



## Original Paper

# Novelties in *Oxypetalum* (Apocynaceae: Asclepiadoideae): a new species and revalidation of the name *O. megapotamicum*

Héctor Alejandro Keller<sup>1,4</sup>, Luis Adriano Funez<sup>2</sup> & Sigrid Liede-Schumann<sup>3</sup>

### Abstract

Based on a specimen collected in Santa Catarina state, Brazil, the new species *Oxypetalum kassneri* is described and illustrated. Moreover, a molecular phylogenetic analysis allows to propose the revalidation of *O. megapotamicum*, a species currently placed in the genus *Ditassa*. The neotype of *D. megapotamica* and the lectotype of *D. oxypetala* are designated here.

**Key words:** *Ditassa megapotamica*, lectotypification, neotypification, Oxypetalinae, *Oxypetalum kassneri*.

### Resumo

Baseado em um espécime de herbário coletado no estado de Santa Catarina, Brasil, descrevemos e ilustramos uma nova espécie: *Oxypetalum kassneri*. Além disso, com base em análises filogenéticas moleculares, propomos a revalidação de *O. megapotamicum*, espécie atualmente circunscrita no gênero *Ditassa*. O neótipo de *D. megapotamica* e o lectótipo de *D. oxypetala* são designados aqui.

**Palavras-chave:** *Ditassa megapotamica*, lectotipificação, neotipificação, Oxypetalinae, *Oxypetalum kassneri*.

## Introduction

*Oxypetalum* R. Br. is the richest genus of Oxypetalinae (Apocynaceae, Asclepiadoideae, Asclepiadeae) with over 130 taxa distributed from Argentina to Mexico, and the Caribbean, but with a center of diversity in Argentina, Brazil, and Paraguay (Ezcurra *et al.* 2008; Farinaccio & Mello-Silva 2006; Fontella Pereira *et al.* 2004; Keller & Funez 2017). Although a twining habit is the predominant growth form, around 45% (ca. 60 taxa) are constituted of erect or creeping plants which typically inhabit open environments such as grasslands and marshes.

Out of the 87 species of *Oxypetalum* recorded in Brazil (Flora do Brasil 2020 under construction), Fontella Pereira *et al.* (2004) recorded 21 species of *Oxypetalum* R. Br. in Santa Catarina State, being only nine growing as erect plants. Analysis of a

recently collected specimen from São Joaquim (SC), revealed an unprecedented combination of morphological characters among the erect species of the genus, allowing the description of a taxon new to science.

During the study of the Asclepiadoideae of Misiones, Argentina, the morphological evidenced lead to the conclusion that the species known as *Ditassa megapotamica* (Spreng.) Malme does not fits the concept of *Ditassa* R. Br. as currently understood in Konno & Fontella Pereira (2004). The basally cordate leaves and the reflexed, slenderly triangular and twisted, yellowish corolla lobes of *D. megapotamica* are not found elsewhere in *Ditassa*, but are typical of *Oxypetalum*, the genus under which the species was firstly described (Sprengel 1827). The availability of a molecular sample allowed

<sup>1</sup> Universidad Nacional de Misiones, Facultad de Ciencias Forestales, Instituto de Botánica del Nordeste, Corrientes, Argentina. ORCID: <<https://orcid.org/0000-0002-1797-9492>>.

<sup>2</sup> Universidade Federal de Santa Catarina, Depto. Botânica, Florianópolis, SC, Brazil. ORCID: <<https://orcid.org/0000-0002-0008-1061>>

<sup>3</sup> University of Bayreuth, Department of Plant Systematics, Bayreuth, Germany. ORCID: <<https://orcid.org/0000-0003-2707-0335>>.

<sup>4</sup> Author for correspondence: [kellerhector@hotmail.com](mailto:kellerhector@hotmail.com)

to reassess the generic affiliation of the species, confirming the morphological interpretations and the name *Oxypetalum megapotamicum* Spreng. is reestablished and neotypified here. The conspecificity of *D. oxypetala* Decne., established by Malme (1911) is confirmed and a lectotype for the name is designated here.

### Materials and Methods

A high resolution digital camera and stereoscopic microscope were used to obtain images and to study the material of *O. kassneri* H.A. Keller & Funez and to compile the illustrations.

The chloroplast DNA regions *trnT-L* and *trnL-F* intergenic spacers, as well as the *trnL* and *rps16* introns were obtained from a sample of *O. megapotamicum* Spreng. (Keller 13062, CTES) following the standard procedures described in Liede-Schumann & Meve (2013). The resulting sequences are available in ENA (European Nucleotide Archive) under numbers LR700193–LR700195. These new sequences were then added to “Metastelma DS1” of Liede-Schumann *et al.* (2014; M15210 in study 12788 of TreeBase (<<http://treebase.org/treebaseweb/search/study/summary.html?id=12788>>)), supplemented by *Topeinae*, as detailed in Keller & Liede-Schumann (2017). This matrix is aimed to provide a taxonomically broad sampling of Asclepiadoideae with emphasis on New World taxa. The resulting dataset was analyzed with Bayesian Inference (BI) and Maximum Likelihood (ML) using the settings described in Liede-Schumann *et al.* (2014).

### Results

#### A new Species from Brazil

***Oxypetalum kassneri*** H.A. Keller & Funez, sp. nov. *Typus*: BRAZIL. SANTA CATARINA: São Joaquim, Morro ao lado do cetejo, centro de treinamento de São Joaquim, Epagri. 1.232 m, 14.II.2019, fl and fr, *A. Kassner-Filho 4778* (*holotypus* FURB!). Figs. 1; 2a

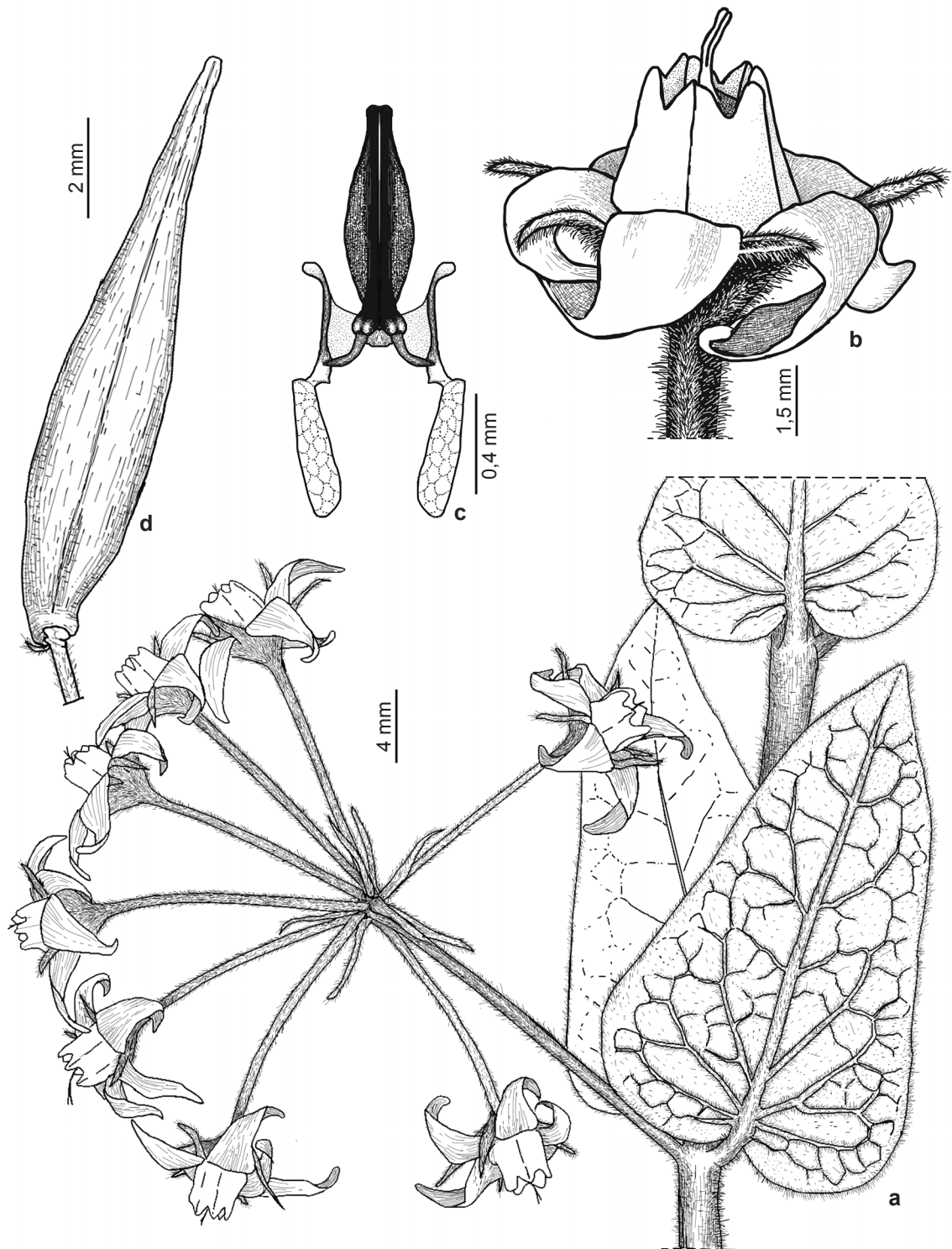
*Quoad habitum, fabricam inflorescentiarum et caput stylare forma ad Oxypetalum crispum* Wight ex Hook. & Arn. *accedit, sed ab ea differt essentialiter pedicellis longioribus, corola lobis latioribus et corpusculum lanceolatis latioribus.*

Erect subshrubs with white latex, 70–100 cm tall; internodes 2.2–5.3 cm long, 1.5–2.2 mm in diam; stems cylindrical, pubescent, trichomes erect, multicellular, uniseriate, whitish, 0.2–0.4 mm long. Leaves opposite, petioles c. 2–4 mm

long; blades broadly deltoid-ovate on the basal portion of the plant, becoming gradually smaller and narrower toward the apex, 1.8–3.8 × 0.7–3.0 cm, concolorous to slightly discolorous, adaxial and abaxial surfaces pubescent, with trichomes similar to those of the stems; margins entire, base cordate, with 2 conic colleters 0.48–0.52 mm long on adaxial surface; apex acute; venation brochidodromous with 5–7 pairs of secondary veins. Inflorescences extra-axillary, umbelliform, erect, alternate, with 6–9 flowers; peduncles 17–36 mm long × ca. 1 mm diam. pubescent; bracts filiform to linear, pilose, ciliate, 5.2–6.5 × 0.5–1 mm; pedicels 9.7–18 mm long × 0.2–0.3 mm diam., pubescent. Calyx with tube 1.1–1.3 mm; lobes linear-lanceolate, acute, c. 4.7 × 1.3 mm, pubescent on both surfaces, ciliate, 0–2 colleters 0.2–0.4 mm long below the sinus. Corolla tube broadly campanulate, 1.6–1.7 mm long × 3.2–3.7 mm diam., abaxial surface pilose, adaxial surface glabrous, corolla lobes lanceolate 5.2–6.2 × 2.3–3.5 mm, recurved, twisted near the distal third, bright green. Corona white; staminal corona lobes rectangular, 3.0–3.5 × 1.2–2 mm, notched, laterally toothed, each tooth ca. 0.7 × 0.3 mm. Gynostegium sessile. Anthers rectangular, 0.8–0.9 × 0.5–0.6 mm, terminal appendage narrowly ovate, 0.24–0.33 × 0.48–0.68 mm. Corpusculum lanceolate, 0.9–1.1 × 0.2–0.22 mm, caudicles c. 0.20 mm long, with teeth 0.3–0.32 mm long., pollinia falcate, 0.55–0.6 × 0.19–0.25 mm. Style-head pentalobed, 0.8–0.98 mm long, × 1.35–1.4 mm diam., with filiform appendage 1.3–1.5 mm long, divided at the end into two connivent processes c. 3 mm long. Ovary 1.4–1.5 × 1.3–1.4 mm, hispid. Follicles erect, fusiform, pubescent, 66–74 × 15–18 mm; seeds ovate, 6.2–6.3 × 2.6–2.9 mm, surfaces and margin rugose, brown, coma 24–31 mm long, white.

The epithet is dedicated to the enthusiastic naturalist and botanist *Anderson Kassner-Filho* (Inventário Florístico Forestal de Santa Catarina), who collected the holotype of this species.

Only known from the type locality, in São Joaquim municipality, Santa Catarina state, southern Brazil. This species inhabits open grasslands with rocky soil, growing between rocky outcrops. The presence of cattle and recent fire was observed in the locality. The high altitudinal grasslands of “Aparados da Serra Geral” region, between Santa Catarina and Rio Grande do Sul states, are extremely rich in vascular plant endemics (Hassemer *et al.* 2015). However, they are rapidly giving way to destructive livestock,



**Figure 1** – a-d. *Oxypetalum kassneri* – a. segment of stem with inflorescence; b. flower; c. pollinarium; d. fruit. Drawing by H.A. Keller (from *Kassner-Filho* 4778).



**Figure 2** – a. Stem of *Oxypetalum kassneri*. b-c. flowers of *O. megapotamicum*. Photographs: a. Andersson Kassner-Filho (Type plant); b-c. Héctor A. Keller (*Keller 13062*, CTES).

agriculture, and silviculture practices. The lack of legal protection in most of this region is a crucial aspect that, if not urgently changed, will lead to the extinction of some of the endemic species.

The only collection of this species shows floral buds, flowers and fruits during the summer, in February.

Some erect *Oxypetalum* R. Br. species have prominent corona lobes that completely hide the body of the gynostegium, but reveal part of the style-head appendage, which protrudes above the apex of the corona lobes. From the species with such characteristics, the one that most closely resembles *O. kassneri* is *O. crispum*, as both species possess broad leaves, many-flowered, long-pedunculate inflorescences, toothed caudicles and a style-head appendage divided at the end into two connivent processes. However, *O. kassneri* has longer pedicels and wider corolla lobes than *O. crispum*. Moreover, the corpuscle is linear oblong in *O. crispum*, while it is lanceolate in *O. kassneri*.

Among erect species of *Oxypetalum* R. Br. with toothed caudicles, only a few have a lanceolate corpusculum. *O. kassneri* differs from these by its non-linear leaves, by its corona lobes without ligule, and by its peduncle of more than 1.5 cm. long

***Oxypetalum megapotamicum*** Spreng., Syst. Veg., 4(2) (Cur. Post.): 111. 1827. *Ditassa megapotamica* (Spreng.) Malme., Bull. Soc. bot. Genève, 2(3-4): 270. 1911. Type: Brazil. *F. Sellow 821* (neotype NY [NY00279078], designated here; isoneotype K [K000095572]). = *Ditassa oxypetala* Decne., in Candolle., Prodr. 8: 574. 1844. Type: Brazil. Rio Grande, 1833, *Gaudichaud 699* (lectotype P [P00252620], designated here).

**Material examined:** ARGENTINA. CORRIENTES: Bonpland, 15.I.1908, *E.L. Ekman 409* (NY). MISIONES: Oberá, Ruta Prov. 103, de San Martín a Mártires, 200 m, 26.IX.1997, fl, *F. Zuloaga & O. Morrone 6515* (SI); L.N. Alem, Caá Yari, 27°30'23,5"S, 55°17'34,8"W, 176 m, 06.X.2012, fl, *H.A Keller et al. 4541* (CTES). San Ignacio, Caá Yari, 27°17'08,9"S, 55°25'09,5"W, 166 m, 22.X.2015, fl, *H.A Keller 6, M.M. Franco 4541* (CTES). Cainguás, Predio UNLP, Reserva Privada, Campito 5, 27°06'56"S, 54°59'19"W, 17.III.2000, fl, *F. Biganzoli et al. 923* (SI). BRAZIL. 1882, *Sellow 175* (NY); *Sellow 821* (NY). PARANA: Calmon, 15.III.1910, fl and fr, *P. Dusén 9322* (GH, S). RIO GRANDE DO SUL: Cachoeiras, 01.I.1902, fr, *Malme 925* (S). SANTA CATARINA: Urubici, Parque Nacional de São Joaquim, Santa Bárbara, estrada para a cascatinha, 28°08'47"S,

49°36'48"W, 1.400 m, 25.I.2019, fl, *L. Funez et al. 8702* (FURB). Chapecó, Fazenda Capo Sao Vicente, 900-1.000 m, 26.XII.1956-28.XII.1956, fl, *L.B. Smith, R. Reitz & O. Sufridini 9462* (NY). Campo de Capivare, Serra Geral, 1.1891, fl, *E. Ule 1846* (HBG). URUGUAY. SORIANO: Juan Jackson, Sta. Elena, X.1939, fl, *J.P. Gallinal et al. PE-4292* (NY).

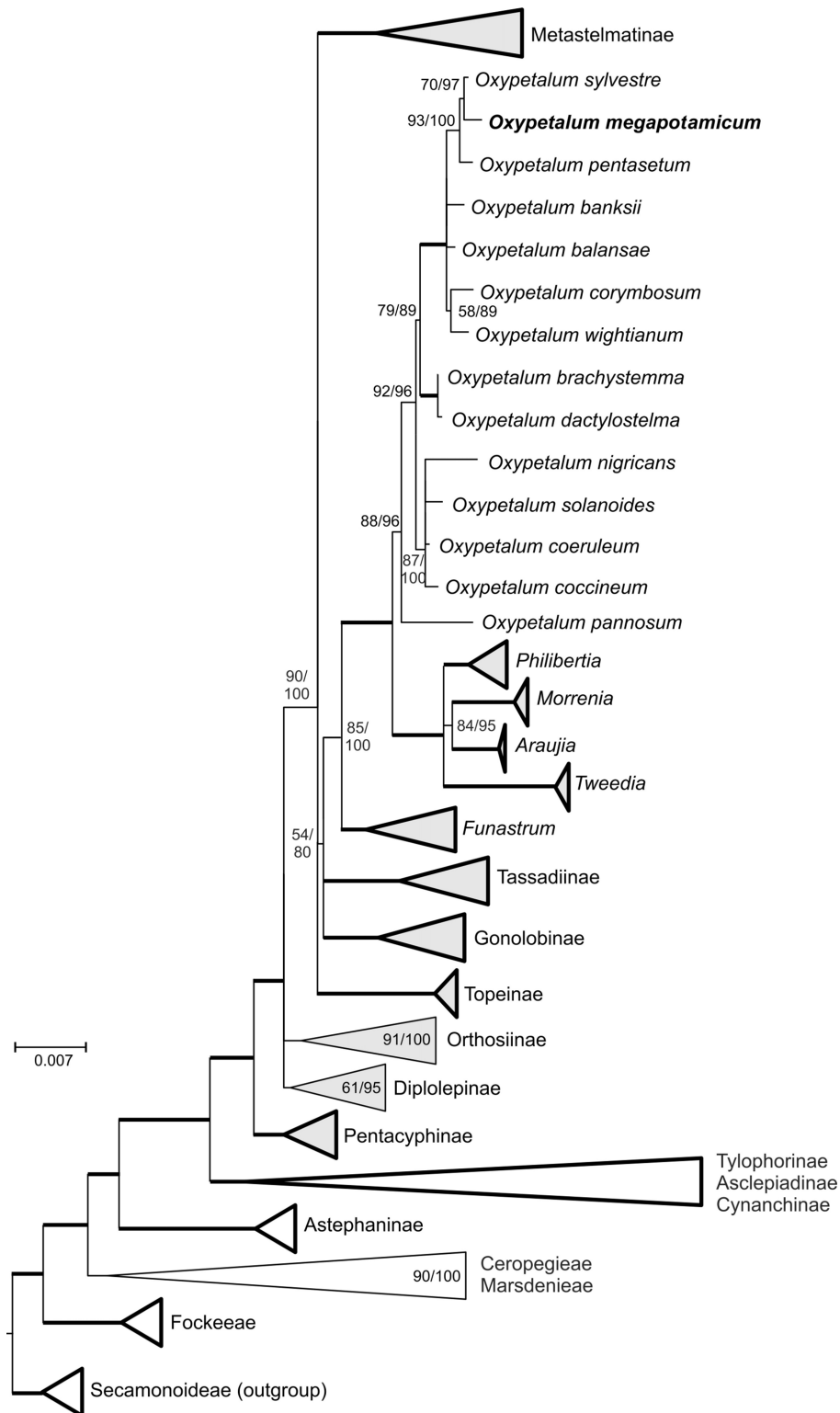
Iconographies and extended descriptions were observed in Fournier (1885: 251, tab. LXXI fig. 1), Meyer (1944: tab. LXXV), Fontella Pereira *et al.* (2004: 155-156, Plate 38).

The geographic distribution is Brazil (Goiás, Paraná, Rio Grande do Sul, Santa Catarina, São Paulo), Argentina (Misiones) and Uruguay (Montevideo, San José, Soriano).

*Oxypetalum megapotamicum* was described on samples not specified by Sprengel (1827), but whose location corresponds to "Rio Grande, Brazil". However, the only specimens from this area still extant are *Gaudichaud 698* ([P00252619], P) and *699* ([P00252620], P), that were later used by Decaisne (1844) to describe *Ditassa oxypetala* Decne., which is lectotypified here on the the specimen [P00252620] bearing a handwritten description. Therefore, the specimen [NY00279078], that bears an original stamp of "Mus. bot. Berol.", the herbarium in Berlin (B), and might have been seen by Sprengel, in whose collection Sellow specimens were found (fide Stafleu & Cowan 1976-1988, online edition: <<https://www.sil.si.edu/DigitalCollections/tl-2/browse.cfm?vol=5#page/820>>), is selected as neotype here. A duplicate of this specimen is housed in K, [K000095572], but it only bears the label, not the stamp of B, and is therefore regarded as an isotype.

Some decades later, Malme (1911: 270) proposed the combination *Ditassa megapotamica* (Spreng.) Malme. and put *Ditassa oxypetala* Decne. into synonymy. A sequenced DNA sample now documented that the species is to be placed in *Oxypetalum* R. Br. (Fig. 3); so here we propose to restore the name originally established by Sprengel (1827).

This taxon must not be confused with *Physianthus megapotamicus* Spreng. (a synonym of *Araujia megapotamica* (Spreng.) E.Fourn.). Therefore, the lectotypification of *Lagenia* E.Fourn. on *L. megapotamica* (Spreng.) E. Fourn. (Rapini *et al.* 2011) needs to be corrected, from "(Sprengel 1827: 111)" which refers to *Oxypetalum megapotamicum* to "(Sprengel 1827: 112)" which refers to *Physianthus megapotamicus*.



**Figure 3** – Position of *Oxypetalum megapotamicum* in the subfamily Asclepiadoideae. Recognized tribes and subtribes without new accessions are summarized by triangles and those restricted to the New World are shaded grey. Numbers indicate Maximum Likelihood bootstrap support (BSML)/Bayesian Posterior Probability (PP); groups with BSML > 95 and PP = 1.0 are indicated by bold lines.

The taxonomic placement of this taxon in *Ditassa* R. Br., proposed by Decaisne (1844) and Malme (1911), possibly responds to the pollinaria with edentate caudicles, corona lobes with internal lobulate processes (ligule) (Fig. 2c) that give the appearance of a “double corona” and the absence of style-head appendages. In contrast, however, the basally slightly cordate leaves and corolla lobes twisted anti-clockwise are not found in other *Ditassa* species.

The absence of style-head appendages is rare in the genus *Oxypetalum* R. Br. and has been used as specific epithets such as *O. muticum* E. Fourn. or to the conformation of other recently synonymized genera such as *Rhyssostelma* Decne. (Liede-Schumann & Meve 2015). However, in the resulting phylogenetic tree (Fig. 3), *O. megapotamicum* forms a well supported group with *O. sylvestris* Hook. & Arn. and *O. pentasetum* (Rusby) Goyder & Rapini. These species were included in *Schistogyne* Hook. & Arn., a genus of eight species now combined in *Oxypetalum* by Rapini *et al.* (2011). *Schistogyne* is characterized by stigmatic appendages with 5–7 filiform branches and untoothed caudicles (Ezcurra *et al.* 2008; Fontella Pereira *et al.* 2004; Hechem & Ezcurra 2006; Meyer 1944) so that the absence of stigmatic appendages in *O. megapotamicum* is possibly due to a reversal of the apomorphic filiform branches of the style-head.

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