

Assembling the puzzle of *Byrsonima fanshawei* (Malpighiaceae): Emended description and new records for a rare species

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Abstract. *Byrsonima fanshawei* is a rare species of Malpighiaceae that was described based only on a fruiting specimen from Kaieteur Plateau, Guyana. Here we provide an emended description, including a complete description of floral characters, along with new records of the species from the Brazilian states of Amazonas and Espírito Santo, and the Venezuelan state of Amazonas.

Keywords: Amazon Forest, Atlantic forest, Brazil, Guyana, Malpighiales, Venezuela.

Byrsonima Rich. ex Kunth is the second largest genus in Malpighiaceae, comprising ca. 140 species endemic to the Neotropics (Anderson, 1981; Anderson et al., 2006). It is easily recognized by its shrubby to arborescent habit, epipetiolar stipules, eglandular leaves, bracts and bracteoles, elongated thyrsi of 1–4-flowered cincinni, slender, apically subulate styles, minute stigmas, and fleshy indehiscent drupes, with 3-locular pyrenes (Anderson, 1981; Mamede, 1987; Francener et al., 2017). Approximately 100 species of *Byrsonima* occur in Brazil, more than in any other country. Within Brazil, the genus is especially well represented in the Cerrado, Amazon and Atlantic Forests domains (Almeida et al., 2016; Anderson, 1981; BFG, 2015).

Byrsonima fanshawei W.R. Anderson was first described from the Guyana savannas based on a single fruiting specimen (Anderson, 1981). It is one of only four species of *Byrsonima* (*B. crispa* A. Juss., *B. duckeana* W.R. Anderson, and *B. stipulacea* A. Juss. being the other three) to display a disjunct distribution between the Amazon and Atlantic Forests (Anderson, 1981; BFG, 2015). This distribution pattern is remarkable, since it is only recorded for ca. 8% of plant

species found in southern Bahian forests (Mori et al., 1981; Amorim et al., 2008).

For several decades *B. fanshawei* was known only from the type collection. However, during visits to herbaria in Northeastern Brazil for the taxonomic revision of *B. sect. Eriolepsis* Nied., we came across additional new specimens of *B. fanshawei*, including the first specimens with flowers. We present an emended description of this species, including a complete description of floral morphology, and an updated distribution map.

Materials and methods

Morphological descriptions and phenology of the studied species were based on herbarium specimens housed at: CEPEC, ESA, HUEFS, INPA, MO, NY, RB, SP and U (see Thiers, 2017, continuously updated), as well as type collections housed at these and other herbaria. The terminology used follows Niedenzu (1928) and Anderson (1981) for indumentum, Radford et al. (1974) for structural shapes, Anderson (1981) for inflorescence morphology, and Niedenzu (1928) and Anderson (1981) for fruit morphology. Scanning

electron microscope (SEM) images were taken of samples fixed in Karnovsky solution (Bozzola & Russel, 1992) and coated in gold. The conservation status assessment for Brazil follows the IUCN Red List Categories and Criteria, Version 3.1 (IUCN, 2012). GeoCAT (Bachman et al., 2011) was used for calculating the Extent of Occurrence (EOO) and Area of Occurrence (AOO). Maps were elaborated using ArcGIS version 9.3 (ESRI, 2010), and geographical coordinates were obtained from herbarium specimens.

Results

We report eight new records of *Byrsonima fanshawei* from Brazil and Venezuela. An emended description for the species is given below, along with notes on its conservation status, geographical distribution, and ecology.

Byrsonima fanshawei W.R.Anderson. Type: Guyana. Kaieteur Plateau, 6 May 1944, Maguire & Fanshawe 23270 (holotype: NY; isotypes: K barcode 000426918, MO barcode 251736, U barcode 0008172, VEN-n.v.).

Figs. 1, 2, 3, 4, and 5.

Tree to 8 m tall, trunk 4 cm diam.; branches tomentose to glabrous, hairs T-shaped, shortly-stalked, reddish. *Stipules* persistent, connate, ca. 6 mm long., broadly ovate, apex obtuse, abaxially sericeous-tomentose to glabrous, adaxially glabrous. *Leaves* opposite, flat; petioles 11–15 mm long, canaliculate, tomentose; leaf blades 10–12.7 × 5–7 cm, elliptic to obovate, base cuneate, margin entire, apex obtuse to rotund, adaxially rugose, tomentose along veins, hairs T-shaped, shortly-stalked, branches 1.5–2 mm long, tortuous or not, stellate hairs absent, abaxially tomentose, hairs T-shaped, shortly-stalked branches ca. 0.5 mm long, tortuous or not, becoming glabrous at age; veins impressed on both sides; glands absent. *Thyrsi* (pseudoracemes) of 1-flowered cincinni, 6–20-cincinni distributed from the middle to the distal part of the rachis; rachis 6.5–10.5 cm long, sericeous-tomentose, hairs 0.2–1 mm long, brown, stalk 0–0.2 mm long; bracts 3.5–5 × 1–1.5 mm, triangular, erect, abaxially tomentose, adaxially sparsely pilose, deciduous in fruiting; peduncle 0–1 mm long; bracteoles 1.5–2.5 × 1–1.2 mm, triangular, erect, abaxially tomentose, adaxially sparsely pilose, deciduous at fruiting; pedicels 9–10 mm

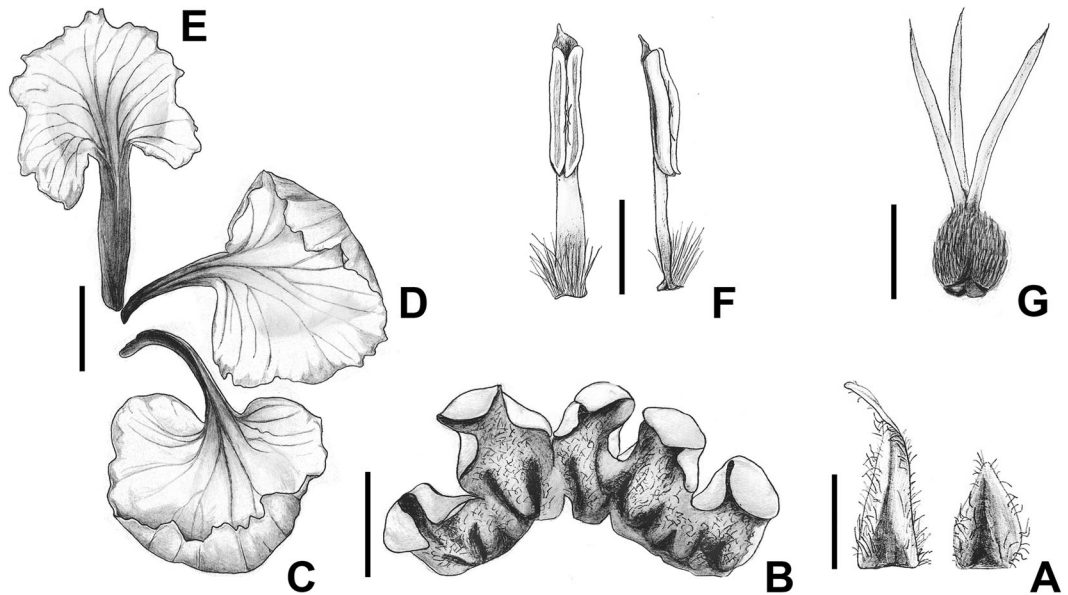


FIG. 1. *Byrsonima fanshawei* (scales=2 mm). A. Bracts and bracteoles in abaxial view. B. Eglanular sepals. C–D. Lateral petals. E. Posterior petal. F. Stamens in frontal and lateral view. G. Sericeous ovary (based on Carvalho et al. 6472).



FIG. 2. Isotype of *Byrsonima fanshawei* (K barcode 000426918).

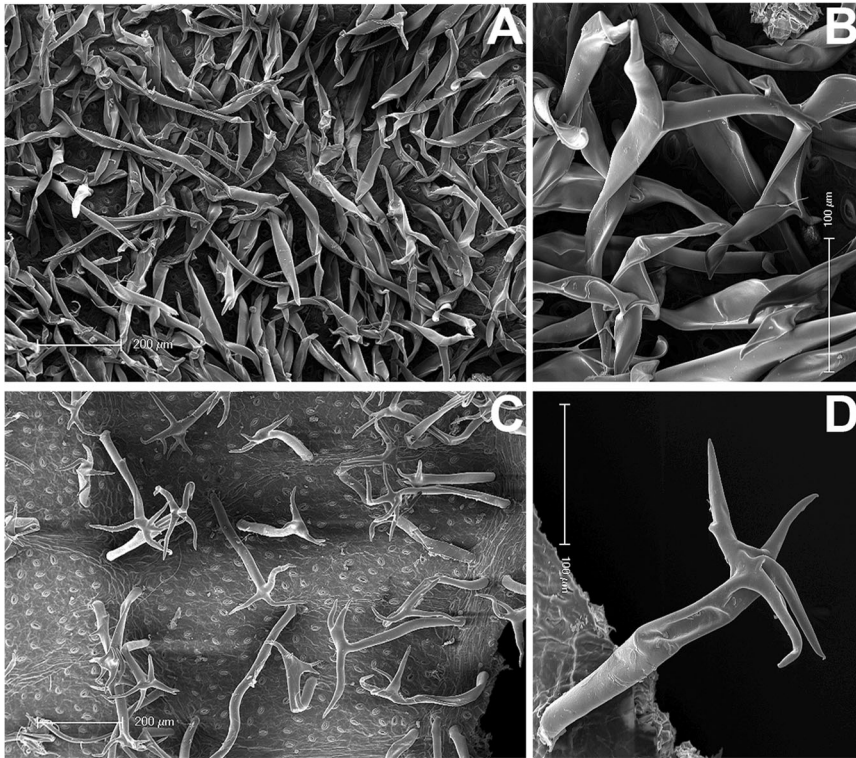


FIG. 3. Scanning electron micrograph images. A–B. *Byrsonima fanshawei*, sessile hairs. C–D. *B. stipulacea*, long-stalked stellate hairs.

long, bent, tomentose, hairs brown. *Sepals* 3–6 × 2.5–4.5 mm, all biglandular, apex rounded, erect or reflexed at anthesis, sericeous on both sides; glands 2–2.6 mm long, yellow, glabrous. *Petals* yellow, glabrous; lateral petals reflexed, limb 5–5.5 × 5–5.2 mm, cuculiform, margin slightly erose, claw 2.3–3 × 0.8–0.9 mm, twisted; posterior petal erect, limb 3.8–4 × 3.5–4 mm, corrugated, base auriculate, margin slightly erose, claw 3–3.5 × 0.9–1 mm, straight. *Stamens* 10, filaments 2–2.3 × 0.7–1 mm, free at base, pilose at base, hairs 1–1.3 mm long, whitish; connective 2–2.7 × 0.6–1 mm, apex acute or acuminate, exceeding or not the locules by up to 0.4 mm, pilose or glabrous; locules 2.5–3.3 × 0.7–0.8 mm, laterally sericeous, apex rounded, connective sericeous, hairs whitish. *Ovary* conical, 2–2.1 × 1.5–2 mm, sericeous, hairs to 0.5 mm long, whitish; ovules 0.9–1 × 0.5–0.6 mm; styles 4–4.8 mm long, erect, subulate, apex bent, glabrous; stigmas minute. *Drupes* 8–9 mm diam., globose, apex

apiculate, tomentose near apex. *Seeds* 3, or 2–1 by abortion, glabrous. *Embryo* not seen.

Distribution, habitat and phenology.—*Byrsonima fanshawei* was originally described from Guyana, growing in the Amazonian savanna of the Kaieteur Plateau. It has hitherto been known only from the type specimens (collected in 1944) and from two specimens collected in 1998 from the sub-montane Atlantic Forest, in Bahia, Brazil. During recent herbarium studies, we were able to locate five new collections of *B. fanshawei*. Four specimens were collected between 2006 and 2013, in the Brazilian states of Amazonas and Espírito Santo, while the fifth represents an older fruiting specimen from Venezuela (Fig. 5). Flowering occurs from January to May, and fruiting from February to July.

Conservation status.—*Byrsonima fanshawei* should be regarded as Critically Endangered [CR, B2ab(ii)] in Brazil, due to its AOO being <10 km² and the continuous decline in the species' habitat quality (see IUCN, 2012).



FIG. 4. Flowering specimen of *Byrsonima fanshawei* (Carvalho et al. 6472, NY).

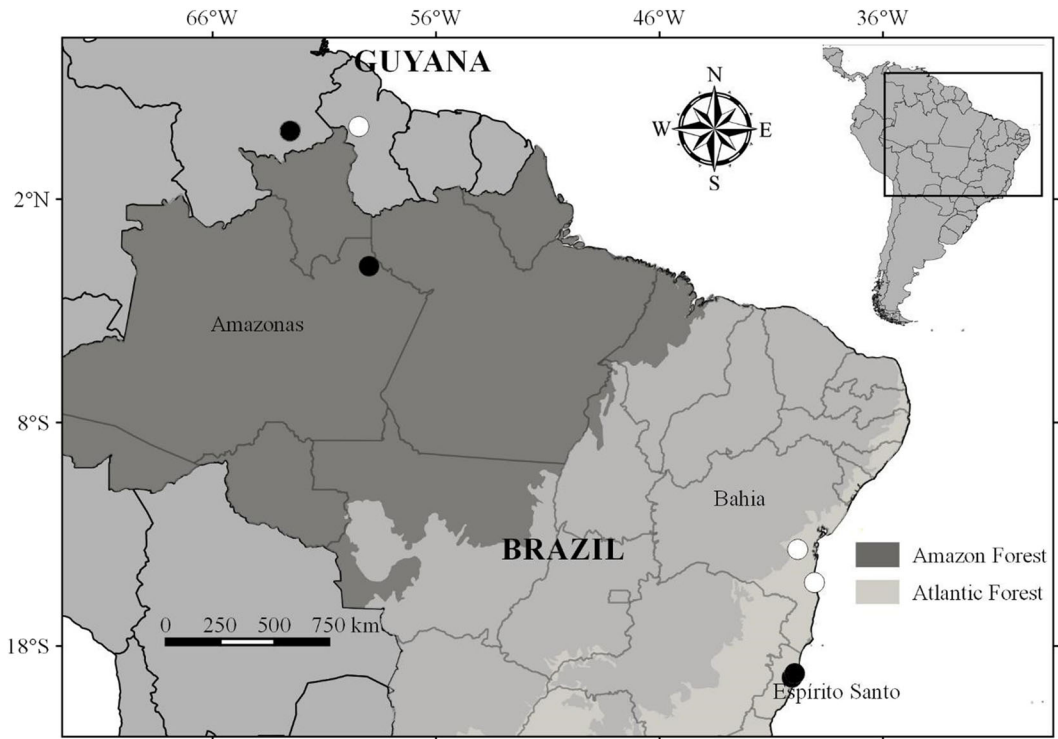


FIG. 5. Distribution map of *Byrsonima fanshawei* in South America. (Closed dots represent new records; open dots represent specimens previously cited in the literature).

Fortunately, all seven Brazilian specimens are located within conservation units (Estação Ecológica de Wenceslau Guimarães, Reserva Biológica de Una, Reserva Biológica de Una, and Reserva Natural Vale).

Additional specimens examined. BRAZIL. Amazonas: Mun. Presidente Figueiredo, Rebio Uatumã, 19 May 2007 [fr], *Zartman 7025* (CEPEC, INPA). **Bahia:** Mun. Una, Reserva Biológica de Una, 28 January 1998, [fl], *Carvalho 6472* (CEPEC, NY, RB, SP); 19 February 1998 [fr], *Jardim 1716* (CEPEC, SP); Mun. Wenceslau Guimarães, Estação Ecológica, 29 May 2015 [fl], *Aona 2318* (HURB, HUEFS). **Espírito Santo:** Mun. Linhares, Reserva Natural da Vale, 19 June 2006 [fr], *Folli 5303* (CEPEC, SP); 20 July 2013 [fr], *Lima 7655* (HUEFS, RB); 6 June 2006 [fr], *Freire 44* (ESA, SP).

VENEZUELA. Amazonas: Santa Rosa de Amanadona, 100 m, 1942 [fr], *Williams 14,706* (RB).

Byrsonima fanshawei is characterized by its ca. 6 mm long, persistent stipules (sometimes deciduous; Fig. 2), sessile leaf-hairs (Fig. 3) and fruits 8–9 mm in diameter. It is morphologically similar to *B. stipulacea* (Fig. 6), but the latter has >7 mm

long deciduous stipules, long-stalked stellate leaf-hairs (Fig. 3), connectives 2.80–2.99 mm long, and fruits 9–18 mm in diameter (Anderson, 1981). Additionally, the connectives have an acute to acuminate apex, while in *B. stipulacea* it is only acute. Most of the informative characters in the taxonomy of *Byrsonima* are floral characters, such as those involving petal and anther morphology. Furthermore, the current infrageneric classification for *Byrsonima* (Niedenzu, 1928) relies exclusively on androecium morphology, especially the overall shape of the anthers and pubescence of the stamens. The original description was based on a single fruiting specimen, but the author had strong suspicions that the petals were yellow and the anthers sericeous, at least between in the connectives (Anderson, 1981). The present description of floral characters for the species supports the original hypothesis of Anderson.

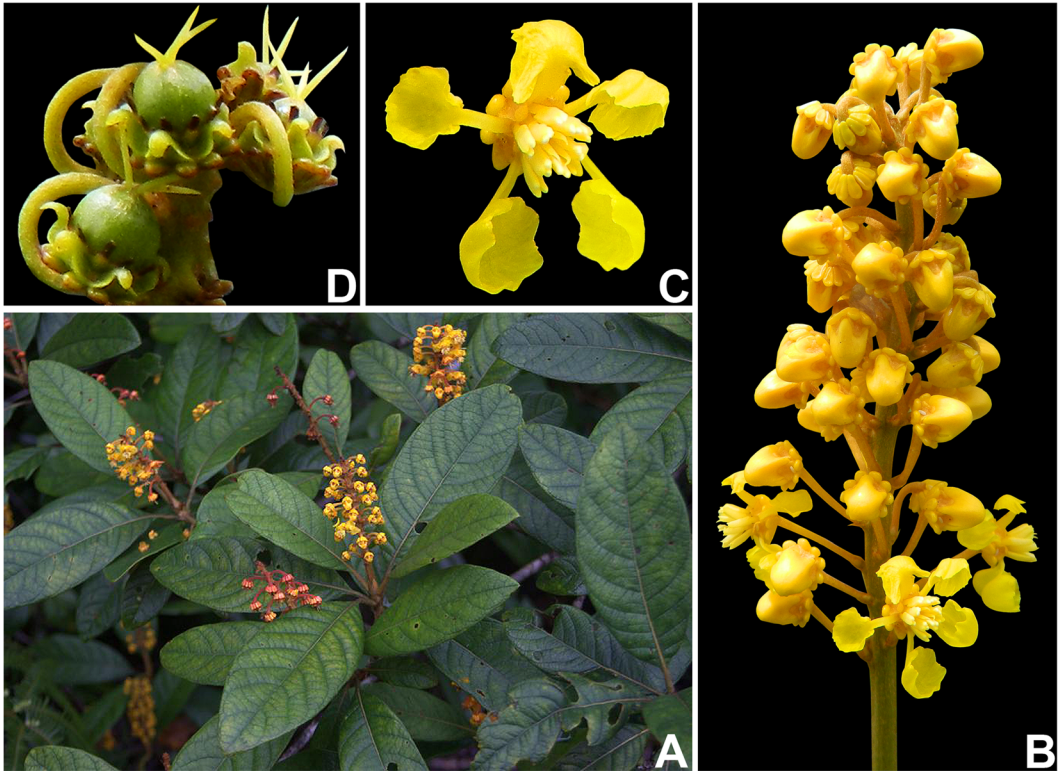


FIG. 6. Field photographs of *Byrsonima stipulacea*. A. Habit. B. Inflorescence. C. Flower in anthesis. D. Immature fruits. (Photographs: A, by O. Gaubert; B–D, by M. Pastore).

Key to the Species of the *B. stipulacea* Species Complex in Eastern Brazil

1. Stipules < 6 mm long, usually persistent; leaf blades, inflorescence and sepals covered in shortly-stalked T-shaped hairs; floral peduncles 0–1 mm long; stamens with connectives 2–2.7 mm long, acute to acuminate at apex; fruits 8–9 mm in diameter. *B. fanshawei*
1. Stipules > 7 mm long, usually deciduous; leaf blades, inflorescence and sepals covered in long-stalked stellate hairs; floral peduncles inconspicuous; stamens with connectives 2.80–2.99 mm long, acute at apex; fruits 9–18 mm in diameter. *B. stipulacea*

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