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Short Communication

Coussapoa curranii: an endemic species of the Atlantic Forest, rare and threatened in Rio de Janeiro state, Brazil

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Abstract

Recent *in situ* samplings and analysis of herbarium material revealed new occurrences of *Coussapoa curranii* (Urticaceae). In this study, an updated distribution map is given for the species in the Brazil. Nevertheless, due to the low representativeness of individuals in forestry surveys, and its natural occurrence in environments under threat of degradation, it is necessary to categorize this species as Critically Threatened (CR) according to IUCN criteria. Also, as a result of this study and in compliance with Target 8 of the Global Strategy for Plant Conservation, the species is being grown in the Parque Botânico do Ecomuseu Ilha Grande. This park is located in the area of its most recent record of natural occurrence, Parque Estadual da Ilha Grande, Angra dos Reis, Rio de Janeiro, Brazil.

Key words: Atlantic Forest, biodiversity conservation, Brazilian flora, endangered species, GSPC targets.

Resumo

Recentes amostragens *in situ* e análises de material de herbário revelaram novas ocorrências de *Coussapoa curranii* (Urticaceae). Neste estudo, um mapa de distribuição atualizado é apresentado para a espécie no Brasil. No entanto, devido à baixa representatividade dos indivíduos em levantamentos florestais, e sua ocorrência natural em ambientes sob ameaça de degradação, é necessário categorizar esta espécie como Criticamente Ameaçada (CR) de acordo com os critérios da IUCN. Além disso, como resultado deste estudo e em conformidade com a Meta 8 da Estratégia Global para a Conservação de Plantas, a espécie está sendo cultivada no Parque Botânico do Ecomuseu Ilha Grande. Este parque está localizado na área de seu registro mais recente de ocorrência natural, Parque Estadual da Ilha Grande, Angra dos Reis, Rio de Janeiro, Brasil.

Palavras-chave: Mata Atlântica, conservação da biodiversidade; flora brasileira, espécies em perigo de extinção, metas GSPC.

Brazil has the largest plant diversity in the world, with a high rate of endemic species (Forzza *et al.* 2012). In the case of vascular plants, about 50% of Brazilian species are endemic (Forzza *et al.* 2012; BFG 2018). These are some of the reasons that justify Brazil as one of the signatories on Convention on Biological Diversity since 1992 (United Nations 2001).

The number of recognized plant taxa of the Brazilian flora is constantly updated by floristic and phytosociological studies and online availability of scientific collections throughout the national territory. These efforts contribute to the development of the list of the Brazilian Flora (BFG 2018) and of the researches to solve the remaining gaps. Some of these studies demonstrated, for example, the rediscovery of species classified as presumably extinct (EX) in the São Paulo and Rio de Janeiro states, which are Brazilian areas whose forests were strongly reduced (*e.g.*, Filgueiras & Shirasuna 2009; Rodrigues & Filgueiras 2013; Rosa *et al.* 2016).

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This work aims to analyse the occurrence of *Coussapoa curranii* S.F. Blake (Urticaceae), commonly known as cipoeiro or cipuero, in the Rio de Janeiro state, since this species is considered uncertain or extinct in its territory (CNCFlora 2018).

In addition, to evaluate the distribution of the species in Brazil were consulted the collections deposited in the following herbaria: B, CVRD, G, HCP, HRJ, HUENF K, MO, NY, R, RB, S, and VIES (acronyms according to Thiers, continuously updated). Species identification was accomplished with reference publications for the group (Berg *et al.* 1990; Carauta *et al.* 1996), and extinction risk assessment followed the criteria and categories of the IUCN (2018).

The distribution map was produced using SimpleMappr (Shorthouse 2018). The geographic coordinates and altitude data (meters above sea level: m.a.s.l.) were referenced by herbarium data, by GPS, Datum WGS84, or determined using the app Map Coordinates. The coordinates are given in DMS notation. The use of GeoCAT (<http://geocat.kew.org/editor>) allowed to calculate the EOO (Extent of Occurrence) and the AOO (Area of Occupancy) which are prerequisites for an IUCN Red List assessment (Bachman *et al*. 2011). The estimation of AOO was based on the sum of squared grids of known occurrence based on grids of 2 km^2 as suggested by IUCN guidelines. The estimation of EOO was based on the minimum convex hull that contains all sites of known occurrence.

The family Urticaceae is represented in Brazil by 13 genera and 102 species, 25 of which are endemic (Romaniuc Neto & Gaglioti 2015). The most comprehensive taxonomic study of the genus *Coussapoa* Aubl. is Flora Neotropica, in which 46 species of the genus are described and illustrated (Berg *et al.* 1990). *Coussapoa curranii* is endemic to the Brazilian Atlantic Forest and occurs at elevations of up to 500 meters (Carauta *et al.* 1996). Most records of this species were made in the 19th and at the beginning of the 20th centuries in Brazil, in the states of Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro and São Paulo (Berg *et al.* 1990; Ribeiro & Gaglioti 2018). However, habitat fragmentation has led to a continuous decline of occupation area and natural habitat quality of this species (Carauta *et al.* 1996; Oldfield *et al*. 1998).

Coussapoa curranii is a perennial dioecious tree with: tiny stipules (0.3–1.0 cm in length); puberulous petioles; coriaceous, obovate leaves with obtuse to rounded apex, entire margin, glabrous abaxial face (or with sparse trichomes) with a prominent vein, denser indumentum of the adaxial face with an attenuate to subcordate base, marginate margin; and branched inflorescences in bunches, with globose flowers, ca. 2 mm in diameter if staminate, and 4–6 mm in diameter, if pistillate (Fig. 1). A detailed morphological description of *C. curranii* is provided by Berg *et al.* (1990). Although the species has an arboreal habit and can reach more than 40 m in height when it is well developed (Berg *et al.* 1990), it sometimes starts its development as a hemiepiphyte. Arboreal and hemiepiphytic habits also occur in *Coussapoa microcarpa* (Schott) Rizzini, a closely related species that also occurs in Brazil (Berg *et al.* 1990).

Dioecious plants may be at disadvantage compared to non-dioecious plants (Vamosi & Vamosi 2005), including reduced mate assurance (Pannell & Barrett 1998), a 'seedshadow handicap' (Heilbuth *et al.* 2001), and a reliance on large pollinator pools (Vamosi & Otto 2002). So, as dioecious plants, *C.curranii* can be particularly susceptible to anthropogenic disturbances.

Coussapoa curranii is listed as Near Threatened (NT) by the CNCFlora in the Red List of Brazilian Flora and as Vulnerable (VU) by IUCN Red List of Threatened Species (CNCFlora 2018; IUCN 2018). The reviewers considered the occurrence of this species in the Rio de Janeiro state as very dubious, since records of its occurrence were in areas that are now fully inhabited. They also identified the Reserva Biológica de Sooretama as the only site where actually *Coussapoa curranii* is known to occur (CNCFlora 2018), and where only a single individual was sampled in one hectare surveyed (De Paula 2006). However, recent samples of *Coussapoa curranii* was recorded in the Parque Estadual da Ilha Grande, at 50 m.a.s.l., Ilha Grande, Angra dos Reis, Rio de Janeiro state (Tab. 1; Fig. 2). The species was found as hemiepiphytic on a palm (*Syagrus romanzoffiana* (Cham.) Glassman). A voucher specimen was deposited and multiplied, by vegetative propagation, in the Parque Botânico do Ecomuseu llha Grande, Universidade do Estado do Rio de Janeiro, also located in the Parque Estadual da Ilha Grande. The herbarium survey also added two other records of *Coussapoa curranii* in different sites of Rio de Janeiro state, besides records from others Brazil regions and a new occurrence to São Paulo State (Tab. 1; Fig. 2). These are promising results that contribute to the first measures aimed at the

conservation of the species, with the location of new specimens belonging to different populations and located in protected areas. As well, it was possible to establish a first protocol for *Coussapoa curranii* reproduction.

Coussapoa curranii is a rare species whose reproductive structures are difficult to obtain in forestry surveys (De Paula 2006). These features may cause a low sampling effort and, together, with the reduction and degradation of Atlantic

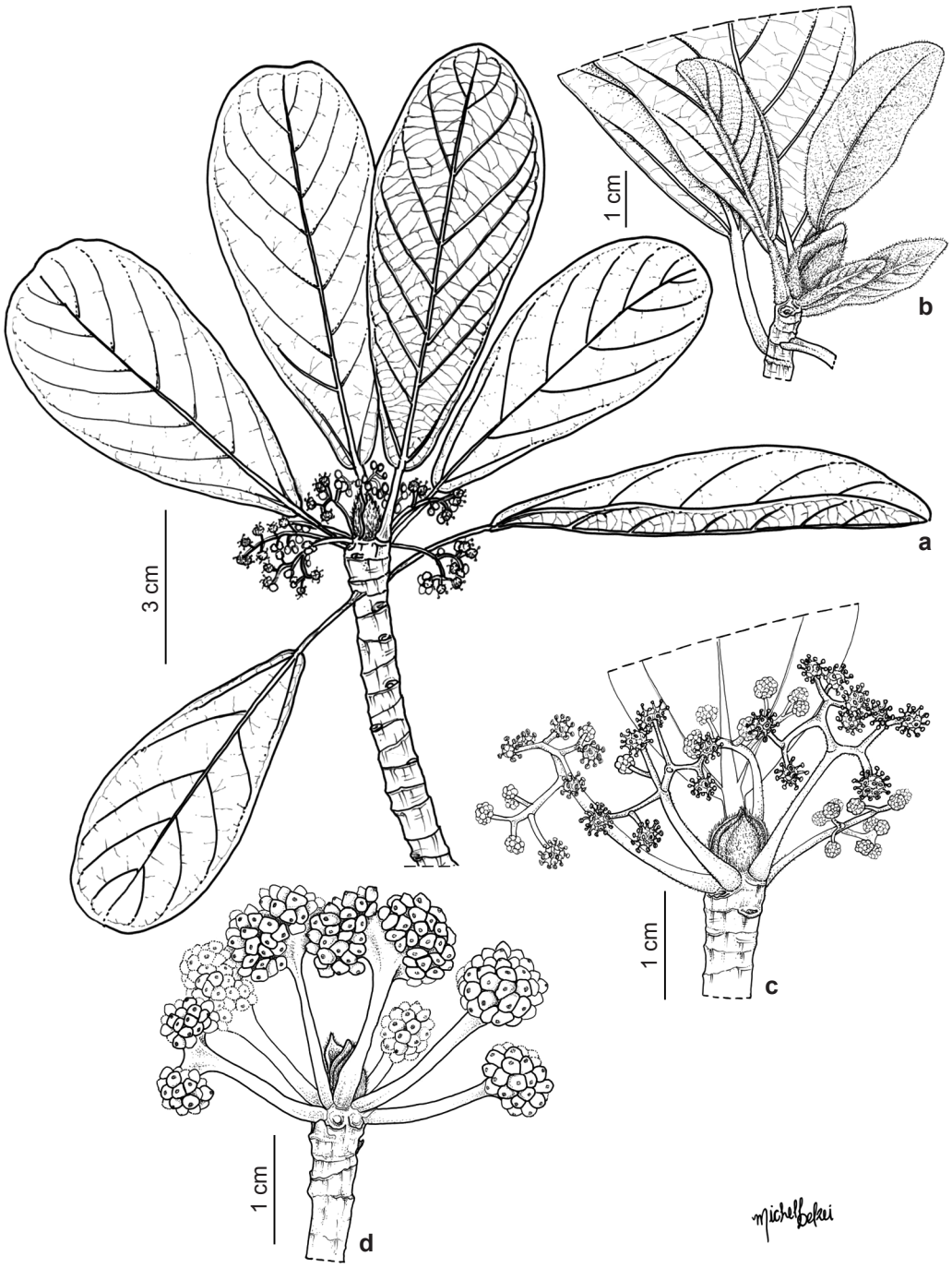

Figure 1 – a-d. *Coussapoa curranii* – a. general aspect; b. sheath apex detail; c. staminate inflorescences; d. pistillate inflorescences. (a. *A.Q. Lobão 275* RB; b. *R.D. Ribeiro 561* RB; c. *A.Q. Lobão 275* RB; d. *L. Leoni 4721* RB).

Table 1 – Records of *Coussapoa curranii* in Brazil.

Brazilian localities			Date	Collectors	Herbaria
States	**Municipalities**	**Geographical coordinates**			
Bahia	Gongogi	-14.8000S, -39.1000W	X.1916	*H.M. Curran*	RB!
Bahia	Ilhéus (Fazenda Serra Grande)	-14.7889S, -39.0494W	30.III.1994	*M. Hummel 168*	CEPEC!
Bahia	Itapebi (Fazenda Lombardia)	-15.9506S, -39.5339W	15.VIII.1971	*T.S. dos Santos 1827*	CEPEC!
Bahia	Jussari	-15.1750S, -39.5550W	9.II.1998	*W.W. Thomas 11766*	RB!, NY!
Espírito Santo	Conceição da Barra	-15.9506S, -39.5339W	21.IX.1983	*O.J. Pereira et al. 194*	VIES!
Espírito Santo	Guarapari	-15.1750S, -40.4760W	27.IX.1982	*O.J. Pereira et al. 4922*	VIES!
Espírito Santo	Linhares	-20.8097S, -42.0213W	10.II.1999	*D.A. Folli 3350*	RB!, CVRD
Espírito Santo	Pinheiros (Reserva Biológica do Córrego do Veado)	-18.4140S, -40.2171W	13.VIII.2004	*L.S. Leoni 5961*	RB!
Espírito Santo	Vila Pavão	-18.6070S, -40.658W	9.VI.2005	*L.C. Marinho 1029*	CEPEC
Minas Gerais	Faria Lemos	-22.0267S, -42.3648W	2.VI.2007	*P.J.D. Heleno 64*	RB!, GFJP
Minas Gerais	Faria Lemos (Fazenda Santa Rita)	-20.8341S, -42.0405W	2.VII.2002	*L.S. Leoni 5097*	RB!, GFJP
Minas Gerais	Faria Lemos (Fazenda Santa Rita)	-20.8341S, -42.0405W	8.IX.2001	*L.S. Leoni 4721**	RB!, GFJP
Minas Gerais	Tombos	-20.8911S, -42.0585W	29.VII.1935	*H.L. Mello-Barreto 1795*	BHCB, SP
Rio de Janeiro	Angra dos Reis (Parque Estadual da Ilha Grande)	-23.0900S, -44.1300W	22.IX.2017	*M.D.M. Vianna-Filho 3001*	HRJ!
Rio de Janeiro	Cabo Frio/Búzios (Fazenda José Gonçalves)	-22.7484S, -41.8835W	20.IV.1997	*A.Q. Lobão 275**	RB!
Rio de Janeiro	Campos dos Goytacazes	-21.7621S, -41.3180W	23.VII.1997	*Moreno 347*	HUENF!
Rio de Janeiro	Cordeiro (Fazenda Santa Clara)	-19.3946S, -40.0642W	II.1970	*Lisboa*	R!
Rio de Janeiro	Maricá (Ponta Negra)	-22.9413S, -42.5145W	20.IV.2012	*M.D.M. Vianna Filho & R. Moura*	HRJ!
Rio de Janeiro	Niterói (Alto Mourão)	-22.9354S, -42.8245W	1.VII.1982	*R.H.P. Andreata 457*	RB!

Brazilian localities			Date	Collectors	Herbaria
States	**Municipalities**	**Geographical coordinates**			
Rio de Janeiro	Petrópolis	-22.5199S, -43.1926W	1861	*A.F. Glaziou 8934*	MO!, G, B, P, K, S
Rio de Janeiro	Rio de Janeiro (Gávea)	-22.5983S, -43.1553W	23.VII.1922	*P. Occhioni*	RB!
Rio de Janeiro	Rio de Janeiro (Jardim Botânico)	-22.5740S, -43.1053W	3.IX.1946	*J.G. Kuhlmann*	RB!
Rio de Janeiro	Rio de Janeiro (São Conrado)	-22.4058S, -43.6685W	VI.1960	*A.P. Duarte 5239*	RB!, NY!
Rio de Janeiro	Rio de Janeiro (Morro São João - Copacabana)	-20.8097S, -42.0213W	16.XII.2005	*R.D. Ribeiro 561**	RB!
Rio de Janeiro	Vassouras	-22.5740S, -43.1053W	30.X.2015	*Rigon 935*	HCP!
São Paulo	Queluz	-20.8911S, -42.0585W	23.V.1996	*R. Goldenberg 202*	SPF

* = illustrated samples.

Forest areas may have contributed to consider the species occurrence in the state of Rio de Janeiro as dubious (CNCFlora 2018). Furthermore, these features point to the high risk of extinction of this species since its geographic area of occurrence and habitat quality are declining (Carauta *et al*. 1996). Thus, *Coussapoa curranii* must be included in the Critically Endangered category (CR D) according to IUCN.

This is a new record for the threatened species list of Ilha Grande (Callado *et al*. 2009) and the single record of these species in botanical garden in the world, as observed on BGCI's List of species of threatened trees without known *ex situ* collections (Oldfield *et al*. 1998; Oldfield & Newton 2012). The specimen grown in the Parque Botânico do Ecomuseu Ilha Grande is available for analyses and studies that may contribute to the conservation of the species, in accordance with Target 8 of the Global Strategy for Plant Conservation (Convention on Biological Diversity 2012).

The geospatial conservation assessment tool based on 24 herbarium records estimated an extent of occurrence (EOO) of 178,804,241 km^2 and a considerable minor area of occupancy (AOO) of 88 km^2 for *C. curranii*. Based on the B criteria of the IUCN, the species was classified as Least Concern according to the EOO (EOO > 20 000 km^2) and as Endangered according to the AOO (AOO < 500 km^2). In addition, following the B2 criteria, the species should also be considered Endangered because it meets the two following conditions: (a) severely fragmented populations and (biii) continuing decline in area, extent, and/or quality of habitat. However, based on the D criteria it should be in the Critically Endangered (CR) category, because the number estimated of mature individuals is less than 50, as can be assumed by the low representativeness in inventories already carried out (Carauta *et al*. 1996; Oldfield *et al*. 1998; De Paula 2006; Callado *et al*. 2009). Therefore, the taxon's final determination is always the highest ranked.

The Atlantic Forest has a fragmented distribution, with a history of disturbance and low functional connectivity among fragments (Ribeiro *et al.* 2009; Muniz *et al.* 2019). Furthermore, the *C. curranii* areas of occurrence in the Atlantic Forest, are dominated by anthropogenic landscapes due to conversion of forested areas to agricultural lands, urbanization, and fire. These are extremely threatening factors for rare and dioecious species, such as *Coussapoa curranii*.

It is important to note that the distributional area coincides with that of the Central Atlantic Forest Corridor and the Serra do Mar Ecological

Corridor, important conservation hotspots. Those Diversity Corridors encompass some of the most densely populated areas of Brazil, within which there are several important fragments of Atlantic Forest, and areas with the richest biodiversity of this Biome (Lima 2006; Lino *et al.* 2007). The Ecorregions (LIFE 2018) where the species occur are shown in Figure 2.

Although *C. curranii* occurs in one of the most-inventoried regions of southeastern Brazil, only 24 occurrence records were found, demonstrating the rarity of the species. It is highly recommended that genetic analyses would be performed to test genetic diversity and its effective population size.

In view of the conservation risk aspects, protection actions are necessary to reduction of the probability of species extinction. It is recommended genetic rescue to increase genetic diversity and maintain genetic connectivity among its populations, as well as reintroduction, and *ex situ* conservation.

The occurrence of this threatened species in protected areas and its propagation in a botanical garden, in the its original area, and available for recovery and restoration programs of degraded areas are essential for developing plans of conservation.

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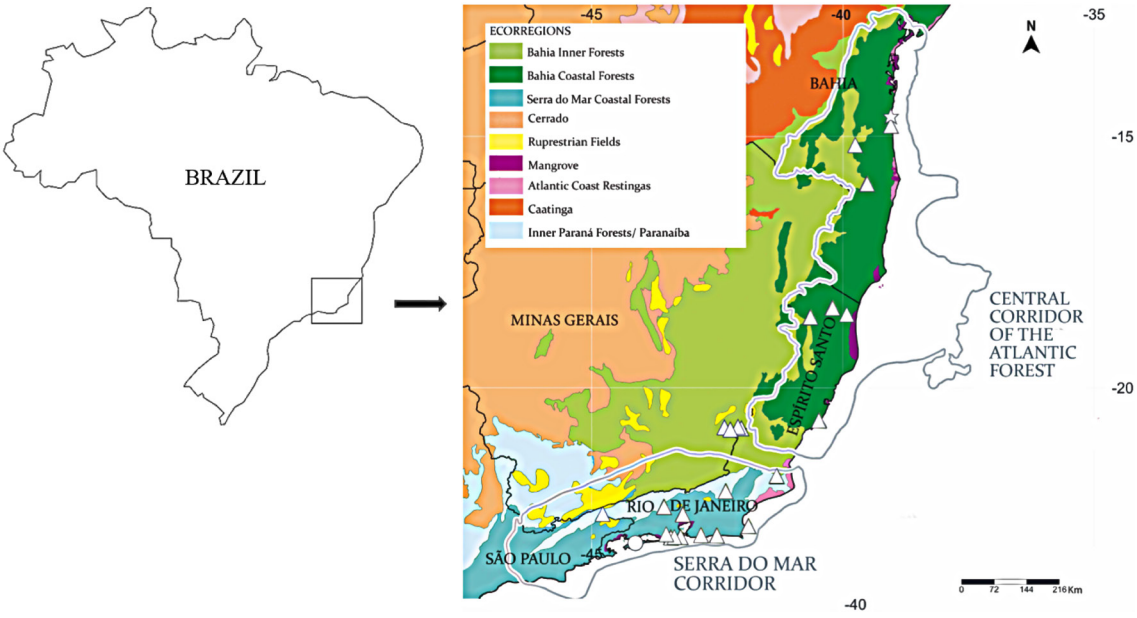

Figure 2 – Map of the distribution area of *Coussapoa curranii*. Ecorregions follow LIFE (2018). ☆ = type location; ○ = Ilha Grande occurrence; Δ = other occurrences.

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