new records were discovered during herbarium revisions. Both species are widely cultivated as ornamental and were introduced to the Americas from the Old World tropics, and have subsequently escaped cultivation and become naturalised in some areas; in the neotropics, *I. walleriana* is clearly an invasive species. We also provide morphological descriptions of these two species, photographs, a distribution map of the new records and an identification key to the species of *Impatiens* naturalised in South America.

Key words: Distribution extension, Identification key, Invasive species.

Novos registros de *Impatiens* (Balsaminaceae) naturalizadas no Brasil

Resumo: Apresentamos aqui os primeiros registros da ocorrência naturalizada (espontânea) de *Impatiens balsamina* no Brasil, e de *I. walleriana* no estado do Ceará, nordeste do Brasil. Esses novos registros foram descobertos durante a revisão de coleções de herbário. Ambas as espécies são amplamente cultivadas como ornamental, tendo sido introduzidas nas Américas vindas dos paleotrópicos, e subsequentemente escaparam do cultivo e se tornaram naturalizadas em algumas áreas; nos neotrópicos, *I. walleriana* é claramente uma espécie invasora. Também fornecemos descrições morfológicas das duas espécies, fotografias, um mapa com a distribuição dos novos registros e uma chave de identificação para as espécies de *Impatiens* naturalizadas na América do Sul.

Palavras chave: Ampliação de distribuição, Chave de identificação, Espécie invasora.

Introduction

Impatiens L. is one of the two genera comprising the Balsaminaceae (the other is the monotypic *Hydrocera* Blume ex Wight & Arn., which is native to southern Asia), and including over 1,000 species is one of the most diverse plant genera (Fischer, 2004, Janssens et al., 2006, Chen et al., 2007, Dessai & Janarthanam, 2011, Yu et al., 2016). Species of *Impatiens* are native to Eurasia, North and Central America, New Guinea, tropical Africa and Madagascar, being most concentrated in Old World tropics and subtropics, in montane or submontane areas (Fischer, 2004, Chen et al., 2007, Yu et al., 2016). Most of these species have preference for humid to mesic environments (Marques, 1976, Yu et al., 2016), and occur in moist montane and submontane forests, along the margins of streams

and rivers, by roadsides and along tracks, in ravines and creeks and amongst moist rocks (Grey-Wilson, 1980). This genus is also remarkable for its difficult taxonomy (Grey-Wilson, 1980, Yuan et al., 2004, Yu et al., 2016).

Impatiens also has a significant economic importance as many species of this genus are highly valued for their ornamental properties, principally the large, showy flowers and relatively easy culture (Grey-Wilson, 1980, Macaya-Berti, 2015). This has led the introduction of some species of *Impatiens* to many new areas, including land masses where no species of this genus previously occurred such as Australia and South America. Because of the explosive capsules and the easily-germinating seeds of the cultivated species, some species have escaped cultivation and subsequently become naturalised in new areas. Some of these species can quickly

disperse and even compete with native species in natural habitats and are thus to be considered invasive (Pyšek & Prach, 1995, Hejda & Pyšek, 2006, Malíková & Prach, 2010, Schmitz & Dericks, 2010).

During herbarium revisions we discovered new, overlooked records of naturally-occurring, i.e. spontaneous, naturalised *Impatiens*: the first records of *I. balsamina* L. in Brazil, and the first record of *I. walleriana* Hook.f. in Ceará state, northeastern Brazil. This last species is clearly invasive in Brazil, as it is able to colonise moist habitats such as river margins and the understorey of moist forests, having already been recorded as invasive in other tropical and subtropical areas (Space et al., 2000, Space & Flynn, 2001, Christenhusz, 2010, Kirschner, 2013). The objective of this work is to present these new records, including descriptions of these species, photographs, a distribution map of the new records and an identification key to the species of *Impatiens* naturalised in South America.

Material and methods

We studied the collections of *Impatiens* kept at ASE, C, EAC, EFC, FLOR, FURB, GB, HBR, HRB, HURB, MBM, TEPB, UESC and UPS (acronyms according to Thiers, 2017), and images of specimens kept at K, LINN and UFRN. Only the new records were included in the lists of material examined. We took maximal care not to include any gathering that included in the labels or elsewhere any evidence of cultivated specimens (see discussion below). The conservation status assessments followed the International Union for Conservation of Nature (2012, 2017) criteria. The concepts of naturalised and spontaneous species were based on those in Pyšek (1995), Richardson et al. (2000), Hassemer and Trevisan (2012) and Moro et al. (2012).

Results and discussion

Impatiens balsamina L., Sp. Pl. 2: 938. 1753 (von Linné, 1753).

Type: *Anonymous s.n.* (lectotype [designated by Christenhusz & Jarvis, 2010] LINN-1053.3!). Image of the lectotype available at <http://linnean-online.org/11126>.

Description: Plants annual, 60–100 cm tall. Stem erect, robust, base ca. 8 mm wide, succulent, simple or branched, glabrous or laxly pubescent when young, with many fibrous roots, lower nodes swollen. Leaves alternate, sometimes lowest ones opposite; petiole 1–3 cm long, adaxially shallowly sulcate, both sides with few pairs of stipitate glands; leaf blade lanceolate, narrowly elliptic, or oblanceolate, 4.0–12.0 × 1.5–3.0 cm, with a pair of sessile black glands toward base, both surfaces glabrous or sparsely pubescent, lateral veins 4–7 pairs, base cuneate, margin deeply serrate, apex acuminate. Inflorescences 1-flowered, or 2 or 3 flowers fascicled in leaf axils, without peduncles. Pedicels 2.0–2.5 cm long, densely pubescent, bracteate at base; bracts linear. Flowers white, pink, or purple, simple or double petalous. Lateral sepals 2, ovate or ovate-lanceolate, 2–3 mm long. Lower sepal deeply navicular, 13–19 × 4–8 mm, pubescent, abruptly narrowed into an incurved spur; spur 1.0–2.5 cm long, slender. Upper petal orbicular, apex retuse, mucronulate, abaxial midvein narrowly carinate; lateral united petals shortly clawed, 2.3–2.5 cm long, 2-lobed; basal lobes obovate-oblong, small; distal lobes suborbicular, apically retuse; auricule narrow. Stamens 5; filaments linear; anthers ovoid, apex obtuse. Ovary fusiform, densely pubescent. Capsule broadly fusiform, 1–2 cm long, densely tomentose, narrowed at both ends. Seeds many, black-brown, globose, 1.5–3.0 mm wide, tuberculate. Description adapted from Chen et al. (2007).

Illustration: Illustration 2. in Marques (1976).

Photographs: Figures 1. and 2.

Figure 1 - Photograph of *Impatiens balsamina* from Itamaraju, southern Bahia (L.A.M. Silva & H.S. Brito 656, UESC-138).

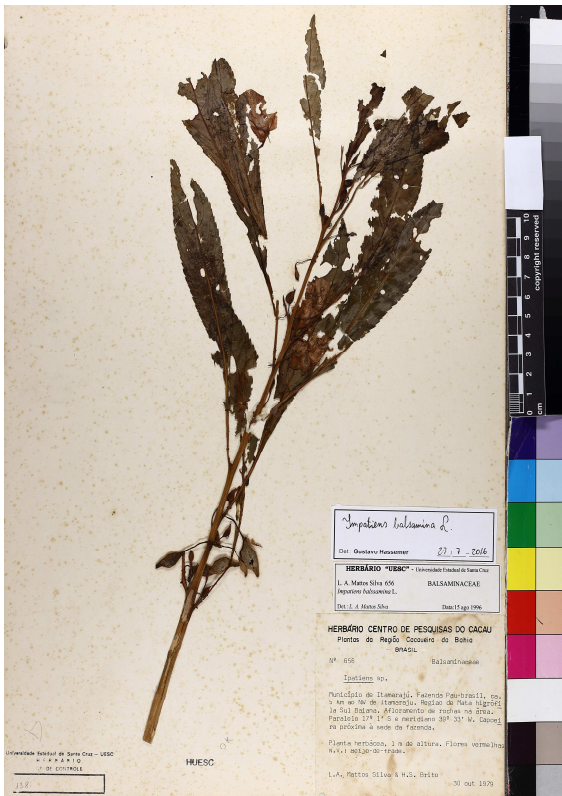
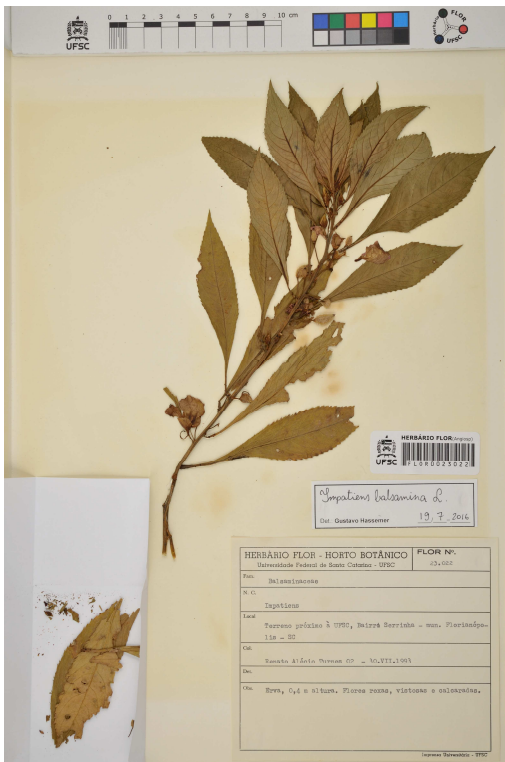


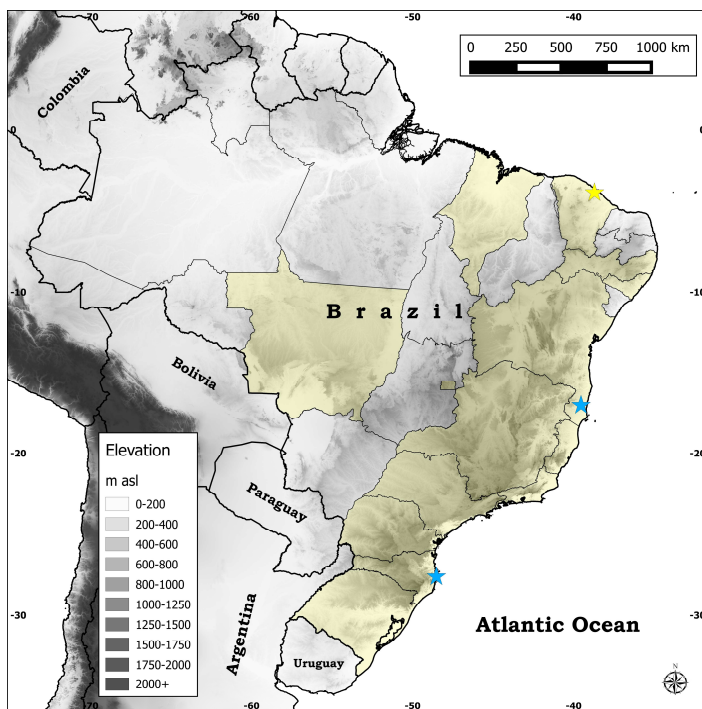
Figure 2 - Photograph of *Impatiens balsamina* from Florianópolis, eastern Santa Catarina (R.A. Turnes 2, FLOR-23022).



Distribution: Originally native to southern Asia (Macaya-Berti, 2015), *I. balsamina* is today cultivated as ornamental worldwide, and has been able to escape cultivation in some areas. In Brazil, this species was hitherto not recorded as a naturalised species (Forzza et al., 2015). We present here the first records of the naturalised

(i.e. spontaneous) occurrence of this species in Brazil, due to the discovery of gatherings of this species originated from Itamaraju, southern Bahia state, and from Florianópolis, eastern Santa Catarina state (Figure 3.). Both gatherings are from areas of Atlantic rainforest.

Figure 3 - Distribution map of the new records of *Impatiens balsamina* (blue stars), and distribution map of *I. walleriana* in Brazil (highlighted in yellow), including the new record of this species in Ceará (yellow star).



Habitat: In Brazil, this species occurs as naturalised in rock outcrops in shaded areas within the Atlantic rainforest domain.

Conservation status: Least concern (LC). In addition to its natural distribution in southern Asia, this species is capable of escaping cultivation and becoming naturalised in other tropical and subtropical areas where it is widely cultivated as ornamental.

Comments: In Brazil, *I. balsamina* is ecologically much less vigorous than *I. walleriana*, but is still capable to escape cultivation and grow and reproduce in both ruderal (anthropic) and natural environments. It is possible that with more time of “residence” in Brazil (Pyšek & Jarošík, 2005), *I. balsamina* could expand its distribution and habitats, as was the case with *I. walleriana*.

New records: BRAZIL. BAHIA: Itamaraju: Fazenda Pau-Brasil, ca. 5 km a NW de Itamaraju, afloramento de rochas, 17°01' S, 039°33' W, 30 October 1979, L.A.M. Silva & H.S. Brito 656 (UESC-138—Figure 1.); SANTA CATARINA: Florianópolis: terreno próximo à UFSC, Serrinha, Ilha de Santa Catarina, 30 July 1993, R.A. Turnes 2 (FLOR-23022—Figure 2.).

Impatiens walleriana Hook.f. in Oliv., Fl. Trop. Afr. 1: 302. 1868 (Oliver, 1868).

Type: MOZAMBIQUE. Moramballa, *H. Waller* s.n. (lectotype [designated by Christenhusz, 2010] K-000419538!). Image of the lectotype available at <http://specimens.kew.org/herbarium/K000419538>.

Description: Plants perennial, succulent, green or reddish tinged, 30–70 cm tall, simple or branched, glabrous or rarely slightly pubescent at

shoot apices. Leaves alternate; petiole 1.5–6.0 cm long, with 1 or 2, rarely few, stipitate glands; leaf blade broadly elliptic, ovate or oblong-elliptic, 4.0–12.0 × 2.5–5.5 cm, with 1 or 2, rarely few, stipitate basal glands, glabrous, lateral veins 5–8 pairs, base cuneate, rarely more or less rounded, attenuate into petiole, margin crenate-denticulate, apex acute or acuminate, or somewhat cuspidate. Inflorescences in leaf axils of upper stem and branches, usually 2(–5)-flowered, sometimes 1-flowered; peduncles 3–5 cm long. Pedicels 1.5–3.0 cm long, slender, bracteate at base; bracts linear-lanceolate or subulate, ca. 2 mm long, apex acute. Flowers variable in size and colour: red, crimson-red, pink, purple-red, purplish violet, or white. Lateral sepals 2, greenish or whitish, ovate-lanceolate or linear-lanceolate, 3–7 mm long, apex acute. Lower sepal shallowly navicular, 0.8–

1.5 cm deep, abruptly constricted into a curved spur; spur filiform, 2.4–4.0 cm long. Upper petal broadly obcordate or obovate, 1.5–1.9 × 1.3–2.5 cm, apex emarginate, cuspidate, abaxial midvein narrowly cristate; lateral united petals not clawed, 1.8–2.5 cm long, 2-lobed; basal and distal lobes nearly equal in size and shape; basal lobes obovate or obovate-spatulate, 1.4–2.0 × ca. 1.4 cm; distal lobes 1.2–2.3 × ca. 1.8 cm, margin entire or emarginate. Ovary fusiform, ca. 4 mm, glabrous. Capsule fusiform, 1.5–2.0 cm long, glabrous. Description adapted from Chen et al. (2007).

Illustration: Illustration 1. in Marques (1976) (presented as "*Impatiens sultani* Hook.").

Photographs: Figures 4. and 5.

Figure 4 - Photograph of *Impatiens walleriana* from Maranguape, Ceará (E. Nunes & P. Martins s.n., EAC-10663).



Figure 5 - Photograph of invasive *Impatiens walleriana* growing close to a waterfall in an Atlantic rainforest area in Blumenau, Santa Catarina, southern Brazil. Photograph by Luís Adriano Funez.



Distribution: Originally native to eastern Africa (Macaya-Berti, 2015), *I. walleriana* has today a pantropical distribution, having become naturalised (and often also invasive) in many tropical and subtropical areas (Christenhusz, 2010). In Brazil, this species was hitherto recorded in the following states: Alagoas, Bahia, Distrito Federal, Espírito Santo, Maranhão, Mato Grosso, Minas Gerais, Paraná, Pernambuco, Rio de Janeiro, Rio Grande do Sul, Santa Catarina and São Paulo (Forzza et al., 2015). We present here the first record of the naturalised (i.e. spontaneous) occurrence of *I. walleriana* in Ceará state, northeastern Brazil, due to the discovery of a gathering of this species originated from Maranguape municipality (Figure 3.).

Habitat: Humid or wet habitats, including the margins of river and streams, waterfalls, gorges and the understory of moist forests (Figure 5.), and also humid ruderal environments such as roadsides and secondary forests.

Conservation status: Least concern (LC). This species is widely distributed in most tropical and subtropical areas around the world.

Comments: In Ceará, *I. walleriana* was collected in a forest (most probably in the understory) in a

hilly area (Serra de Maranguape) ca. 18 km to the southwest from the state capital, Fortaleza. This new record represents a distribution extension of ca. 550 km from Buíque municipality, Pernambuco state, and ca. 660 km from Anajatuba municipality, Maranhão state, which are the nearest recorded localities for this species. In addition to the gathering from Maranguape (*E. Nunes & P. Martins s.n.*), there is another gathering of *I. walleriana* from Ceará at EAC (*M.I.B. Loiola 1514*, EAC-52143), which however has a clear indication of being a cultivated specimen, and therefore cannot be considered a naturalised occurrence of this species.

New record: BRAZIL. CEARÁ: Maranguape: Serra de Maranguape, mata, 28 June 1981, *E. Nunes & P. Martins s.n.* (EAC-10663—Figure 4.; UFRN-98).

Identification key to the species of *Impatiens* naturalised in South America

1. Leaf blade lanceolate, narrowly elliptic or oblanceolate. Fruit densely tomentose

..... *I. balsamina* L.

1'. Leaf blade broadly elliptic, ovate or oblong-elliptic. Fruit glabrous
 *I. walleriana* Hook.f.

Conclusions

The new records presented here highlight the importance of critical study of herbarium collections, as there are still many taxonomic and floristic novelties waiting for discovery both in bigger, older collections, but also in smaller and less visited herbaria. Also, these results show the importance of studying poorly-represented, non-native plant groups, which are often floristically overlooked, and yet can have a significant impact in the understanding and monitoring of the distribution and expansion of non-native and/or invasive species.

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