



Original Paper

Quararibea bovinii (Malvaceae), a new species from the Brazilian Atlantic Forest

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Abstract

In the present study, I propose a new species, *Quararibea bovinii*, an Atlantic Forest tree. The new taxon occurs in southeastern Brazil, in the states of Espírito Santo, Rio de Janeiro, and São Paulo. It resembles *Q. similis* in terms of floral morphology and fruit shape, but it is distinguished by the indumentum of leaves, leaf width, and seed shape.

Key words: bifurcated trichome, conservation, domatia, Matisieae, taxonomy.

Resumo

Quararibea bovinii é proposta como uma nova espécie para a Mata Atlântica. Sua distribuição é restrita ao sudeste do Brasil, ocorrendo nos estados do Espírito Santo, Rio de Janeiro e São Paulo. É semelhante a *Q. similis* em relação à morfologia das flores e forma dos frutos, mas se distingue pelo indumento das folhas, a largura das folhas e a forma das sementes.

Palavras-chave: tricoma bifurcado, conservação, domácia, Matisieae, taxonomia.

Introduction

Quararibea Aublet (1775: 692) is a genus of Malvaceae comprising at least 44 species broadly distributed in the Neotropics from Mexico to Brazil and Bolivia (Pittier 1945; Alverson 1986; Fernandez-Alonso 1999, 2001a, b, 2002; Zamora *et al.* 2017; Cascante-Marín *et al.* 2018; Ferreira *et al.* 2018). This genus is characterized by small to medium-sized trees with simple leaves, flowers ranging from 2 to 23.5 cm in length, half-inferior ovaries, staminal tubes that are slightly lobed apically, anthers with completely fused filaments, and fleshy indehiscent drupes (Pittier 1945; Alverson 1986, 1989; Bayer & Kubitzki 2003; Ferreira *et al.* 2018).

The analyzes by Alverson *et al.* (1999) and Baum *et al.* (2004) support the positioning of *Quararibea* in the Matisieae clade, together with two other genera, *Phragmothecha* Cuatr. and *Matisia* Humb. & Bonpl. These molecular phylogenies place tribe Matisieae in subfamily Malvoideae, which is plausible because of their highly fused

staminal filaments, monothebate anthers, tubular calyces, and apparently simple leaves, however none of which are a unique synapomorphy of Malvoideae (Alverson *et al.* 1999).

In Brazil, there are eleven species recorded in northern, northeastern, midwestern, and southeastern regions of the country (Flora do Brasil 2020; Ferreira *et al.* 2018). According to Ferreira & Bovini (2020), there are five *Quararibea* species in the southeastern Brazilian Atlantic Forest: *Q. angustifolia* (Martius 1839: 17) C.D.M. Ferreira & Bovini (2018: 1013), *Q. bragae* C.D.M. Ferreira & Bovini (2020: 225), *Q. penduliflora* (Saint-Hilaire 1825: 269) Schumann (1886: 241), *Q. similis* C.D.M. Ferreira & Bovini (2018: 1016), and *Q. turbinata* (Swartz 1788: 102) Poiret (1816: 636).

After a careful revision of specimens from Brazilian herbaria and collections of specimens *in situ*, I observed differences in the morphology of the specimens from the states of Espírito Santo, Rio de Janeiro, and São Paulo, recognized here as *Q. bovinii*.

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Materials and Methods

The present study involved bibliographic search and analysis of herbarium specimens, including BHCB, C, ESA, GUA, HB, K, MBML, R, RB, RBR, RFFP, SP, SPF, UEC, and VIES (acronyms follow Thiers, continuously updated), to obtain data about their geographic distribution and morphology. I also carried out field expeditions to the states of Espírito Santo, Rio de Janeiro, and São Paulo to update distribution, morphology, and habitat data. I deposited the specimens collected in the herbarium of the Rio de Janeiro Botanical Garden Research Institute (RB). I used leaf samples removed from vouchers RB159179 and RB338616 for scanning electron microscopy (SEM) analyses. All samples were fixed with carbon adhesive tape on stubs and coated with a thin gold layer of approximately 20 nm (Emitech K550X Sputter Coater) and observed under a scanning electron microscope (EVO 40, Zeiss) at a voltage of 15 kV. The description of trichome morphology followed Payne (1978) and Theobald *et al.* (1979), and for the domatia adopted the terminology of O'Dowd & Wilson (1989). Additionally, I determined the conservation status of this new species following IUCN guidelines (2019).

Results and Discussion

Quararibea bovinii C.D.M. Ferreira, *sp. nov.*

Figs. 1; 2

Similar to *Quararibea similis* C.D.M. Ferreira & Bovini, but differing in the width of the leaves [(3.8–)6.2–13.3(–16) × 4.1–7.2(–10)], the indumentum of the leaves, comprised of simple, bifurcate and fasciculate trichomes (*vs.* glabrous or fasciculate and/or dentate-lepidote trichomes), the presence of hair-tuft domatia (*vs.* the absence of domatia) and obovoid or rarely fusiform seeds (*vs.* fusiform to oblong).

Type: BRAZIL. RIO DE JANEIRO: Jacarepaguá, Parque Estadual da Pedra Branca, 22°56'17"S, 43°27'46"W, 518 m, 10.IV.2016, C.D.M. Ferreira & T.B.S. Patusco 288 (Holotype: RB!, Isotypes: CEPEC!, MG!, NY!).

Small trees 3–8 m tall. Young branches covered with fasciculate brownish trichomes. Petioles ca. 0.9–1.2(–1.6) cm long, densely covered with fasciculate brownish trichomes; stipules densely covered with dentate-lepidote trichomes. Leaves (8.5–)14.1–24.4(–32.1) × (3.8–)6.2–13.3(–16) cm., membranaceous,

usually asymmetric, obovate to elliptic, margins entire, apex acuminate, base usually rounded, sometimes subcordate, asymmetric; midvein of adaxial surface with simple, bifurcate and fasciculate hyaline trichomes, abaxial surface covered with simple, bifurcate and fasciculate hyaline trichomes and bearing hair-tuft domatia (rarely absent), which consist of simple, bifurcate and fasciculate trichomes in the axillary midveins. Flowers solitary, opposite the leaves, sometimes ramiflorous, erect; pedicels 0.6–1.2(–1.7) cm long, densely covered with dentate-lepidote, hyaline trichomes and micro-trichomes, bearing three triangular, marcescent bracteoles with obtuse apices, the bracteoles densely covered with dentate-lepidote, brownish micro-trichomes; calyces 0.6–1.2 × 0.4–0.5 cm, 2–5 lobate, the lobes triangular and cuneate-inflexed at their apices, densely covered with dentate-lepidote brownish trichomes and micro-trichomes; petals ca. 1.4 × 0.2 cm, narrowly spatulate, bearing fasciculate and dentate-lepidote, hyaline trichomes and micro-trichomes on both sides; staminal columns 0.9–1.7 cm long, 5-toothed at apex, covered with densely fasciculate, hyaline trichomes, glabrate; ovaries pilose, covered with stellate-porrect, hyaline trichomes; styles frequently exceeding the staminal columns by ca. 1 mm, covered with stellate-porrect, hyaline trichomes; stigmas capitate, white. Fruits turbinate, ca. 3.3 × 0.6–1.6 cm, 1–2 seeded, the apices covered by dentate-lepidote micro-trichomes, the bases acute and surrounded by the accrescent calyces; seeds plano-convex or rounded, obovoid, rarely fusiform, ca. 1.2 × 0.5–0.8 cm.

Selected examined material: BRAZIL. ESPÍRITO SANTO: Atilio Vivacqua, Moitão, 19.I.2008, fl. and fr., *L. Kollmann et al. 10329* (MBML, RB). RIO DE JANEIRO: Angra dos Reis, Parque Estadual de Cunhambebe, 16.III.2013, fl., *A.A.M. de Barros et al. 4848* (RFFP). Casimiro de Abreu, Reserva Biológica União, 7.IV.2012, fl., *E.A. Ribeiro 286* (RFFP). Caxias, Reserva da Petrobras, 22°33'S, 43°16'W, 6.V.1997, fl. and fr., *J.M.A. Braga et al. 4010* (RB). Magé, III° Distrito, Paraiso, Centro de Primatologia do RJ, 4.XII.1984, *G. Martinelli & S. Pessoa 10463* (RB). Mangaratiba, Rio das Pedras, 18.I.2001, fl., *M.G. Bovini et al. 1962* (RB). Paraty, Laranjeiras, APA-Cairuçu, 29.III.1995, fl., *L.C. Giordano et al. 1869* (RB). Petrópolis, estrada Rio-Petrópolis, XI.1938, fl., *H. Monteiro 1933* (RB). Rio das Ostras, Reserva Biológica União, 11.III.1999, fl., *P.P. Oliveira 903H* (BHCB). Rio de Janeiro, Parque Estadual da Pedra Branca, Jacarepaguá, 22°56'17"S, 43°27'46"W, 19.III.2016, fl., *C.D.M. Ferreira & P. Feliz 265* (RB); III.1872, fl., *A. Glaziou 2934* (C, K). SÃO PAULO: Iguape,

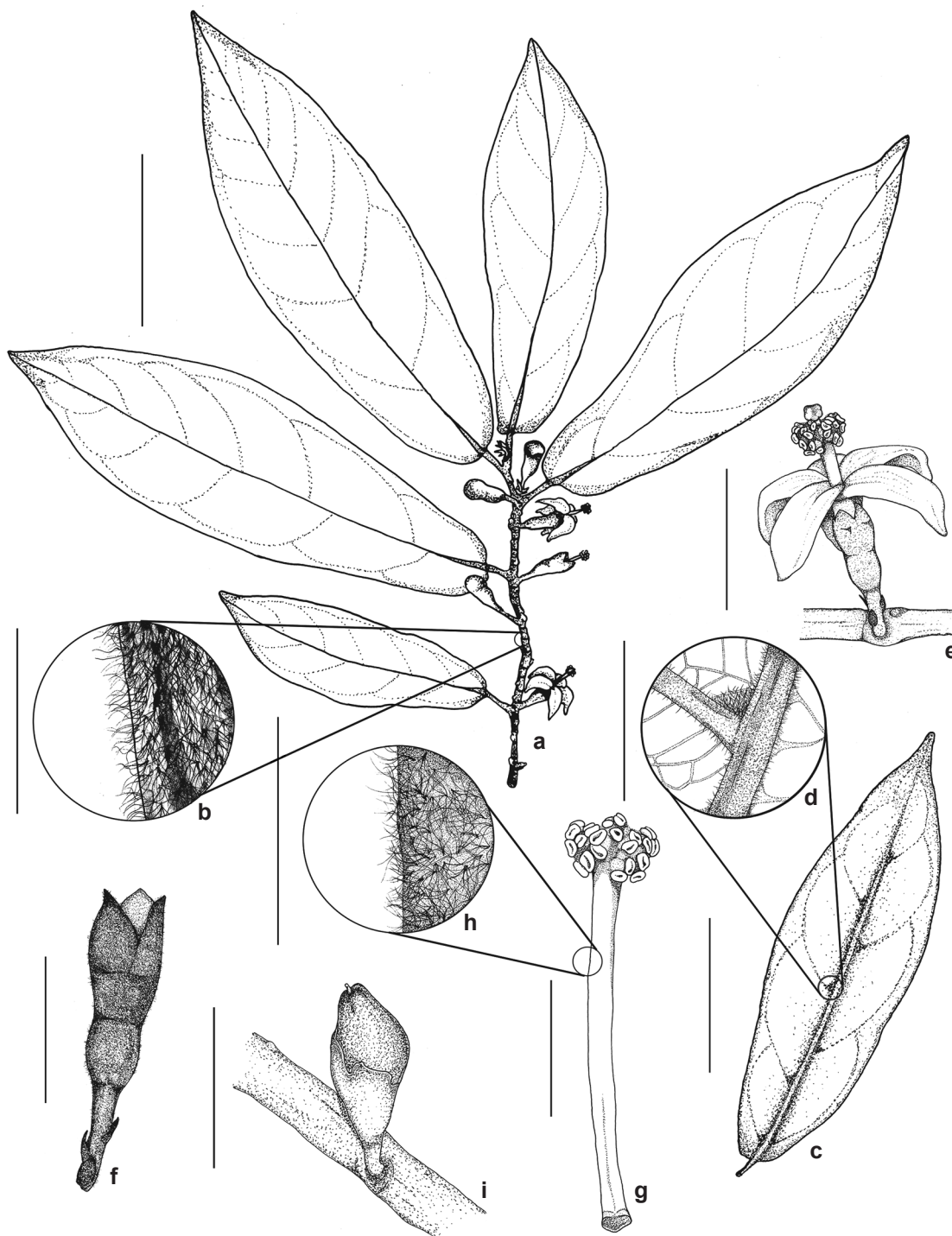


Figure 1 – a-i. *Quararibea bovinii* – a. floriferous branch; b. detail of branch indumentum; c. leaf (abaxial face); d. detail of hair-tuft domatia; e. flower; f. calyx; g. staminal column; h. detail of staminal column indumentum; i. immature fruit. Drawing by Thayane Patusco, based on C.D.M. Ferreira & T.B.S. Patusco 288 (a-d. dry material; e-i. fresh material). Scale bar: a, c = 5 cm; e, i = 2 cm; b, d, h = 1 mm; f, g = 5 mm.

Estação Ecológica Juréia-Itatins, Serra da Juréia, trilha do Imperador em direção à Praia da Juréia, 10.I.1995, fl., *A. Rapini et al. 15* (SP, SPSF). Peruíbe, Estação Ecológica Júreia-Itatins, Núcleo Guarau, 27.I.2000, fl., *I. Cordeiro et al. 2000* (SP). São Vicente, Parque Estadual Xixová-Japuí, 19.I.2001, fl., *J.A. Postore & C. Moura 935* (SP, SPSF). Ubatuba, Picinguaba, 26.III.1996, fl., *A. Takahasi 259* (SP).

Quararibea bovinii is characterized by membranaceous leaves with hair-tuft domatia composed of simple, bifurcate and fasciculate

trichomes on the abaxial surface between midribs and the secondary veins (Fig. 3). The presence of bifurcated trichomes and hair tuft domatia are considered diagnostic characteristics, allowing the identification of the taxa even when sterile, as none of the other species occurring in southeastern Brazil show them.

Quararibea bovinii occurs in the states of Espírito Santo, Rio de Janeiro, and São Paulo (Fig. 4), in shaded and humid habitats, predominantly



Figure 2 – a-c. *Quararibea bovinii* in the field – a. floriferous branch; b. flower, floral bud and immature fruit; c. mature fruit. Photos C.D.M. Ferreira.

in rainforest areas with second-growth vegetation. It is found on the coast, at low elevations, ranging from 50–700 m a.s.l. and forms an aggregate distribution pattern. This species occurs over a vast area of the Atlantic Forest, with EOO surpassing 30,000 km² and AOO surpassing 4,000 km². In addition, most populations occur within reserves, such as Área de Proteção Ambiental de Mangaratiba, Estação Ecológica de Juréia-Itatins, Parque Estadual da Pedra Branca, Parque

Estadual Cunhambebe, Parque Estadual dos Três Picos, Parque Estadual da Serra do Mar, Parque Estadual Xixová-Japuí, Reserva Biológica União, and Reserva da Petrobras. Therefore, in a formal assessment, *Q. bovinii* would most likely be considered a least concern species (LC) (IUCN 2019).

Quararibea bovinii flowers from November to May, showing nocturnal-crepuscular anthesis, and set fruits from May to September.

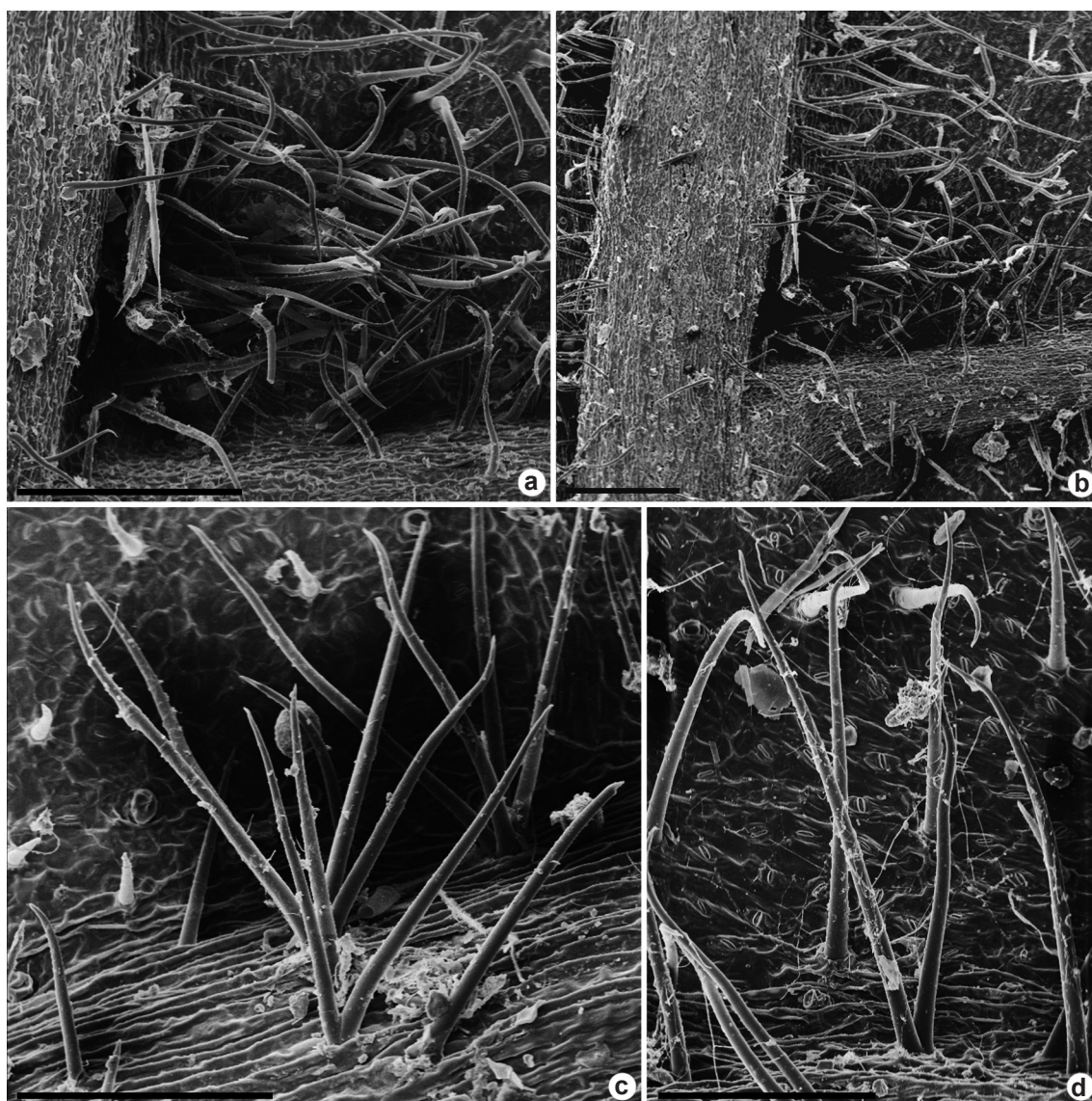


Figure 3 – a-d. Leaf (abaxial) surface of *Quararibea bovinii* – a, b. hair-tuft domatia; c, d. simple, bifurcate and fasciculated trichomes. Scale bar: a, b = 400 µm; c, d = 200 µm.

The epithet *bovini* was named in honor of Ph.D. Massimo Giuseppe Bovini, one of the most significant contributors to the studies of

Malvaceae in Brazil. He also collected part of the materials examined for the description of this new taxon.

Key to species of *Quararibea* from the Atlantic Forest of Brazil

1. Abaxial surface of leaves with pocket domatia with simple trichomes only; flowers pendant; fruits oblong to obovoid or subglobose 2
- 1'. Abaxial surface of leaves with hair-tuft domatia with simple, bifurcate and fasciculate trichomes, or domatia absent; flowers erect; fruits oval to elliptic or turbinate 4
 2. Leaves with fasciculate trichomes, abaxial surface with domatia in the primary, secondary, tertiary, and rarely in quaternary veins axils; staminal columns cylindrical-thoothered at apex, columns glabrous; fruits oblong to obovoid *Quararibea bragae*
 - 2'. Leaves with dentate-lepidote trichomes, rarely glabrous on the adaxial face, abaxial face with domatia only in primary veins; staminal columns cylindrical-undulate at apex, columns with dentate-lepidote trichomes; fruits subglobose 4
 3. Pedicels 0.4–1.1 cm long; calyces 1.1 × 0.5 cm; petals 1.4–1.7 × 0.3–0.4 cm; staminal columns ca. 1.8 cm long; fruits 2-seeded *Quararibea turbinata*
 - 3'. Pedicels (1.3–)2.5–3.6(–4.3) cm long; calyces 1.5–1.6 × 0.6–0.7 cm; petals ca. 2.9 × 0.5 cm; staminal columns 2.4–2.9 cm long; fruits 2–3-seeded *Quararibea penduliflora*
 4. Leaves lanceolate; pedicels ca. 0.6 cm long; fruits oval to elliptic
..... *Quararibea angustifolia*

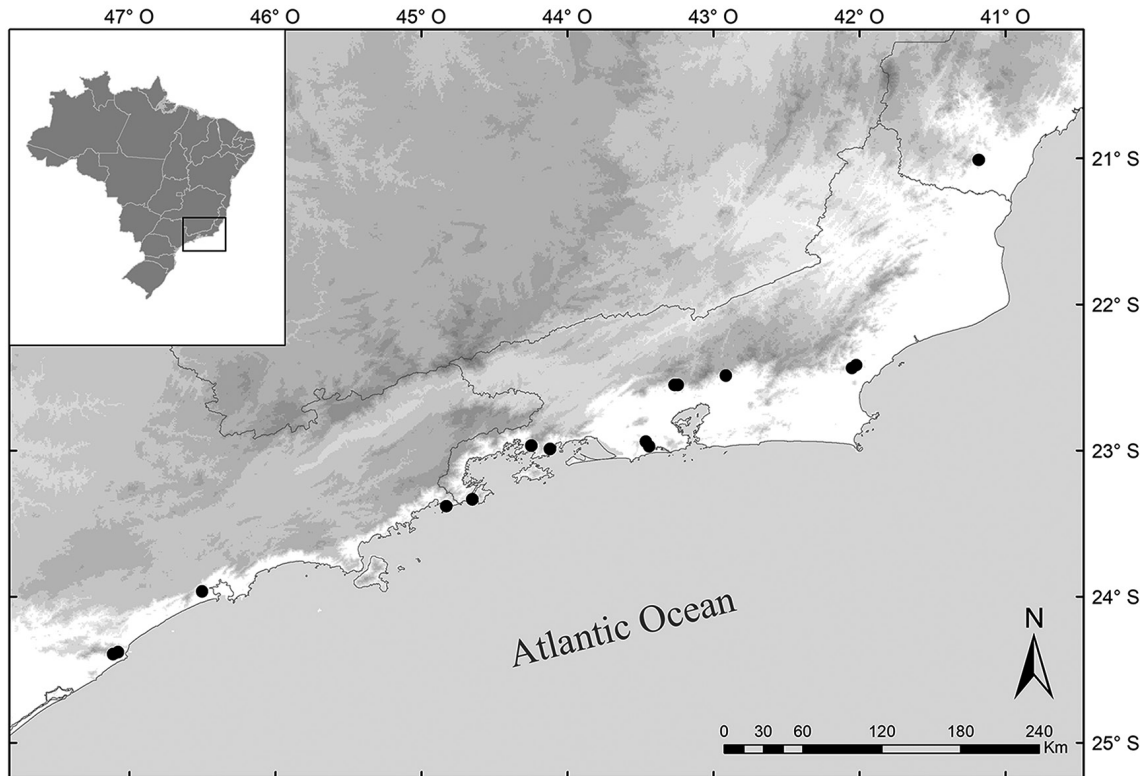


Figure 4 – Geographical distribution of *Quararibea bovini* (circle).

- 4⁷. Leaves elliptic to obovate; pedicels 0.6–1.9 cm long; fruits turbinate 4
5. Petioles with dentate-lepidote trichomes; adaxial surface of leaves with fasciculate and/or dentate-lepidote trichomes in the midvein, or glabrate, abaxial surface with dentate-lepidote trichomes in the primary and secondary veins, domatia absent *Quararibea similis*
- 5⁷. Petioles with fasciculate trichomes; adaxial surface of leaves with simple, bifurcate and fasciculate trichomes on the midvein, abaxial surface with simple, bifurcate and fasciculate trichomes, hair-tuft domatia present with simple, bifurcate and fasciculate trichomes *Quararibea bovinii*

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