First occurrence of *Dioclea ruddiae* Maxwell (Leguminosae) in Brazil

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ABSTRACT - (First occurrence of *Dioclea ruddiae* Maxwell (Leguminosae) in Brazil). *Dioclea ruddiae* (Leguminosae, Papilionoideae) is recorded for the first time in Brazil. Specimens were collected in the Serra do Tepequém, a tepui in the State of Roraima near the border with Venezuela. This study expands the distribution range of *Dioclea ruddiae* in the region of the Guiana Shield, where this species is probably endemic.
Keywords: Diocleinae, Guiana Shield, new record, Roraima, Serra do Tepequém, Tepui

RESUMO - (Primeira ocorrência de *Dioclea ruddiae* Maxwell (Leguminosae) no Brasil). *Dioclea ruddiae* (Leguminosae, Papilionoideae) é registrada pela primeira vez no Brasil. Espécimes foram coletados na Serra do Tepequém, um tepui no Estado de Roraima, próximo à fronteira com a Venezuela. Deste modo, este estudo amplia a distribuição de *Dioclea ruddiae* na região do Escudo das Guianas, na qual é provavelmente endêmica.
Palavras-chave: Diocleinae, Escudo das Guianas, nova ocorrência, Roraima, Serra do Tepequém, Tepui

Introduction

Dioclea Kunth is one of 13 genera of Diocleinae, a subtribe of Phaseoleae (Leguminosae, Papilionoideae) of vines or lianas with trifoliolate leaves and nodose pseudoracemes (Queiroz *et al.* 2003, Schrire 2005). Traditionally, *Dioclea* has comprised ca. 40 species, mostly in Brazil (Schrire 2005). However, recent phylogenetic analysis of Diocleinae has indicated that *Dioclea* species form a clade with *Cleobulia* Mart. *ex* Benth., *Cymbosema* Benth., and *Macropsychanthus* Harms *ex* K. Schumann & Lauterbach, recognized by multi-flowered inflorescences with a woody rachis, bicallose and auriculate standard petal, lignescent fruits and seeds mostly with a linear hilum (Queiroz *et al.* 2015).

In Brazil, *Dioclea* is represented by 32 species, of which 15 are endemic to the country (BFG 2015). In the north region, 23 species occur mainly in Amazon rainforests and particularly in Roraima State BFG (2015) recorded four species, *D. apurensis* Kunth, *D. guianensis* Benth., *D. macrantha* Huber, and *D. reflexa* Hook.f.

The Guiana Shield comprises a northeastern region of South America between the Amazonas, Negro and Orinoco Rivers (Funk *et al.* 2007). This region extends through Colombia, Venezuela, Guiana, Suriname, French Guiana and extreme north of Brazil and is distinguished by more than 50 tabletop mountains, known as tepuis, which show high levels of endemism (Huber 1995). Among these mountains there can be highlighted in Brazil the Serra do Aracá and Pico da Neblina in the Amazonas State and Monte Roraima and Serra do Caburaí in the Roraima State (Prance & Johnson 1992; Coelho *et al.* 2015). In these mountains, recent botanical expeditions have led to a significant increase in the number of new records for the flora of Brazil (Rodrigues & Flores 2010, Barbosa-Silva *et al.* 2016, Costa 2017).

In addition, in northern Roraima there is a low tepui, the Serra of Tepequém, located about 30 km north of the Ilha de Maracá ecological station boundary (Milliken & Ratter 1998). Since studies on the flora of the Serra do Tepequém are not available, in the last years we carried out field expeditions to

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this site focusing on Leguminosae taxa. As a result of these efforts, we have found a new record of *Dioclea* for Brazil, which is described and illustrated herein.

Materials and methods

The Serra do Tepequém is located in the municipality of Amajarí, ca. 200 km by road from Boa Vista, the capital of the Brazilian State of Roraima. It is a tepui with up to 1000 m high, consisting of a single massif about 70 km^2 whose sandstone sedimentary rocks dating back to Precambrian (Reis & Carvalho 1996).

Botanical expeditions to the Serra do Tepequém were monthly undertaken between 2008 and 2010 to examine its different herbaceous, shrub and forest vegetation types (Barbosa 1992). A morphological analysis was carried on collections deposited in MIRR herbarium (Thiers 2017). Specimens were identified using specialized literature (Maxwell 1988, 1999) and available images of type specimens from F, US, GH, RB, S, US and VEN herbaria (Thiers 2017). Geographic distribution information of the analyzed species was obtained from its protologues (Maxwell 1988) and Maxwell (1999) supplemented with data from US, F, and MO herbaria provided that they have been identified by R. H. Maxwell. Localities of specimens were georeferenced primarily using label data which were checked with Google Earth and the Global Biodiversity Information Facility (GBIF 2017). A map was generated using DIVA-GIS software (Hijmans *et al.* 2012).

Results and Discussion

Dioclea ruddiae R.H. Maxwell, Ann. Missouri Bot. Gard. 75: 730. 1988. Type: VENEZUELA. Amazonas: Cerro Huachamacari, Río Cunucunuma, occasional in slope forest near Camp 2, 16-XII-1950, *B. Maguire et al. 29930* (holotype US!; isotypes F!, GH!, HUEFS, IAN, K, MO, NY, P, RB!, S!, U, US!, VEN!).
Figures 1-2

Woody vines; stipules not extending below attachment. Leaflets elliptic, subcoriaceous, pubescent, 12-21 × 6.8-9 cm. Inflorescence axillary, flowers with petals glabrous, the keel petals asymmetrically oblong; anthers 10, monomorphic. Legume 2-seeded, turgid, oblong, glabrescent, 8-10.5 × 3.5-4.3 × 2.6-3 cm, indehiscent, with indistinct sutural ribs, the beak upcurved. Seeds compressed, elliptic, overgrown, 4-4.5 × 2.8-3.2 mm, hilum oblong, encircling half of seed circumference.

Material examined: BRAZIL. Roraima: Amajari, Serra do Tepequém, platô, Igarapé do Paiva, junto à ponte, 03°46'21.0" N, 61°43'18.0" W, 605 m, 24-IV-2008, fr., *R. Schütz Rodrigues et al. 1931* (MIRR); id, *R. Schütz Rodrigues et al. 1947* (MIRR).

Dioclea ruddiae is most similar to *D. macrocarpa* Huber, as both have flowers with monomorphic anthers, indehiscent fruits, and overgrown seeds with an oblong hilum (Maxwell 1988, 1999, Queiroz *et al.* 2003). On the other hand, *D. macrocarpa* has papyraceous leaflets glabrous or glabrescent beneath; inflorescences frequently cauliflorous and flat fruits ca. 1 cm thick (Maxwell 1988). In contrast, *D. ruddiae* has subcoriaceous leaflets pubescent beneath, axillary inflorescences and turgid fruits ca. 3 cm thick (figure 1 a-b). In addition, turgid fruits of *D. ruddiae* promptly distinguish it from the other four species of *Dioclea* previously recorded in the State of Roraima (BFG 2015) that possess compressed legumes.

In Roraima State, specimens were collected in flower and fruit in April. In Venezuela, according to Maxwell (1988), specimens flowered from December through June and bore fruits from April to May.

Dioclea ruddiae was earlier known as endemic to Venezuela (Maxwell, 1988) from a few localities in the States of Amazonas and Bolívar, occurring in savannas or humid forests in mountains from 800 to 1600 m altitude (Maxwell 1999). This species is reported here for the first time from Brazil, in montane riverine forest edges, at 605 m altitude, in Serra do Tepequém (figure 1 c-d). The previously known populations of *D. ruddiae* closer to the Serra do Tepequém are 120 km northeast away in Bolivar State and 330 km west in the State of Amazonas, both in Venezuela (figure 2).

Most specimens of Venezuelan populations of *D. ruddiae* have been collected at or near protected areas in both States of Amazonas and Bolivar such as Duida-Marahuaca, Parima-Tapirapeco and Canaima national parks (Maxwell 1988, 1999). On the other hand, the Serra do Tepequém has a long history of environmental degradation due to mining activities (Barbosa 1992). As this tepui unfortunately remains an unprotected area, it has continuously been subject to the disorganized human settlement, deforestation and tourism activities, which might threat the existence of the only known Brazilian population of *D. ruddiae.*

In short, this study expands the distribution range of *D. ruddiae* within the Guiana Shield where it appears to be endemic. It also emphasizes the need of more botanical collection efforts in the Brazilian

Figure 1. Habitat and morphology of *Dioclea ruddiae*. a. Branch with flowers and a turgid two-seeded legume. b. Detail of an inflorescence. c. Locality where *D. ruddiae* was collected in the Serra do Tepequém, Roraima State, Brazil. d. Specimen growing on riverine forest edge (figures a-b and d by C.S. Costa and figure c by R.S. Rodrigues).

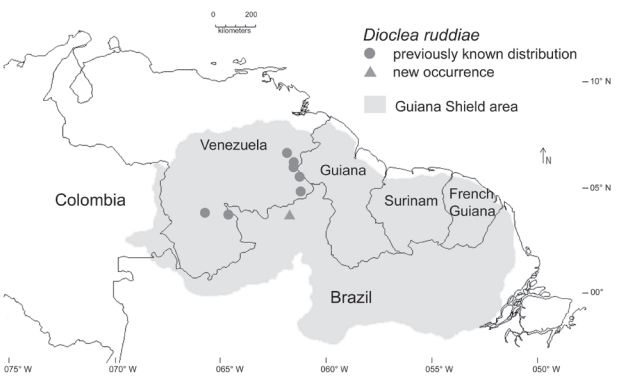

Figure 2. Geographical distribution of *Dioclea ruddiae* with emphasis on the new occurrence in Brazil. The Guiana Shield area according to Funk *et al.* (2007).

Guiana Shield, which is relatively poorly known in relation to neighbor areas.

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