

A new species of *Varronia* P. Browne (Cordiaceae) from the Brazilian Cerrado

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Abstract: We describe a new species of Cordiaceae, *Varronia elsieae* T.S. Silva, J.I.M. Melo & I.L. Morais. This species is currently known from Cerrado vegetation of midwestern and southeastern Brazil in the states of Goiás and Minas Gerais. It can be recognized mainly by leaves with elliptical blades, tomentose branches, inflorescences that are clavate or short-cylindrical and never paniculate, and flowers with a calyx that is completely tomentose outside, with an acuminate apex on the calyx lobes, and trichomes on the corolla. A distribution map with known occurrence records as well as comments on the ecology, morphological diagnostic features, and phenology of the species are provided.

Keywords: Boraginales, Neotropical flora, South America, taxonomy.

In its current circumscription, *Varronia* P. Browne (Cordiaceae) includes approximately 125 species distributed exclusively in the Neotropics (Miller, 2013), with Brazil, Mexico, and the northern Andes (Venezuela, Colombia and Ecuador) as their centres of diversity (Estrada-Sánchez, 1995). This genus can be recognized mainly by its habit (multi-branched sub-shrubs or shrubs), leaf margins (serrate or dentate), inflorescences of three basic types (capituliform, spiciform, or cymose), flowers that are exclusively white, and pollen that is 3-porate and cross-linked (Estrada-Sánchez, 1995; Miller & Gottschling, 2007).

The Cerrado domain is South America's largest tropical dry forest, with an area of two million km², comprising approximately seven thousand species of plants, 44% of which are endemic (Klink & Machado, 2005; Nóbrega et al., 2017; INPE, 2021). In Brazil, this is the second largest phytogeographic domain covering ca. 25% of the territory, including approximately 37% of the angiosperm diversity (Klink

& Machado, 2005; BFG, 2018; Espírito-Santo et al., 2018; INPE, 2021).

During a visit to the herbarium of France's Museum National of d'Histoire Naturelle (P) in 2019, the first author examined a specimen collected in the 1960s from the southern part of Goiás state, Brazil, that did not correspond to any of the *Varronia* species hitherto recognized for South America. However, more recent collections by a group of botanists from southern Goiás obtained samples that allowed us to confirm the identity of this species, which is morphologically similar to another South American species, *V. buddleoides* (Rusby) J.S. Mill. This new species stands out among the other species of *Varronia* especially due to the presence of clavate or short-cylindrical inflorescences that are never paniculate, and a calyx that is completely tomentose outside with an acuminate apex, and a corolla with sparse trichomes on the outer surface.

Therefore, this study presents a description, illustrations, and comments on closely related species, a preliminary conservation assessment,

and a map containing the currently known distribution for *Varronia elsieae*.

Materials and methods

Specimens were collected and processed following techniques described Harris & Harris (2001). Specimens and spirit material are incorporated at HACAM [the Herbarium of the State University of Paraíba, Campus I] and JAR [the Herbarium of the State University of Goiás, Campus Quirinópolis]. Also consulted was material from the following herbaria: HUFU, NY, and P (herbarium codes follow Thiers, 2022, continuously updated). The species description was based on fresh material, herbarium specimens, and flowers preserved in 70% ethanol. Reproductive structures were rehydrated before being measured and sketched from dried material. Definitions of vegetative indumentum and size follow Ellis et al. (2009), whereas inflorescence terminology follows Weberling (1989). The map was made using ArcGIS shapefiles acquired at IBGE (2019). The distribution points of the species were obtained in the field using GPS (Global Positioning System) and the coordinate system was aligned (SIRGAS, 2000). All processes were performing using ArcGis Pro.

Data regarding distribution, habitat, and phenology were obtained from herbarium specimens and field notes taken during field expeditions. A preliminary conservation assessment was obtained by calculating the extent of occurrence (EOO) and the area of occupancy (AOO) with GeoCAT (Bachman et al., 2011) and applying the IUCN Red List Categories and Criteria (IUCN, 2017). The AOO was calculated based on a user defined grid cell of km².

TAXONOMIC TREATMENT

Varronia elsieae T.S. Silva, J.I.M. Melo & I.L. Morais, **sp. nov.**—Type: Brazil. Goiás: Quirinópolis, Córrego Capela, Mata de galeria, 15 Aug 2018 (fl.), A. C. B. Dias 29 (holotype: JAR [!]; isotypes: ALCB [!], HACAM [!], RB [!]). (Figs. 1, 2 and 3).

Diagnosis.—*Varronia elsieae* resembles *V. buddleoides* especially in sharing globose inflorescences but differs from the latter by its leaves with elliptical blades (vs. ovate), tomentose

branches (vs. densely hirsute), inflorescences that are clavate or short cylindrical and never paniculate (vs. only globose and paniculate), and flowers with a calyx that is completely tomentose outside with an apex acuminate (vs. puberulent at the base and hirsute at the apex, apex long filiform) and sparse trichomes on the outer surface of the corolla.

Shrubs, 2–3 m tall; erect, branches densely tomentose, ferruginous. Leaves petiolate, petiole 0.5–1 cm long, geniculate; blade 6–11 × 2.5–4.5 cm, elliptic, subcoriaceous, adaxial surface scabrous, primary and secondary veins evident, abaxial surface tomentose mainly on the veins, primary and secondary veins prominent, venation craspedromous sometimes almost brochidromous, apex acute, margins serrulate, entire near the base, slightly revolute, base cuneate. Inflorescence 1.5–2.5 × 1–1.5 cm, clavate or short cylindrical, terminal or axillary; peduncle 2–7.5 cm long, densely tomentose. Flowers ca. 6 mm long; calyx with five sepals, 4–5 mm long, conical-campanulate, completely tomentose outside, interior sparsely strigose, lobes 1.1–1.2 × 1–1.2 mm, triangular or deltate, apex acuminate; corolla ca. 5 mm long, tubular, lobes 5, evident, erect, apex irregular crenulate, sparse simple trichomes outside, glands absent. Stamen filaments ca. 1 mm long, homodynamous, inserted or exerted, trichomes at the base; anthers ca. 0.5 mm long. Ovary ca. 1.3 mm long, globose, nectariferous disc ca. 0.2 mm tall; longstyle ca. 3.5 mm long; stigmatic branches 1–1.5 mm long, stigmas 0.8–1 mm long; brevistyle not seen. Drupe ca. 6 mm long, red, globose or pyriform.

Distribution and habitat.—*Varronia elsieae* was recorded in the states of Goiás and Minas Gerais, Brazil, growing in Cerrado vegetation including gallery forests, between elevations ranging from 542 to 586 m. The species is found mainly at the edges of gallery forests, in the transition area between the shaded forest environment and areas with greater light, especially in the ecotone between gallery forest and savanna vegetations (such as veredas) or wet fields. According to Ribeiro & Walter (2008), these types of phytophysiognomies are typically found adjacent to gallery forests. In Quirinópolis (Goiás state), the species was recorded in four areas of gallery forest. Three of these border urban and rural areas where urbanization is advancing into the native vegetation, helpings to account for why these sites

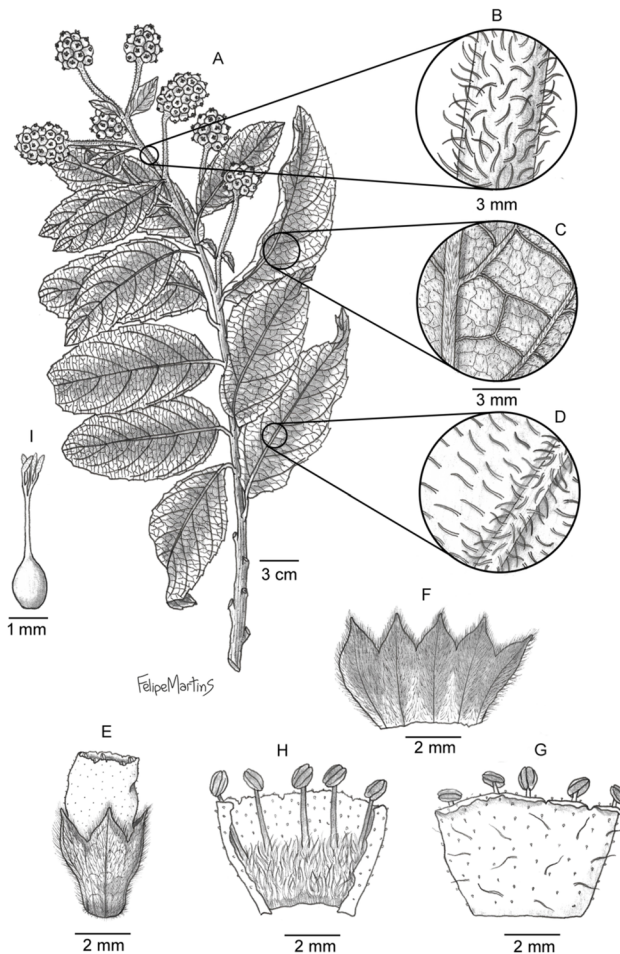


FIG. 1. *Varronia elsieae*. **A.** Reproductive branch. **B.** Detail of the stem, highlighting the indumentum. **C.** Detail of the adaxial surface of the leaf blade. **D.** Detail of the midvein of the adaxial surface of the leaf blade. **E.** General aspect of the flower. **F.** Calyx opened, highlighting the inner surface. **G.** Corolla opened, showing the outer surface. **H.** Corolla opened, showing the inner surface and the attachment of the androecium. **I.** Gynoecium. (A. C. B. Dias 29, HACAM, JAR).

are so severely degraded. The fourth area is located in the countryside where livestock is the main economic activity, and a large part of this area has been converted into pasture, leaving an only narrow strip of native vegetation.

Phenology.—Flowering from August to November and fruiting from September to December.

Etymology.—The specific epithet was given in honour to Elsie Franklin Guimarães, a Brazilian taxonomist who in the 1970s began her studies with the family Boraginaceae s.lat.

Preliminary conservation assessment.—*Varronia elsieae* was recorded in gallery forests

in two municipalities in the state of Goiás (Caiapônia and Quirinópolis), and in a single municipality in the state of Minas Gerais (Uberlândia). Based on these records, the Extent of Occurrence (EOO) of the species is 12,622.3 km² and its Area of Occupancy (AOO) is 16 km². The species' population has only 3–10 individuals at six locations, all of which are threatened by a reduction in the width of the gallery forests, either by the expansion of urbanization or agricultural activities. Thus, the loss of portions of the habitat occupied by *Varronia elsieae* and the small number of individuals

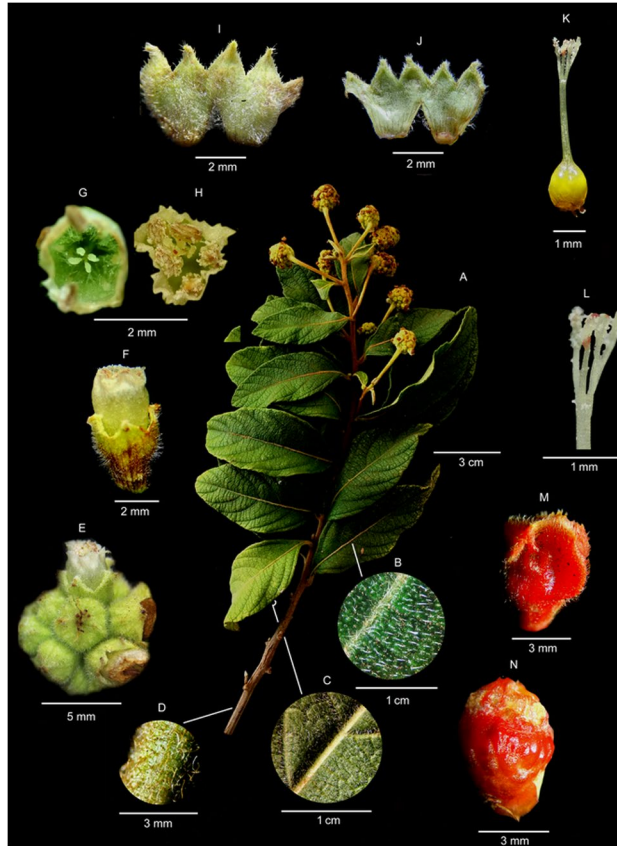


FIG. 2. *Varronia elsiae*. **A.** General aspect of the reproductive branch. **B.** Detail of the leaf blade, exhibiting the venation and indument on adaxial surface. **C.** Detail of the leaf blade, exhibiting the venation and indument on abaxial surface. **D.** Detail of the stem, highlighting the indumentum. **E.** Inflorescence. **F.** Flower. **G.** Frontal view of the flower, showing the stigmas. **H.** Frontal view of the flower, showing the androecium. **I–J.** Outer (I) and inner (J) surface of the calyx. **K.** Gynoecium. **L.** Stigmatic branches and stigmas. **M.** Fruit enclosed by the calyx. **N.** Fruit, lateral view. (Photos: A by Ana Cláudia Bernardes Dias; B–N by Isa Lucia de Morais).

represents a threat of their survival. Based on these facts, we propose a Red List threat assessment of *Varronia elsiae* as EN B26bii (IUCN, 2017), as it has small populations, so far occurring only in these six locations, and the projected continued decline in the AOO due to the continued degradation of its habitats.

Additional specimens examined.—**BRAZIL.** **Goiás:** Quirinópolis, Córrego Formiga, área urbana, borda de mata de galeria, 18°26'51"S, 50°25'13"W, 542.7 m, 16 Aug 2022 (fl.), *I. L. Morais* 7331 (JAR); *ibid.*, 18°26'48"S, 50°25'15"W, 552 m, 22 Aug 2022 (fl.), *I. L. Morais* 7347 (JAR); *ibid.*, Córrego Capela, 27 Aug 2022 (fl.), *I. L. Morais*

7353 (JAR); *ibid.*, Córrego Formiga, área urbana, borda de mata de galeria, 18°26'51"S, 50°25'13"W, 542.7 m, 19 Sep 2022 (fl.), *I. L. Morais* 7398 (JAR); *ibid.*, Fazenda Rosa Alegre, Córrego Carreirão do Rosa, borda de mata de galeria, 18°37.4'69"S, 50°37.1'52"W, 542.7 m, 9 Oct 2022 (fl.), *I. L. Morais* 7503 (JAR); *ibid.*, mata de galeria próxima ao Aeroporto, área urbana, 18°27'08"S, 50°24'02"W, 586 m, 26 Dec 2017 (fl.), *A. B. S. Santos* 1042 (JAR); Serra do Caiapó, 40 Km South of Caiaponia, riverine forest on agricultural lands, 26 Oct 1964 (fl., fr), *G. T. Prance & N. T. Silva* 59,661 (P barcode 03860070, NY barcode 00855522). **Minas Gerais:** Uberlândia,

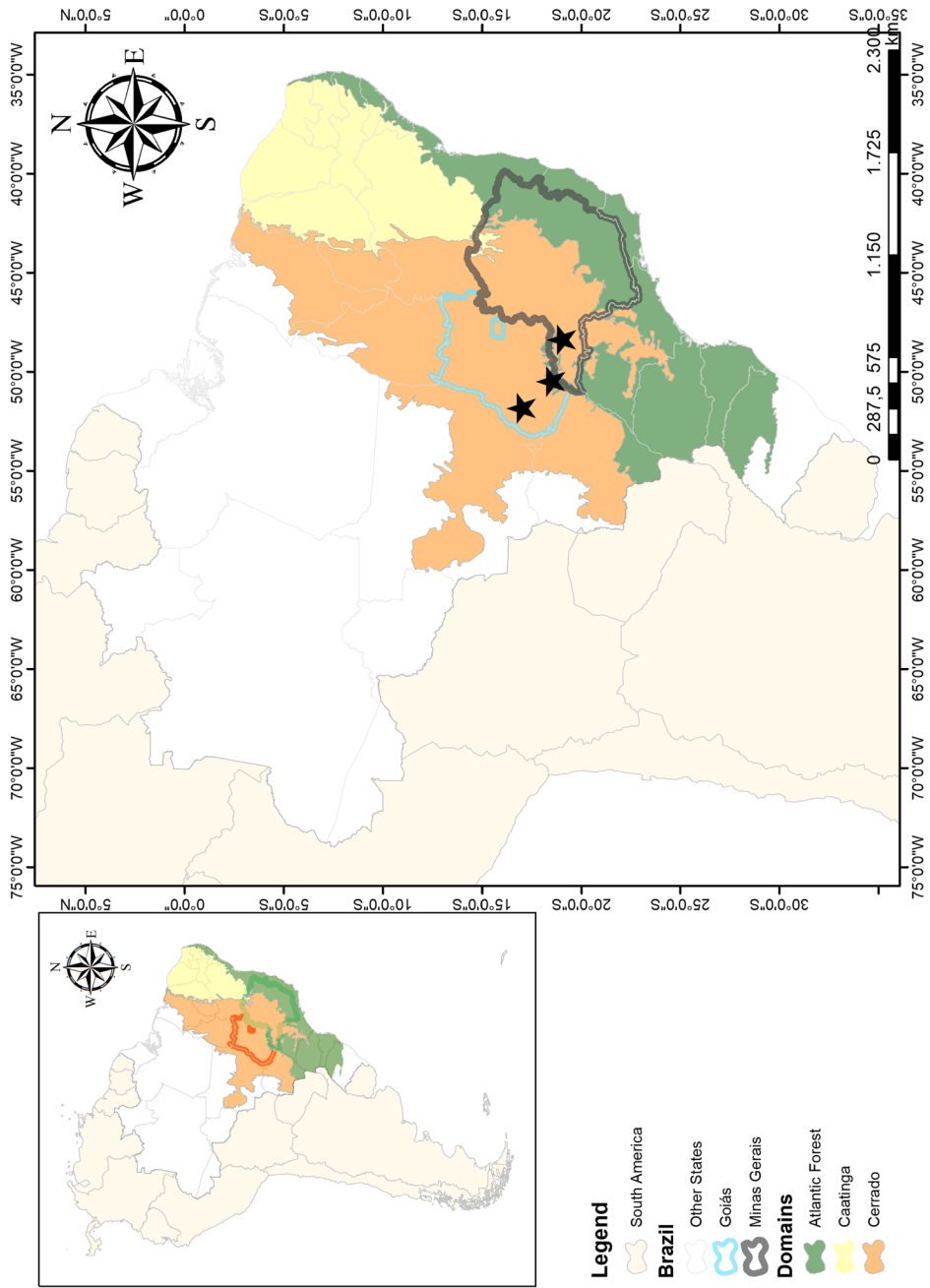


FIG. 3. Geographic distribution of *Varronia elstecae*.

Fazenda Dona Lourdes, 1 Feb 2006 (fl., fr.) *R. Kilca et al. s.n.* (HUFU barcode 00003410).

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Author contribution

The contributions of the authors were roughly equal. TSS conceived the study and contributed to the data analysis and writing; JIMM contributed to the data analysis, writing, and editing; ILM led the field expeditions, collected the morphological data, and helped writing the manuscript.

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Declarations

Competing interests We declare that there is no conflict of interest regarding the publication of this paper.

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