

HELIANTHEMUM JONIUM (CISTACEAE), A NEW SPECIES IN THE EASTERN ADRIATIC

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The occurrence of *Helianthemum jonium* Lacaita & Grosser ex Bég. in Fiori & Bég. (Cistaceae) is reported and documented here for the first time in Croatia and Montenegro, and it is confirmed in the Albanian flora after 80 years. The species grows on sandy soils within maquis and garrigue communities in four Adriatic islands: Vis, Biševo, Hvar and Lopud, and within psammophilous vegetation near Ulcinj in Montenegro and in Hamallaj, north of Durrës in Albania. The morphological relationship with the allied *H. leptophyllum* Dunal and *H. apenninum* (L.) Mill. is here briefly discussed. Remarks about its taxonomy, lectotypification, habitat and ecology in the Adriatic region are also provided. The species *H. jonium* was previously known only from the Apennine Peninsula; hence these new eastern Adriatic records extend its distribution area to the east, and it can therefore be considered an amphi-Adriatic endemic element.

Key words: amphi-Adriatic, endemic species, flora, *Helianthemum*, lectotypification

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Prisutnost vrste *Helianthemum jonium* Lacaita & Grosser ex Bég. in Fiori & Bég. (Cistaceae) je ovdje po prvi puta zabilježena i dokumentirana u flori Hrvatske i Crne Gore te potvrđena u flori Albanije nakon 80 godina. Vrsta raste na pješčanim tlima unutar vegetacije makije i gariga na četiri jadranska otoka: Vis, Biševo, Hvar i Lopud te unutar psamofilne vegetacije kod Ulcinja u Crnoj Gori i Hamallaju, sjeverno od Drača u Albaniji. Morfološka sličnost sa srodnim vrstama, *H. leptophyllum* Dunal i *H. apenninum* (L.) Mill. je ovdje ukratko diskutirana. Također se daju napomene o njezinoj morfologiji, lektotipifikaciji, staništu i ekologiji u Jadranskom području. Vrsta *H. jonium* prethodno je bila poznata jedino s Apeninskog poluotoka, a nova nalazišta u istočnom Jadranu pridonose istočnom proširenju granice areala vrste te se ista mora smatrati amfi-jadranskim endemičnim elementom.

Ključne riječi: amfi-jadranski, endemična vrsta, flora, *Helianthemum*, lektotipifikacija

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INTRODUCTION

The genus *Helianthemum* Mill. (Cistaceae) is represented with about 100 taxa in the European flora (ARRINGTON & KUBITZIKY, 2003; RAAB-STRAUBE, 2018). In particular, about 50 of these occur in the Mediterranean region, with the highest diversity concentrated in the western Mediterranean area, where nearly half of *Helianthemum* species grow in the Iberian Peninsula (PROCTOR & HEYWOOD, 1968; GREUTER *et al.*, 1984; PAREJO-FARNÉS *et al.*, 2013). In addition to its remarkable morphological variability, species of this genus show a high degree of diversification with respect to their requirements for environmental conditions. In fact, they colonize extremely differentiated habitats, such as grasslands, sand dunes, forests, garrigues, maquis, rocky outcrops and synantropic stands, as well various types of substrata like limestones, dolomites, marls, gypsum, salt and sand-soils (PAREJO-FARNÉS *et al.*, 2013).

In the Croatian flora, according to NIKOLIĆ (2019, 2020), the genus *Helianthemum* is represented by 11 taxa, of which one is annual and ten are perennials. In neighbouring Italy, thirty taxa are currently recorded (CONTI *et al.*, 2005; PERUZZI *et al.*, 2014, 2015; BRULLO & GUARINO, 2017; BARTOLUCCI *et al.*, 2018) and among them only five taxa (*H. farinulentum* Lacaita, *H. morisianum* Bertol., *H. oelandicum* (L.) Dum. Cours. subsp. *nebrodense* (Heldr. ex Guss.) Greuter & Burdet, *H. oelandicum* (L.) Dum. Cours. subsp. *al-lionii* (Tineo) Greuter & Burdet and *H. sicanorum* Brullo, Giusso & Sciandr.) are considered endemics, while *H. jonium* Lacaita & Grosser ex Bég. in Fiori & Bég. is usually excluded, since it is considered a subendemic species. From a taxonomic viewpoint, *H. jonium* was described by BÉGUINOT (1910), using the unpublished name of Lacaita and Grosser quoted in the label of herbarium specimens collected by Lacaita in Apulia (South Italy), which were distributed in many Herbaria as “Schedae ad Floram Italicam Exsiccatam” (FIORI & BÉGUINOT, 1910). Currently, *H. jonium* was known as a species with a scattered distribution along the Italian peninsula, occurring in Veneto, Emilia Romagna, Molise, Puglia and Basilicata (cf. BRULLO *et al.*, 2001; CONTI *et al.* 2005; PER-RINO & SIGNORILE 2009; BRULLO & GUARINO 2017). Morphologically, *H. jonium* is a suffruticous chamaephyte with hairy stem, narrow and elliptical-lanceolate leaves, revolute at margin, green above and pale green below, with yellow flowers and hairy or subglabrous calyx. On account of its opposite stipulate leaves, racemose inflorescences, strongly ribbed calyx, showy coloured petals, and geniculate style exceeding the stamens, it belongs to the *H.* sect. *Helianthemum* (cf. LÓPEZ-GONZÁLEZ, 1993; SORIANO, 2002; ALONSO *et al.*, 2015).

During recent field trips on the islands of Vis, Biševo and Lopud in Dalmatia, *H. jonium* was discovered for the first time in insular Croatian territory. Afterwards, following herbarium and field investigations its occurrence was verified also in some littoral sites of the Adriatic coast in Montenegro and Albania.

MATERIAL AND METHODS

In April and May of 2018, previously unknown *Helianthemum* populations were found within garrigue and maquis communities, developed on sandy soils, on the islands of Vis, Biševo and Lopud in Dalmatia. The collected plants were attributed to *H. jonium* according to GROSSER (1903), PROCTOR & HEYWOOD (1968), PIGNATTI (1984) and BRULLO & GUARINO (2017).

The inspection of type materials of *H. jonium* deposited in several virtual herbaria (BM, F, K, and P) confirmed the correct identification of these Dalmatian plants. Afterwards, several other herbarium investigations were performed on the Adriatic *Helianthemum* material kept in CAT, CNHM, TIR, ZA, ZAGR and ZAHO and also in virtual herbaria of G, GZU, MW, PI and Z. Herbaria acronyms are according to THIERS (2020). The collected specimens of *H. jonium* from Croatia were scanned, digitalized and inserted according to BOGDANOVIĆ *et al.* (2016) in the online Virtual herbarium ZAGR.

To provide a distribution map of *H. jonium* in the Adriatic Basin, previously published localities from the literature data (BEGUINOT, 1910; FIORI, 1925; CHAYTOR & TURRILL, 1934; ALSTON & SANDWITH, 1940; PIGNATTI 1982; BRULLO *et al.*, 2001; PERRINO & SIGNORILE, 2009; DI PIETRO & MISANO, 2010; PERRINO *et al.*, 2011, 2013; PERRINO & CALABRESE, 2014; BRULLO & GUARINO 2017), as well as localities from the herbarium labels of the above mentioned collections were geocoded and are presented on the map (Fig. 1).

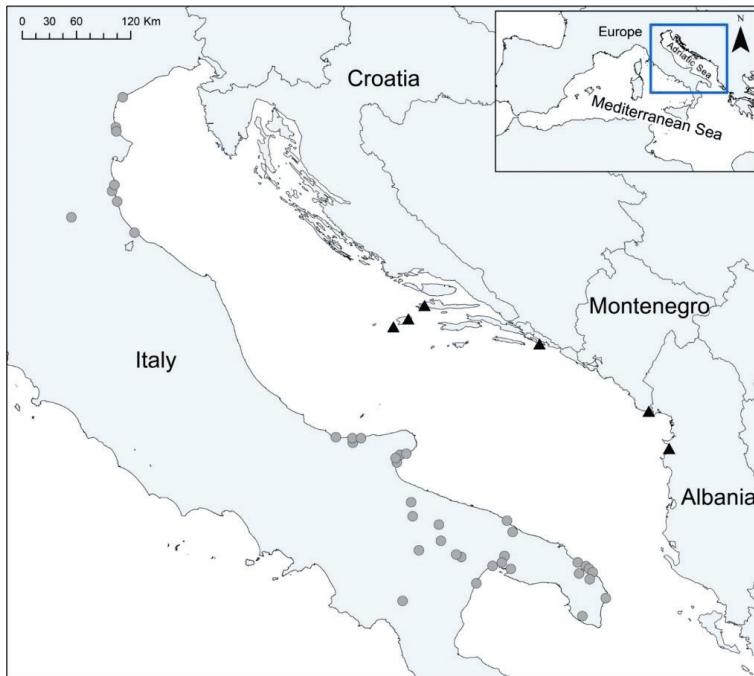


Fig. 1. Distribution map of *Helianthemum jonium* in the Adriatic Basin based on literature and herbarium data (grey dots) and new findings that are based on recent field observations and herbarium revision (black triangles).

RESULTS AND DISCUSSION

The occurrence of *H. jonium* is reported and documented here for the first time in Croatia and Montenegro, and it is confirmed in the Albanian flora after 80 years. According to GREUTER *et al.* (1984) this species shows close relationships with *H. leptophyllum* Dunal, which represents a species complex distributed in some territories of western Mediterranean, such as Spain, Morocco, Sardinia and Corsica (GREUTER & RAUS,

1982; GREUTER *et al.* 1984; ARRIGONI, 2010; RAAB-STRAUBE, 2018). Therefore, *H. jonium* can be considered an eastern vicariant of the last species, localizing in several Adriatic islands (Vis, Biševo, Lopud and Hvar), in sandy beaches of Montenegro (Ulcinj) and Albania (Hamallaj), where it grows usually on sandy soils within maquis and garrigues, as well as on coastal psammophilous vegetation (Fig. 1).

Helianthemum jonium Lacaita & Grosser ex Bég. in Fiori & Bég., Nuovo Gior. Bot. Ital., nov. ser., 17: 609 (1910)

Synonyms: *H. leptophyllum* sensu E. Groves (Nuovo Giorn. Bot. Ital. 19: 127, 1887), non Dunal. in DC. (Prodr. 1: 279, 1824); *H. leptophyllum* Dunal var. *euleptophyllum* Gross. (Pflanzenreich 14, IV. 193: 69, 1903); *H. chamaecistus* Mill. var. *jonium* (Lacaita & Gross.) Fiori (Nuova Fl. Anal. Ital. 1: 532, 1925).

Typification: **Lectotype (here designated)** – Apulia. Prov. di Lecce: Taranto, in silvaticis maritimis (macchia mediterranea), loco dicto Pineta del Pantano sociis *Erica arboorea* et *Pino halepensi*, 29 Apr. 1910, C. Lacaita 1277 (FI 001349!, Fig. 2). Isolectotypes: FI 001395!; FI 001393!; K 000651283!; P 04728870!; BM 000751852!; Z 000002834!; MW 0593629!. The examination of type materials reveals the existence of several specimens kept in various herbaria (BM, FI, K, MW, P and Z). In accordance with Art. 9.3 of the ICN (TURLAND *et al.*, 2018), we designate here (Fig. 2) as lectotype Lacaita's specimens kept in the Florence herbarium (FI). All other type materials must be considered as isolectotypes. Regarding the type material of *H. leptophyllum* we have found in de Candolle herbarium (G-DC 00208416!) the original Lagasca material from Spain collected in 1819, that was quoted by DUNAL (1824) in the protologue for a description of *H. leptophyllum* and therefore it is here designated as lectotype.

Morphological description: Perennial plant, ascending to erect, suffruticous, very branched, with branches intricated (Fig. 3A), woody at the base, up to 40 cm tall, stem and branches with appressed white hairs. Leaves 5–20 mm long, 1–2 mm wide, shortly petiolate, green on adaxial surface, pale green on abaxial surface, narrow, linear-elliptical, slightly revolute at the margin, subglabrous, with stipules persistent, linear-subulate, 3–6 mm long (Fig. 3D). Inflorescence racemose, 3–7 flowered, usually unilateral, flower pedicel pendular, 6–12 mm long (Fig. 3B). Inner sepals 5–9 mm long, pubescent, with setulae or sparse erect-patent hairs, that are 0.6–0.8 mm long. Petals yellow, obovate, up to 10 mm long, usually with orange dot in the basal part (Fig. 3C). Stamens numerous, filaments unequal, anthers yellow with style exceeding the stamens. Capsule ovoid-globose, puberulous, 4–5 mm diameter, with style persistent. Seeds yellow or brownish.

Phenology: This species blooms from April to June and fructifies from May to July.

Habitat and ecology: In the eastern Adriatic, *H. jonium* is a heliophilous species that grows mainly on calcareous and sandy substrates within Mediterranean maquis and garrigues from sea level up to an altitude of 100 m. It can be considered a rare species of the Croatian flora since it was found only at a few localities in Central and South Dalmatia (Fig. 1). On the island of Biševo, *H. jonium* grows on sandy soils of the abandoned vineyards of Gornja Salbunara within garrigues of *Cisto-Ericetalia* Horvatić 1958, characterized by *Cistus incanus* L., *C. salvifolius* L., *C. monspeliensis* L., *Fumana ericifolia* Wallr., *F. arabica* (L.) Spach, *F. laevipes* (L.) Spach, *Rosmarinus officinalis* L., *Erica multiflora* L. and other shrubs. On the island of Vis, *H. jonium* is common in north-eastern part, growing on sandy substrates in Malo and Velo Zlopolje along roads and abandoned vineyards, where it is a member of maquis and garrigues, as well as on calcareous



Fig. 2. Lectotype of *Helianthemum jonium* from FI herbarium (with permission for reproduction of Museo di Storia Naturale, Sezione Botanica “F. Parlatore”, <http://parlatore.msn.unifi.it>).

ous rocks in open grasslands mixed with garrigues as at Rt Stupišće. As concerns the population in Velo Zlopolje, it is the biggest one, with numerous individuals, colonizing sunny sandy slopes of abandoned excavations, where it grows within a community characterized by *Alkanna tinctoria* Tausch, *Ononis natrix* L., *Foeniculum vulgare* Mill., *Brachypodium retusum* (Pers.) P. Beauv., *Helichrysum italicum* (Roth.) G. Don and others. On the island of Lopud, *H. jonium* grows on sandy substrates within garrigues dominated by *C. saviifolius*, *C. incanus*, *Calicotome villosa* (Poir.) Link, *Hyparrhenia hirta* (L.) Stapf, *B. retusum*, *H. italicum* and others. In Italian territory, *H. jonium* was surveyed within different habitats showing greater ecological plasticity. According to BRULLO *et al.* (2001), this species is included among the characteristics of the order *Helianthemo*

jonici-Scabiosetalia albae Brullo et al. 2001, which is distributed along the western Adriatic coast of Italy, where it is linked to the psammophilous retrodunal vegetation of the class *Euphorbio paraliae-Ammophiletea australis* Géhu & Rivas Martinez in Rivas Martinez et al. 2011. In other localities of Basilicata and Apulia, it was recorded from the calcareous garrigues of *Cisto-Micromerietea* Oberd. 1954, where it characterized in particular some associations of this class, such as *Helianthemum jonii-Corydolithum capitati* Pietro & Misano 2010 and *Helianthemum jonii-Fumanetum thymifoliae* Taffetani & Biondi 1992 (DI PIETRO & MISANO, 2010; PERRINO & CALABRESE 2014; BRULLO & GUARINO, 2017). Finally, in Albania, *H. jonium* grows within sandy vegetation in the locality Hamallaj (north of Durrës). At this locality *H. jonium* grows on sandy dunes within open places among *Juniperus macrocarpa* Sm., *C. salviifolius*, *Medicago marina* L., *A. tinctoria*, *Juncus acutus* L. and others.

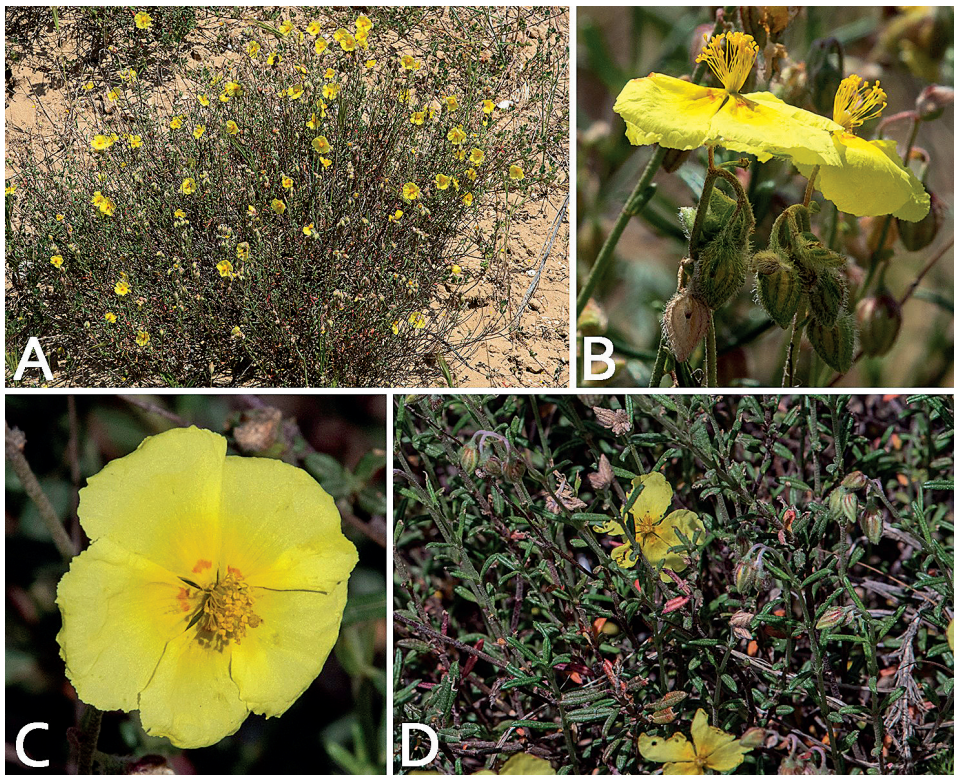


Fig. 3. *Helianthemum jonium*. A) habit, B) part of inflorescence, C) flower, D) leaves (photos by S. Bogdanović and D. Holcer).

Remarks: As already emphasized by PIGNATTI (1982) and BRULLO & GUARINO (2017), morphologically *H. jonium* can be easily confused with *H. apenninum* (L.) Mill. due to its similar habit, woody stem and leaf shape, but the two species differ mainly in petal colour, white in *H. apenninum* and yellow in *H. jonium*, as well as in the indumentum of sepals that consist of a dense tomentum with short stellate hairs in *H. apenninum* and of simple patent hairs in *H. jonium*. Another species closely related to *H. jonium* is *H.*

leptophyllum, a West Mediterranean species that in Italy occurs in Sardinia. According to THE PLANT LIST (2013), *H. jonium* is treated as a synonym of *H. leptophyllum*, while many other authors (PIGNATTI, 1982; GREUTER *et al.*, 1984; BRULLO & GUARINO 2017; RAAB-STRAUBE, 2018) are not of this opinion treating them as two distinct species. At first, GROVES (1887), although with much doubt, but at the suggestion of Willkomm, attributed the Italian populations of this species to *H. leptophyllum*, while subsequently BÉGUINOT (1910: 609) described them as a species new to science sub *H. jonium* Lacaita & Grosser. In particular it differs from *H. leptophyllum* mainly in having the upper part of the stem glabrous or subglabrous, narrow linear-elliptical, subglabrous leaves that are 1–2 mm wide, inflorescence 3–7 flowered, sepals purpurescent on ribs, with setulae or sparsely erect-patent hairs. Concerning the occurrence of *H. jonium* in Morocco, where it was reported by RUIZ DE LA TORRE (1956), it is now considered to have been a mistake as emphasized by GREUTER & RAUS (1982), since this record had to be more correctly referred to *H. leptophyllum*.

The previous reports of *H. jonium* in the Balkan Peninsula date back to CHAYTOR & TURRILL (1934: 438), who quoted it from the sand dunes near Durrës (Durazzo) in Albania referring this population to *H. jonium* var. *psilosepalum* Gross. & Lacaita. Later, this record was confirmed also by ALSTON & SANDWICH (1940: 149), while BARINA *et al.* (2018) in their "Checklist of vascular plants of Albania" stress that this is a misidentification, probably to be attributed to *H. leptophyllum*, but this cannot be verified because the reference herbarium vouchers are missing. Our inspection of the specimens deposited in the herbarium of Tirana (TIR) confirmed only the occurrence of *H. apenninum* and/or *H. nummularium*, as already stated by BARINA *et al.* (2018). Besides, a field trip was carried out on the sandy vegetation in the locality of Hamallaj (north of Durrës) and *H. jonium* was found and confirmed after 80 years in Albania. Concerning the chorological status of *H. jonium*, it can be considered as endemic amph-Adriatic element.

Specimina visa: **ALBANIA**: Hamallaj, north of Durrës, sandy dunes, 41°28'51.86"N, 19°30'26.96"E, 21.04.2020., *L. Shuka s.n.* (TIR). **CROATIA**: Dalmacija, otok Lopud, Šunj, sjeverno od plaže, 12.05.2018., *S. Bogdanović s.n.* (ZAGR 48010, 47217, 47218, 47219); o. Vis, Podhumlje, 13.03.1972., *I. Trinajstić s.n.* (CNHM 47501; 600:ZAG; 3465:BOT); o. Hvar, 01.05.1975., *I. Trinajstić s.n.* (CNHM 47500; 600:ZAG; 3464:BOT); Otok Vis, Velo Zlo polje, 05.05.2018., *D. Holcer s.n.* (ZAGR 46434, 46433, 46432); Otok Biševo, Gornja Salbunara, 01.05.2018., *S. Bogdanović s.n.* (ZAGR 46429, 46428, 46427); Dalmacija, otok Vis, Velo Zlo polje, 21.04.2018., *S. Bogdanović s.n.* (ZAGR 46193, 46192, 46191); Dalmacija, otok Vis, Malo Zlopolje, 22.04.2008., *S. Bogdanović, T. Nikolić, I. Boršić s.n.* (ZAGR 46189, 46188, 46187); Dalmacija, otok Vis, Rt Stupišće, 21.04.2008., *S. Bogdanović, T. Nikolić, I. Boršić s.n.* (ZAGR 46186, 46185, 46184, 46178); Dalmacija, otok Biševo, naselje Polje, 115 m/nv, travnjak na pješčanoj podlozi, 16.05.2009., *S. Bogdanović s.n.* (ZAGR 51618, 51619). **ITALY**: Italia, Le Cesine (Lecce-Puglia), 13.03.2008, leg. *S. Sciandrello & V. Tomaselli s.n.* (CAT 13731); Matera (Basilicata), 09.05.1984, leg. *S. Brullo s.n.* (CAT 38561); Italia, Basilicata, Dopo Gravina per Potenza, 09.05.1984, leg. *S. Brullo, P. Signorello, G. Spampinato s.n.* (CAT 38562); Italia, Puglia, Marina di Chiatona (Ta), dune, 16.07.1985, leg. *S. Brullo, P. Minissalle, P. Signorello, G. Spampinato s.n.* (CAT 38563); Italia, Puglia, Puglie, S. Cataldo, gariga, 17.07.1985, leg. *S. Brullo, P. Minissalle, P. Signorello, G. Spampinato s.n.* (CAT 38564); Italia, Basilicata, Cava nei pressi di Moliterno, Potenza, 21.06.1995, leg. *R. Galesi s.n.* (CAT 7139); Marina di Rosolina, 16.6.1989, *S. Brullo & G. Spampinato, s.n.* (CAT), Porto Caleri, 16.6.1989, *S. Brullo & G. Spampinato, s.n.* (CAT), Casal Rosetti, 17.6.1989, *S. Brullo & G. Spampinato, s.n.* (CAT), Cavallino, 17.6.

1989, S. Brullo & G. Spampinato, s.n. (CAT), Puglia, Marina di Chiatona, 15.7.1985, S. Brullo s.n. (CAT); Italien, Provinz Táranto, Golfo di Táranto, Marina di Genosa, SW-Rand der Ortschaft, kleine Sandhügel am Rande des Pinetums, 15.04.2003, leg. R. Karl (GZU 241739, 241740); Apulia, Proc. di Lecce: Taranto, in aridis saxosis calcareis prope locum dictum Leucaspidè, alt. cir. 50 m, 07.1908, leg. C. Lacaita 1460 (P 04728871); Pineta el Pantano prope Taranto, in silvaticis maritimis solo arenoso, est forma «psilosepalum», 29.04.1910, leg. C. Lacaita s.n. (P 06716346); Gravinola prope Taranto, in sax. calc., c. 30 m, 18.03.1906, leg. C. Lacaita s.n. (P 06716345); Apulia, Proc. di Lecce: Taranto, in aridis saxosis calcareis prope locum dictum Leucaspidè, alt. cir. 50 m, 07.1908, leg. C. Lacaita 1460 (K 000651284); Leucaspidè, near Tarnato (s. Italy), 04.1881, leg. C. Lacaita s.n. (sub *Helianthemum leptophyllum* Dunal) (K 000651286; 000651285); Gravina di Petruscio (Mottola, TA), vegetazione casmofitica con *Campanula versicolor*, *Scrophularia lucida* e garighe con *Salvia fruticosa*, 120 m s.l.m., 09.05.0018, leg. F. Roma-Marzio, M. D'Antraccoli s.n. (PI 018365, 018364); Gravina di Leucaspidè (Statte, TA), vegetazione casmofitica, 120 m s.l.m., 10.05.2018, leg. F. Roma-Marzio, M. D'Antraccoli s.n. (PI 018515); Masseria Amastuola (Crispiano, TA), gariga a *Cistus* sp.pl. e *Thymra capitata* e pinete aperte, 130 m s.l.m., 10.05.2018, leg. F. Roma-Marzio, M. D'Antraccoli s.n. (PI 018440). **MONTENEGRO:** Ulcinj-Velika plaža, 03.10.1977., I. Trinajstić s.n. (CNHM 47493; 600:ZAG; 3457:BOT).

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