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DUILIO IAMONICO (\*)

## POLYCARPON TETRAPHYLLUM SUBSP. ARABICUM COMB. ET STAT. NOV. (CARYOPHYLLACEAE), A TAXON FROM THE EASTERN MEDITERRANEAN-ARABIAN AREA

**Abstract** - *Polycarpon tetraphyllum subsp. arabicum comb. et stat. nov.* (*Caryophyllaceae*), a taxon from the eastern mediterranean-arabian area. The names *Alsine succulenta*, *Polycarpon succulentum* and *P. arabicum* (*Caryophyllaceae*) are investigated. *A. succulenta* was validly described in 1813, but in its protologue the earlier name *Illecebrum alsinifolium* was cited as a synonym, making *A. succulenta* automatically typified by the type of *I. alsinifolium*. *P. succulentum*, published as a new combination based on *A. succulenta*, is a replaced name and has the same type. *I. alsinifolium*, *A. succulenta* and *P. succulenta* are heterotypic synonyms of *P. tetraphyllum*. *P. arabicum*, here lectotypified on a specimen preserved at G-BOIS, is the first name available for the taxon currently known as *P. succulentum*. The new combination *P. tetraphyllum* subsp. *arabicum* is here proposed on the basis of the available molecular investigations and considerations on morphology and chorology. This subspecies occurs in north-eastern Africa (Egypt) and south-western Asia (Israel, Jordan, Lebanon, and Syria). A description of the subspecies is provided, as well as key of the studied taxa.

**Keywords** - Africa, *Alsine succulenta*, Asia, Mediterranean area, new combination, new synonym, *Polycarpon succulentum*, typification

**Riassunto** - *Polycarpon tetraphyllum subsp. arabicum comb. et stat. nov.* (*Caryophyllaceae*), a taxon from the eastern mediterranean-arabian area. Sono state condotte indagini a carattere tassonomico-nomenclaturale relativamente ad *Alsine succulenta*, *Polycarpon succulentum* e *P. arabicum* (*Caryophyllaceae*). *Alsine succulenta* è stata validamente descritta nel 1813, ma il nome è superfluo e illegittimo in quanto il nome precedente *Illecebrum alsinifolium* è riportato in sinonimia. *Alsine succulenta* è pertanto automaticamente tipificata dal tipo di *I. alsinifolium*. *Polycarpon succulentum*, pubblicato come nuova combinazione basata su *A. succulenta*, è da interpretare come un nome di rimpiazzo, anch'esso basato sul medesimo tipo. *Illecebrum alsinifolium*, *A. succulenta* e *P. succulenta* sono sinonimi eterotipici di *P. tetraphyllum* subsp. *tetraphyllum*. *Polycarpon arabicum*, qui lectotipificato con un campione conservato in G-BOIS, appare il primo nome utilizzabile per il taxon attualmente conosciuto come *P. succulentum*. Quindi, sulla base degli studi molecolari disponibili e di considerazioni morfologiche e corologiche, si propone la nuova combinazione *P. tetraphyllum* subsp. *arabicum*. Infine si fornisce una descrizione della sottospecie, presente in Africa nordorientale (Egitto) e Asia sudoccidentale (Israele, Giordania, Libano e Siria), e una chiave relativa ai taxa inclusi nel complesso di *P. tetraphyllum* e presenti in quest'area.

**Parole Chiave** - Africa, *Alsine succulenta*, area Mediterranea, Asia, nuova combinazione, nuova sinonimia,

*Polycarpon succulentum*, tipificazione

### INTRODUCTION

*Polycarpon* L., as traditionally circumscribed, includes about 16 species distributed in tropical and temperate regions of the world (Fraga & Rosselló, 2011; Iamonico & Domina, 2015). The molecular studies by Kool *et al.* (2007) showed the polyphyly of this genus using DNA sequence data and highlighted three different clades with high support values: (1) the aggregate *P. coquimbense suffruticosum* aggregate (from South America), (2) *P. prostratum* (Forssk.) Asch. & Schweinf. (tropical, widespread), and (3) the *P. tetraphyllum* aggregate (main diversity in the Mediterranean region). The first two clades have to be excluded from *Polycarpon* [*P. coquimbense* Gereau & Martic. and *P. suffruticosum* Griseb. were recently transferred by Iamonico (2015) to a new genus (*Augustea* Iamonico), endemic from South America, *P. prostratum* should be recognized under *Polycarpaea* Lam.], while the remaining members represent a polyploid complex that can be treated as a single species, *P. tetraphyllum* (L.) L.

Concerning the Mediterranean area, a further taxon belonging to the *P. tetraphyllum* aggregate remains to be investigated: it is currently known as *Polycarpon succulentum* J.Gay (see e.g., Marhold, 2011+). A nomenclatural study is here presented and data about morphology, ecology and distribution are provided as well as a key of the studied taxa.

### MATERIALS AND METHODS

This paper is based on both analysis of the relevant literature, floristic surveys, and online checking/examination of the specimens kept in the Herbaria BM, CAT, FI, G, HFLA, K, LINN, LY, MA, MPU, P, RO, and PAL (acronyms according to Thiers, 2015+).

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## RESULTS AND DISCUSSION

Delile (1813) published *Alsine succulenta* Delile as a new species, providing a short diagnosis, a detailed description and an illustration ("Planche 24 Fig. 3"; image available at <http://www.biodiversitylibrary.org/item/54153>). However, he listed the earlier name *Illecebrum alsinifolium* L. (Linnaeus, 1767a, 1767b) as a synonym. Hence, the name *A. succulenta* was nomenclaturally superfluous when published and is illegitimate according to Art. 52.1 of the International Code of Nomenclature for algae, fungi, and plants (ICN: McNeill *et al.*, 2012). It is also automatically typified by the type of *I. alsinifolium* (Art. 7.5).

Some months later Delile (late 1813-early 1814) published again his *Alsine succulenta* through the same diagnosis [the work by Delile (1813) is an extract of that published in late 1813-early 1814], image and synonyms given in 1813. According to Art. 6 Note 2 of the ICN, this name is an isonym without a taxonomic status.

*Polykarpon succulentum* J.Gay (Gay, 1847), published as a new combination, actually is a replacement name based on and homotypic with *A. succulenta* (Arts. 6.11 and 7.4 of the ICN); it is legitimate because, although Gay did not exclude the type of *I. alsinifolium*, its epithet was not available for use in *Polykarpon* (Art. 58 Note 2) as *P. alsinifolium* (Biv.) DC. (Candolle, 1828) had already been published.

Concerning *Illecebrum alsinifolium*, Linnaeus published this name in 1767 simultaneously in *Mantissa plantarum* (Linnaeus, 1767a) and the 12<sup>th</sup> edition of *Systema naturae* (Linnaeus, 1767b). According to Jarvis (2007) these works can be considered alternative references for the name *Illecebrum alsinifolium*, but in *Systema Naturae* Linnaeus (1767b) cited his *Mantissa* ("ILLECEBRUM alsinefolium [...] Mant. 51."). The name was lectotypified by Amich (in Cafferty & Jarvis, 2004) on the specimen Herb. Linnaeus no. 290.28 (LINN). No discussion was made on the typification, but Amich (l.c.) treated the Linnaean name as a synonym of *Polykarpon tetraphyllum* s.str. Digital examination of the lectotype at LINN allowed me to confirm this synonymy.

Because both *Alsine succulenta* and *P. succulentum* are homotypic with *I. alsinifolium*, they are likewise heterotypic synonyms of *P. tetraphyllum* s.str. As a consequence, the taxon which Delile intended to describe, and currently recognized at species level (see Marhold, 2011), needs a different name. On the basis of his description and associated image (Delile, 1813), and original collections by Delile found at MPU (specimen barcodes MPU008039 and MPU008040: images available at <http://www.collections.univ-montp2.fr/herbier-mpu-presentation/base-de-donnees-botanique-herbier-mpu>), it resembles *P. tetraphyllum*

subsp. *alsinifolium* (Biv.) Ball ( $\equiv$  *Hagaea alsinifolia* Biv., lectotype designated by Iamonico & Domina, 2015). These two taxa are morphologically similar by their habit (prostrate-diffuse), leaf arrangement and thickness (opposite and fleshy), inflorescence structure ( $\pm$  dense dichasia) and preferred habitat (sandy soils). However, other characters distinguish them: shape of leaves (ovate to lanceolate in *P. tetraphyllum* subsp. *alsinifolium* vs. obovate-spatulate in "*P. succulentum*"), shape of stipules (ovate, obtuse vs. lanceolate, acute), ratio of petal/sepal length (0.50-0.75 vs. c. 1.00), and seed surface (smooth vs. finely reticulate). Concerning the distribution area, the taxon currently indicated as "*P. succulentum*" is known for north-eastern Africa (Egypt), and south-western Asia (Israel, Jordan, Lebanon, Syria) where *P. tetraphyllum* subsp. *alsinifolium* is not known to occur (see Greuter *et al.*, 1984; Boulos, 1999; Danin, 2015+; Marhold, 2011+). All things stated, I confirm that the populations from eastern Mediterranean and Arabian areas deserve to be treated separately as currently suggested by Danin (2015+) and Marhold (2011+; both sub *Polykarpon succulentum* J.Gay). However, on the basis of the results given by Kool *et al.* (2007), and of my ongoing studies on the *P. tetraphyllum* aggregate, I think that the subspecific rank under *P. tetraphyllum* appears to be the better choice. A name, which was synonymized with *Alsine succulenta* by some authors (e.g., The Plant List, 2010+; Marhold, 2011+; Zaharan & Willis, 2013; Danin, 2015+), has to be considered: *Polykarpon arabicum* Boiss. Boissier (1849) published *P. arabicum* with a detailed diagnosis, the provenance ("Hab[itat]. in arenosis *Arabiae petreae*") and a comparison with *P. alsinifolium* (Biv.) DC. (see Candolle, 1828). There is one specimen at G-BOIS (barcode G00330561) bearing four plants (probably part of the same gathering) collected by Boissier in "Arabia Petreae, Mart. [= March] 1846". On the bottom-center of the sheet a red label "holo-TYPUS" is also pinned. However, since it is not unequivocally demonstrable that Boissier used only this specimen in establishing the diagnosis, we cannot state that this specimen is the holotype (Art. 9.1 and Note 1 of the ICN). The morphological characteristics of all the plants on G00330561 match Boissier's diagnosis, the locality also corresponds and the date of collection is before 1849. This specimen can be designated as the lectotype of the name *P. arabicum*. It clearly belongs to the taxon currently known as *P. succulentum*. Boissier's name appears to be the only available name for this taxon.

*Polykarpon tetraphyllum* (L.) L., Syst. Nat., ed. 10 2: 881. 1759 subsp. *tetraphyllum*  $\equiv$  *Mollugo tetraphylla* L., Sp. Pl. 1: 89. 1753. – Lectotype (designated by Burtt & Lewis, 1952: 339): Herb. Clifford: 28, *Mollugo* 2 (BM000557701; image available at <http://www>.

[nhm.ac.uk/resources/research-curation/projects/clifford-herbarium/limages/BM000557701.JPG](http://nhm.ac.uk/resources/research-curation/projects/clifford-herbarium/limages/BM000557701.JPG).

= *Illecebrum alsinifolium* L., Syst. Nat., ed. 12. 2: 188. 1767 [“*alsinefolium*”]; Mant. Pl.: 51. 1767 [“*alsinifolium*”] ≡ *Alsine succulenta* Delile, Fl. Egypte: 67. 1813, nom. illeg. (Art. 52.1 of the ICN), syn. nov. ≡ *Arenaria succulenta* Ser., Prodr. [A. P. de Candolle] 1: 400. 1824, nom. illeg. (Art. 52.1 of the ICN), syn. nov. ≡ *Polykarpon succulentum* J.Gay, Duc. Rev. Bot. 2: 372. 1847, non *Polykarpon alsinifolium* (Biv.) DC., Prodr. [A. P. de Candolle] 3: 376. 1828, syn. nov. – Lectotype (designated by Amich in Cafferty & Jarvis, 2004: 1052): Herb. Linnaeus no. 290.28 (LINN; image available at <http://linnean-online.org/2992/>).

– *Alsine succulenta* Delile, Descr. Egypte, Hist. nat.: 211. 1813-1814, isonym (Art. 6 Note 2 of the ICN).

*Polykarpon tetraphyllum* subsp. *alsinifolium* (Biv.) Ball., J. Linn. Soc. Bot. 16: 370 (1877) ≡ *Hagaea alsinifolia* Biv., Stirp. Rar. Sic. Manip. 3: 7-8 (1815) ≡ *Labaya alsinifolia* (Biv.) Schult., Syst. Veg., ed. 15 bis [Roemer & Schultes], 5: 405 (1819) ≡ *Mollia alsinifolia* (Biv.) Spreng., Syst. Veg. (ed. 16) [Sprengel] 1: 795 (1825) ≡ *Polykarpon alsinifolium* (Biv.) DC., Prodr. 3: 376 (1828) ≡ *Polykarpa alsinifolia* (Biv.) C.Mohr., Contr. U.S. Natl. Herb. 6: 502 (1901). – Lectotype (designated by Iamionico & Domina 2015: 724): [Icon] *Alsine facie Paronichiae secundae* (Boccone 1674: t. 38)

*Polykarpon tetraphyllum* subsp. *arabicum* (Boiss.) Iamionico, comb. et stat. nov. ≡ *Polykarpon arabicum* Boiss., Diagn. Pl. Orient., ser. 1, 10: 13. 1849. – Lectotype (designated here): Arabia Petreeae, Mar 1846, P. E. Boissier s.n. (G-BOIS G00330561) – Fig. 1.

Description: Annual herb, 3–4(–5) cm tall; stems prostrate-diffuse, branched, usually green. Leaves opposite, never whorled, petiolate, usually green; blade obovate-spatulate, 2–4(–5) × 0.5–1.0 mm, fleshy, cuneate at base, entire at margin, obtuse at apex; petiole 1–4 mm long; stipules 2, persistent, ovate to triangular-lanceolate, 1.0–1.2 × 0.7–1.0 mm, white-silvery scarious, apex acute. Inflorescences dichasial cymes, terminal and axillary, densely flowered, glabrous or slightly pubescent. Flowers bisexual; sepals usually 5, usually green, lanceolate, 1.5–2.0 mm long, scarcely keeled, margin whitish, membranous, apex acute; petals 5, usually white (sometimes pink), oblong, as long as sepals, apex obtuse; stamens 5, free; anthers yellow; pistil 1. Fruit a loculicidal capsule, ovoid, c. 2.0 × 1.5 mm, dehiscent by 3 twisting valves; seeds brown, dorsally reticulate. Photos: good photos of *Polykarpon tetraphyllum* subsp. *arabicum* are available (sub *P. succulentum*) at <http://flora.org.il/en/plants/POLSUC/>

Habitat: sandy soils on dunes, Mediterranean woodlands and shrublands, shrub and subshrub steppes.

Phenology: flowering from January to May.

Chorotype/Distribution: an Eastern Mediterranean-Arabian taxon known to occur in Egypt, Israel, Jordan, Lebanon, and Syria.

#### Specimina visa selecta:

*Polykarpon tetraphyllum* subsp. *arabicum* – Egypt, dans le petit ravin sablonneux, sur le chemin du Kaire à Souyes, s.d., F. Delile s.n. (MPU008039, digital image); Egypt, s.d., F. Delile s.n. (MPU008040). ISRAEL, Palaestina australis, Jaffa, in siccis arenosis, 28 Mar 1897, J. Bornmüller 213 (P04925677, digital image); *ibidem* (P04925679, digital image); *ibidem* (P04925682, digital image); Palaestina, in planitiae Phillistaea ad Ascalon, in arenosis, 26 Jun 1897, J. Bornmüller 214 (P04925674, digital image); *ibidem* (P04925678, digital image); *ibidem* (P049256780, digital image); *ibidem* (P049256781, digital image). SYRIA, Iter Syriacum 1855, in arena mobili ad margines deserti in humosis, 16 Mar 1855, T. Kotschy 494 (P04925675, digital image); *ibidem* (P04925676, digital image).

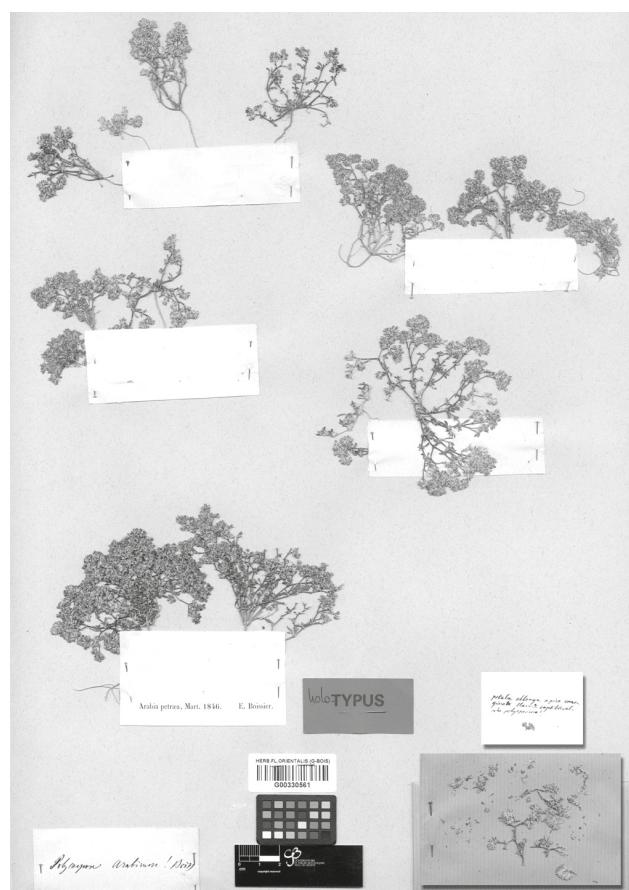


Fig. 1 - Lectotype of the name *Polykarpon arabicum* (G-BOIS-00330561).

*Polycarpon tetraphyllum* subsp. *alsinifolium* – Algeria, El Tarf, à la Calle, s.d., M. C. Durieu s.n. (PAL57867). Italy. Calabria, Reggio, s.d., *Citarda* s.n. (PAL57866); Sicily, Palermo a Mondello, s.d., *A. Todaro* s.n. (PAL47364); Sicily, Palermo, Madonie, rupi di Quacella, *G. Bartolo et al.* 1613 (PAL); Sicily, Siracusa, Noto, Vendicari, a S di Calamosche, *R. Galesi* 2057 (CAT); Sicily, Caltanissetta, Niscemi, Piano Stravolata, *R. Galesi* 7649 (CAT); Sicily, Enna, Monte Navone, Pi-azza Armerina, *R. Galesi* 7574 (CAT).

A key to the three subspecies studied is presented:

1. Plants 3–4(–5) cm tall, seeds dorsally reticulate ..... subsp. *arabicum*
1. Plants (5–)7–25(–35) cm tall, seeds smooth or all tuberculate ..... 2
2. Leaves not fleshy, in whorl of 4, green, stipules acute or acuminate at the apex, usually shorter than the peduncles of flowers, sepals 1.5–2.0 mm long, acute to acuminate and clearly keeled, petals 0.5–1.0 mm long, seed al tuberculate; habitat disturbed areas ..... subsp. *tetraphyllum*
2. Leaves fleshy, mostly opposite, often purplish or reddish, stipules obtuse at the apex, as well as or longer than the peduncles of flowers, sepals 2.0–3.0 mm long, subacute to obtuse and slightly keeled, petals 1.2–2.0 mm long, seeds smooth; habitat sandy soils and mud barckish ..... subsp. *alsinifolium*

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