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 amphip-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 garige na četiri jadranske otoka: Vis, Biševo, Hvar i Lopud, a 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 Jadranjskom području. Vrsta H. jonium prethodno je bila poznata jedino s Apenninskog 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 & Kubitzky, 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. albionii (Tineo) Greuter & Burdet and *H. sicanorum* Brullo, Giusso & Scand.) 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 Béguiinot (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 & Béguiinot, 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; Perrino & 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).

**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. leptophylllum* 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 garri-gues, 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. leptothyllum* Dunal var. *eulepthophyllum* 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 silva-tics maritimis (macchia mediterranea), loco dicto Pineta del Pantano sociis Erica arborea 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 isolecotypes. 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, short-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 garri-gues 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 garri-gues of Cisto-Ericetalia Horvatić 1958, characterized by *Cistus incanus* L., *C. salviifolius* L., *C. monspeliensis* L., *Fumana ericifolia* Wallr., *F. arabica* (L.) Spach, *F. laevipes* (L.) Spach, *Rosmarinus officinalis* L., *Erica multi-flora* 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 garri-gues, as well as on calcare-
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 *Helianthemoo*
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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 paralii-Ammophiletalia 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-Corydothymetum 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 & Sandwith (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, oto...
1989, S. Brullo & G. Spampinato, s.n. (CAT), Puglia, Marina di Chiatona, 15.7.1985, S. Brullo s.n. (CAT); Italien, Provinz Tárranto, Golfo di Tárranto, 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: Tárranto, in aridis saxosis calcareis prope locum dictum Leucaspide, alt. cir. 50 m, 07.1908, leg. C. Lacaita (K 000651286; 000651285); Gravina di Leucaspide (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 Thymbra capitata e pinete aperte, 130 m s.l.m., 10.05.2018, leg. F. Roma-Marzio, M. D’Antraccoli s.n. (PI 018440).

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