



ON THE TAXONOMICAL IDENTITY OF THE SOUTH AMERICAN *POLYCARPON APURENSE* (CARYOPHYLLACEAE) WITH CLARIFICATION ON ITS DISTRIBUTION

Sobre la identidad taxonómica de *Polycarpon apurense* (Caryophyllaceae) con una aclaración sobre su distribución en Sudamérica

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Summary: As part of the ongoing studies of the genus *Polycarpon* (Caryophyllaceae) and the preparation of its treatment for the Argentinian Flora, we here present a taxonomic note concerning the identity of the name *P. apurense*. A specimen preserved at P is designated as the lectotype of this name. Its identity was discussed and the synonymy with *P. prostratum*, recurring in the literature, was discarded on the basis of its habit and leaf shape and size. A nomenclatural change (i.e. *P. tetraphyllum* subsp. *apurense*) is proposed here on the basis of the current concept in the genus *Polycarpon*. Concerning the distribution of this taxon, it is excluded from Brazil and Uruguay and its presence in Peru is uncertain.

Key words: Nomenclature, *Polycarpon tetraphyllum*, South America, typification.

Resumen: Como parte de los estudios en curso del género *Polycarpon* (Caryophyllaceae) y la preparación de su tratamiento para la Flora Argentina, presentamos aquí una nota taxonómica sobre la identidad del nombre *P. apurense*. Un espécimen preservado en P es designado como el lectotipo de este nombre. Se discute su identidad y se descarta la sinonimia con *P. prostratum*, recurrente en la literatura, sobre la base de algunos caracteres morfológicos como el hábito, forma y tamaño de las hojas. Se propone un cambio nomenclatural (*P. tetraphyllum* subsp. *apurense*), sobre la base del concepto actual en el género *Polycarpon*. Sobre la distribución de este taxon, se excluye de las floras de Brasil y Uruguay y, se considera un registro dudoso para Perú.

Palabras clave: América del Sur, nomenclatura, *Polycarpon tetraphyllum*, tipificación.

Introduction

Polycarpon L. (Caryophyllaceae Juss.) is a genus that traditionally includes about 16 species distributed in tropical and temperate regions of the world (Fraga et Rosselló, 2011; Iamónico et Domina, 2015). On the basis of molecular investigations, Kool et al. (2007) demonstrated the polyphyly of *Polycarpon*, highlighting the following three well supported clades: 1) the *P. coquimbense*/*P. suffruticosum* aggregate (from

South America), 2) *P. prostratum* (Forssk.) Asch. et Schweinf. (Africa, Syria, north-eastern Pakistan to south China and Indo-China), and 3) the *P. tetraphyllum* aggregate (main diversity in the Mediterranean region of the Old World). According to these results, the first two clades have to be excluded from *Polycarpon*. Accordingly, Iamónico (2015a) described the new genus *Augustea* Iamónico, including into it *P. coquimbense* Gereau et Martic., and *P. suffruticosum* Griseb., whereas

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a new combination under this new genus [*A. moreirana* (Muñoz-Schick) Iamónico et Montesinos] was proposed two years later by Iamónico et Montesinos-Tubée (2017). On the other hand, *P. prostratum* (Forssk.) Asch. et Schweinf., should be recognized under the genus *Polycarpaea* Lam. [as *P. prostrata* (Forssk.) Decne.]. Finally, the remaining members of *Polycarpon* represent a polyploid complex that can be treated as a single species, *P. tetraphyllum* (L.) L. as currently accepted (Iamónico, 2015b, c, 2017; Iamónico et Domina, 2015).

As part of the ongoing studies of the genus *Polycarpon* and its treatment for the Argentinian Flora (by the first author), we here present a work concerning the taxonomical identity of the untypified name *P. apurense* Kunth.

Material and Methods

The work is based on both analysis of the relevant literature and checking and examination of specimens deposited in the herbaria B, BM, COL, H, K, L, LINN, P, SI, U, WAG, and WU (acronyms according to Thiers, 2022).

The articles cited throughout the text follow the Shenzhen Code (hereafter indicated as ICN; Turland et al., 2018).

Results and Discussion

Kunth (1823: 33) validly described *Polycarpon apurense* providing both a short diagnosis (i.e. *P. [Polycarpon] caulibus diffusis, ramosis; foliis quinis aut denis*) and a detailed description; the provenance and the flowering time were also given (“*Crescit in ripa arenosa fluminis Apures. (Provincia de Varinas) Floret April*”). On the basis of HUH-Index of Botanists (2013a-onwards), Kunth’s herbarium and types are preserved at B, whereas other Kunth’s material is included in the Humboldt, Bonpland, and Kunth’s collection at P and at BM, H, and K. Unfortunately, no specimen which can be considered as part of the original material was traced in the B (R. Vogt, pers. comm.), BM (J. Yesilyurt and J. Waier, pers. comm.), H (H. Väre, pers. comm.),

and K (S. Zmarzty and A. Paton, pers. comm.). Concerning the herbarium P, there is one specimen (barcode P04925644) bearing one complete plant (top-half of the sheet) and three branches (bottom-half of the sheet). Moreover, the following three labels occur on the sheet: “HERB. MUS. PARIS. | *Polycarpon apurense* Kunth in K. [Kunth] et Bnpl. [Bonpland] | *Am. merid.* ... | Herbarium donné par M^F. Bonpland 1833” (bottom-right-corner), “*germin. An riv. apure* | n^o. 5534 | *aphanes, mollugo et aff. | arenos apure*” (this script in pen overlaps another one in pencil written by another person: “*Pharmaceum depressum valde affinis*”), and “*germinatam* 8.f.³ Fernando⁴. | n^o 5534 | *caryophyllaceae* | *Mollugo aff. | Polycarpon apurense* | ... | *in humidis rio apure*” (the latter two labels occur on the bottom-left-corner of the sheet). S. Zmarzty and collaborators at K herbarium (pers. comm.) informed that the name “*Polycarpon apurense*” (label on the bottom-right-corner) was in Kunth’s handwriting, whereas the other scripts on the same label were by Bonpland’s handwriting (for a comparison see Leuenberger et Arroyo-Leuenberger, 2006). To note that, unfortunately, the date of collection, which is useful per the lectotypification purpose, is lacking. However, we have the following important data:

- 1) Kunth’s identification as “*Polycarpon apurense*”;
- 2) the printed script (on the bottom-right-corner label), which highlights that the specimen was donated by Bonpland and, as consequence, it is part of the original Bonpland Herbarium (currently deposited at P; HUH-Index of Botanists, 2013b-onwards);
- 3) the absence of specimens at the herbarium B (probably destroyed after the II World War) where Bonpland’s original collection is also preserved;
- 4) Kunth dedicated 17 years of his life to study (at Paris) the large botanical collection by Bonpland and Humboldt (Stearn, 1968);

3 In specimens not identified to a genus, Bonpland used to indicate the Linnaean classification, e.g. as “hexandria”, sometimes abbreviated to “6ria” with the first letter “r” modified to a symbol resembling to “j” (see Leuenberger et Arroyo-Leuenberger, 2006: 602).

4 San Fernando the Apure is the main city of the Venezuelan state Apure neighbouring the river Apure.

- 5) the work *Nova Genera et Species Plantarum* was based on many specimens of Bonpland's and Humboldt's collections (Stauffer et al., 2012: 79);
- 6) last but not least, according to Wulf (2016: 94), Humboldt and Bonpland were at San Fernando de Apure (*locus classicus* of *P. apurense*), along the river Apure, at the end of March of 1800.

All things considered, we can estimate the P specimen as part of the original material used by Kunth (1823: 40) to describe the new species. We here designate the sheet P04925644 as the lectotype of the name *Polycarpon apurense*.

As regard the identity of *Polycarpon apurense* is to be noted, firstly, that it was considered both as a separate species (e.g., Macbride, 1937: 627) and as a heterotypic synonym of *P. prostratum* (e.g., Larsen, 2002: 31). *P. prostratum* is a species distributed in the tropical and subtropical regions of Africa and Asia, and in Pakistan (POWO, 2017a and literature therein). According to the current concept (i.e., Dequan et Gilbert, 2001: 6), *P. prostratum* is an annual prostrate plant with leaves opposite, ovate or spatulate, 5-15(-25) × 1.5-2.5(-5.0) mm. The lectotype of *P. apurense* here designated (P04925644) is clearly a perennial and erect plant (see the plant on the top-half of the sheet) and has leaves in whorl of five, linear, 0.5-1.5 × 0.3-0.5 mm. This leaves features were also verified by us on both examined herbarium specimens and on available online pictures (i.e. Hyde et al., 2021). So, we can exclude the synonymization of *P. apurense* with *P. prostratum*. Anyway, *P. prostratum* is a species that has to be excluded from *Polycarpon* based on molecular data (Kool et al., 2007).

Although Kool et al. (2007) did not included *Polycarpon apurense* in their analysis, Kunth's taxon can be clearly included in the *P. tetraphyllum* aggregate, as made, e.g., for the Moroccan *P. savaugei* Mathez or the Eastern Mediterranean-Arabian *P. arabicum* Boiss. which were proposed at subspecies rank of the Linnaean species [as, respectively, *P. tetraphyllum* subsp. *savaugei*

(Mathez) Iamónico (Iamónico, 2015c) and *P. tetraphyllum* subsp. *arabicum* (Boiss.) Iamónico (Iamónico, 2017)]. Accordingly, we here propose a new status and combination of Kunth's taxon.

Polycarpon tetraphyllum* L. subsp. *apurense* (Kunth) Iamónico et C. A. Zanotti, *comb. et stat. nov.

Polycarpon apurense Kunth, Nov. Gen. Sp. 6: 40. 1823. *Typus*: Venezuela. Apure: *In humidis rio Apure, sine die* [Mar 1800], A. J. A. Bonpland 5534 (*lectotypus* here designated P04925644!, image available at <http://mediaphoto.mnhn.fr/media/1441382679984hJthng2WCgIVpaPK>).

Polycarpon depressum sensu Rorhback (1872: 257) *pro minima parte*.

Polycarpon depressum sensu Pedersen (1987: 268) *pro minima parte*.

Polycarpon depressum sensu Gereau et Marticorena (1995: 152) *pro minima parte*.

Perennial herb, (5-)8-12(-15) cm tall; stems erect, glabrous or distally pubescent, branched. Leaves in whorl of usually 5, the distal ones sometimes opposite, shortly petiolate, green; blade linear or lanceolate, 5-15(-20) × 0.2-0.5 mm, not fleshy, sparsely ciliate, cuneate at base, entire at margin, obtuse at apex; stipules 2, ovate or lanceolate, 2.0-3.0 × 0.5-1.0 mm, white-silvery scarios, apex acuminate, pubescent. Inflorescences of dichasial cymes, terminal and axillary, densely flowered. Flowers bisexual; sepals 5, ovate or oblong, 1.5-2.5 mm long, glabrous, keeled, margin whitish, membranous, apex obtuse and awned, awn green, from the median vein of the sepal; petals 5, white, shorter than the sepals, ca. 1 mm long, apex obtuse; stamens 3-4, free, shorter than the sepals; anthers yellow; gymnoecium with 1 pistil, 1 style and ovary 3-loculed, 3 stigmas. Loculicidal capsule ovoid, 2.0-2.5 × 1.0-1.5 mm, dehiscent by 3 twisting valves; seeds, up to 40-50 per fruit, oblong or pyriform, ca. 0.5 mm in diameter, yellow-brownish, dorsally reticulate with cells more or less hexagonal, margins brown.

Phenology: flowering and fruiting times April-November.

Habitat and Distribution: River banks and humid places at elevation of 0-500 m a.s.l. This subspecies occurs in Argentina (Corrientes, Entre Ríos, Misiones; Zuloaga et al., 2008; Zuloaga et Anton, 2018-onwards; POWO, 2017b; Zuloaga et al. 2019), Colombia (Vichada; Ulloa Ulloa et al., 2008-onwards; Bernal et al., 2015: 1046; POWO, 2017b), Paraguay [Zuloaga et al., 2008 (based on a single specimen collected in Department Central by *Schinini 3964* (preserved at SI) which we traced, examined, and confirmed); POWO, 2017b]; Venezuela (Amazonas, Apure, Barinas, Bolívar, Delta Amacuro, Guyana; Funk et al., 2007: 237; Hokche et al., 2008; POWO, 2017b). It is doubtful in Peru where Macbride (1937: 627) reported the species as occurring “Probably”. We have not traced any specimen of *Polycarpon apurense* collected in Peru but, it is not impossible that the species could be present in this country.

Gereau et Marticorena (1995: 152) indicated *Polycarpon apurense* also in Brazil and Uruguay. According to POWO (2017b) this species does not occur in these two countries [see also Carneiro (2020) for Brazil and Zuloaga et al. (2008) for Uruguay]. We think that the Gereau et Marticorena’s statements mainly refer to Pedersen (1987: 268) which was quoted in the synonymy [“Synonymy in Pedersen (1987)”]. Pedersen (1987) accepted the name *P. depressum* (L.) Rohrb. [*nom. illeg.* (Art. 53.1 of ICN) *non* Nuttall in Torrey et Gray (1838: 174)] as heterotypic synonym of *P. apurense*. Rohrbach (1872: 257), who proposed a new combination of the Linnaean *Pharnaceum depressum* L. (Linnaeus, 1771: 562) also synonymized these two names. On the basis of the Rohrbach’s detailed description and illustration (“*Tabula LIX*”), as well as the examination of the lectotype of the Linnaean basionym [designated by Turrill (1956: 5) on the specimen LINN-387.4, image available at <http://linnean-online.org/4082/>], *P. depressum sensu* Rohrbach differs from *P. apurense* by the habit (annual *vs.* perennial respectively), the hairness of the stem (pubescent *vs.*

glabrous, pubescent only distally), the shape and size of the leaves (lanceolate, 10-20 × 1-3 mm *vs.* linear, 5-15(-20) × 0.2-0.5 mm), and the length of the stipules (ca. 2 mm *vs.* ca. 1 mm). Moreover, to note that Rohrbach’s taxon is currently accepted as *P. prostratum* (see POWO, 2017b). Also the diagnostic key proposed by Gereau et Marticorena (1995: 152) reveals that their concept of *P. apurense* only partially match that of the real taxon; in fact, they reported “..leaves...blade...oblanceolate; sepals not winged on keel”, whereas the lectotype of *P. apurense* (P04925644, designated in the present paper) has leaves linear and sepals winged. All things considered, the citation of *P. apurense* for Brazilian and Uruguayan Floras actually referred to *P. prostratum* [a taxon which should be considered as part of a different genus (*Polycarpaea* Lam.); see the introduction of the present paper] and the concept of *P. apurense* by Rohrbach (1872: 257), Pedersen (1987: 268), and Gereau et Marticorena (1995: 152) are to be considered as *syn. pro minima parte* (see the taxonomic treatment).

Polycarpon tetraphyllum subsp. *apurense* is a further addition to the currently accepted subspecies of the Linnaean *P. tetraphyllum* (Iamónico, 2013, 2015a, b, c, d, 2017; Iamónico et Domina, 2015). The diagnostic character of the subsp. *apurense* is the arrangement of the leaves which are in whorls of five, sometimes 10 and the upper leaves sometimes opposite, whereas this configuration never occur in the other subspecies.

Among the perennial members (subsp. *apurense* is perennial) of the *P. tetraphyllum* aggregate [i.e. subsp. *alsinifolium* (Biv.) Ball., subsp. *colomense* (Porta) Iamónico & Domina, subsp. *herniarioides* (Ball.) Iamónico & Domina, subsp. *polycarpoides* (Biv.) Iamónico, subsp. *savaugei*, and subsp. *tetraphyllum*], the subsp. *apurense* also differs by various vegetative and sexual characters. From subsp. *alsinifolium*: habitus (always perennial *vs.* also annual), leaves (linear-lanceolate *vs.* ovate to lanceolate, mostly opposite), stipules (acuminate *vs.* obtuse), sepals (1.5-2.0 mm long, clearly keeled *vs.* 2-3 mm long, slightly keeled), number of stamens (3 *vs.* 4-5),

seed surface (smooth *vs.* reticulate). From subsp. *colomense*: leaves (linear-lanceolate *vs.* ovate to lanceolate, opposite the lowers, and whorl of 4 the upper), inflorescence (dense *vs.* lax), petal length (about 2 mm *vs.* about 1 mm), number of stamens (3 *vs.* 4-5), seed surface (verrucose *vs.* reticulate). From subsp. *herniarioides*: high of plant [(5-)8-12(-15) cm *vs.* up to 6 cm], leaves (linear-lanceolate *vs.* ovate to obovate-spatulate, opposite the lowers, and whorl of 4 the upper), inflorescence (dense *vs.* lax), sepals (not or slightly keeled *vs.* clearly keeled), number of stamens (3 *vs.* 5), seed surface (verrucose *vs.* reticulate). From subsp. *polycarpoides*: leaves (linear-lanceolate *vs.* suborbicular to lanceolate, mostly opposite), number of stamens (3 *vs.* 5), seed surface (verrucose *vs.* reticulate). From subsp. *sauvagei*: high of plant [(5-)8-12(-15) cm *vs.* 3-4 cm], leaves (linear-lanceolate, not fleshy, green *vs.* ovate-lanceolate, opposite, fleshy, glaucous), length of stipules (up to 1 mm *vs.* about 1.5 mm), sepals (1.5-2.0 mm long, clearly keeled *vs.* 3.5-4.0 mm long, slightly keeled), length of petals (about 1 mm *vs.* about 3.5 mm), number of stamens (3 *vs.* 5), seed surface (verrucose *vs.* reticulate). Finally, from subsp. *tetraphyllum*: habit (always perennial *vs.* also annual or biennial), leaves (linear-lanceolate *vs.* ovate to lanceolate, in whorl of 4), inflorescence (dense *vs.* lax), sepals (slightly keeled *vs.* clearly keeled), petal length (1.5-2.0 mm *vs.* about 1 mm), number of stamens (3 *vs.* 5).

Representative studied material:
ARGENTINA. Corrientes: Empedrado, Estancia “Las Tres Marias”, on almost bare sands, foot of the bank of the Rio Paraná, about 1-2 m, 22-VIII-1951, *Pedersen 1152* (P04925767). **COLOMBIA.** Vichada: Entrada del raudal San Borja, Ventanas, 17-III-1971, *Pinto et Sastre 1323* (COL000401650). **PARAGUAY.** Asunción. Distrito Santa María de la Asunción. Ribera del Río Paraguay, Itá Enramada, IX-1971, *Schinini 3964* (SI). **VENEZUELA.** Amazonas: Pto. Ayacucho airport, 5°40'N 67°40'W, 100 m, sandy beach and adjacent laja, 03-IV-1984, *Gentry et Stein 46280* (U1886783). **Apure:** Distrito Pedro Camejo, 9 km directly (in a straight line)

WNW of Paso de Cinaruco chalana along the banks of the Rio Cinaruco, 6°35'N 67°35'W, 60 m, sand bar with mostly annual herbs, 02-V-1977, *Davidse et González 12492* (L3751387); Distrito Pedro Camejo, 2.5 km up-stream from the mouth of the Rio Campanaro at its junction with the Rio Orinoco directly west of Isla La Urbana, 7°10'N 76°3'W, 30 m, sand bar in river, 05-V-1977, *Davidse et González 12702* (WAG1396615). **Barinas:** a lo largo de los márgenes del Río Cáparo, entre campamento Cachicamo y Boca de Garza, este de El Cantón, 12-IV-1968, *Steyermark 102274* (COL000401648); *ibidem* (COL000401649). **Guyana:** Angustura, 1864, *de Grosuordy 13* (P04325763); *ibidem*, *de Grosuordy 13* (P04925764); Caicara, 1864, *de Grosuordy 13* (P04925762).

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