

THE FIRST RECORD OF *ZINOWIEWIA* IN THE BRAZILIAN FLORA AND A SHORT ACCOUNT OF ITS HISTORY

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Abstract. We report here the first record of *Zinowiewia* (Celastraceae) for the Brazilian flora, based on a specimen of *Z. australis* collected in Serra do Surucutus, at 1000–1400 m, Roraima state, in the basin of the Rio Branco and subsequently the Rio Negro, the latter being the largest tributary of the Amazon River. This novelty will be added to the Brazilian Flora 2020 project. With this addition, the family is now represented in Brazil by 20 genera and 142 species. An account of the history of *Zinowiewia* is also provided.

Keywords: Brazil, Celastraceae, Celastroideae, Lundell, *Wimmeria*

Zinowiewia Turcz. (Celastraceae) has been recognized as an endemic genus of the Neotropics where it is represented by 17 species distributed in South and Central America and Mexico (Simmons et al., 2012) and found at altitudes of 250–3,150 m (Ulloa and Jørgensen, 1994). The number of species was recently reduced to 10–12 after new synonyms were proposed for Mesoamerican species (Barrie, 2015).

Plants in the genus can be glabrous trees or shrubs, the leaves opposite, decussate, with entire margins, the inflorescences axillary cymes forked one to several times, the flowers bisexual, 5-merous, ovary 2-locular, fruits a samara with one apical wing, and one (rare two) linear-oblong seed (Simmons, 2004; Ulloa and Jørgensen, 1994). Another particular character of this taxon is that the branches are slightly expanded and compressed at the nodes, a helpful character to identify sterile collections at generic level. From some morphologically related genera, especially those from the Neotropics the plants of which bear samaras, *Zinowiewia* is easily distinguishable from *Plenckia* Reissek and *Wimmeria* Schlttdl. & Cham. by the opposite leaves (vs. alternate leaves). It can also be differentiated from *Wimmeria* by flowers 5-merous and samaras with a single terminal wing (vs. flowers 4-merous and samaras with 3–4 longitudinal wings). Another taxon with plants bearing samaras is *Rzedowskia* Medrano, a monotypic genus endemic to montane areas from Mexico that includes shrubs with denticulate leaves and flowers 4-merous.

Zinowiewia was proposed by Turczaninow (1859) to allocate a new combination for *Wimmeria integerrima* Turcz., published by him a year before, but with questions remaining about its generic position (Turczaninow, 1858). Based on the winged fruits with one or two seeds without aril (Simmons et al., 2012), Loesener (1942)

placed it in subfamily Tripterygioideae. Simmons et al. (2012) provided a phylogeny for Tripterygioideae based on morphological and molecular characters and showed that *Zinowiewia* is the sister clade of *Microtropis* + *Quetzalia*, sharing with those opposite leaves, ovary two carpelate, and molecular synapomorphies in the ITS region. Currently, Tripterygioideae has been recognized as a highly polyphyletic clade (Simmons et al., 2012) and *Zinowiewia* is nested in Celastroideae (Simmons, 2004).

Of 17 species names for *Zinowiewia*, 13 were proposed by Cyrus Lundell between 1938 and 1987, several of them being reduced to *Z. integerrima* (Turcz.) Turcz. and *Z. rubra* Lundell after Barrie's treatment (2015) for Mesoamerica. Barrie (2015) cited three species in Mesoamerica (the former two and *Z. pallida* Lundell). Moreover, we have two additional species cited for Mexico: *Z. concinna* Lundell and *Z. pauciflora* Lundell. In South America, four species have been recorded: *Zinowiewia madsenii* C. Ulloa & P.M. Jørgensen, endemic to Ecuador, *Z. sulphurea* Lundell, endemic to Colombia, *Z. aymardii* Steyermark, endemic to Venezuela, and *Z. australis* Lundell, present in various countries, accounting for the nine species recognized in the genus.

After Turczaninow's delimitation in 1859, it took almost 80 years for additional species to be described in the genus. Then, six new species for Central America and Mexico were published at once by Lundell (1938). In the following years, two more taxa were described by him (Lundell, 1939b, 1940), as well as the unique revision for the genus completed until currently (Lundell, 1939a). A few new taxa were published in the following decades (Williams, 1964; Lundell, 1970, 1981, 1985, 1987; Steyermark, 1988). The last species described was *Z. madsenii* (Ulloa and Jørgensen, 1994) published also with a short comment about the genus,

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and details about the two species that occur in Ecuador.

According to Standley and Steyermark (1949), the genus remained monotypic for a long time, and then had several species described in a short time. They considered all the species to be closely related and had doubts about the differentiation amongst many of them. The revision supplied by Lundell (1939a) is outdated and was based almost exclusively on specimens deposited in American herbaria, where the genus does not occur. However, he provided a relatively complete morphological description of the genus. At that time, he recognized seven species, presented a key, and provided individual descriptions, a short list

of material examined, and plates for four taxa. The main characters he used to differentiate the species in the key are based on the shape of leaves and fruits, and the length of petals (Lundell, 1939a). All those characters are questionable when a large number of specimens are examined and thus justify the new synonymy proposed by Barrie (2015).

When checking Celastraceae collections in several herbaria, the authors came across the first record of *Zinowiewia australis* for the Brazilian flora. Here we document this new record as well as the expansion of its known distribution to the Brazilian Amazon region.

TAXONOMY

Zinowiewia australis Lundell, Bull. Torrey Bot. Club 65(7): 469. 1938. TYPE: VENEZUELA. Selvas nubladas [entre] Agua Negra y El Junquito, at alt. of 1,800 m, 29 December 1936, *H. Pittier 13826* (Holotype: F [894843]; Isotypes: LL, MICH, NY, US, VEN).

This species is known from Venezuela, Colombia, Ecuador, Peru, and Bolivia. The following collection represents the first record from Brazil:

Specimen examined: BRAZIL. Roraima: Serra do Surucutus, 2°42–47'N, 63°33–36'W, NE of Mission station, 1000–1400 m.s.n.m., forest at foot at red sandstone cliff, 17 February 1969 (fl), *G.T. Prance 10015* (F [1772295], INPA [27148], K [001137341], M [s.n.], MG [41717], P [05493140], U [260544]).

The images for the specimens deposited in F and U can be accessed on their websites. For images of the material in INPA, check the database SpeciesLink (<http://splink.cria.org.br/>), and for those in K and P, visit the database REFLOA (<http://reflora.jbrj.gov.br/>).

The new record presented here will be added to the monograph of Celastraceae for the Brazilian Flora 2020 project (Brazilian Flora, 2020), a project currently in progress the goal of which is to catalogue all the species of plants, algae, and fungi that occur in Brazil: the authors are responsible for the Monograph of Celastraceae.

With this addition, 20 genera of Celastraceae are represented in Brazil, eight of them from the Celastroideae subfamily, which is the case of *Zinowiewia*, and 142 widely distributed species. Of these, two genera have samaras: *Zinowiewia* and *Plenckia*.

We support Standley and Steyermark's view that several taxa, especially those that Lundell described from Central

America, are very closely related and that the actual number of species is uncertain (Standley and Steyermark, 1949). The characters usually cited to distinguish species (see Lundell, 1939a; Standley and Steyermark, 1949; Barrie, 2015) show overlap amongst species, which complicates the identification of herbarium specimens. Even after the synonyms proposed by Barrie (2015), we believe that species circumscriptions are not clear and that a detailed taxonomic study is still required.

Zinowiewia australis and *Z. aymardii*, and *Z. concinna*, *Z. integerrima* and *Z. sulphurea* are all difficult to be distinguished based only on their morphological characters. For example, the differences cited by Steyermark (1988) to identify *Z. aymardii* from *Z. australis* are based on the number of flowers, length of primary and secondary axes of inflorescences, seed body and fruits wing; notwithstanding, any metrics for these characters are cited for *Z. australis* and *Z. aymardii* are based on just three collections.

Given that most of the *Zinowiewia* species have been described based on a few specimens (especially Lundell's taxa), we predict that the distinction of some taxa will become questionable when more collections are studied, and that additional new synonymy will be proposed in the genus.

Several genera of Neotropical Celastroideae, especially those with a small number of species, e.g. *Crossopetalum* P. Browne, *Gyminda* Sarg., *Haydenoxylon* M.P. Simmons, *Quetzalia* Lundell, *Schaefferia* Jacq., *Wimmeria*, and *Zinowiewia* have not been the subject of consistent taxonomic studies or these studies have become outdated throughout recent decades. Probably new records of occurrence, and even undescribed species, will be registered when more taxonomic studies are carried out for them.

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