



***Miconia gigantea*, a long-forgotten endemic and endangered species of Melastomataceae in the Brazilian Atlantic Forest**

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ABSTRACT

Taxonomic and floristic studies in the state of Rio de Janeiro allowed the rediscovery of *Miconia gigantea*, an endemic species to the Atlantic Forest, until recently known only from the type specimen, collected over 100 years by A.F.M. Glaziou. We present an amended and detailed description of *M. gigantea*, providing characteristics of the flowers, fruits and seeds, in addition to illustrations, comments about taxonomic affinities with closely related species, the presently known distribution together with new occurrence records, and the conservation status.

Key words: conservation, endemism, *Glossocentrum*, Miconieae, Rio de Janeiro.

INTRODUCTION

In the Brazilian flora, Melastomataceae are the sixth-richest family of angiosperms, with 1,360 species, and the fifth-richest family in terms of endemism, with 408 species that are found only in the Atlantic Forest (Forzza et al. 2010, Baumgratz et al. 2015a).

Miconia Ruiz & Pav. is the genus with the greatest number of species in Brazil, represented by 281 species, of which 76 are endemic to the Atlantic Forest (Goldenberg and Caddah 2015). The genus has a wide morphological diversity, and has not been revised since the monographs of Cogniaux (1886-1888, 1891), with several taxa circum-

scribed by inconsistent morphological characteristics (Goldenberg et al. 2013).

Miconia gigantea Cogniaux is one of the 26 species which are endemic of the Atlantic Forest in the state of Rio de Janeiro. Although there are several floristic and taxonomic studies on the family Melastomataceae in this state, no record of this species is mentioned (Baumgratz 1980, 1982, 1984, 1996, 1997a, b, Baumgratz et al. 2006, Silva et al. 2013, Silva-Gonçalves et al. 2014). The few floristic studies conducted in the region where the type specimen was collected (municipality of Angra dos Reis) did not mention the occurrence of the species (Callado et al. 2009, C.Y.G. Manão, unpublished data). However, L.P.G. Rosa (unpublished data) conducted a floristic and phytosociological study of the Montane Atlantic

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Forest in the Ilha Grande State Park, from the same municipality, and listed *M. gigantea* as a doubtful species, because the material found was sterile. Cogniaux (1891) described *M. gigantea* as doubtful (*species incertae sedis*), and based on a single, sterile collection (Glaziou 17548). Recent surveys and floristic studies have recognized this species as endemic to the Atlantic Forest and to the flora of the state of Rio de Janeiro (Stehmann et al. 2009, Forzza et al. 2010, Goldenberg et al. 2013, The Plant List 2013, Baumgratz et al. 2015b, Goldenberg and Caddah 2015).

Fieldwork has led to the rediscovery of *Miconia gigantea* in the municipality where the type was collected, and in nearby poorly known or previously unvisited areas. Several individuals of *M. gigantea* were found in areas with the same type of physiognomy and altitudes, with vegetative characteristics consistent with those described in the original paper (Cogniaux 1891), and matching the type specimens. Furthermore, specimens collected with flowers and fruits have now made it possible to confirm the distinctiveness of this species. We present an amended and detailed description of *M. gigantea*, providing morphological characteristics of the flowers, fruits and seeds, in addition to illustrations, comments on taxonomic affinities with closely related species, the presently known distribution, with new occurrence records, and the conservation status.

MATERIALS AND METHODS

We reviewed the literature, mainly of the genus *Miconia* (Cogniaux 1886-1888, 1891, Baumgratz 1980, 1982, 1984), in addition to Brazilian flora checklists (Baumgratz et al. 2015b, Goldenberg and Caddah 2015). Herbaria data bases with species records and images available digitally (Index Herbariorum 2015, SpeciesLink 2015) were also accessed.

Samples were collected on expeditions to the Conservation Units of the state of Rio de Janeiro.

Five samples of each individual in reproductive and/or vegetative state was collected according to the usual procedures of taxonomic studies proposed by Guedes-Bruni et al. (2002). Reproductive structures were fixed in 70% ethanol for morphological studies and illustration. Habitat, ecological aspects of the populations, details of vegetative and reproductive characteristics and phenological data were record in the field, in addition to photographs. Vouchers were deposited at HRJ and RB (acronyms according to Thiers 2013).

The description was prepared through detailed analysis of vegetative and reproductive structures of the specimens collected and samples of herbarium BR, F, HRJ, K, P, R, RB and RBR, including types. For the species description we used concepts and terminology proposed by Radford et al. (1974) and Baumgratz (1985). Abbreviations of author names follow Brummitt and Powell (1992).

Information about geographic distribution of the species was obtained from the herbarium specimens and original description. The distribution map was drawn using the ArcGis ArcMap, version 10.3, program. We adopted the vegetation classification according to Veloso et al. (1991). The degree of threat was assessed using the IUCN criteria (2014).

TAXONOMIC TREATMENT

Miconia gigantea Cogniaux in Candolle & Candolle, Monogr. Phan. 7: 937 (1891). *Acinodendron giganteum* (Cogn.) Kuntze, Rev. Gen. Pl. 2: 951 (1891).

Type: BRAZIL. “in Brasiliae prov. Rio de Janeiro, à Angra”, 27 March 1889, *A.F.M. Glaziou 17548* (holotype BR! (barcode 522791); isotypes BR!, K!, P!; photo in F!), *emend.* Figures 1 and 2.

AMENDED DESCRIPTION

Trees 7–18 m; indumentum of the branches, petioles, adaxial surface of young leaves, inflorescences, abaxial surfaces of bracts and bracteoles, hypan-

thium, calyx and fruits brownish to pale-brownish, densely stellate-lepidote, trichomes with a dark-brown center with very short rays, mixed with furfuraceous-stellate trichomes. Young branches flattened, slightly sulcate, adult branches becoming tetragonal, striate, glabrescent; nodes with evident interpetiolar linear protrusions. Leaves with petioles 3–13.5 cm long, striate, glabrescent; blade (11.5–) 15–46.5 (–55) × (–6) 10–34 (–40) cm, discolorous, adaxial surface green, abaxial surface grey-brownish to pale-brownish, chartaceous to subcoriaceous, elliptic, broadly elliptic, ovate or broadly ovate, sometimes oblong, base rounded to subcordate, sometimes broadly obtuse, apex obtuse to acuminate, margin obscure-undulate, revolute; young leaves with adaxial surface early-glabrescent, abaxial surface densely and completely covered by indumentum, with the epidermal surface not exposed, trichomes usually persistent; venation acrodromous, suprabasal veins 5–7, (sometimes with an additional, inconspicuous inframarginal pair), inner pair 0.3–3.5 cm distant from the base. Inflorescence a panicle of glomerules 5.1–18 cm long, terminal, glabrescent; bracts 0.8–1 mm long, not involucreal, bracteoles 0.5–0.7 mm long, both caducous. Flowers 5-merous, sessile; hypanthium 3–3.5 × 2.5–3 mm, campanulate, slightly 10-costate, indumentum persistent; inner torus glabrous; calyx 0.8–1.1 mm long, light green, apparently truncate, lobes inconspicuously denticulate, thick, revolute in young fruit, caducous; petals 3–4 × 2–2.7 mm, white, reflexed, obovate, apex asymmetric and emarginate; stamens subequal in size and shape, anthers 2.5–3 × 0.4–0.6 mm, oblong, thecae light yellow, slightly undulate, base truncate, apex oblique-truncate, pore apical-ventral, connective white, not prolonged below the thecae, dorsally appendaged, stamens antesealous with filaments 3–3.5 mm long, appendage sheath-like, truncate, stamens antepetalous with filaments 3–3.2 mm long, appendage minute acute or truncate calcar, rarely similar to a sheath, truncate; ova-

ry 1.2–1.5 × 1–1.3 mm, semi-inferior, 3–4-locular, glabrous; style 6–6.5 mm long, white, cylindrical, slightly curved, glabrous, stigma truncate. Fruits *baccaceous*, 2.5–4 × 3–5 mm, purple-black when mature, oblate, later-glabrescent; seeds 1.5–3 × 2.2–5 mm, 5–10, obovate, obtriangular to plane convex, raphe expanded on the ventral side, testa yellow-brownish, smooth.

Specimens examined: BRAZIL. **Rio de Janeiro. Angra dos Reis:** Ariró, Toca da Onça, 27 March 1889, ster., *A.F.M. Glaziou s.n.* (P 05319109); Ilha Grande, Parque Estadual da Ilha Grande, Unidade Amostrual Cabituba, 5 December 1991, fr., *A.T. Silva et al. s.n.* (RBR 32977); Ilha Grande, Parque Estadual da Ilha Grande, Morro das Andorinhas, 505 m, 23°10'34.8" S 044°12'48.3" W, 15 September 2012, bud, *L.P.G. Rosa s.n.* (HRJ 12627); Ilha Grande, Parque Estadual da Ilha Grande, Pedra D'Água, 554 m, 23°08'06.1" S 044°12'07.4" W, 15 August 2013, bud, *L.P.G. Rosa & M.F. Castilho 03* (HRJ); Ilha Grande, Parque Estadual da Ilha Grande, Pedra D'Água, 557 m, 23°08'09.4" S 044°12'24.2" W, 15 August 2013, ster., *L.P.G. Rosa & M.F. Castilho 05* (HRJ); Ilha Grande, Parque Estadual da Ilha Grande, Trilha do Poço dos soldados, 447 m, 12 December 2014, ster., *K.C. Silva et al. 483* (HRJ); **Mangaratiba:** RPPN Rio das Pedras, trilha para o Corisco, 750 m, 23 September 2009, ster., *J.F.A. Baumgratz et al. s.n.* (RB 613550). **Paraty:** Cunha, Parque Nacional da Serra da Bocaina, estrada para a Cachoeira das Sete Quedas, 440–560 m, 23°11' S 44°46' W, 28 November 2014, ster., *J.F.A. Baumgratz 1398, 1399, 1400* (RB); **Rio Claro:** Distrito de Lídice, Parque Estadual do Cunhambebe, 635 m, 22°53'07" S 44°14'7" W, 7 August 2013, fr., *J.F.A. Baumgratz et al. 1306* (RB); Distrito de Lídice, Parque Estadual do Cunhambebe, 772 m, 22°53'7" S 44°12'57" W, 8 August 2013, fr., *J.F.A. Baumgratz et al. 1311* (RB); Lídice, 597 m, 22°52'42" S 44°12'58" W, 8 August 2013, fl., *J.F.A. Baumgratz et al. 1312* (RB).

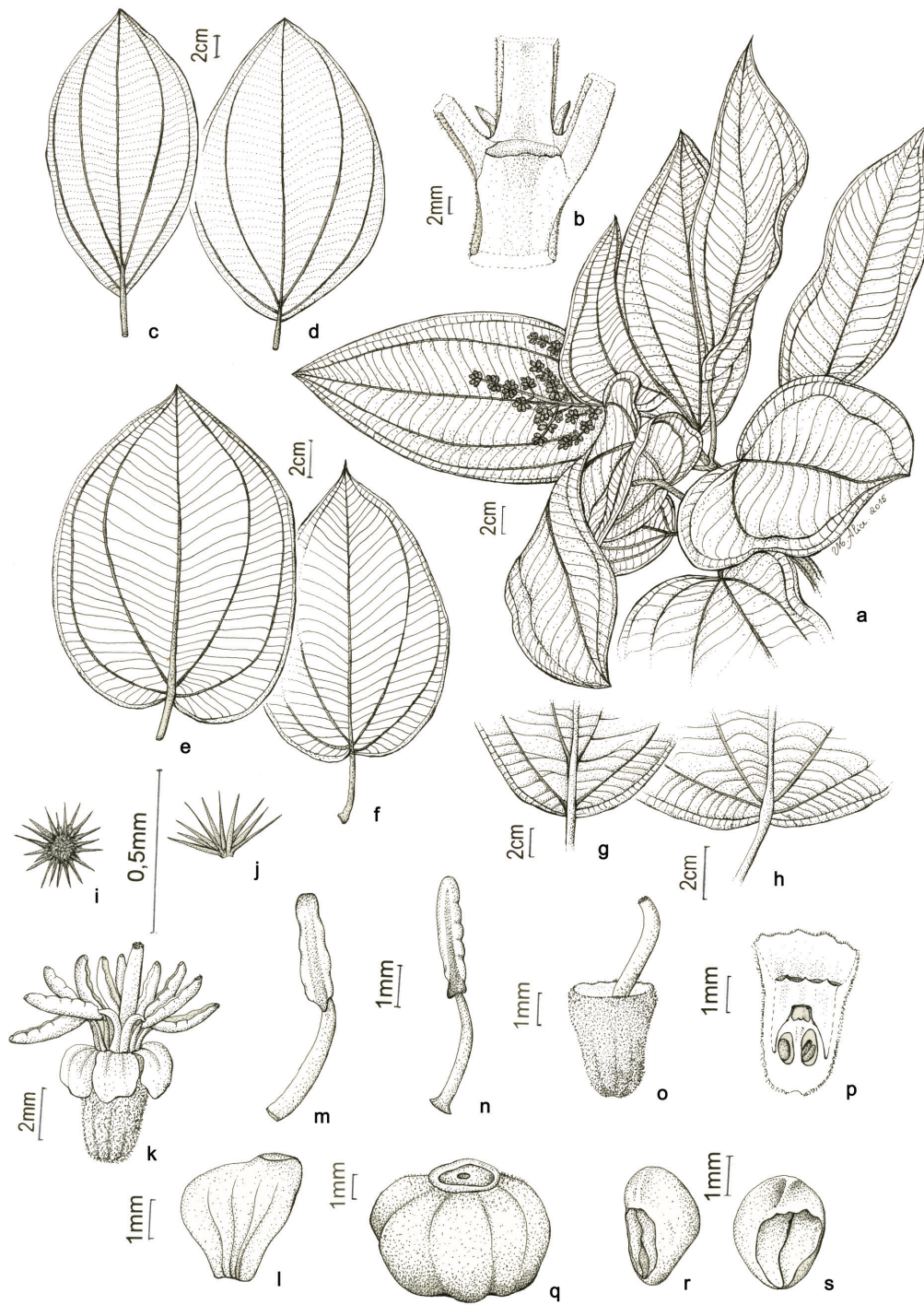


Figure 1 - *Miconia gigantea* Cogn. **a.** floriferous branch. **b.** branch node highlighting the interpetiolar linear bulge. **c-f.** morphological variation of the leaves. **g-h.** variation in the position of the acrodromous veins on the abaxial surface of the leaf base. **i-j.** trichomes of the indumentum: stellate-lepidote (I) and furfuraceous-stellate (J). **k.** flower. **l.** petal. **m-n.** antepetalous and antesepalous stamens, respectively. **o.** hypanthium and style. **p.** longitudinal section of the hypanthium, calyx and ovary. **q.** mature fruit. **r-s.** seeds (a-d, i-s. Baumgratz 1306, e-h. Baumgratz s.n. (RB 613550)).

Etymology: The epithet “*gigantea*” refers to the large size of the trees, described on the labels of type individuals (BR and P) by A.F.M. Glaziou as “très grand arbre”.

Phenology: The specimens were collected with flowers in August and September, and with fruits in August, September and December.

Distribution and Habitat: *Miconia gigantea* was found predominantly in remnants of Dense Montane Ombrophilous Forest, and more occasionally in Submontane formations, in areas of the municipalities of Angra dos Reis, Mangaratiba, Paraty and Rio Claro, in the state of Rio de Janeiro (Fig. 3). It occurs aggregated or sparsely distributed within and on the slopes of preserved humid forests, in addition to treeless areas, ranging from 400–800 m elevation (Fig. 2a, b). Most individuals collected are large, with stem circumferences up to 1.14 m.

Conservation status: *Miconia gigantea* is endemic to the state of Rio de Janeiro, thus far known only from montane and submontane Atlantic Forest in four contiguous municipalities in the southern part of the state, including an insular remnant (Ilha Grande). It has an EOO of 1,333,79 km² and AOO of 44 km², and is subject to four situations of threat. The fragmentation of vegetation due to grazing areas and/or expansion of urban and rural areas has led to a continuing decline of the EOO, AOO and habitat quality. Although this species occurs in four Conservation Units (Ilha Grande State Park, Cunhambebe State Park, Serra da Bocaina National Park, and Rio das Pedras Private Natural Heritage Reserve (RPPN)), there is no guarantee of the viability of subpopulations since they are represented by only a small number of individuals, except in Cunhambebe State Park, where there are more than 80 trees. Based on our current knowledge, the values of EOO and AOO, and IUCN (2014) criteria, the species is assigned a conservation status of Endangered [EN B1ab (i,ii,iii) + B2ab (i,ii,iii)].

Taxonomic relationships: The position of *Miconia gigantea* in Cogniaux’s classification

(1886-1888; 1891) for the genus is very doubtful, due to inconsistencies in the circumscriptions of the sections and series. The tentative nature of this classification is also apparent in the results of recent phylogenetic analyses that showed these taxonomic categories of *Miconia* as non-monophyletic (Michelangeli et al. 2004, Goldenberg et al. 2008). Recently, Goldenberg et al. (2013) noted the possibility that *M. gigantea* belongs to the section *Glossocentrum*, probably due to the morphological similarity with *Miconia cabucu* Hoehne. Based on the anthers that are short, oblong, and with the apex obliquely truncated and the connective sometimes with a dorsal calcar, *M. gigantea* can be placed in this section. It is very close to *M. cabucu*, and Goldenberg and Reginato (2007) pointed out that the two may be a single taxon. However, *M. cabucu* can be distinguished, mainly, by the generally smaller leaves, and the anthers with an attenuated base and the connective with ventral appendage. In addition, so far there is no record of the latter for the flora of the state of Rio de Janeiro, based on the checklists of Baumgratz et al. (2015b) and Goldenberg and Caddah (2015).

Within section *Glossocentrum*, *Miconia gigantea* also shows similarities to two species that are endemic to the state of Rio de Janeiro, *M. saldanhae* Cogniaux and *M. oblongifolia* Cogniaux, in having leaves with 5 acrodromous veins distinctly suprabasal, the abaxial surface rufous, densely covered with stellate trichomes, and pentamerous flowers, with the lobes of the calyx much smaller than the tube. However, *M. saldanhae* is distinguished by the leaves with shorter petioles (1-2 cm long), base often attenuate, calyx clearly with 4-5 lobes, and the ovary distinctly pilose. *Miconia oblongifolia* differs from *M. gigantea* in having leaves with shorter petioles (2-3 cm long), shorter petals (ca. 2 mm long), and unappendaged stamens. Two other species of *Glossocentrum* section that occur in southeastern Brazil have morphological similarities to *Miconia gigantea*. *Miconia*

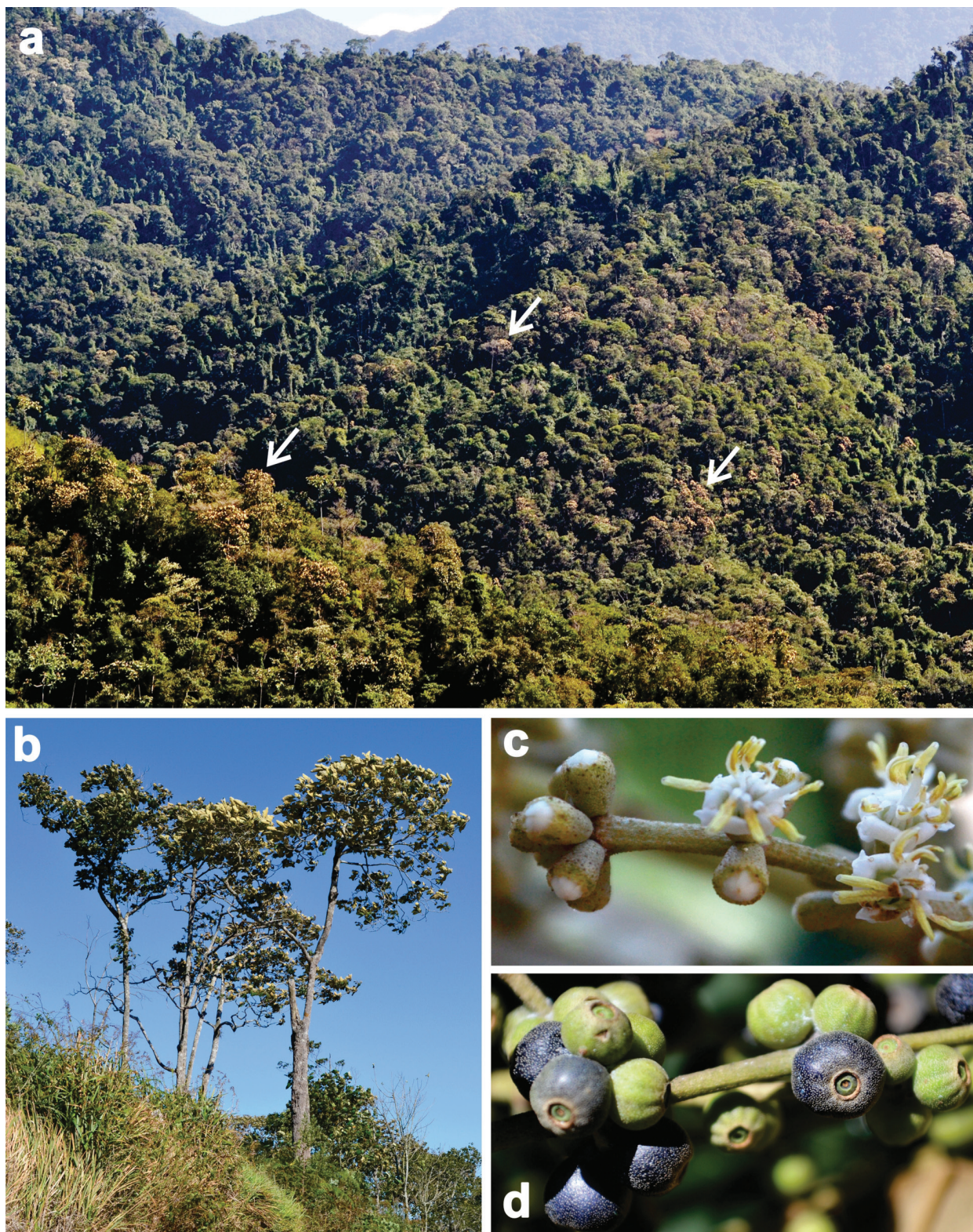


Figure 2 - **a.** individuals of *Miconia gigantea* Cogn. (arrows) in Dense Ombrophilous Forest of the Cunhambebe State Park, Rio de Janeiro, Brazil, which are distinguished by the color of the adaxial surface of the leaves. **b.** remnant individuals of *M. gigantea* in a pasture area. **c.** detail of buds and flowers. **d.** details of young (green) and mature (purple-black) fruits.

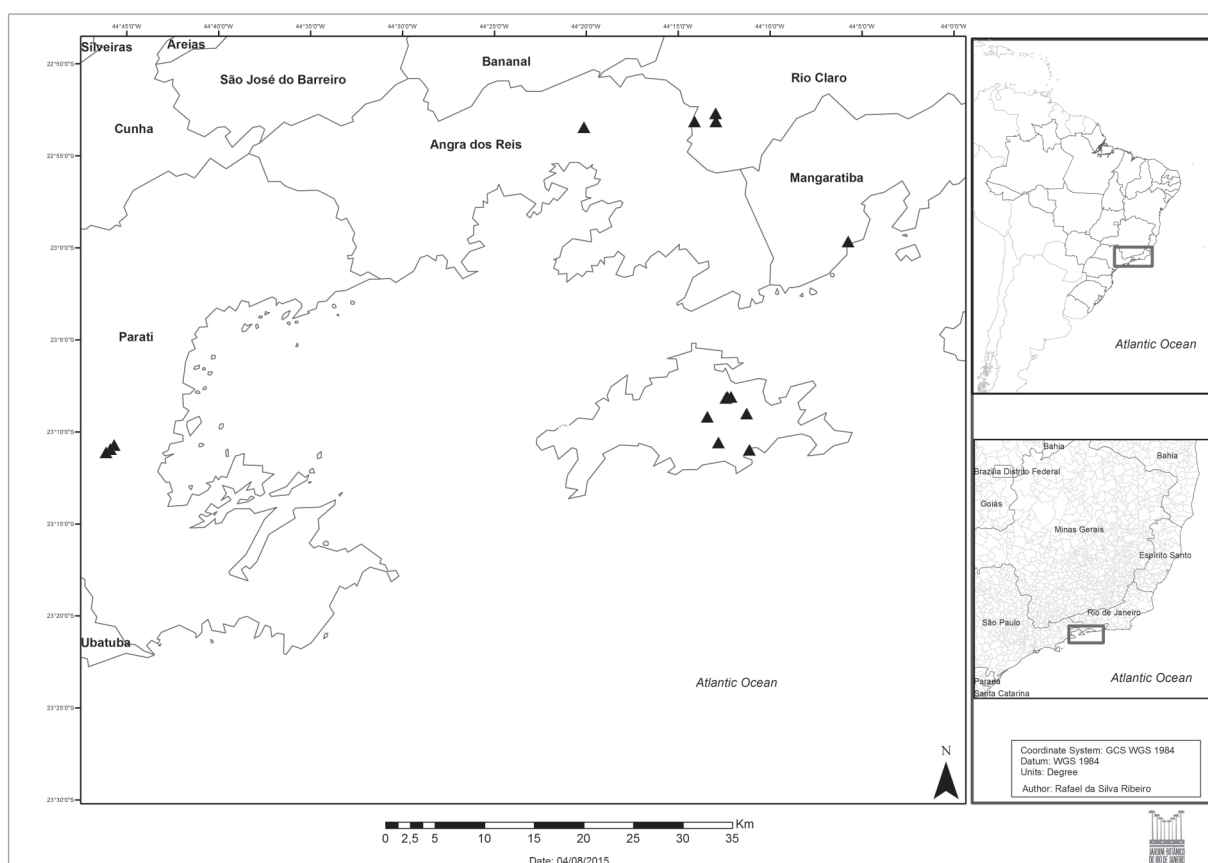


Figure 3 - Distribution map of *Miconia gigantea* Cogn., endemic to Rio de Janeiro, southeastern Brazil, with the localities of the occurrence the specimens.

shepherdii R. Goldenb. & Reginato resembles *M. gigantea* by the size of the tree, morphology of the leaves, and nodes of the branches with interpetiolar linear protrusions, as also noted by these authors. However, *M. shepherdii* is distinguished mainly by the indumentum of dendritic trichomes, leaves with denticulate margin, and tetramerous flowers, with unappendaged stamens. *Miconia gigantea* can also be said to resemble *M. formosa* Cogn., by the tree habit, indumentum stellate-lepidote, and discoloured leaves, but the latter is distinguished by leaves that are smaller, narrow-elliptic to elliptic, with bases cuneate to acute, apices short to long-acuminate (or abrupt cuspidate) and acrodromous veins clearly (1-3 cm long) suprabasal.

In Dense Ombrophilous Forest formations in the state of Rio de Janeiro, the main morphological

features of *Miconia gigantea* that make it possible to identify it in the field, including in the canopy, are: the leaves generally large in length and width, which can reach to 55×40 cm, discoloured, with the adaxial surface green, and the abaxial surface grey-brownish to pale-brownish, and the indumentum completely covering the abaxial surface (Fig. 1a, b). In these characteristics, *M. gigantea* can resemble *M. formosa*, *M. hypoleuca* Triana, *M. ovalifolia* Cogniaux and *M. shepherdii*, but the vegetative and reproductive characteristics can distinguish them from each other: *Miconia hypoleuca* by the lanate indumentum, leaves with higher order venation forming a fine, well-defined reticulum and mature orange fruits; *M. ovalifolia* by the tomentose-stellate indumentum; and *M. formosa* and *M. shepherdii* by the characteristics previously mentioned.

Moreover, *M. gigantea* can also be placed in *Miconia* series *Glomeratiflorae* (Cogniaux 1886-1888, 1891), based on the inflorescences in panicles with no spiciform branches, and flowers arranged in glomerules, with short oblong anthers, 1-porose, and the connective appendage slightly 2-lobed. In this series it is related to *M. crassipes* Triana, *M. organensis* Gardner and *M. ovata* Cogniaux, by having leaves with the abaxial surface brownish, completely covered by the lepidostellate indumentum. *Miconia organensis* differs in its unappendaged stamens and pilose ovary; *M. ovata* in its crenulated-denticulate leaf-margins and persistent calyx; and *M. crassipes* in having leaves with auriculate-cordate base and slightly denticulate margin, and in the shorter length of the petiole, in addition to being endemic to Peru.

M.K. Caddah (unpublished data) while carrying out taxonomic studies in *Miconia* sect. *Discolor* subsect. *Discolor* Caddah & R. Goldenb., proposed the synonymization of *M. gigantea*, *M. cabucu* and *M. ovalifolia* with *M. formosa*. However, based on our previous reviews and by the fact that the author analyzed only the material type and sterile of *M. gigantea*, we do not agree with this proposition. These species are morphologically closely related, and we believe that population genetics research associated with phylogenetic studies may improve the understanding of the relationships between them.

Notes: Advancing knowledge of the diversity of *Miconia* in the Brazilian Atlantic Forest is still a challenge, because the numerous species present in this domain, the lack of taxonomic revision, species poorly known or represented by few specimens or only the type specimen, and unidentified specimens in herbaria collections. Furthermore, nomenclatural problems still persist, and the classification of the genus is complex. Recent phylogenetic studies for the tribe Miconieae show *Miconia* as a polyphyletic genera. *Miconia gigantea* is a good example of this, because until very recently existing trees were unknown, as well as a fertile specimen collected

in the nineties, and the taxon was described based only on a sterile specimen.

CONCLUSIONS

The rediscovery of *Miconia gigantea* has allowed us to present an amended description for the species, describing for the first time the flowers and fruits, and to increase the knowledge of vegetative characteristics. It also provides fertile specimens in herbaria, reveals new areas of occurrence for the species and highlights *M. gigantea* for the first time as an Endangered Brazilian species. The control of threats in the areas of occupancy and monitoring of the species are necessary in order to ensure the maintenance of *M. gigantea* in nature. Thus, the rediscovery of Brazilian species of Melastomataceae can provide valuable information about the Brazilian flora, increasing morphological and ecological knowledge of the taxonomic diversity of the family, and assist in the solution of taxonomic problems.

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RESUMO

Estudos taxonômicos e florísticos no estado do Rio de Janeiro permitiram a redescoberta de *Miconia*

gigantea, uma espécie endêmica da Floresta Atlântica, até recentemente conhecida apenas pelo espécime tipo, coletado há mais de 100 anos por A.F.M. Glaziou. Apresentamos uma descrição emendada e detalhada de *M. gigantea*, fornecendo características das flores, frutos e sementes, além de ilustrações, comentários sobre afinidades taxonômicas com espécies estreitamente relacionadas, a distribuição atualmente conhecida juntamente com novos registros de ocorrência, e o estado de conservação.

Palavras-chave: conservação, endemismo, *Glossocentrum*, Miconiae, Rio de Janeiro.

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