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A new species of *Wahlenbergia* (Campanulaceae) from the Itatiaia National Park, Brazil

ISIS ROLLIM[1] & MARCELO TROVÓ[1]
[1]*Laboratório Integrado de Sistemática Vegetal, Departamento de Botânica, Universidade Federal do Rio de Janeiro, Av. Carlos Chagas Filho 373, 21941–590, Rio de Janeiro, Brazil. email: isisrollim@gmail.com, martrovo@gmail.com*

Abstract

We describe and illustrate *Wahlenbergia itatiaiensis*, a new species of Campanulaceae, endemic to the Itatiaia National Park in the Atlantic Forest (Brazil). The new species is compared with *W. linarioides*, the sympatric and morphologically most similar species, and to *W. intermedia*. *Wahlenbergia itatiaiensis* is mainly distinguished by the linear to lanceolate leaves with few, short denticles along the margin, 3-locular ovary, and 3-lobed stigma. An identification key for these species is provided. The new species occurs on sandy and rocky, wet soils, adjacent to dirt roadsides of the upper part of the National Park. Detailed comments on the distribution and conservation status, as well as details of morphological variation and photographs are provided.

Keywords: Atlantic Forest, Conservation, Flora, Mantiqueira Mountains, Taxonomy

Introduction

Wahlenbergia Schrad. ex Roth (1821: 399) is a genus of Campanulaceae included in Campanuloideae, encompassing about 260 species (Haberle *et al*. 2009), which are mainly distributed in the Southern Hemisphere. The species are annual or perennial herbs, with leaves usually alternate, sometimes opposite, margins with conspicuous, short, blunt, pale, spine-like hydathodes (Smith 1992). The flowers in this genus are a campanulate tube with five petals ranging in color from white to bluish-purple (Petterson 1997). The fruit is a capsule, which characteristically opens via erect apical valves in most species (Cupido 2011). Their seeds are numerous and are dispersed by the wind (Thorsen *et al.* 2009). In Brazil only six species have been reported, of which three are endemic to the country; most species occur in the Atlantic Forest Domain (Funez *et al.* 2017; BFG 2018).

The Itatiaia National Park is situated within the Mantiqueira Mountains in the Atlantic Forest Domain, hosting a unique diversity distributed in a highly variable topography and different phytophysiognomies. Within the Atlantic Forest hotspot, the Itatiaia National Park is part of the Atlantic Forest Biosphere Reserve, one of the biggest conservation areas in the world (Conservation International 2000). For Campanulaceae, 46 out the 55 species that occur in Brazil are found in the Atlantic Forest, reinforcing this biome as an important center of diversity for the family in the country.

During the course of our efforts to prepare the monograph of the Campanulaceae from Rio de Janeiro state, based on fieldwork, herbarium analyses, and literature review, we detected a new species of *Wahlenbergia* from Itatiaia National Park. Here, we present a detailed description, illustrations, and comments on the morphology, ecology, and distribution of the new species. An identification key for the morphologically most similar species is also provided.

Material & Methods

Fieldwork was carried out in Rio de Janeiro state—Brazil from 2015 to 2018. Species identification and morphological descriptions were based on living specimens and the herbarium collections of *Wahlenbergia* housed at R, RB, and SPF herbaria (acronyms according to Thiers, continuously updated), using a Leica EZ4 stereoscopic microscope with a camera. The taxonomic species concept follows Stuessy (1990). We also reviewed and adopted the morphological

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terminology in the relevant taxonomic literature on the Brazilian Campanulaceae, especially of *Wahlenbergia* (Kanitz 1885, Trinta & Santos 1989, Godoy 1992, Godoy 2003). A distribution map using Q-GIS 2.8, with geographical coordinates obtained from all available specimens, is provided. The conservation status was assessed using the GeoCAT Tool (Bachman *et al.* 2011) and IUCN (2014) categories and criteria. Area of occupancy (AoO) analysis was run with the IUCN default cell width of 2 km^2. Values of AoO and extent of occurrence (EoO) are given.

Taxonomic treatment

Wahlenbergia itatiaiensis Rollim & Trovó, ***sp. nov.*** (Fig. 1)

Differs from *Wahlenbergia linarioides* (Lamarck 1785: 580) Candolle (1830: 158) by the linear to lanceolate leaves, margin with sparse, short denticles, bracts linear to lanceolate, 3-locular ovary and 3-lobed stigma.

Type:—BRAZIL. Rio de Janeiro: Resende, estrada para o abrigo Rebouças, coord. 22º21'07" S, 44º42'43" W, 29 November 2018, *Rollim, I.M. et al. 67*. (holotype RB; isotypes R, NY, B, SPF).

Herb, up to 16–35 cm tall. Stems erect or rarely decumbent, slender, glabrous or pubescent. Leaves alternate, sessile, linear to lanceolate, 0.2–0.4 × 0.8–1.3 cm, apex acute to obtuse, margin with sparse, short denticles; axillary clusters of smaller leaves often present. Inflorescence paniculate, with few flowers, bracts similar to vegetative leaves. Flowers actinomorphic, 4.0–6.0 mm long; pedicel 0.5–3.0 cm long; hypanthium obconic. Calyx five-lobed, alternating with corolla lobes, triangular, lobes 1.0–3.0 mm long, lobe margins entire. Corolla campanulate, white or very light pink; tube 2.1–2.8 mm long; lobes 5, 1.9–3.2 mm long, triangular. Stamens 5, free, inserted at the base of the corolla tube; filaments 1.5–2.0 mm long; anthers linear, basifixed, 0.5 mm long. Ovary 3-locular; style yellow, glabrous, 3.2–4.8 mm long, cylindrical; stigma 3-lobed, 0.5 mm long. Fruit a capsule with persistent calyx lobes, dehiscing via erect apical valves, 5.0–7.5 mm long. Seeds numerous, ellipsoidal, 0.5 mm long.

Etymology:—The epithet is a reference to the Itatiaia National Park, the locality where the species was collected and is, until now, endemic.

Distribution and Ecology:—The species is restricted to the upper part of the Itatiaia National Park (Fig. 2), being recorded from a few populations occurring at an altitude of about 1800 m. The species grows on sandy and rocky, wet soils usually covered with mosses and grasses, adjacent to dirt roadsides. Some populations are frequently found in an area locally known as Brejo da Lapa, growing sometimes sympatrically with *Wahlenbergia linarioides*, a species just recently reported to the state of Rio de Janeiro (Rollim & Trovó 2016). It is also found in the vicinities of the entrance for the upper part of the park, locally known as Posto Marcão, and in the surroundings of the Rebouças mountain shelter.

Conservation status:—A GeoCAT analysis and IUCN (2014) criteria suggest that *Wahlenbergia itatiaiensis* should be classified as Critically Endangered (CR). EoO = 1.048 km^2; AoO = 12.000 km^2. The species is found in a conservation unit, but due to its small area of occurrence we may consider this species to be endangered according to IUCN (2014) criteria CR.

Additional specimens examined:—BRAZIL. Rio de Janeiro: Itatiaia. 30.X.2017, *Rollim, I.M. et al. 53* (R), 29.XI.2018, *Rollim, I.M. et al. 68* (RB).

Comments:—The new species clearly belongs to *Wahlenbergia* due to its deeply divided corolla lobes, and by its fruit type and dehiscence, a capsule which characteristically opens via erect apical valves (Thulin 1975; Lammers 1995; Cupido 2011). The linear to lanceolate leaves with few short denticles on the margin, the 3-locular ovary, and the 3-lobed stigma are crucial to recognize the taxon as a distinct entity. The species slightly resemble *W. intermedia* Zahlbruckner (1900: 518), a species occurring in Minas Gerais state. However, *W. itatiaiensis* is distinguished by the linear to lanceolate leaves, margin with sparse, short denticles, bracts linear to lanceolate, the 3-locular ovary, and the 3-lobed stigma.

Wahlenbergia itatiaiensis is morphologically most similar to the sympatric *W. linarioides*, a species distributed in Espírito Santo, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, and São Paulo states. However, the new species can be easily distinguished by the corolla with triangular lobes comprising 1/2 of the corolla length, 3-locular ovary, and 3-lobed stigma. Additionally, *W. itatiaiensis* usually has only one leaf shape along the stem, while *W. linarioides* has leaves of different shapes along the same stem. The morphological differences and especially the variation in the carpel numbers could be interpreted as a variation within the populations of *W. linarioides* as this species was also recently recorded to the Itatiaia National Park. However, homogeneous populations of the new species were observed growing isolated and possessing stable character states that differentiate both species.

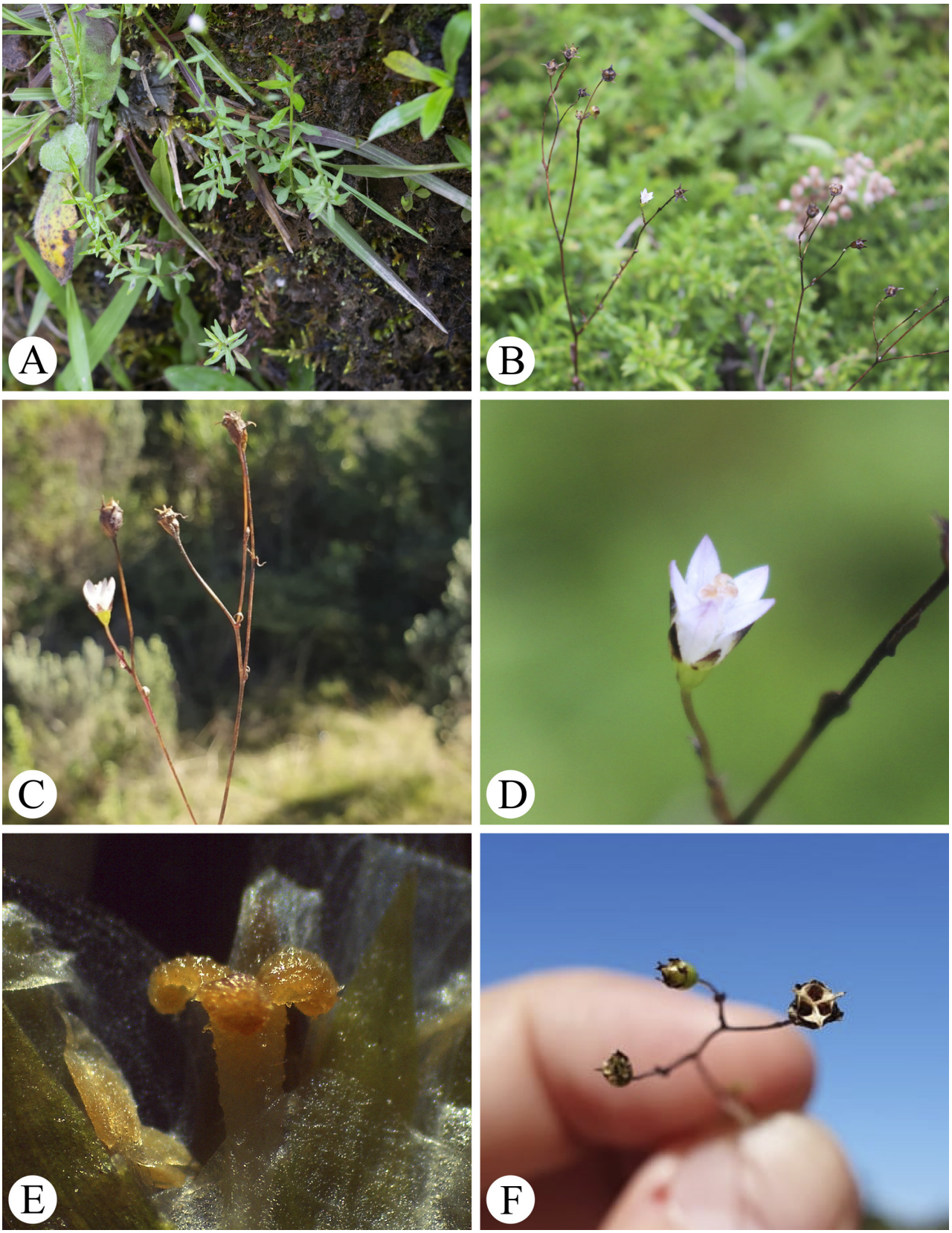

FIGURE 1. *Wahlenbergia itatiaiensis* Rollim & Trovó. A. Leaves detail. B–C Inflorescence detail. D. Flower detail. E. Stigma detail. F. Fruit. (Photos A: Isis Rollim; B, C, D, F: M. Trovó; E: Lucas Espindola).

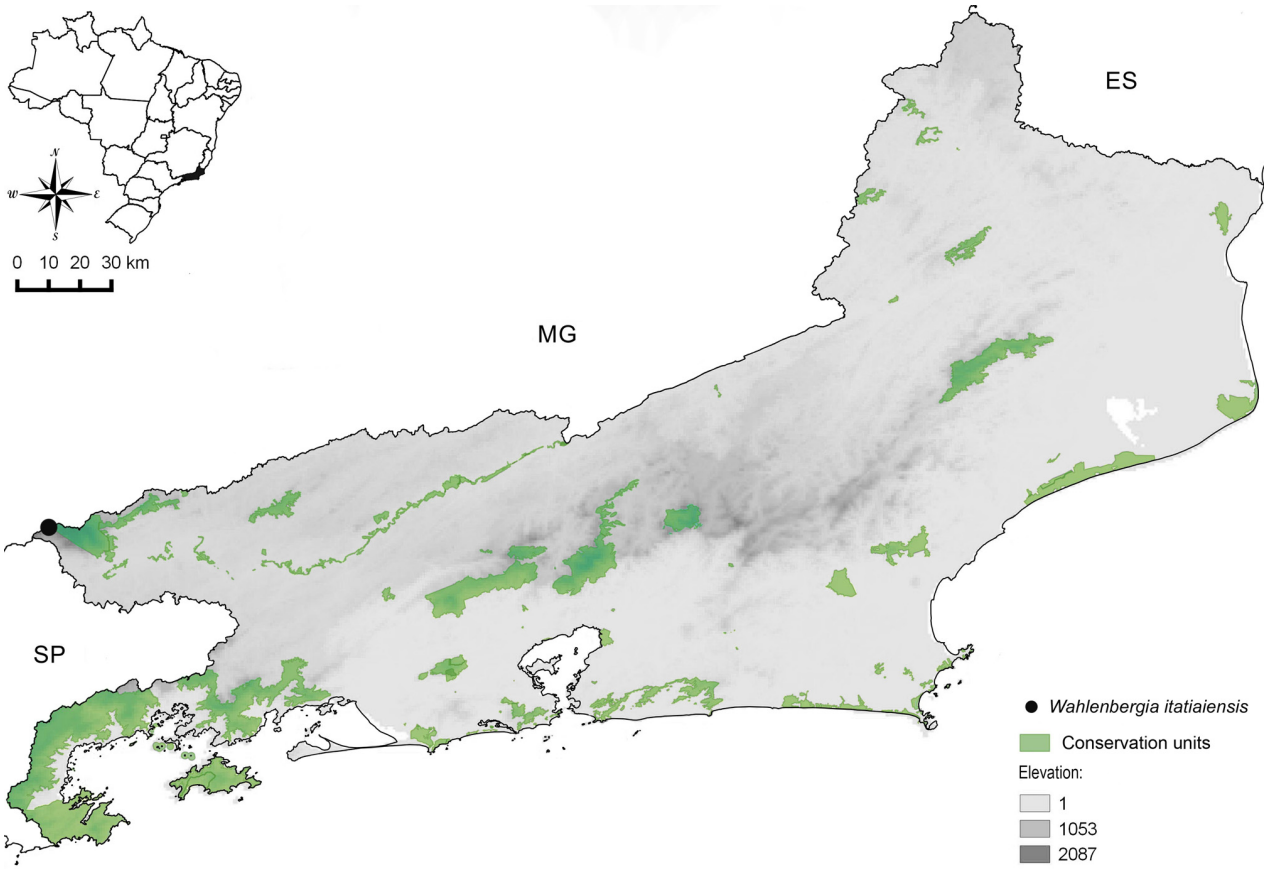

FIGURE 2. Distribution map of *Wahlenbergia itatiaiensis* Rollim & Trovó in the Rio de Janeiro state.

Identification key for the species morphologically similar to *Wahlenbergia itatiaiensis*

1. Leaves oblong-linear with margin entirely denticulate; bracts oval to oblong ..... ***Wahlenbergia intermedia***
1'. Leaves spathulate, lanceolate or oval, margin with sparse and short denticles; bracts linear to lanceolate..... 2
2. Leaves only lanceolate along the stem; corolla with triangular lobes comprising 1/2 of the corolla length; ovary 3-locular; stigma 3-lobed..... ***Wahlenbergia itatiaiensis***
2'. Leaves spathulate, lanceolate, and oval along the stem; corolla with lanceolate lobes comprising 2/3 of the corolla length; ovary 2-locular; stigma 2-lobed..... ***Wahlenbergia linarioides***

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