NAT. CROAT. | VOL. 27 | No 2 | 331-342 | ZAGREB | December 31, 2018

original scientific paper/izvorni znanstveni rad
DOI 10.20302/NC.2018.27.22

CONTRIBUTIONS AND PLANT GEOGRAPHICAL NOTES TO THE FLORA OF CRES – LOŠINJ ARCHIPELAGO (CROATIA)

Norbert Bauer

Department of Botany, Hungarian Natural History Museum, Könyves Kálmán krt. 40., H–1087 Budapest, Hungary

Bauer, N.: Contributions and plant geographical notes to the flora of Cres – Lošinj archipelago (Croatia). Nat. Croat. Vol. 27, No. 2, 331-342, 2018, Zagreb.

This paper introduces some important results of botanical research from Cres, Lošinj and Ilovik islands, Croatia. Besides the first records of taxa that have biogeographical importance (*Erythronium dens-canis, Crocus vittatus, Anemone ranunculoides, Corydalis cava*), the distributions of several rare (e.g. *Medicago marina, Potentilla micrantha, Scilla bifolia, Sedum litoreum*) and some adventive (e.g. *Oxalis pes-caprae, Symphyotrichum squamatum*) plant species are also given. Presumably the survival of Central European forest elements (with montane characters) on Cres Island is related to the macroclimatic and orographic features, the special microclimate and the ability of karst dolines (in the areas of Prašče brdo and Tamniški dolac) to provide safe haven for relict populations.

Key words: biogeography, Kvarner bay, plant distribution, doline, sinkhole, microclimate, micro refugium, *Erythronium dens-canis*

Bauer, N.: Prinosi i geografske crtice o flori Cresko-lošinjskog arhipelaga (Hrvatska). Nat. Croat. Vol. 27, No. 2, 331-342, 2018, Zagreb.

Rad donosi neke važne rezultate botaničkih istraživanja Cresa, Lošinja i Ilovika. Osim prvih nalaza svojti koji imaju biogeografsku važnost (*Erythronium dens-canis, Crocus vittatus, Anemone ranunculoides, Corydalis cava*), daje se i rasprostranjenost nekih rijetkih (npr. *Medicago marina, Potentilla micrantha, Scilla bifolia, Sedum litoreum*) i nekih novopridošlih biljnih vrsta (npr. *Oxalis pes-caprae, Symphyotrichum squamatum*). Opstanak srednjeeuropskih šumskih elemenata (montanog karaktera) na Cresu dovodi se u vezu s makroklimatskim i orogeografskim obilježjima, posebnom mikroklimom i sposobnošću krških ponikvi (na području Prašče brdo i Tamniški dolac) da pruže sigurno utočište reliktnim populacijama.

Ključne riječi: biogeografija, Kvarnerski zaljev, rasprostranjenost biljaka, ponikva, vrtača, mikroklima, mikrorefugij, *Erythronium dens-canis*

INTRODUCTION

The flora and vegetation of the islands of Cres, Lošinj and the neighbouring little isles are traditionally well-researched. The vegetation and climate of Lošinj were first examined by Haračić (1890, 1891, 1905). The vegetation types of Cres were depicted in detail by Morton (1932–1934). The latter description was completed with interesting additions by Martinoli (1948) and Trinajstić (1965).

An annotated list of the flora of these islands was published a decade ago (Wallnöfer, 2008), and it provides a thorough overview of the botanical research of the area, ranging from the basic facts (Haračić, 1905; Hirc, 1913, 1914a, 1916, 1917; Hruby, 1913;

*corresponding author: bauer.norbert@nhmus.hu

Marchesetti & Béguinot, 1930; Morton, 1929, 1930, 1932–1934; Lusina, 1932, 1938, 1941, 1949) to publications providing sporadic data. The newest synthesis of the Cres and Lošinj flora was compiled in a systematic overview of the data of herbaria, bibliography and field researches by Rottensteiner (2014), who included it into Istrian flora. Later, some additional publications completed the knowledge about the flora of the area (Rottensteiner, 2015, 2016, 2017; Rottensteiner *et al*., 2018). In the earlier publications, several taxa were reported the occurrence of which was either uncertain or incorrectly reported, or of which the confirmation had been pending for a long time. In this paper, I summarize my most important floristic data collected on the isles of Cres and Lošinj in the past five years. In addition, along with the new taxa, I have also included some recorded occurrences of taxa to be confirmed in the enumeration, because they are either rare or have phytogeographic importance. I also provide some additional information concerning the history of floristic research in the area.

MATERIALS AND METHODS

For the comparative study of and research into the flora of Mediterranean and sub-Mediterranean dry grasslands, shrubs and forests, I travelled 9 times and did 45 days of field-work in Cres and Lošinj between the spring of 2013 and the early spring of 2018. I aimed to visit the typical areas every season. I determined the geographic coordinates of interesting plant occurrences by means of a Satnav device (Trimble Juno 3B). Taking nature conservation aspects into account, I also documented the most important plant occurrences with photos as well as with herbarium sheets (placed in the BP herbarium). In the enumeration, geocoordinates are given for collected specimens and for cases of very rare and protected species that were only photographically documented. The geographical names in my paper are based on the names in the topographic and touristic maps available in the area (Anon.; Smerke, 2011; Košta, 2014).

I have used the following works for determining the taxa: Jávorka (1925), Domac (1994), Rottensteiner (2014). The nomenclature of taxa follows the Euro+Med PlantBase (Euro+Med 2006–), except in special cases in which the results of other papers and syntheses were considered relevant to the definition and use of names.

RESULTS

New taxa to the flora of islands of Cres and Lošinj

Anemone ranunculoides L.: On Cres Island it grows (in a small number) in rocky forests of dolines in the elevated region above 400 m a.s.l. Locality: eastern to Dragozetići, dolines of Tamniški dolac and Prašče brdo (03.04.2015. N 45.08493833°, E14.32643500°).

Corydalis cava (L.) Schweigg. & Körte: It occurs sporadically in the elevated region of Cres Island above 400 m a.s.l. Typical habitats of the species are mesophilic rocky forests (with *Quercus pubescens* Willd., *Q. cerris* L., *Ostrya carpinifolia* Scop., *Carpinus orientalis* Mill. in the canopy layer) and forest patches characterized by rendzinas. Localities: Mt Gorice, Sis peak, Mukova peak, Veli Črni, Prašče brdo, Tamniški dolac, Cerakovi.

Crocus vittatus Schloss. & Vuk.: Cres Island: Veli Črni, Prašče brdo (in dolines of rocky forests), 24.03.2018. N 45.07486333°, E 14.33751333°), Sis peak (13.05.2014. N 45.06703833°, E 14.35454333°; 24.03.2018. N 45.06704500°, E 14.35450167°), Orline peak (in rocky forests). Wallnöfer (2008) and Rottensteiner (2014), based on map data of Starmühler

(2006) (without a locality), mentioned the taxon of *Crocus albiflorus* Kit. ex Schult. from Cres. I found *Crocus* specimens in the upland region of Cres Island (at 450–630 m a.s.l.) that could not be identified as „*Crocus albiflorus*" which was typified as *Crocus vernus* (L.) Hill by Peruzzi *et al*. (2013) (some individuals were with white flowers, but the stigmas were always longer than the stamens etc.). *Crocus* populations found in the mountainous region of Cres belong to „*Crocus heuffelianus*" morphologically (Milović, 2016). The results of Mosolygó *et al*. (2016) showed that *C. heuffelianus* s. s. is restricted to Transylvanian-Carpathian and adjacent areas, and in the Western Balkans *Crocus vittatus* Schloss. & Vuk. occurs (commonly referred to as a synonym for the widely understood species *C. heuffelianus* Herb.), presumed to be of allotetraploid hybrid origin. My view is that *Crocus vittatus* Schloss. & Vuk. occurs on Cres Island too, but it would be good to justify this with genetic research.

Erythronium dens-canis L.: The species has previously not been reported from the Croatian islands. It occurs on the northern part of Cres Island, south-east of Dragozetići, on the plateau between Veli Črni peak and Prašče brdo, in humid rocky forests of some dolines, at an altitude of ~450 m. (24.03.2018. N 45.07588167°, E 14.33723667°). The size of this relict population can be estimated at about some hundred individuals. Its local habitat is one of the most montane habitats of Cres Island, one on which many other woodland species occur. A list of these taxa contains previously unrecorded species (*Anemone ranunculoides*, *Corydalis cava*), species that are rare or uncertain based on the former literature (*Cyclamen purpurascens* Mill., *Galanthus nivalis* L., *Scilla bifolia* L., *Prunus avium* (L.) L.), and species that are frequent on the island, having a mesophilic and rocky forest character (e.g. *Carex halleriana* Asso, *Cephalanthera damasonium* (Mill.) Druce, *Digitalis laevigata* Waldst. & Kit., *Epipactis microphylla* (Ehrh.) Sw., *Euphorbia amygdaloides* L., *Helleborus multifidus* Vis. subsp. *istriacus* (Schiffn.) Merxm. & Podlech, *Lamium maculatum* L., *Ranunculus ficaria* L.). Based on the Croatian distribution map, the closest population of *Erythronium dens-canis* (Nikolić, 2015) to the newly revealed one can be found in the Istrian mountains to the northwest (Mt Učka = "Monte Maggiore") (see also Benl & Mayer, 1975). Occurrences of relict montane species of Cres Island should be in the closest biogeographical relations with the above mentioned populations.

Oxalis pes-caprae L.: Lošinj Island, Mali Lošinj: from the western slope of Tovar to the Poljana hills near Mali Lošinj bay and Kovčanja bay (Poljana, 02.04.2015. N 44.55169667°, E 14.44950833°). Occurrences in sun-facing, ruderal rocky habitats (roadsides, rocky grasslands, rocky gardens, *Pinus halepensis* Mill. plantations) at an altitude of some 10 m. It is frequent on 10–100 square metres patches. It has not been reported from the islands of Cres and Lošinj, but the spread of the species was detected in similar habitats of other islands in the last two decades (Bogdanović *et al*., 2003, 2004, 2012; Bogdanović & Nikolić, 2004). Although the species is listed by Boršić et al. (2008) and the Global Invasive Species Database (GISD, 2015), Barina *et al*. (2014) do not count it an invasive species in Albania, where its distribution restricted to the southern rocky seaside.

Additional floristic data

Adiantum capillus-veneris L.: Cres Island, Lubenice: side of Uvala Žanja in a fissure of a limestone rock (26.07.2016. N 44.87171000°, E 14.32398500°). Former data: Marchesetti & Béguinot (1930), Haračić (1905), Hirc (1913) Lusina (1932, 1938), Hofmann & Morton (1929).

Allium tenuiflorum Ten.: Cres Island, Belej: Bunci in extensively grazed dry grassland (26.07.2016. N 44.78866333°, E 14.42296167°). Former data of the species was questioned by Wallnöfer (2008), but Rottesteiner (2014) mentioned it as a rare species in Cres. There are some specimens (ID 44341, 44342, 44343) from Lubenice in Herbarium ZAGR (Bogdanović *et al*., 2016).

Alnus glutinosa (L.) Gaertn.: Inner part of Cres-bay (Uvala Pisčel), west of Marina Cres, at the head of Pisčel, in a ~0.5 hectare patch of alder forest grove. The stand benefits from the karstic water of early spring. The alder forest is bordered by marshy vegetation dominated by *Phragmites australis* (Cav.) Steud. and *Juncus acutus* L. It was not mentioned by the synthesis of Wallnöfer (2008). According to Rottensteiner (2014) the species is rare on Cres Island.

Anacamptis papilionacea (L.) R. M. Bateman, Pridgeon & M. W. Chase: It was found on the northern part of Cres Island, on the slope of Sis peak, in a scrub patch. Former data: Marchesetti & Béguinot (1930), Haračić (1905), Hertel & Hertel (2003).

Anemone nemorosa L.: It occurs in the northern third of Cres, in the highest habitats of the island, southeast of Dragozetići, in rocky forests of Mt Gorice, Mt Orline and Prašče brdo (Mt Gorice, 03.04.2015. N 45.08032000, E 14.34383167°). Very rare species. Former data: Morton (1932–1934), Anić (1953).

Anthericum liliago L.: It was found in the inner parts of Cres Island, in extensively grazed dry grassland, Belej: Bunci area (18.05.2013. N 44.78795167°, E 14.42324333°); near to Srem on the plateau of Konfin. Wallnöfer (2008) mentioned previous data (Morton 1929) with the note of "confirmation required". The species is frequent north of Belej, on the western slope of Kus Hill, in extensively grazed, very species rich, dry grassland (e.g. *Aira elegantissima* Schur, *Anacamptis pyramidalis* (L.) Rich., *Anthyllis vulneraria* subsp. *rubriflora* (DC.) Arcang., *Asterolinon linum-stellatum* (L.) Duby, *Astragalus monspessulanus* subsp. *illyricus* (Bernh.) Chater, *Astragalus muelleri* Steud. et Hochst., *Blackstonia perfoliata* (L.) Huds., *Bromopsis erecta* (Huds.) Fourr., *Bupleurum veronense* Turra, *Convolvulus cantabrica* L., *Crepis rubra* L., *Edraianthus tenuifolius* (Waldst. et Kit.) A.DC., *Fumana procumbens* (Dunal) Gren. et Godr., *Genista sericea* Wulfen, *Genista sylvestris* subsp. *dalmatica* (Bartl.) H. Lindb., *Helianthemum nummularium* subsp. *obscurum* (Čelak.) Holub, *Linum tenuifolium* L., *Ononis reclinata* L., *Onosma echioides* subsp. *dalmatica* (Scheele) Peruzzi & N. G. Passal., *Ophrys bertoloni* Moretti, *Parentucellia latifolia* (L.) Caruel, *Romulea bulbocodium* (L.) Sebast. et Mauri, *Sanguisorba minor* Scop., *Stipa eriocaulis* Borbás, *Scorzonera austriaca* Willd., *Taraxacum* sect. *Erythrosperma* (Lindb.) Dahlst., *Teucrium montanum* L.).

Anthericum ramosum L.: Rare species in Cres Island, which occurs on open, rocky limestone slopes of the range of Sis peak, Mukova peak, Mt Gorice, Mt Orline (peak Mukova, 29.07.2016. N 45.06736167°, E 14.34757167°). It was mentioned by Marchesetti & Béguinot (1930) from Sis peak. Bernhardt & Kropf (2006) recorded the species south of Belej, when they sampled the xerophitic *Schoenus nigricans* grasslands. According to my observations, *Anthericum liliago* L. occurs in the latter stands.

Bidens subalternans DC.: The occurrence of this species was published by Martini & Poldini (1990) and Melzer & Bregant (1990) from the study area. According to Rottensteiner (2014), it is rare. Recently, the margins of Veli Lošinj, Mali Lošinj: Poljana, outskirts of the airport, it is frequent and is spreading in the ruderal areas of Kurila and Čunski.

Bunium ferulaceum Sm.: It was found on Cres Island, on the western slope of Sis peak, in a clearing in a xerothermic forest (*Quercus pubescens* Willd., *Fraxinus ornus* L., *Ostrya*

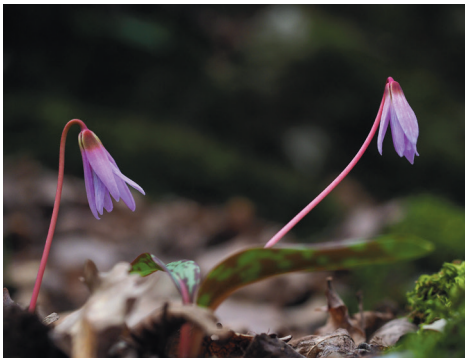

Fig. 1. *Erythronium dens-canis* from a sinkhole of the Prašče brdo on the island Cres (24.03.2018. photo by N. Bauer)

Fig. 2. The rare *Sedum litoreum* occurs on some limestone rock debris at the foot of Arat Hill on the island of Lošinj (15.05.2014. photo by N. Bauer)

carpinifolia Scop., *Acer monspessulanum* L.) (Mt Sis, 13.05.2014. N 45.06638667°, E 14.35293000°). Morton (1929, 1932–1934) published a record of it in two relevés from Cres, Wallnöfer (2008) mentioned this species with the note "confirmation required".

Calystegia soldanella (L.) R.Br.: Rare, it was found on the southern part of Ilovik Island, on a sandy beach (Uvala Paržine) (02.10.2015. N 44.44779500°, E 14.55840000°). It was reported from this locality by Lusina (1938) but this occurrence was not listed by Kumbarić (2005). According to Rottensteiner (2014), it is rare on Cres and Lošinj Islands. See also: *Medicago marina* L.

Carex humilis Leyss.: It occurs on Cres Island, east of Dragozetići, on the rocks of Mt Gorice, Mt Veli vrh, in the rocky grasslands around Lubenice (peak Hrip, Helm Hill). Recent study confirmed the data collected at Srem, Belej, Ustrine (Wallnöfer, 2008), and on the highest elevation of Lošinj Island (Mt Osorščica) (Lusina, 1941).

Colchicum kochii Parl.: The taxon was published from Cres and Lošinj (Marchesetti & Béguinot, 1930; Haračić, 1905; Morton, 1932–34), but these data were discussed by Wallnöfer (2008) and Rottensteiner (2014) as *Colchicum neapolitanum* (Ten.) Ten. The Euro-Med (2006-/Feb.2018/) defined *C. neapolitanum* in a narrower way and validated it as *Colchicum haynaldii* Heuff. in the Balkans. Milović (2017) distinguished *C. kochii* and *C. visiani* Parl. within *Colchicum haynaldii* agg., based on morphological data. According to the key of Milović (2017), the presence of *C. kochii* could be confirmed on the islands of Cres and Lošinj. The taxon is frequent in dry grasslands, rocky garigue and rocky forest habitats both on Cres and Lošinj. The species was recorded in the following localities: Cres island: in forests near to Dragozetići and Filozići (Mt Gorice, Mt Veli vrh, Mt Halm, Tamniški dolac, Prašče brdo), on shrubby pastures near to the settlement of Belej (Bunci, Kus Hill); Lošinj island: above Nerezine (Mt Osorščica), near Veli Lošinj and Mali Lošinj (Arat, Bulbin Hill, Grgošćak Hill, Uvala Krivica and above U. Balvanida).

Cyclamen purpurascens Mill.: It was found in several locations of the upland areas of Cres Island (at an altitude of 400–650 m), in rocky forests, rocky scrub. Localities: Sis peak, Mukova peak, Mt Gorice, Mt Veli vrh, Veli Črni, Prašče brdo, Tamniški dolac. This taxon was published by Hirc (1904) around Meraška jama and below Stivan. Based on the map of Starmühler (2001), the species occurs on Cres, but the author did not give the exact locality, in the annotated flora list of Wallnöfer (2008) mentioned as "confirmation required".

Eragrostis cilianensis subsp. *starosselskyi* (Grossh.) Tzvelev.: This subspecies of *Eragrostis cilianensis* (All.) Vignolo ex Janchen is considered taxonomically problematic, but morphologically separable specimens were reported from Lošinj by Rottensteiner (2014). I collected specimens of the above mentioned taxon on Cres Island at the settlement of Grmov, in ruderal grassland on a roadside (Grmov, 10.10.2014. N 44.82414167°, E 14.38016667°).

Gagea pusilla (F. W. Schmidt) Sweet.: It was reported from the highest mountain („Monte Ossero"= Mt Osorščica) of Lošinj by Lusina (1941) and from Cres, near to Lubenice, by Martini & Poldini (1990). This is a very rare species in the study area. I recorded the species southeast of Dragozetići, at the western foot of Mt Gorica, in an open clearing of an oak forest occurring in the Bubnji area (24.03.2018. N 45.07498500°, E 14.34074333°).

Galanthus nivalis L.: It was reported in several previous publications (Haračić, 1905; Lusina, 1941; Morton, 1932–1934), but nowadays it is very rare in the study area. I found it on Cres Island in rocky forests of the western slope of Mt Gorice (03.04.2015. N 45.07655833°, E 14.34718333°).

Hornungia petraea (L.) Rchb.: It is known from both Cres and Lošinj (Marchesetti & Béguinot, 1930; Haračić, 1905; Hirc, 1913; Morton, 1932–34), but very rare. (Rottensteiner, 2014). It occurs in rocky grasslands, and sometimes in pine-plantations, of Cres. The species was recorded in the following localities: Cres Island: near to Dragozetići, Filozići and Beli (Sis peak, Mt Gorice, Veli Črni peak), Predoščica (Barbin), Lubenice (Lubenice cliffs, Zaglavec, Hrip peak, Mt Helm), Vidovići (Ograjčine); Lošinj Island: rocky, open habitats of Mt Osorščica near Osor and Nerezine.

Iris illyrica Tomm.: It was found on Cres, west of the settlement of Lubenice, in limestone rocky grasslands occurring above Uvala Sv. Ivan (Lubenice cliffs, peak Hrip, Zaglavac) (18.05.2013., 06.10.2015. N 44.88482500°, E 14.33281500°). It seems to be rare on the studied islands. Data were previously published by Marchesetti & Béguinot (1930) from Cres („*Terreni rupestri a Cherso ed allo sc. Pregasnig*"). Rottensteiner (2014) mentioned it only from Lošinj. The habitats close to Lubenice are west-facing rocky slopes. Lots of rare plants grow here, which makes the area particularly interesting from a biogeographic point of view: e.g. *Asphodeline lutea* (L.) Rchb., *Achillea nobilis* L., *Aurinia sinuata* (L.) Griseb., *Allium moschatum* L., *Allium lusitanicum* Lam., *Arabis sagittata* (Bertol.) DC., *Aurinia leucadea* (Guss.) K.Koch, *Cerastium pumilum* Curtis, *Cotinus coggygria* Scop., *Inula conyza* DC., *Odontites luteus* (L.) Clairv., *Ornithogalum comosum* L., *Saxifraga tridactylites* L., *Scorzonera austriaca* Willd., *Sedum album* L., *Seseli montanum* subsp. *tommasinii* (Rchb. f.) Arcang., *Teucrium montanum* L., *Viola rupestris* F.W. Schmidt.

Lythrum hyssopifolia L.: I collected this species on Cres Island, south of the settlement of Grmov, in a drying pond occurring in pastureland (10.10.2014. N 44.8095304°, E 14.4069094°). Until now it was only mentioned for Lošinj (Wallnöfer, 2008; Rottensteiner, 2014) and Susak (Haračić, 1905)

Medicago marina L.: Not recorded for Cres and Lošinj islands, previous data from the study area are only from: Susak by Haračić (1905, also for Sv. Petar islet) and Hirc (1914b) and from Ilovik by Lusina (1938). This is a rare species which was found on the southern part of Ilovik island, on a sandy shore (Uvala Paržine) (04.10.2013. N 44.44783000°, E 14.55884333°). In this habitat-patch, the occurrence of several sandy seashore species was also typical (*Calystegia soldanella* (L.) R.Br., *Euphorbia peplis* L., *Euphorbia paralias* L., *Parapholis incurva* (L.) C. E. Hubb., *Polygonum maritimum* L.). These species are rare on the islands of Cres and Lošinj, because of the absence of this habitat type. The

studied habitat was characterized by some more common and less sensitive accompanying species, such as *Cynodon dactylon* (L.) Pers., *Salsola tragus* L., *Tragus racemosus* (L.) All., *Trifolium subterraneum* L. and *Tribulus terrestris* L.

Minuartia mediterranea (Link) K. Maly: In the Cres and Lošinj archipelago this species was mentioned first from Unije Island by Lusina (1956). According to Rottensteiner (2014) (without localities), the species is rare on Cres and Lošinj islands. It occurs in south-facing rocky grasslands of Sis peak (Sis peak, 13.05.2014. N 45.06593333°, E 14.35654167°). In these grasslands I found several locally rare or sporadic species such as *Aethionema saxatile* (L.) W. T. Aiton, *Alyssum montanum* L., *Aphanes arvensis* L., *Cerastium pumilum* Curtis, *Echinops ritro* L. subsp. *ruthenicus* (M.Bieb.) Nyman, *Linum tenuifolium* L., *Hornungia petraea* (L.) Rchb., *Medicago minima* (L.) Bartal., *Onosma echioides* subsp. *dalmatica* (Scheele) Peruzzi & N. G. Passal., *Ornithogalum comosum* L., *Saxifraga tridactylites* L.

Muscari botryoides (L.) Mill.: Hirc (1913) published it from Cres (on the top of Cres and around Merag), but Rottensteiner (2014) did not mention it from this island. I found *M. botryoides* in some areas in the northern part of Cres in dry oak forests (*Quercus cerris* L., *Quercus pubescens* Willd. forests): east of Dragozetići, on the western slope of Mt Gorice, Veli vrh, in rocky oak forests of Prašče brdo (Mt Gorice 03.04.2015. N 45.07845167°, E 14.34111333°; Prašče brdo, 03.04.2015. N 45.08411000°, E 14.32574500°), south to Lubenice, toward to Mt Helm (Mt Helm 04.04.2015. N 44.87375167°, E 14.34465000°).

Ophrys lutea subsp. *galilaea* (H. Fleischm. & Bornm.) Soó: A small population of the species was found on Cres Island, north of Belej, in the Bunci area, in a piece of *Bromopsis erecta* grassland scattered with juniper (12.05.2014, N 44.78771833°, E 14.42277000°). The above mentioned taxon was reported from Cres by Morton (1929) for the first time. Recently, Rottensteiner (2014) wrote that *Ophrys lutea* subsp. *galilaea* as a rarity of Cres. Its local habitat is a species-rich grassland with high frequency of *Ophrys bertoloni* Moretti. Typical species were *Anacamptis coriophora* (L.) R. M. Bateman, Pridgeon & M. W. Chase, *Anacamptis pyramidalis* (L.) Rich., *Neotinea tridentata* (Scop.) R. M. Bateman, Pridgeon & M. W. Chase, *Spiranthes spiralis* (L.) Chevall., *Gladiolus italicus* Mill., *Romulea bulbocodium* (L.) Sebast. & Mauri.

Potentilla micrantha Ram. ex DC.: I found some occurrences of the species in rocky xerothermic forests of peak Sis, Mt Gorice, Mt Orline dominated by *Quercus pubescens* Willd. and *Ostrya carpinifolia* Scop. (Mt Gorice 03.04.2015. N 45.08697500°, E 14.33944167°; Mt Sis, 24.03.2018. N 45.06920167°, E 14.35200833°). The species is mentioned in the enumeration of Marchesetti & Béguinot (1930) without a locality. Hirc (1913) published it from „*Črešnevici u Mergu*" and noted it as rare, Trinajstić (1965) recorded it in *Ostryo carpinifoliae - Quercetum ilicis* (Horvatić 1958) Trinajstić (1965) 1974 association; however, according to Rottensteiner (2014) the species is rare on Cres.

Scilla bifolia L.: It occurs sporadically in the upland region of Cres Island, above 400 m a.s.l. Its typical habitats are mesophilic rocky forests and forest patches of *Quercus pubescens* and *Q. cerris* with good soil conditions, but I found it at the altitude of 600 m, in open rocky habitats and scrubs of mountain-ridges. Localities: Mt Gorice, Sis peak, Mukova peak, Veli Črni, Prašče brdo, Tamniški dolac, Cerakovi (Mt Gorice, 03.04.2015. N 45.08483000°, E 14.34135000°; Tamniški dolac, 03.04.2015. N 45.08312000°, E 14.32628833°, Mukova peak, 24.03.2018. N 45.07416667°, E 14.34496500°). Rottensteiner (2014) mentioned it as a rare species in Cres, without giving a reference or precise locality.

Verbascum chaixii Vill. subsp. *chaixii*: It was found south of Mali Lošinj, on the ridge of Grgošćak Hill, in scrubby vegetation (15.05.2014. N 44.50066833°, E 14.50944000°). Previously it was reported by Haračić (1905).

Sedum litoreum Guss.: Very rare taxon. It was found on the foot of Arat Hill (Veli Lošinj), towards Uvala Kriška, along the seashore, some metres above the sea level, in fissures of rock and on debris (Rovenska, Arat Hill, 15.05.2014. N 44.52068500°, E 14.51296833°). It is in the same area mentioned for Veli Lošinj by Lusina (1938) where he wrote: „pr. S. Nicolo di Lgr, 50 m. s. m.; tra S. Nicolo e Arat; Iamna, 6 m. s. m."

Sesleria juncifolia Suffren.: It was found on Cres, on limestone rocks of forest clearings of Mt Gorice and west of the settlement of Lubenice, in limestone rocky grasslands above Uvala Sv. Ivan (Lubenice cliffs), on Zaglavec and Helm Hill (Mt Gorice, 03.04.2015. N 45.08843029°, E 14.33625626°; Lubenice cliffs, 06.10.2015. N 44.88217667°, E 14.32798333°). According to Wallnöfer (2008) "*confirmation for Cres required!*", and according to Rottensteiner (2014) it is rare on Cres.

Symphyotrichum squamatum (Spreng.) G.L. Nelson.: Cres: Porozina; Lošinj: Mali Lošinj, it is typical in ruderal habitats by ports, close to the shoreline (Porozina, 05.10.2013. N 45.13161270°, E 14.28451530°). The species was found by Rottensteiner (2016) in Cres: „*am Weg vom Franziskaner-Kloster zum Jachthafen*".

Additions to botanical research history of Cres and Lošinj islands

Due to the history of the area, botanical research into Istria and the Kvarner region is very diverse, and many Croatian, Italian, Austrian and Hungarian researchers contributed to the botanical exploration of the area. I have added some literature data to the comprehensive overview of Klemun (2014) and to the paper of Wallnöfer (2008).

We have to emphasize the phytogeographical statements of Vince Borbás who examined the area of Fiume (Rijeka) thoroughly. According to Borbás, the typical Mediterranean vegetation of Lussin (Lošinj) and Arbe (Rab) is interrupted by the inner parts of Kvarner bay ("*Fiumei-öbölben a mediterrán flóra koszorúja megszakad*"). Borbás also found that the western part of Istria had a richer flora than Fiume and its vicinity (Borbás, 1883, Borbás & Matisz, 1897). Bernátsky (1901) gave a detailed description of the vegetation of Lošinj Island. He presented the dominant and typical species of the main vegetation types and mentioned some important occurrences such as *Narcissus tazetta* L., *Orchis purpurea* Huds., *Anacamptis morio* (L.) R. M. Bateman, Pridgeon & M.W. Chase, *Ophrys sphegodes* Mill. subsp. *litigiosa* (E. G. Camus) Bech. /"Val di Sole"/, *Juniperus communis* L. /"Val d'Arche"/), but his data concerning *Smyrnium perfoliatum* L. are probably wrong. Géczy (1908) studied the "morphological effect of the ecological factor" of the macchia vegetation on Lošinj Island.

Rottensteiner (2014) investigated the material of several herbaria for his work, but the herbarium of the Hungarian Natural History Museum (BP) was excluded from his research. An overview of the data of the Hungarian Natural-History Museum collected in the environs of Istria exceeds the frame of this paper, but I checked the BP-collection focusing on all species listed in the Croatian Red Book (Nikolić & Topić, 2005) or others which are considered locally rare. According to this, the BP-collection has materials from Cres and/or Lošinj islands from the following collectors: Carl Gabriel Baenitz (1837–1913), Jenő Bernátsky (1873–1944), Kálmán Czakó (1843–1895), Evers Georg Gotthilf (1837–1916), Josef Franz Freyn (1845–1903), Wilhelm Gugler (1874–1909), Ambrogio Haračić (1855–1916), Zoltán Kárpáti (1909–1972), Jenő Béla Kümmerle (1876–1931),

Adolf Ferenc Láng (1795–1863), Géza Lengyel (1884–1965), Friedrich Morton (1890–1969), Bernát [Bernardus] Müller (1810–1901), Friedrich Wilhelm Noë (1798–1858), Ljudevit Rossi (1850–1932), József Sadler (1791–1849), Móricz Staub (1842–1904), Lajos Thaisz (1867–1937), Muzio Tommasini (1794–1879), Zoltán Zsák (1880–1966).

DISCUSSION AND CONCLUSIONS

The flora and vegetation of Cres and Lošinj have been extensively studied by many, but systematic research still yields interesting, sometimes biogeographically important, additions even in this well-known area. Research into this area is especially interesting due to its size, north–south direction, geographic position and its really diverse geomorphological features. Wallnöfer (2008) noted in his annotated flora list that, out of the 1130 taxa recorded, 253 taxa were reported only from Cres, and 273 only from Lošinj. Even early works refer to significant differences in the vegetation of Cres and Lošinj (Lorenz, 1863 /pp. 78–79./; Borbás, 1883), the striking difference is best illustrated by the map of Horvatić (1957). He clearly classified the north and northeastern part of Cres into the sub-Mediterranean, while the west and south (lower altitudes) of Cres and Lošinj into the eumediterranean zone. That the climate of the northern third of Cres is a bit cooler and rainier than other parts of the island is clearly to be seen on several maps by Zaninović *et al*. (2008). This difference is very pronounced in terms of the flora, which is enhanced by the fact that in the northern third of Cres there are 600-metre-high peaks and the eastern slopes of the island are much cooler and windier. These particular climatic conditions are the reason for the presence of many montane, mesophilous forest species, whose distribution is limited to the above mentioned sub-Mediterranean, cooler territories (e.g. *Anemone nemorosa, Anemone ranunculoides, Campanula trachelium* L., *Crocus vittatus, Cyclamen purpurascens, Digitalis laevigata, Erythronium dens-canis, Euphorbia amygdaloides, Potentilla micrantha, Primula vulgaris* Huds., *Prunus avium, Stachys sylvatica* L., *Veronica chamaedrys* L.). Based on my field-trips and previous researches, I can report that several eumediterranean subregional species (e.g. *Sternbergia lutea* (L.) Ker Gawl. ex Spreng., *Smyrnium olusatrum* L., *Viburnum tinus* L., *Cistus creticus* L., *Cistus salviifolius* L., *Cistus monspeliensis* L.) are found on both islands, but some of them (e.g. *Asphodelus fistulosus* L., *Cytinus hypocistis* (L.) L., *Sedum litoreum* Guss., *Sedum sediforme* (Jacq.) Pau) are present only on Lošinj (and the south of it).

However, the mesoclimatic character of the island of Cres is not only due to its higher hills (Mt Osorščica (558 m) in the northern part of the island of Lošinj is not much lower than the mountains of Cres, e.g. Mt Gorice, 648 m) and to the sub-Mediterranean climate of the northern part of the Kvarner Bay, but can certainly be attributed to higher relief (ridges and plateau), continental influence and geomorphological features marked by karst dolines. The specific microclimates of the dolines and their role in preserving relicts have been demonstrated in many papers (Horvat, 1953; Jakucs, 1971; Antonić *et al*., 1997;Bátori *et al*., 2011, 2012). They have special potential importance under global warming (e.g. species-holding capacity) (Bátori *et al*., 2017), and they protect the flora and vegetation against other anthropogenic threatening factors (e.g. forestry activity, soil degradation) (Kovačič & Ravbar, 2013; Breg Valjavec *et al*., 2018). Their importance is also significant on Cres Island. At 400–450 m above sea level, the special microclimatic conditions of the sinkholes of limestone plateaus (Prašče brdo, Tamniški dolac) contribute to the survival of many Central European woodland species, which occur in these sheltered habitats surrounded by xeric pubescent

oak forests. The occurrences of these relicts may be important subjects of flora history and biogeographic research in the future. Further, conservation of the karstic areas of Cres and Lošinj has to be considered because the microrefugia of the diverse limestone terrain (with dolinas, cliffs etc.) play an important key factor in preservation of the local biodiversity.

ACKNOWLEDGEMENTS

I would like to thank to the anonymous reviewers for their precious comments and additions. Grateful thanks to Judit Bajzáth, Judit Esztergályos, Angéla Matuszka, Réka Sebestyén, József Büki and Gábor Papp for their help in museological work related to this research.

Received May 31, 2018

REFERENCES

Anić, M., 1953: Pitomi kesten na Cresu. Eurasian chestnut (*Castanea sativa* Mill.) on the island of Cres, Croatia. Glasnik za šumske pokuse **11**, 321–356.

Anon.: Navigabene, Carta dei porti e della navigazione interna 13. Isole Croate Cherso–Cres 1:50.000, Carte Nautiche.

Anon.: Navigabene, Carta dei porti e della navigazione interna 14. Isole Croate Lussino– Lošinj 1:50.000, Carte Nautiche.

Antonić, O., Kušan, V. & Hrašovec, B., 1997: Microclimatic and topoclimatic differences between the phytocoenoses in the Viljska Ponikva Sinkhole, Mt. Risnjak, Croatia. Hrvatski Meteorološki Časopis **32**, 37–49.

Barina, Z., Rakaj, M., Somogyi, G., Erős-Honti, Z. & Pifkó, D., 2014: The alien flora of Albania: history, current status and future trends. Weed Research **54**, 196–215.

Bátori, Z., Vojtkó A., Farkas T., Szabó A., Havadtői K., E. Vojtkó A., Tölgyesi Cs., Cseh V., Erdős L., Maák, I. & Keppel, G., 2017: Large- and small-scale environmental factors drive distributions of cool-adapted plants in karstic microrefugia. Annals of Botany **119**, 301–309.

Bátori, Z., Gallé, R., Erdős, L., & Körmöczi, L., 2011: Ecological conditions, flora and vegetation of a large doline in the Mecsek Mountains (South Hungary). Acta Botanica Croatica **70**(2), 147–155.

Bátori, Z., Körmöczi, L., Erdős, L., Zalatnai, M. & Csiky, J., 2012: Importance of karst sinkholes in preserving relict, mountain, and wet-woodland plant species under sub-Mediterranean climate: A case study from southern Hungary. Journal of Cave and Karst Studies **74**(1), 127–134.

Benl, G. & Mayer, E., 1975: Erythronium dens-canis L., ein interessanter Neufund auf der Učka. Acta Botanica Croatica **34**, 151–155.

Bernátsky, J., 1901: Növényökologiai megfigyelések Lussin szigete déli részén (Pflanzenökologische Beobachtungen auf Süd-Lussin). Természetrajzi Füzetek **24**, 88–137.

Bernhardt, K-G. & Kropf, M., 2006: *Schoenus nigricans* (Cyperaceae) xerophytic grasslands on the NE Adriatic islands Cres and Krk (Croatia). Acta Botanica Croatica **65**(2), 127–136.

Bogdanović, S. & Nikolić, T., 2004: Notulae ad indicem florae Croaticae 4. Natura Croatica **13**(7), 407–420.

Bogdanović, S., Britvec, M., Ljubičić, I., Dujmović Purgar, D. & Vitasović Kosić, I., 2016: Herbarium ZAGR of the Faculty of Agriculture (Zagreb, Croatia). Agriculturae Conspectus Scientificus 81 (1), 1–5. (http://herbarium.agr.hr/)

Bogdanović, S., Dobrović, A., Ostojić A., & Boršić, I., 2003: Oxalis pes-caprae L. (Oxalidaceae) a new species in the flora of Croatia. Natura Croatica **12**(1), 31–37.

Bogdanović, S., Dobrović, A., Ostojić A., Boršić, I., Modrić, Ž. & Vojnić Rogić, I., 2004: A contribution to the vascular flora of the island of Biševo (central Adriatic, Croatia). Acta Botanica Croatica **63**(2), 125–134.

Bogdanović, S., Župan, D. & Mitić, B., 2012: Vaskularna flora otoka Silbe. In: Mužinić, J. & Purger, J. (eds), Otok Silba, Prirodno i kulturno blago, Sveučilište u Zadru pp. 81–94.

Borbás, V., 1883: Az örökzöld növények övének megszakadása a Fiumei-öbölben. [Break of the zone of evergreen plants in the Kvarner bay. /in Hungarian/] Természettudományi Közlöny, **15**, 130–132.

Borbás, V. & Matisz, J., 1897: Fiume és környékének növényzete. (Vegetation of Fiume and its surroundings) In: Sziklay, J. & Borovszy, S. (ed.): Magyarország vármegyéi és városai II., Fiume és a Magyar–horvát tengerpart, Apollo, Budapest, pp. 450–462.

Boršić, I., Milović, M., Dujmović, I., Bogdanović, S., Cigić, P., Rešetnik, I., Nikolić, T. & Mitić, B., 2008: Preliminary check-list of invasive alien plant species (IAS) in Croatia. Natura Croatica **17**(2), 55–71.

Breg Valjavec, M., Zorn, M. & Čarni, A., 2018: Bioindication of human-induced soil degradation in enclosed karst depressions (dolines) using Ellenberg indicator values (Classical Karst, Slovenia). Science of the Total Environment 640/641, 117–126. doi: 10.1016/j.scitotenv.2018.05.294. Epub 2018 May 30.

Domac, R., 1994: Flora Hrvatske, priručnik za određivanje bilja. Školska knjiga, Zagreb.

Euro+Med (2006–): Euro+Med PlantBase - the information resource for Euro-Mediterranean plant diversity. Published on the Internet http://ww2.bgbm.org/EuroPlusMed/ [Jan–Oct 2018]

Géczy, I., 1908: Lussin macchia növényzetének oikologiai és physiologiai jellemzése (Oikolog. u. physiol.–anat. Schiedlerung der Macchien-Vegetation der Insel Lussin). Magyar Botanikai Lapok **7**(9/12), 301–305.

Global Invasive Species Database (GISD), 2015: Species profile Oxalis pes-caprae. Available from: http://www.iucngisd.org/gisd/species.php?sc=1599 [Accessed 22 April 2018]

Haračić, A., 1890: Vegetazione dell"isola di Lussin. Prima parte. Gorizia, 37 pp.

Haračić, A., 1891: Vegetazione dell"isola di Lussin. II. parte. Rappport fra il clima e la vegetazione. Gorizia, 65 pp.

Haračić, A., 1905: L'isola Lussin. Il suo clima e la sua vegetazione. Scuola Nautica Lussinpiccolo.

Hertel, S. & Hertel, K., 2003: Die Orchideen der Inseln Cres und Lošinj. Journal Europäischer Orchideen 35, 685–721, with corresponding Errata in Journal Europäischer Orchideen. **36**, 605–606 (2004).

Hirc, D., 1904: Revizija hrvatske flore (Revisio florae croaticae). Rad Jugoslavenske akademije znanosti i umjetnosti 158, 171–221.

Hirc, D., 1913: Građa za floru otoka Cresa. Rad Jugoslavenske akademije znanosti i umjetnosti 200, 19–88.

Hirc, D., 1914a: Građa za floru otoka Cresa. Materialen für die Flora der Insel Cres. Izvješća o raspravama Matematičko-prirodoslovnoga Razreda 1, 68–77.

Hirc, D., 1914b: Proljetna flora otoka Suska i Unija. Rad Jugoslavenske akademije znanosti i umjetnosti 202, 1–50.

Hirc, D., 1916: Novi prilozi hrvatskoj flori. Na otoku Lošinju. Glasnik Hrvatskoga Prirodoslovnoga Društva **29**, 18–32.

Hirc, D., 1917: Prilozi flori otoka Cresa. Beiträge zur Flora der Insel Cres. Izvješća o raspravama Matematičko-prirodoslovnoga Razreda 8, 7–11.

Hofmann, E. & Morton, F., 1929: Interessante Standortsformen von *Adiantum capillus veneris* und *Asplenium trichomanes*. Botanisches Archiv **24**, 178–181.

Horvat, I., 1953: Vegetacija ponikava. Geografski Glasnik **14–15**, 1–5.

Horvatić, S., 1957: Pflanzengeographische Gliederung des Karstes Kroatiens und der angenzenden Gebiete Jugoslaviens. Acta Botanica Croatica **16**, 33–61.

Hruby, J., 1913: Der Monte Ossero auf Lussin. Allgemeine Botanische Zeitschrift **18**, 66–71.

Jakucs, L., 1971: A karsztok morfogenetikája. [Morphogenetic of karsts. /in Hungarian/] Akadémiai Kiadó, Budapest, 310 pp.

Jávorka, S., 1925: Magyar Flóra [Flora of Hungary]. Studium, Budapest, 1307 pp.

Klemun, M., 2014: Das Wissen zur „Flora Istriens" im Wandel von vier Jahrhunderten. In: Rottensteiner, W. K. (ed.), 2014: Exkursionsflora für Istrien. Verlag des Naturwisseschaftlichen Vereins für Kärtnen, Klagenfurt, 21–24 pp.

Košta, D., 2014: Serija Dinarske Alpe 16. Otok Lošinj 1:25.000, Hrvatska Gorska Služba Spašavanja (http://www.gss.hr/hgss/kartografija/).

Kovačič, G. & Ravbar, N., 2013: Analysis of human induced changes in a karst landscape – the filling of dolines in the Kras plateau, Slovenia. Science of the Total Environment 447, 143–151. doi: 10.1016/j.scitotenv.2013.01.002. Epub 2013 Feb 1.

Kumbarić, A., 2005: *Calystegia soldanella* (L.) R. Br. In: Nikolić, T. & Topić, J. (eds.), Red Book of Vascular Flora of Croatia. Ministry of Culture & State Institute for Nature Protection, Zagreb (in Croatian), pp. 131–132.

Lorenz, J. R., 1863: Physikalische Verhältnisse und Vertheilung der Organismen im Quarnerischen Golfe. Wien, 379 pp.

Lusina, G., 1932: Contributo alla flore delle isole del Quarnero. Annali di Botanica (Roma) **19**, 544–549.

Lusina, G., 1938: Secondo contributo alla flora delle isole del Carnaro. Annali di Botanica (Roma) **21**(2), 336–365.

Lusina, G., 1941: Terzo contributo alla flora delle isole del Carnaro. Annali di Botanica (Roma) **22**(2), 1–10.

Lusina G., 1949: Contributo alla flora dell'isola di Lussino. Annali di Botanica (Roma) **23**(1), 107–115.

Lusina, G., 1956: Flora e vegetazione dell'isola di Unie. Parte I. Flora. Annali di Botanica (Roma) **25**(1–2), 179–248.

Marchesetti, C. & Beguinot, A., 1930: Flora dell'isola di Cherso. Archivio Botanico per la Sistematica **6**, 16–59, 113–157.

Martini, F. & Poldini, L., 1990: Beitrag zur Floristic des Nordadriatischen Küstenlandes. Razprave IV Razreda Sazu **31**(10), 153–167.

Martinoli, G., 1948: La vegetazione degli stagni di Ossero (Cherso). Nuovo Giornale Botanico Italiano **55**(2), 276–319.

Melzer, H. & Bregant, E., 1990: Neues zur Flora von Friul-Julisch Venetien, Slowenien und Kroatien. Gortania, Atti Museo Friul. Nat., **11**('89), 161–176.

Milović, M., 2016: Rod Crocus L. (Iridaceae) u flori Hrvatske. Glasnik Hrvatskog botaničkog društva **4**(2), 4–20.

Milović, M., 2017: Rod *Colchicum* L. (Colchicaceae) u flori Hrvatske. Glasnik Hrvatskog botaničkog društva **5**(1), 20–31.

Morton, F., 1929: Beiträge zu einer pflanzengeographischen Monographie der Quarneroinsel Cherso. Botanisches Archiv **24**, 128–177.

Morton, F., 1930: Weitere Beiträge zu einer pflanzengeographischen Monographie der Quarneroinsel Cherso. Archivio Botanico per la Sistematica **6**, 206-231, [with 17 plant association-tables]

Morton, F., 1932–1934: Pflanzengeographische Monographie der Quarneroinsel Cherso. Archivio Botanico per la Sistematica **8**[1932], 321–344., **9**[1933], 54–85., 135–166., 237–268., **10**[1934], 71–92, 119–152., 275–313.

Mosolygó-L. Á., Sramkó, G., Barabás, S., Czeglédi, L., Jávor, A., Molnár, V., A. & Surányi, Gy., 2016: Molecular genetic evidence for allotetraploid hybrid speciation in the genus Crocus L. (Iridaceae). Phytotaxa **258**(2), 121–136.

Nikolić, T. (ed.), 2015: Flora Croatica Database (http://hirc.botanic.hr/fcd). Faculty of Science, University of Zagreb (Accessed Date: 2018/03/26).

Nikolić, T. & Topić, J. (eds.), 2005: Red Book of Vascular Flora of Croatia. Ministry of Culture & State Institute for Nature Protection, Zagreb (in Croatian).

Peruzzi, L., Carta, A. & Garbari, F., 2013: Lectotypification of the name *Crocus sativus* var. *vernus* L. (Iridaceae) and its consequences within *Crocus* ser. *Verni*. Taxon **62** (5), 1037–1040.

Rottensteiner, W. K. (ed.), 2014: Exkursionsflora für Istrien. Verlag des Naturwisseschaftlichen Vereins für Kärtnen, Klagenfurt, 1014 pp.

Rottensteiner, W. K., 2015: Notizen zur „Flora von Istrien", Teil I. Joannea Botanik **12**, 93–195.

Rottensteiner, W. K., 2016: Notizen zur „Flora von Istrien", Teil II. Joannea Botanik **13**, 73–166.

Rottensteiner, W. K., 2017: Notizen zur „Flora von Istrien", Teil III. Joannea Botanik **14**, 145–260.

Rottensteiner, W. K., Berg, C., Mayrhofer, H., Munda, I. M. & Kremer, B. P., 2018: Die Pflanzen Istriens in ihre natürlichen Lebensraumen. – Verlag des Naturwissenschaflichen Vereins für Kärtnen, Klagenfurt, 848 pp.

Smerke, Z., 2011: Otok Cres 1:75.000 i 1:25.000; Tramontana, Beli, Porozine, Križići, Sis, Lubenice, Helm, Martinšćica, Merag, Cres, V. Gračište. SMAND 21a.

Starmühler, W., 2001: Vorarbeiten zu einer "Flora von Istrien", Teil IV. Carinthia II **191**/111, 409–457.

Starmühler, W., 2006: Vorarbeiten zu einer "Flora von Istrien", Teil IX. Carinthia II **196**/116, 519–610.

Trinajstić, I., 1965: Istraživanja zimzelene šumske vegetacije sjevernog Cresa. Acta Botanica Croatica **24,** 137–142.

Wallnöfer, B., 2008: An annotated checklist of the vascular plants of the Cres-Lošinj (Cherso-Lussino) archipelago (NE-Adriatic Sea, Croatia). Ann. Naturhist. Mus. Wien, **109** B, 207–318.

Zaninović, K., Gajić-Čapka, M., Perčec Tadić, M. *et al*., 2008: Klimatski atlas Hrvatske / Climate atlas of Croatia 1961–1990. 1971–2000. Državni hidrometeorološki zavod, Zagreb, 200 pp.