

Original Paper

Lectotypification, geographic distribution and conservation status of *Cephalanthus glabratus* (Naucleaeae-Rubiaceae)

María Florencia Romero^{1,4,5}, Roberto Manuel Salas^{1,2} & Ana María Gonzalez^{1,3}

Abstract

Cephalanthus glabratus is an imperfectly known species of the family Rubiaceae. It is a medicinal plant widely used by the locals in its area of distribution, however until now it has received little attention from the scientific community, which is evidenced in the few articles treating the species. The species is a much-branched shrub, with whorled leaves, glomeriform inflorescences, schizocarpic fruits with 1-seeded mericarps, and seeds with a large spongy strophiole. It grows only in the vegetation of the lowlands and is always related to the basins of the main rivers of the region, Paraguay, Paraná, Uruguay and Río de la Plata, and therefore is strongly threatened by the human activities along them (hydroelectric dams, deforestation, advances of urban areas, reduction of the wetlands, etc.). Following IUCN guidelines and all available distributional data, we rated it NT (Near Threatened). Despite the fact that the genus was taxonomically revised, the nomenclatural type of *Cephalanthus glabratus* was not correctly clarified, so we have done so here. A detailed description, ecological and distributional data are provided.

Key words: conservation assessment, geographic distribution, lectotypification, medicinal plant, taxonomy.

Resumo

Cephalanthus glabratus é uma espécie imperfeitamente conhecida da família Rubiaceae. Esta é uma planta medicinal muito utilizada pelos habitantes locais em sua área de distribuição, porém até agora tem recebido escassa atenção da comunidade científica, o qual é evidenciado na escassa literatura que trata do táxon. A espécie é um arbusto muito ramificado, com folhas verticiladas, inflorescências em glomérulos, fruto esquizocárpico, uma semente por mericarpo, e sementes com um estrofiolo proeminente e esponjoso. A espécie cresce somente em vegetação de áreas baixas alagáveis e está sempre relacionada às bacias dos principais rios da região, Paraguai, Paraná, Uruguai e Rio da Prata, e, portanto, é fortemente ameaçada pelas atividades humanas ao longo delas (hidrelétricas, desmatamento, avanços das áreas urbanas, redução das zonas úmidas etc.). Seguindo as diretrizes da IUCN e baseado em todos os dados disponíveis de distribuição, classificamos como NT (Near Threatened, quase ameaçada). Apesar de que gênero foi taxonomicamente revisado, a nomenclatura do tipo de *Cephalanthus glabratus* não foi por enquanto corretamente estudada, portanto, é revisada aqui. Uma descrição detalhada, dados ecológicos e de distribuição são adicionalmente fornecidos.

Palavras-chave: avaliação da conservação, distribuição geográfica, lectotipificação, planta medicinal, taxonomia.

Introduction

The genus *Cephalanthus* L. belongs to the coffee family, Rubiaceae, tribe Naucleaeae. Haviland (1897) distinguished the tribe by having globose and multiflowered inflorescences, infundibuliform corolla, elongated tube and

imbricated or valvate lobes, stamens fixed at the corolla tube, short filaments, style elongated and exerted, stigma capitate, entire or 2-lobed, 2-locular ovary, placenta linear, and locules with 1-numerous ovules. In contrast, Ridsdale (1976) separated *Cephalanthus* from the tribe Naucleaeae and located

¹ Instituto de Botánica del Nordeste (UNNE-CONICET), Corrientes, Argentina.

² Facultad de Ciencias Exactas y Naturales y Agrimensura (FaCENA-UNNE), Corrientes, Argentina. ORCID: <<https://orcid.org/0000-0001-7799-9017>>.

³ Facultad de Ciencias Agrarias (UNNE), Corrientes, Argentina. ORCID: <<https://orcid.org/0000-0002-9311-0967>>.

⁴ ORCID: <<https://orcid.org/0000-0003-4780-340>>.

⁵ Author for correspondence: email: mariafloromero@gmail.com

it in its own tribe called Cephalantheae Kunth. The author considered Naucleaeae, as conceived by Schumann (1888), as a heterogeneous group, with the globose multiflowered inflorescences the only morphological character shared by all their members. This kind of inflorescences was considered by Ridsdale (1976) as irrelevant to differentiate it from other tribes, because it appears in numerous other Rubiaceae. Based on molecular and morphological analysis, Razafimandimbison & Bremer (2002) transferred *Cephalanthus* back to the tribe of Naucleaeae, in the Cephalanthinae subtribe. Razafimandimbison & Bremer (2002) redefined the tribe Naucleaeae as a monophyletic group supported mainly by the multiflorous globose inflorescences and floral epigenous nectaries deeply embedded in the hypanthium, being Cephalanthinae, the sister group of the remaining subtribes.

The genus comprises only six species, of which five are small trees or shrubs, while one is a liana or small climbing tree. Three species inhabit the Americas, *Cephalanthus glabratus* (Spreng.) K. Schum., *C. occidentalis* L., *C. salicifolius* Bonpl., two species are from Tropical Asia, *C. angustifolius* Lour., *C. tetrandrus* (Roxb.) Ridsdale & Bakh. f., and one is African, *C. natalensis* Oliv. The American species have a markedly disjunct distribution, *C. occidentalis* grows in North America (from Canada to Mexico), *C. salicifolius* is from South of North America and Mesoamerica, while *C. glabratus* only inhabits the Southern Cone of South America (Ridsdale 1976).

Cephalanthus is the only genus of the tribe with most of the species that grow in permanent aquatic environments, both lentic (lakes and lagoons) and lotic (rivers and small streams of variable flow), and even in mixed environments, such as flooded river plains or in dams (Romero *et al.* 2019). Curiously, *C. natalensis* is the only species that grows on margins of montane forests, rocky outcrops or mountain pastures, places that although rainy, the soil is not waterlogged (Bridson & Verdcourt 2003).

Cephalanthus glabratus, commonly known in the countries where it grows as “sarandí”, or “sarandí colorado” (red sarandí), is widely used in popular medicine as a replacement or in combination with the “sarandí blanco” (white Sarandí, *Phyllanthus sellowianus* Mull. Arg.), for the treatment of diabetes by its hypoglycaemic effect (Martínez Crovetto 1981). On the other hand, although it is a species widely used by locals as medicinal, melliferous and even as an ornamental,

its distributional limits and state of conservation were unknown until this treatment, where they are analysed.

Taxonomic history of *Cephalanthus glabratus*

Cephalanthus glabratus was originally described by Sprengel (1824) as *Buddleja glabrata* Spreng., that genus currently located in Scrophulariaceae. The author based its description on a specimen of Friedrich Sellow, without number, and whose location was cited as “Monte Video”, apparently deposited in the Berlin herbarium (B). In 1827, Chamisso & Schlechtendal, described the species again but this time correctly in the genus *Cephalanthus*, as *C. sarandi* Cham. & Schldl., placing *Buddleja glabrata* in synonymy. The authors correctly relocated this species under *Cephalanthus*, because they mentioned the globose inflorescences, hairy spatulate bracteoles, capitate stigma, and 1-seeded locules and dry fruit. However, they based their description on a material also collected by Sellow, currently deposited in the HAL herbarium. Because it is duplicate of Sellow’s collection, previously used by Sprengel (1824) to describe *B. glabrata*, the binomial is currently considered a homotypic synonym. In 1888, Schumann combined the epithet *glabratus* to *Cephalanthus*, thus *Cephalanthus glabratus* (Spreng.) K. Schum., and placed *C. sarandi* under its synonymy. This transfer was unnoticed by Haviland (1897) in his review of the Naucleaeae tribe, who kept *C. sarandi* as a valid name. According to Urban (1891), part of Sprengel’s herbarium (ca. 12,000 specimens) was acquired by the Herbarium of Berlin in 1890, including specimens gathered by other well-known collectors (ca. 20, *e.g.*, Balbis, Bertero, Lamarck), among which were the collections of Sellow analysed by him. As it is widely known, the Berlin collections were destroyed in the Second World War (Hiepko 1987), including the original collections of Sellow. For this reason, in the present work we lectotypify the basonym *Buddleja glabrata* (= *Cephalanthus glabratus*) by holotype destruction.

Material and Methods

Taxonomic treatment

Our study was based on the analysis of 120 specimens of *Cephalanthus glabratus* from the following herbaria AS, BR, CTES, FCQ, G, HAL, HUEFS, IAC, MNES, MBM, MO, LIL, NY, P, PY, SPF, SI, R, UEC, (acronyms according to Thiers,

continuously updated). We complemented the study with fieldwork in NE Argentina, Oriental Paraguay and South Brazil in order to collect fresh materials, images or observations of its habitat. The materials collected were deposited in the Herbarium (CTES), Instituto de Botánica del Nordeste, Corrientes, Argentina.

Geographic distribution and conservation assessment. To analyse the distribution of the species, specimens which were analysed for the morphological observations in addition to digital images of specimens available at the websites of the following herbaria: APA, BOTU, CEPEC, CGMS, COR, ESA, FEUL, FLOR, FURB, HAS, HCF, HDCF, HLP, HRB, HUCC, HUEM, INPA, JOI, MPUC, PACA, R, RB, UFG, UNOP, UPCB, and US (JSTOR Global Plants <<http://plants.jstor.org>>, and Re flora, Virtual Herbarium <<http://reflora.jbrj.gov.br/reflora>>). One hundred and twenty-two specimens were georeferenced using Google Earth Pro (2018) version 7.3.2 and plotted in QGIS for the USA map (QGIS 2019). The conservation assessment was performed using GeoCAT (Bachman *et al.* 2011) and following the guidelines of the IUCN (2019). The report was generated using 319 georeferenced points, of which 122 points are those cited in additional materials, 188 points from GBIF dataset (different to the examined materials) and 9 are human observations from iNaturalist. The last two dataset were previously visually examined.

Results and Discussion

Taxonomic treatment

Cephalanthus glabratus (Spreng.) K. Schum., in Martius, (eds.), *Fl. bras.* 6(6): 128, tab. 94. 1889. *Buddleja glabrata* Spreng., *Syst. Veg.* 1: 431. 1824. *Cephalanthus sarandi* Cham. & Schltdl., *Linnaea* 2: 610, *nom. illeg.* 1827. Type: [Uruguay], “Monte Video” [Montevideo], 1814–1831, *F. Sellow* (Lectotype HAL0107358, here designated; islectotypes BR0000005576456!, BR0000005576784!, E00505359!, HAL0097791!, L0000206!, M0187150!)

Shrub 3–5 m tall, basally much branched, bark almost smooth, slightly striate longitudinally. Stems basally smooth, sparsely lenticellate, fragile and brittle, glabrous apical stems, glabrous or puberulous elsewhere. Leaves in whorls, 3(–4) foliate; petiolate, petiole subcylindrical, margin puberulous, rest glabrous, 3–9 cm long; blades narrowly ovate or narrowly elliptic, base attenuate, apex acute, glabrous above, glabrous or puberulous below, margin hirtellous, glabrescent or glabrous,

membranaceous or papery when fresh, papery or subcoriaceous when dry, slightly discoloured; veins 3–6 on each side, visible in abaxial face, slightly discoloured, domatia in tuft of hairs; stipules interpetiolar, tardily deciduous, entire, narrowly ovate, ovate acuminate to narrowly triangular, membranous, green or green-reddish when young, castaneous when shed, pubescent on both sides, apex, margin and lower half of adaxial face covered by colleters. Inflorescences thyrsoid, axillary and terminal, cymose, in a pleiochasium, frondose; partial inflorescences glomeriform, strongly compressed, spherical, long pedunculate, individually ebracteate or reduced to the stipular sheath, the terminal generally larger in diameter, opening of the flowers irregular; bracteoles spatulate, pubescent, margin with colleters. Flowers perfect, actinomorphic, proterandrous, with stigmatic pollen presentation, sessile, with a mild aroma of cinnamon; calyx 4–5-lobed, light green, hypanthium cupuliform, 0.67–1.05 mm long, tube 0.69–1 mm long, with a dense ring of hairs at the base of the inner surface, lobes broadly ovate, obtuse, margin puberulous, 0.37–0.7 mm long, with interlobular colleters; corolla 4–5-lobed, imbricated, 5 mm long., externally with minute appendages at the interlobular sinuses that end in a black colleter, rest glabrous, lobes rounded, internally pubescent, from the base to upper third, glabrous outside; tube glabrous on both faces; stamens 4–5(6–7), included; filament filiform, glabrous, 0.4–0.7 mm long. anthers subsessile, base sagittiform, with a terminal appendix of the connective, 1–1.4 mm long., ovary 2(3–4) carpellate, 2–(3–4) locular, locules 1-ovulate, style filiform, 6–7 mm long, stigma capitate, exerted at the end of anthesis, nectariferous disc entire. Fruit dry, schizocarpic, rarely scarcely opened septically at the apex, mericarp 1-seeded, obpyramidal, turbinate, or sometimes subglobose, faces rounded or angulate, even irregular, 5–5.5 mm long, glabrous, pericarp coriaceous, thin; seed plane-convex, sub-rhomboidal, smooth, microscopically papillate, strophiole longer than the seed, white, slightly rugose, spongy (Fig. 1a-n).

Cephalanthus glabratus inhabits Brazil (Mato Grosso do Sul, Rio Grande do Sul, and Santa Catarina), Eastern Paraguay, Uruguay, and NE Argentina. In Argentina, it grows in Buenos Aires, Chaco, Corrientes, Entre Ríos, Formosa and Misiones; In Brazil, in the Southeast (São Paulo), South (Paraná, Rio Grande do Sul, and Santa Catarina), and Central-West (Mato Grosso do

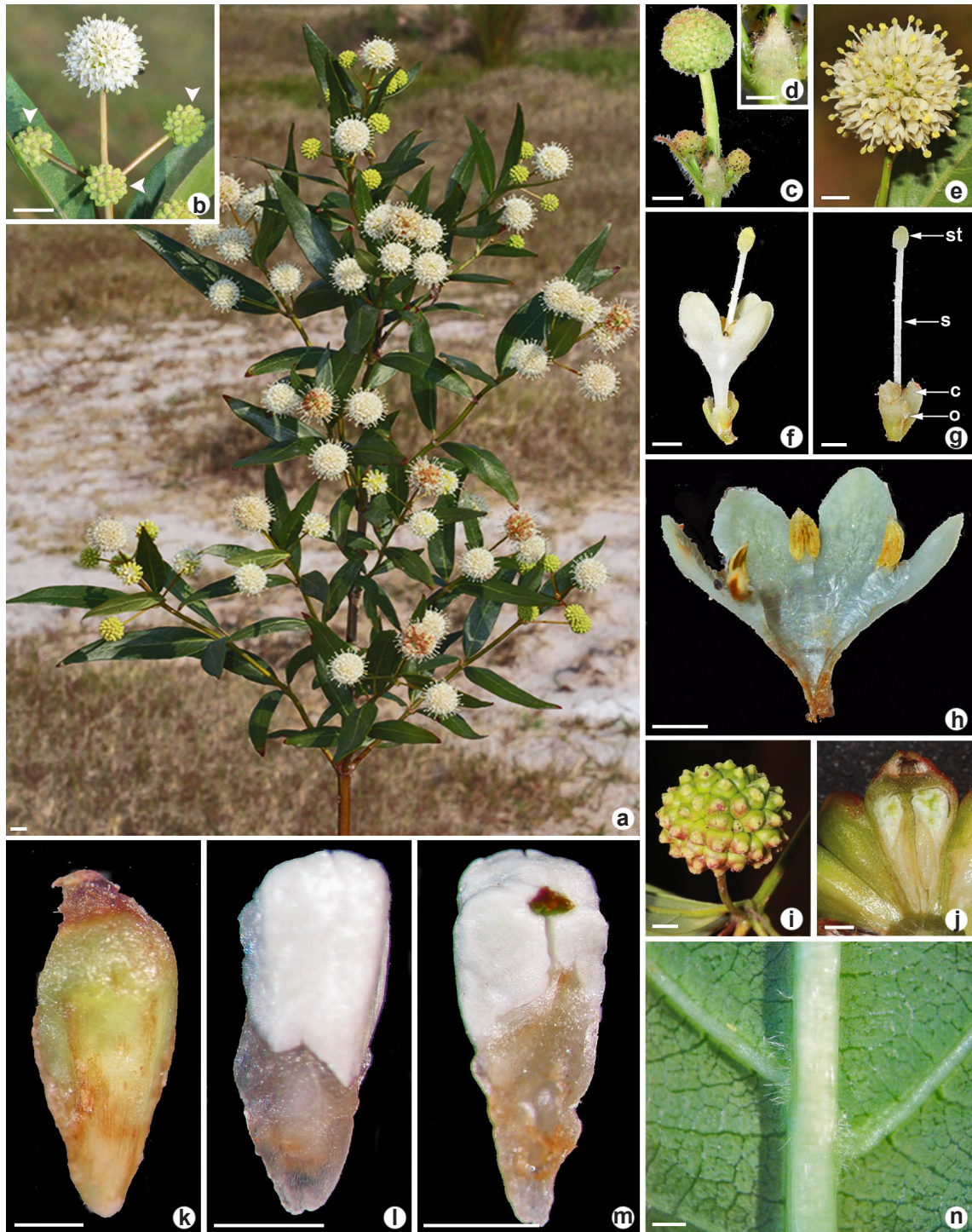


Figure 1 – a-n. Diagnostic features of *Cephalanthus glabratus* – a. inflorescences thyrsoid; b. partial inflorescences glomeriform (arrowhead); c. young glomerulus; d. detail of stipula with black colletter at apex and margin; e. glomerulus with flowers in anthesis; f. detail of flower; g. detail of hypanthium, style and stigma; h. corolla unfolded with welded anthers; i. infructescence; j. longitudinal cut of fruit dry, schizocarpic; k. mericarp; l. seed with strophiol in dorsal view; m. seed with strophiol in lateral view; n. domatia in tuft of hairs. (st=stigma; s=style; c=calyx; o=ovary). Scale bars: a, b = 10 mm; c, d, e, f, g, h, i, j, k, l, m, n = 1 mm.

Sul). In Paraguay, it grows in the oriental portion of the country, Alto Paraná, Caazapá, Canindeyú, Central, Concepción, Cordillera, Itapúa, Misiones, Paraguari, and San Pedro departments, while in Uruguay, inhabits Cerro Largo, Colonia, Rivera, San José, and Soriano departments (Fig. 2).

It blooms profusely from August to October, declines towards December and remains with flowers in isolated individuals until May. It fructifies from the end of October to January, declining towards March.

The species grows always in low terrains, mainly inundated, and following the main rivers and their tributaries. In Argentina, it inhabits from Formosa, Chaco, Corrientes, and Misiones to the depression of the Salado River in to Northeast Buenos Aires, following the course of the main rivers as Uruguay, Paraná, and Río de la Plata (Fig. 3). In Paraguay, and Brazilian states of Mato Grosso do Sul, São Paulo, and Paraná, *Cephalanthus* grows almost exclusively in relation to the basins of the Paraguay and Northern portion of Paraná rivers. In Rio Grande do Sul, it forms dense clusters, especially in the flooding margins of the Uruguay River, Jacuí River, Los Patos, and Los Quadros lagoons. In the state of Santa Catarina, it is very scarce because it was only collected in the margins of the Uruguay River, near to Rio Grande do Sul and Argentina border.

According to Di Persia & Neiff (1986), environments where *Cephalanthus glabratus* grows can be characterized as a particular type of seasonal wetlands or “bañados” (Argentinian regional term), which is exposed to an alternation of wet and dry periods. This kind of vegetation is composed of herbaceous species with scattered trees and shrubs of *C. glabratus* and *Phyllanthus sellowianus*. Frequently, authors called these environments “woody wetlands” or “bañado-bosques”. In field observations, we observed that these types of vegetation can be observed as patches of irregular shapes up to one or more hectares, which follow contours of lagoons and streams with scarce slope, to narrow forms in the transitional zones in coastal rivers with higher flow and pending (e.g., Paraná or Uruguay rivers). In coincidence with this seasonality, Romero *et al.* (2019), proposed that the anatomical leaf structure of all *Cephalanthus* species gathers adaptations to both xerophytic (dry periods, leaves with heterobaric anatomy) and mesophytic (humid periods, thin cuticle and cell walls, single layered epidermis, mesophyll with large intercellular spaces, and

few trichomes) habitats. Taking into account the vegetation in which it lives and its adaptation to reofilic habits, Marchiori (2004), and Sieglösch *et al.* (2011), studied the wood anatomy of *C. glabratus*. The authors determined that the wood characteristics coincide with a plant with strong mechanical adaptations to fast flowing rivers. In this sense, Delprete *et al.* (2004), mentioned that it is a plant that can be useful in restoration projects of degraded riparian areas. Kettenhuber (2017) also considered the anatomy as an indicator of a useful plant for natural restoration. In this work, it is concluded that it is a highly recommended species for bioengineering works due to its mechanical adaptations to the reofily, rapid vegetative propagation and adaptation in field.

In popular medicine, a decoction of *Cephalanthus glabratus* bark is used as a substitute for white sarandí (*Phyllanthus sellowianus*), for the treatment of diabetes. The infusion of the leaves is diuretic, depurative and astringent (Martínez Crovetto 1981). In Corrientes, Argentina, at “Iberá Microsystem” (second largest wetland in South America), local people reported *Cephalanthus glabratus* as a very important source in the domestic honey production, even giving honey the same medicinal benefits as the plant (Salas, R.M., personal observation, 2016). About its phytochemical aspects, Jorge *et al.* (2006) found heteroyohimbine-type alkaloid tetrahydroalstonine, white solid identified as the triterpene ursolic acid, the oxindoles mitraphylline and Uncarine E, however its active principles remain obscure.

Romero *et al.* (2015), mentioned that *C. glabratus* lacks domatia, however a study carried out by the same authors found that this species has leaf domatia (tufts of hairs), its presence being an infrequent trait (Romero *et al.* 2019).

The area of occupancy (AOO) was calculated in 944 km² and the Extent of Occurrence (EOO) in 1,286,359 km², being the report generated using GeoCAT (Bachman *et al.* 2011) based on all available data provided by this online tool (<<http://geocat.kew.org/>>). Due to the species shows a discontinuous and fragmented distribution, we follow the criterion of geographical distribution (B), in the form of AOO. In this sense, area of occupancy reflects the fact that species are often habitat specialists, and will not usually occur throughout the area of its extent of occurrence, which may contain unsuitable or unoccupied habitats (IUCN 2019). According to the estimated value AOO = 944 km² (cell width 2 km), and

following the guidelines of the IUCN (2019), the species should be considered as VU (vulnerable). However, based on the present knowledge of the species (it has more than ten known localities),

does not gather two or more of the conditions necessary to be categorized as VU. For this reason, the species should be considered as NT (Near Threatened).

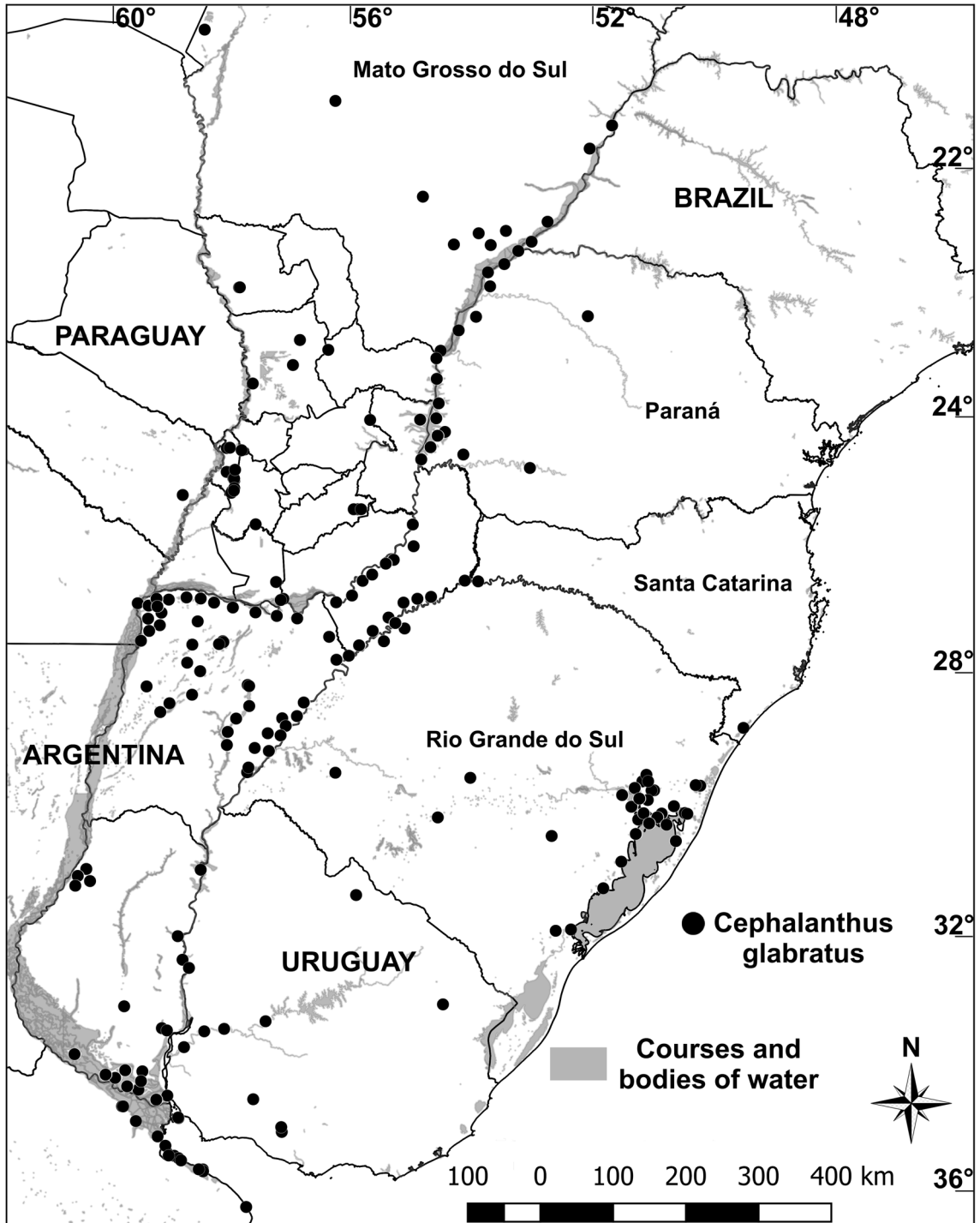


Figure 2 – Distribution map of *Cephalanthus glabratus* in South America.

As *Cephalanthus glabratus* has a continuous decrease in the area of occupation (AOO) and in the number of known populations (more than 50% of the specimen have 50 or more years old), it is advisable to perform a new assessment in the next years in the light of the numerous threats that affect its habitat quality, some of the are mentioned following. The main threats are the numerous dams in the basins of the Parana river (in operation: Puerto Primavera, Ilha Solteira, Jupíá, Itaipú, and Yacyreta; and projected dams in coming decades: Paraná Medio Project and Corpus Christi Hydroelectric Project), Uruguay River (in operation: represa of Foz de Chapecó, Represa de

Itá, represa Machadinho, and Salto Grande; and other dams projected in the next years: Garabí and Panambí dams, in Argentinean-Brazilian border), and Rio Negro river, in Uruguay (three dams in operation). In Argentina, provinces of Corrientes and Entre Ríos, the habitat of *Cephalanthus glabratus* was strongly modified to obtain lowlands to rice culture and pine monoculture, and also to expand the livestock activities, these economic activities are currently in a frank expansion in the region. In Southern Brazil, Rio Grande do Sul and Santa Catarina states, Delprete *et al.* (2004) mentioned that the species has a discontinuous distribution in the basins where it grows. In the



Figure 3 – a-d. Habitats of *Cephalanthus glabratus* – a. Yabotí river in Misiones, Argentina, the coastal community is composed by *Mimosa pellita* and some intermingled specimens of *C. glabratus* (arrows); b. a seasonal affluent of the Riachuelo river (Paraná River basin). There, *C. glabratus* can be grows on both sides of the stream (arrow); c. view from the Argentinian part of Uruguay River during the rise of river, showing the community in where *C. glabratus* grows (arrow); d. view of the coastal of a lagoon, inside Iberá system, Concepción, Corrientes, Argentina, showing a dense and impassable community of *Schoenoplectus californicus* and *Cephalanthus glabratus* (arrows). Photos: a, c. Sobrado S.; b, d. Salas R.

country, natural habitats are currently threatened by the strong deforestation of the original vegetation and by the installation of numerous hydroelectric projects. The most Southern populations, in the Province of Buenos Aires, were strongly modified by the expansion of urban areas and large projects of private neighbourhoods in areas that were naturally waterlogged. Due to most of the collections in Buenos Aires being more than seventy years old, the populations of this province are the most threatened in the whole range of the species.

Some questions need to be answered about the species to obtain a more accuracy conservation assessment in next years, for example: 1) to know if there is a genetic exchange between known populations; 2) to know its reproductive system (its closest species, *Cephalanthus occidentalis* L., has protandry, incompatibility, and secondary pollen presentation, Imbert & Richards 1993); 3) viability, germination power and germinative energy; and 4) to evaluate if it has autochory and hydrochory (e.g., floatability of its diaspores). The present conservation assessment was performed using all available information of the species, as proposed by the IUCN guidelines (2019).

Additional material examined: ARGENTINA. 7. XI.1907, *E.L. Ekman 1395* (MO); II.1918, *P. Jörgensen 3418* (MO). Buenos Aires, Isla Martín García, Reserva Natural y Sitio Histórico, Isla Martín García, Talar de Arenal Central, 24.XI.2005, *S. Torres Robles 2315* (MO). Isla Martín García, 12.II.1994, *J.A. Hurrell & et al. 2126* (MO, SI); Río de la Plata, bosque ribereño, 30.XI.1945, *A. Krapovickas 2701* (CTES, MO). Puerto Punta Indio "sarandí colorado", X.1988, *A. Abba et al. 80* (MO). Berisso, Isla Paulino, 1905, *C. Nianelli 90* (SI). Bernal, costa de Bernal a Quilmes, 3.XII.1899, *C.M. Hicken* (SI). Campana, Reserva Natural Estricta Otamendi, barranca, 1.XI.2004, *S. Torres Robles et al. 2175* (MO). La Plata, Río Santiago, 28.XI.1909, *C.M. Hicken* (SI); Punta Lara, entre Buenos Aires y la Plata, 7.XII.1930, *A.L. Cabrera 1571* (SI, SP); 30.XI.1944, *V. Rodrigues 523* (SI). Las Palmas, cerca de Zarate, 13.XI.1951, *O. Boelcke 5142* (SI); sobre la costa del Río Paraná, 19.XI.1961, *N. Bacigalupo & S. Crespo 2109* (SI). Quilmes, XI.1910, *D. Jurado* (SI). Tigre, Delta, Puerto Mirú, 4.XII.1931, *A. Burkart 4541* (SI). Capital Federal, Belgrano, 22.XI.1927, *A. Burkart 1682* (SI); Barracas, al sur, 12.III.1902, *S. Venturi 23* (SI). Chaco, 1 de Mayo, Campo Antequera, Laguna La Mora, 1.IX.1971, *N.M. Bacigalupo et al. 9529* (MO, SI). CORRIENTES: Colonia Pellegrini, Ile de végétation flottante sur la lagune Ibera, 5.XI.1973, *N. Goodall & C. Tirel 255* (P, SI). Laguna Ibera, Nacientes do Miriñay, 4.IX.1997, *M.S. Ferrucci et al. 1235* (CTES); Colonia Pellegrini, orillas de Laguna Iberá, 5.XI.1973, *Aurelio Schinini*

7821 (CTES, MO); abundante en embalsado, arbusto perfumado, 5.XI.1973, *M.N. Correa 5290* (MO, SI); Reserva Natural Provincial del Ibera, Costa W de la laguna Ibera, 9.XII.1992, *S.G. Tressens et al. 4303* (CTES, MO). Concepción, Grassland with patches of scrub forestand plantations, 30.XI.1978, *S.A. Renvoize 3686* (CTES, MO, P); 11 km NW de Santa Rosa, embalsado, 13.XII.1977, *S.G. Tressens & et al. 814* (MO); Estancia Yatay Corá, 50 km NE de Chavarria, ca. 2 km al NE del casco, 3.IX.1996, *M.M. Arbo et al. 6797* (CTES); Estancia Yatay Corá, 50 km al NE de Chavarria, camino a Concepción, arroyo Garzal cerca del casco, 5.XII.1996, *M.M. Arbo et al. 7098* (CTES, MO, HUEFS). Empedrado, Estación Agronómica Tres Marias, próximo al Río Paraná, 20.III.1998, *A. Schinini 34402* (CTES, IAC). Mburucuyá, Parque Nacional Mburucuyá, Potrero 2 chico embarcadero, 19.IX.2006, *M.M. Arbo 9425* (CTES, HUEFS). Mercedes, Macrosistema Iberá, Estancia Rincón del Diablo, Laguna Yacaré, 28°42'00"S, 58°02'00"W, 30.XI.1998, *M.M. Arbo et al. 8036* (CTES). Paso de los Libres, Ruta 14, ca. 3 km E da entrada de Pucheta, alrededores de Ayo. Ayui, 13.I.2007, *J. Paula-Souza 7149* (CTES, HUEFS, SPF); Laguna Mansa, 2.XI.1973, *A.M. Faggi et al. 14024* (MO); zone inondable au bord de la lagune Mansa, 2.XI.1973, *N. Goodnall & C. Tirel 49* (P, SI). San Martín, Ruta 14, km 887, Estancia De Los Milagros, 14.I.1947, *A.M. Ruiz Huidobro 4213* (MO); San Miguel, Ea. San Juan Poriajhu, ruta 17, 18 km ruta 12, Potrero El Rodeito, 4.XII.1992, *S.G. Tressens et al. 4190* (CTES); 12 km NE de San Miguel, Ea. Toro-y, 27. II.1990, *R.O. Vanni et al. 1431* (CTES); 12 km NE de San Miguel, Ea. Curupaty, 28.II.1990, *R.O. Vanni et al. 1508* (CTES). San Roque, Estancia Caaguazú, 11 km NE de Chavarria camino a Tacuaritas, potrero Planteil, ca. 3 km al W del casco, 28°53'24"S, 58°29'24"W, 25.IX.1996, *M.M. Arbo et al. 6881* (CTES). Santo Tomé, Garruchos, costa del río, 9.II.1993, *S.G. Tressens et al. 4394* (CTES, MO, SPF). ENTRE RÍOS: Colón, Paraje La Calera, márgenes del Río Uruguay, desembocadura del arroyo Perucho Verna en Río Uruguay, 21-22. XII.1998, *P.M. Simón 96* (MO); El Palmar, 10.XII.1978, *M. Vázquez Avila 163* (SI). Federación, Rincón del Mocrete, orillas del Río Uruguay, 16.IV.1960, *A. Burkart 21937* (SI). Gualaguay, Aldea Asunción, Estancia La Jarra, Río Gualaguay, 23.II.2003, *J.A. Hurrell 5043* (MU, SI); Boca del Río Gualaguaychú, 20.XI.1946, *T. Meyer 10246* (LIL, P); Arroyo Ibicuicito y Arroyo Baltazar, 26.II.1970, *A. Burkart & N. Troncoso 27886* (SI). Santa Elena, Arroyo Feliciano y Ruta 12, *A. Burkart et al. 23509* (SI). MISIONES: Posadas, costas del río, 16.XI.1905, *M. Bertoni 1886* (LIL, P). San Pedro, Parque Provincial Moconá, 27°08'00"S, 53°53'00"W, *G.J. Seijo 849* (CTES, G, MNES). BRAZIL. MATO GROSSO DO SUL: Anaurilândia, 22°11'28"S, 52°37'26"W, 15.IX.1998, *A. Amaral Jr. 235* (UPCB). Aquidauana, Fazenda Rio Negro, Rio Negro, canal novo do rio, campo alagável, próximo a capão, 3.IX.1998,

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Velázquez 18329* (AS, MO); Northern part of Lake Ypoá basin, 12.6 km SE of Nueva Italia, Southern border of bañado on Arroyo Cañabe basin, gallery forest, 200 m, 25°38'S, 57°23'W, 13.I.1990, *E.M. Zardini & U. Velázquez 18033* (AS, MO); 27.I.1990, *E.M. Zardini & C. Velázquez 18385* (AS, MO); 25°38'S, 57°23'W,

14.XII.1989, *E.M. Zardini & R. Velázquez 16841* (AS, MO); Estero del Ypoá, Lago Ypoá, Taruma Fondo, tall forest and Cerrado forest along Lago on basaltic rocks, 25°56'S, 57°26'W, 4.I.1994, *E.M. Zardini & L. Guerrero 37736* (AS, MO); Lago Ypoá, Estero 2 km E of Cerro Taruma, on the lake, inundated savanna, 25°55'S, 57°25'W, 4.I.1994, *E.M. Zardini & T. Tillería 37778* (AS, MO); 1 km N of Villa Florida on Tebicuary River, gallery forest, 26°23'S, 57°08'W, 25.V.1993, *E.M. Zardini & L. Guerrero 35812* (AS, MO); Lago Ypoá, Estero between Isla Poi and Taruma Fondo, 1.5 km W of coast, on the lake, floating Island, 25°58'S, 57°27'W, 22.XII.1993, *E.M. Zardini & Tulio Tillería 37696* (AS, MO). San Pedro, between Santa Rosa and Santa Barbara, inundated savanna, 23°50'26"S, 56°23'47"W, 29.X.1996, *E.M. Zardini & L. Guerrero 45505* (AS, MO); Arroyo Capiibary, 18 km al E Choré, en Pantano, 1.X.1987, *E.M. Zardini & C. Benítez 3286* (MO, PY); Primavera, entre esteros y orillas húmedas, 11.XI.1957, *A. Woolston 969* (P, SI). URUGUAY. DPTO. CERRO LARGO: ruta 8, km 374, ayo, El Parao, 32°44'34"S, 54°13'14"W, *G. Seijo & al. 2714* (CTES, SI). DPTO. COLONIA: Colonia, Colonia Punta Gorda próximo a confluencia del Río Uruguay con el Río de la Plata, E de Rincón de Darwin, 33°54'57"S, 58°24'49"W, 24.XI.2007, *V. Solis Neffa & G.J. Seijo 2121* (CTES; ICN). DPTO. RIVERA: Rivera, [damp] Cuñapirú, in silvula paludosa, 12.I.1941, *B. Rambo* (PACA3996). Dpto. San José, *W.G. Herter 520* (MO); Barra, 10 m, XII.1926, *W.G. Herter 769* (MO). DPTO. SORIANO: mun. unknown, arbusto paludoso, 17.III.1940, *J.P. Gallinal H. PE-4361* (MO). Juan Jackson, P. de Soriano, 13.IX.1954, *B. Rosengurt 4361* (PACA); Paysandú, 8.XI.1888, *M. Calot* (P03820043).

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