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A new species of *Vriesea* Lindl. (Bromeliaceae) from the Atlantic Rainforest of São Paulo State, Brazil

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ABSTRACT – (A new species of *Vriesea* Lindl. (Bromeliaceae) from the Atlantic Rainforest of São Paulo State, Brazil). A new species of *Vriesea* Lindl. is described and illustrated. *Vriesea altobocainensis* is only known for the Atlantic Forest of Serra da Bocaina. It is a robust epiphyte, characterized by a reddish inflorescence, and floral and primary bracts with an orbicular and broadly ovate shape; morphologically, it is close to *Vriesea altodaserrae* L.B.Sm. and *Vriesea sceptrum* Mez. However, the new species can be distinguished from these others mainly for the color, dimensions and shape of floral and primary bracts, number of inflorescence branches and number of flowers per branch.

Keywords: epiphyte, serra da Bocaina, taxonomy, Tillandsioidae

RESUMO – (Uma nova espécie de *Vriesea* Lindl. (Bromeliaceae) da Mata Atlântica do Estado de São Paulo, Brasil) Uma nova espécie de *Vriesea* Lindl. é descrita e ilustrada. *Vriesea altobocainensis* é conhecida apenas para a Mata Atlântica da Serra da Bocaina. É uma epífita de porte robusto, caracterizada pela inflorescência avermelhada com brácteas primárias e florais de formato orbicular a largamente oval. Relaciona-se morfologicamente com *Vriesea altodaserrae* L.B.Sm. e *Vriesea sceptrum* Mez, das quais pode ser distinta principalmente pela coloração, dimensões e forma das brácteas florais e primárias, número de ramos da inflorescência e quantidade de flores por ramo.

Palavras-chave: epífita, serra da Bocaina, taxonomia, Tillandsioidae

Introduction

Vriesea Lindl. is included in the subfamily Tillandsioideae, which, based on phylogenetic and morphological studies, has gone through segregation, with the establishment of new genera (Barfuss *et al.* 2016). In this new circumscription, *Vriesea* is characterized mainly for the presence of a stigma of the convolute blade II type (with lobes ± fused, spreading, strongly broadened, infundibuliform to umbrella-shaped), petals usually bearing basal appendages (Barfuss *et al.* 2016). They are epiphytic plants, terrestrial or rupiculous, and are mainly distributed throughout South America, with one of the main diversity centres being the Brazilian Atlantic Forest (Costa *et al.* 2007). According to Forzza *et al.* (2015), *Vriesea* is the richest genus of Bromeliaceae in Brazil with almost 230 species (Gouda *et al*. cont. updated). It is also among the most diverse genera (ca. 170 spp.) within the Atlantic Rainforest domain (BFG 2018, Flora do Brasil 2020 under construction).

Serra da Bocaina is part of the Serra do Mar mountain range and is located along the boundaries of the States of São Paulo and Rio de Janeiro, in Southeastern Brazil. Serra da Bocaina is formed by large extensions of well-preserved Atlantic Rainforest, including several physiognomical formations like lowland forests, nebular forests and altitude fields. The diversity of physical attributes, such as the great topographical variation (rising from sea level to 2,088 m) with marked steep slopes and mountainous highlands, and the high pluvial rates (annual average of ca. 1,700 mm), have likely formed distinct niches and refuges, rendering high levels of biological diversity and endemism (IBAMA 2002, Freitas 2010).

During our collecting expeditions in Serra da Bocaina, a new species of *Vriesea* was identified. Here, we describe and illustrate this new species.

Material and Methods

The species description was based on herbarium and fresh material, which were collected during the field expeditions to Serra da Bocaina, in areas surrounding the Parque Nacional da Serra da Bocaina (Serra da Bocaina National Park), and deposited at SP Herbarium.

In order to complement the information and evaluate the morphological characters, samples of the new species and the two species morphologically closest to it were carefully analysed.

The measurement of the floral bracts was done in the structures of the middle of the inflorescence and additional information was obtained from specialized literature (Smith & Downs 1977, Reitz 1983, Costa *et al.* 2007, Rosa 2011, Flora do Brasil 2020 under construction), as well as the Brazilian virtual herbarium Herbário Virtual REFLORA (Reflora cont. updated) and *species*Link network.

Description of the new species and Discussion

Vriesea altobocainensis S.E. Martins & Wand., *sp. nov*. Type: **BRAZIL. São Paulo**: São José do Barreiro, Serra da Bocaina, estrada para a rampa da Asa Delta, Floresta Ombrófila Densa Alto-Montana (23K 0537064 7488814), 1.770 m.s.m., 01.X.2019, fl., fr., S.E. Martins 1214 & M.G.L. Wanderley. (Holotype SP)

Figures 1-3

Epiphytic plants. Leaf rosettes infundibuliform. Leaf-sheaths broadly elliptic, dark-brow, *leaf-blades linear-lanceolate, apex acute-attenuate, mucronate. Peduncle bracts imbricate, the lower ones green, foliaceous and suberect; the upper ones with dilated sheaths, orbicular, reddish, blades suberect to patent, lanceolate, green. Inflorescence compound, heterothetic double raceme; branches 10-21, patent with an ascending to slightly sigmoid apical portion, bearing (8-)10-20 flowers; primary bracts longer than the peduncles of branches but shorter than the branches, red; peduncle of branches with 1-2 sterile bracts; rachilla red, slightly geniculate, internodes short, ca.* 1 cm long.

Floral bracts red or red with a yellow apex, orbicular to broadly-ovate, apex obtuse, apiculate, carinate. Flowers distichous, suberect in anthesis; sepals yellow; petals yellow, slightly orangish at the apex, apex rounded, petal appendages 2, longitudinally adnate to the petal, with superior free portion *ovate or rhombic-ovate, apex rounded or obtuse, margins entire. Anthers included to slightly exserted; ovary cylindrical. Seeds with long funicles.*

Epiphytic plants, 0.8-1.7 m tall when flowering. Leaf rosettes infundibuliform. Leaf-sheaths 23 × 9-14 cm, broadly elliptic, dark-brown; leaf-blades 36-72 × 5.5-7.5 cm, linear-lanceolate, green with some darker and tenuous transversal stripes, apex acute-attenuate, mucronate. Peduncle 50-63 cm long, erect, green or reddish towards the apex; peduncle bracts imbricate, the lower ones green, foliaceous, suberect, with sheaths ca. 5 × 6.5 cm, broadly-ovate, blades ca. 40 × 5.5 cm, narrowly triangular, becoming smaller towards the apex, the upper ones with dilated sheaths, ca. 6 × 7 cm, orbicular, reddish, blades suberect to patent, ca. 10 × 3 cm, lanceolate, green, apex attenuate, mucronate. Inflorescence compound, heterothetic double raceme, erect, 35-100 cm long; branches 10-21, sometimes bracts with undeveloped branches at base and in the middle portion of the inflorescence, branches 13-30 cm long, usually patent with an ascending to slightly sigmoid apical portion, flowers (8-)10-20; primary bracts generally longer than the peduncles of branches but shorter than the branches, 4.5-12 × 6-8 cm, the lower ones distinctively bigger, similar to the bracts of the peduncle, with sheaths ca. 7 × 8 cm, reddish, dilated, blades 10 × 3 cm, lanceolate, green, patent, becoming smaller towards the apex, the upper ones shorter than the peduncle of the branches, ca. 4.5 × 6 cm, orbicular, red, apex mucronate, without blades; peduncle of branches 2-8.5 cm long, each one with a sterile bract, the lower branches with up to 2 sterile bracts, similar to the floral bracts, ca. 3.5 × 2.2-4 cm, carinate; rachilla red or reddish-green, slightly geniculate, internodes 0.8-1.1 cm long in the flowering branches and up to 2.2 cm long in the fruiting branches. Floral bracts 2.1-3.5 × 2-3 cm, orbicular to broadly-ovate, almost completely embracing the base of the rachilla, apex obtuse, apiculate, carinate, red, equaling the length of sepals or only those in the distal portion of the branch

red with a yellow apex and shorter than the sepals, suberect and imbricate before anthesis, subpatent and spaced after anthesis, exposing the rachilla. Flowers distichous, suberect in anthesis; sepals ca. 2.5 × 1 cm, narrowly ovate, yellow, apex acute, mucronate, not carinate; petals ca. 3.2-3.5 × 0.7 cm, ligulate, yellow, slightly orange at the apex, apex rounded, petal appendages 2, bilateral to the antepetalous filament, longitudinally adnate to the petal for ca. 4 mm, superior free portion ovate to rhombic-ovate, apex rounded or obtuse, margins entire; stamens ca. 2.8 cm long, three free in the outer verticil, and three of the inner verticil epipetalous, adnate ca. 0.4 cm, anthers ca. 0.5 cm long, linear; gynoecium 3-3.4 cm long, ovary cylindrical, axile placentation. Fruit a capsule, 3.5-4.5 × 1.4 cm; seeds ca. 1.7 cm long, funicle long, ca. 1 cm.

Paratypes: **BRAZIL. São Paulo**: São José do Barreiro, arredores do Parque Nacional da Bocaina, capão de mata próximo à pista de decolagem de voo-livre (22º42'21,0" S, 44º38'16,5" W), 1692 m.s.m., 15.X.2007, fl., L.M. Versieux & A.M. Calvente 449 (SP). São José do Barreiro, Serra da Bocaina, estrada para a rampa da Asa Delta. Floresta Ombrófila Densa Alto-Montana (23K 0537189 7488859), 1770 m.s.m., 03.XI.2016, fl., fr., M.G.L. Wanderley 3017, S.E. Martins & M. Leodegario (SP). São José do Barreiro, Serra da Bocaina, estrada para a rampa da Asa Delta, Floresta Ombrófila Densa Alto-Montana (23K 0537189 7488859), 1770 m.s.m., 03.XI.2016, fl., fr., M.G.L. Wanderley 3018, S.E. Martins & M. Leodegario (SP). São José do Barreiro, Serra da Bocaina, estrada para a rampa da Asa Delta, Floresta Ombrófila Densa Alto-Montana (23K 0537296 7489106), 1770 m.s.m., 30.IX.2019, fl., fr., S.E. Martins 1214 & M.G.L. Wanderley (SP).

Vriesea altobocainensis is a remarkable species from the Atlantic Forest of Serra da Bocaina. It is characterized by the robust habit, infundibuliform rosettes, inflorescences branches patent, with the apical portion of the branches ascending to slightly sigmoid [as documented in some species of *Alcantarea* (E. Morren ex Mez) Harms], red primary and floral bracts, and distichous flowers. Although this species is tipically an epiphyte, it can be found growing on the soil when falling from the forest canopy.

According to Costa *et al.* (2015), through the analysis of morphological characters, *Vriesea sceptrum* Mez and *Vriesea altodaserrae* L.B. Sm. belong to the same clade, along with basal lineages of *Vriesea* species. These species can be characterized by the compound inflorescences, with bracts longer than the peduncle of the branches, erect and linear to narrowly-oblong petals with apressed apices, and included stamens as detailed below.

Vriesea altobocainensis is morphologically similar to *V. sceptrum*, a species from the highlands of Serra da Mantiqueira, in the States of São Paulo, Minas Gerais and Rio de Janeiro. Both present a robust habit, inflorescences with patent branches, dense and distichous flowers, short internodes (0.7-1.5 cm long), and red primary bracts. *Vriesea altobocainensis* can be distinguished by a greater number of inflorescence branches (10-21) and flowers in the branches [(8-)10-20], orbicular to broadly-ovate upper primary bracts, 6-8 cm wide, red rachillas, orbicular to broadly-ovate floral bracts, 2-3 cm wide, obtuse at the apex, and yellow sepals. *Vriesea sceptrum* has a lower number of inflorescence branches (13-15) and flowers in the branches [5-9(-12)], triangular to ovate upper primary bracts, 2-5 cm wide, greenish-orange to orange rachillas, ovate floral bracts, 1.5-2.2 cm wide, acute to obtuse at the apex, and orange sepals (figure 3).

Vriesea altobocainensis can also related to *Vriesea altodaserrae*, a species that inhabits the Serra do Mar mountain range, from sea level to the highest lands of Paraná, Santa Catarina and São Paulo, occuring also in Serra da Bocaina. Both species co-occur, with *Vriesea altodaserrae* being very common in the region. *Vriesea altobocainensis* is rarer, with the individuals inhabiting, in general, the forest canopy, which makes it of more difficult visualization, and therefore, harder to estimate population sizes. The two species share similar general morphology, especially in terms of the shape and size of the rosettes, the predominant red color of the primary bracts, and the distichous flowers with yellow sepals and petals. However, *Vriesea altobocainensis* presents more robust inflorescence branches, lower in number (10-21), thicker red rachillas, densely aggregated flowers, and internodes with 0.8-1.1 cm long. In addition, the primary bracts of the upper portion of the rachis are orbicular

to broadly-ovate, 6-8 cm wide; floral bracts are red or, when at the apex of the branch, red and yellow at the apex, orbicular to broadly-ovate, 2-2.8 cm wide. *Vriesea altodaserrae* has more delicate inflorescence branches, more numerous (20-30), thinner green to greenish-yellow rachillas, and internodes 1.5-2 cm long. The primary bracts of the upper portion of the rachis are broadly-ovate, 3-6 cm long; floral bracts are yellow, ovate, 1.4-2 cm wide (figure 3).

Vriesea altobocainensis is restricted to the montains of Serra da Bocaina, in the Atlantic Rainforest, growing preferably as an epiphyte. The specific epithet we propose refers to the locality where the species occurs, the highlands of Serra da Bocaina.

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Author Contributions

Suzana Ehlin Martins: Substantial contribution in the concept and design of the study, contribution to data collection, contribution to data analysis and interpretation, contribution to manuscript preparation, contribution to critical revision, adding intellectual content.

Maria das Graças Lapa Wanderley: Substantial contribution in the concept and design of the study, contribution to data collection, contribution to data analysis and interpretation, contribution to manuscript preparation, contribution to critical revision, adding intellectual content.

Conflicts of interest

There is no conflict of interest.

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Table 1. Diagnostic characters of *Vriesea altobocainensis* S.E. Martins & Wand. and its most closely related species, *V. altodaserrae* L.B. Sm. and *V. sceptrum* Mez.

Table 1. Diagnostic morphological characters of *Vriesea altobocainensis* S.E. Martins & Wand. in relation to *V. altodaserrae* L.B. Sm. and *V. sceptrum* Mez.

Characters	*Vriesea altobocainensis*	*Vriesea altodaserrae*	*Vriesea sceptrum*
Number of inflorescence branches	10-21	20-30	13-15
Length of inflorescence branches	13-30 cm	20-30 cm	15-25 cm
Number of flowers per branch	(8-)10-20	7-14	5-9(-12)
Primary bracts (dimension)	4,5-12 × 6-8 cm	4-18 × 3-6 cm	(4,5)6-10 × 2-4 cm
Rachilla (color)	Red or reddish-green	Green to yellowish-green	Greenish-orange to orange
Rachilla internodes in flowering (length)	0,8-1,1 cm	(1-)1,5-2 cm	0,7-1,5 cm
Floral bracts (color)	Red to red with a yellow apex	Yellow	Orangish to red
Floral bracts (dimension/shape)	2,1-3,5 × 2-3 cm	(2-)2,5-3 × 1,4-2 cm	(2-)2,7-3 × 1,5-2 cm
	Orbicular to broadly-ovate	Ovate	Ovate
Relation between floral bracts × sepals	Bracts equalling the sepals, to shorter than the sepals at the apex of the branch	Bracts shorter than the sepals	Bracts shorter than the sepals
Sepals (color)	Yellow	Yellow	Orangish or red
Petals (color)	Yellow	Yellow	Orangish

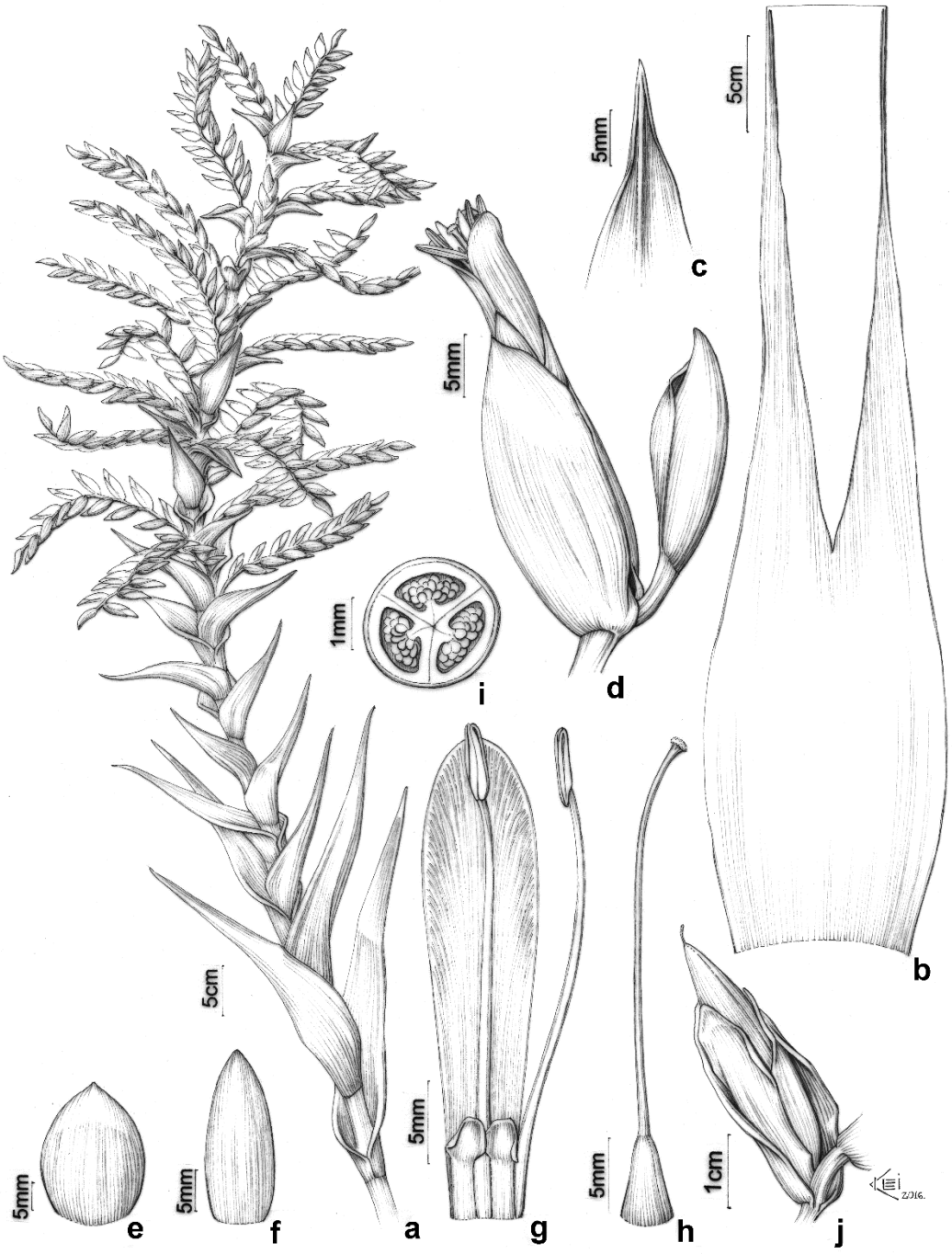

Figure 1. *Vriesea altobocainensis* S.E. Martins & Wand. a. Inflorescence. b. Leaf. c. Apex of the peduncle bract. d. Whole flower in the apex of the inflorescence branch, and a bract of an undeveloped flower. e. Flowering bract. f. Sepal. g. Petal with petal appendages, epipetalous stamen, and one free lateral stamen. h. Pistil. i. Cross-section of the ovary showing axile placentation. j. Immature capsule. (Wanderley 3018).

Figure 2. *Vriesea altobocainensis* S.E. Martins & Wand. a. Habitat. b. Habit of a plant growing on the ground. c. Branched inflorescence. d. Apex of an inflorescence branch before anthesis. e-f. Detail of an inflorescence branch with one flower during anthesis. g. Flower without a flowering bract. h. Petal, epipetalous stamen, and a petal appendage. (b. Wanderley 3018; c-h. Martins 1215).

Figure 3. Habit. a. *Vriesea altobocainensis* S.E. Martins & Wand. b. *Vriesea altodaserrae* L.B. Sm. c. *Vriesea sceptrum* Mez.

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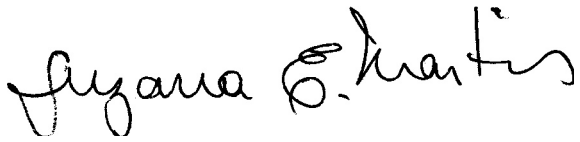

Suzana Eh1in Martins

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