

BOTANICAL RARITIES FROM SLOVENIAN ISTRIA:  
THE INFLUENCE OF THE MEDITERRANEAN EDGE*Josip OTOPAL*

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## ABSTRACT

*Eight (8) botanical rarities have been rediscovered within the last years in Slovenian Istria: two species, *Opopanax chironum* and *Nepeta pannonica* tall herbs, which were neglected before due to a lack of botanical investigations, are present in a limited area of a very restricted vegetation belt. Two anthropophytes – the two *Adonis* species (*A. flammea*, *A. annua*) – are actually on the edge of extinction due to changed agricultural practices. *Ophrys bertolonii*, *Linaria angustissima* and *Trigonella gladiata* are typical cases for three Eu-mediterranean species, which occur here on the northern edge of their distributional ranges. They occur extensively in mowed grasslands (*Ophrys*) or in abandoned, now mixed scrub and stony grasslands. Only *Eryngium campestre* was found in strongly disturbed habitats; its occurrence should be classified as periodical. Thus, we should emphasise that the future of the botanical rarities discussed in this paper largely depends on human activities, which maintain a certain disturbance regime in the forms of ploughing, mowing or grazing.*

**Key words:** rare species, Istria, Slovenia, distributional ranges, habitat preferences

RARITÀ BOTANICHE DELL'ISTRIA SLOVENA: INFLUENZA DEL MARGINE  
MEDITERRANEO

## SINTESI

*Otto (8) rarità botaniche sono state rinvenute negli ultimi anni nell'Istria slovena. Due specie di erbe alte, che in passato sono state trascurate a causa della mancanza di indagini botaniche - *Opopanax chironum* e *Nepeta pannonica* - sono presenti in una zona limitata di una fascia vegetazionale molto distinta. Due antropofite - due specie di *Adonis* (*A. flammea* ed *A. annua*) sono prossime all'estinzione a causa dei cambiamenti nelle pratiche agricole. *Ophrys bertolonii*, *Linaria angustissima* e *Trigonella gladiata* sono tre casi tipici di specie eu-mediterranee, che in questa zona vivono sul margine settentrionale del loro range di distribuzione. Tali specie crescono in praterie da falciare (*Ophrys*) o in abbandono, dove sono ora presenti macchia mista e praterie sassose. Solo *Eryngium campestre* è stata trovata in habitat fortemente disturbati e la sua presenza dovrebbe venir classificata come periodica. Gli autori pertanto rilevano che la gran parte delle rarità botaniche presentate nell'articolo dipende strettamente dalle attività umane, che mantengono un determinato regime di disturbo nelle forme di inserimento, falciatura o pascolo.*

**Parole chiave:** specie rare, Istria, Slovenia, range di distribuzione, preferenze di habitat

## INTRODUCTION

Species distributional patterns are not random and follow geographic patterns that reflect both recent ecology and phylogeographic history (Avisé, 2000). The Mediterranean flora is adapted to its Mediterranean environment, which is primarily characterised by its climate, followed by specific life forms and anatomical structures adapted to this environment (Wraber, 1993). However, the plants occurring in the Mediterranean area might be evolving under different regions and different conditions elsewhere (e.g. Thompson, 2005).

Although a part of Slovenia geographically belongs to the Mediterranean zone, many typical Mediterranean plants do not appear as part of its autochthonous flora (Wraber, 1993). In phytogeographic terms, the area of the Slovenian Sub-Mediterranean region, as defined by M. Wraber (1969), forms a contact area between the Mediterranean and Euro-Siberian biogeographic zone, having the characteristics of both zones; its natural vegetation type is deciduous forest (Kaligarič *et al.*, 2006). It could be considered as a Supra-Mediterranean belt, constituted by various species of oak (Quézel & Médail, 2003), or a Sub-Mediterranean belt (Kaligarič, 1997).

More specifically, in addition to Euro-Mediterranean and Sub-Mediterranean zones, Šugar (1983) also recognises a Mediterranean-montane zone. The basis for this delineation is forest vegetation. The rough criterion is evergreen forest vegetation, dominated by deciduous oak and beech vegetation. On the basis of new research, the same author (Šugar, 1984) further elaborates the delineation of Istria as being on the edge of the Mediterranean basin. He distinguishes between the Mediterranean and Eurosibiric-North-American phytogeographic regions. The first region consists of three zones – Euro-Mediterranean, Sub-Mediterranean and Epi-Mediterranean. The second one consists of Para-Mediterranean and Illyric zones. The differences are grounded in a combination of delineations based on plant associations and chorological spectra of species from these associations.

Our investigated area consists mainly of Sub-Mediterranean and Para-Mediterranean zones. The chorological spectrum of the flora of the nearby Trieste karst could be defined as European in a broad sense (33 %), featuring Euro-Mediterranean (Sub-Mediterranean)-Illyrian-Pontic species (Poldini, 1989). There are different opinions about the level of “mediterraneity” of the flysch area of Slovenian Istria. Zupančič (1997) strongly supports the statement that its natural potential vegetation, which is deciduous forest, leads us to a conclusion that this area is far from being typically Mediterranean, referring also to palynological data of Šercelj (1981-1982) from the mouth of the Dragonja River.

The hypothesis that beech forests were natural potential vegetation also very close to the sea (in sites of present-day oak-forests) was proposed already

by Piskernik (1985) and then supported with palynological evidences by Šercelj (1996). However, the strong anthropogenic influence over the last 2500 years, which created secondary dry grasslands, arable land, ruderal vegetation, etc, led the species composition in a much more thermophytic direction. Substantial vegetation changes were stated on the basis of pollen diagrams for Istria (Beug 1977). Later, in Roman times, species indicating farming activities proves the existence of agriculture associated with new settlements in Istria, but more interesting is the increase in the presence of evergreen trees (*Phillyrea*) (Beug, 1977). This can be taken as a sign that pioneer scrub and trees, which represent secondary succession, are regularly more thermophytic than the mesic primary forest. The primary forest creates and maintains mesic conditions with high humidity and lower temperature. These facts support the thesis proposed by Zupančič (1997). A scheme by Quézel (2004), which includes geological zonation, civilizations and vegetation types during the Holocene in southern France, also shows a transition between deciduous forests and evergreen sclerophytic forests about 5000 years BP. It was proposed by Kaligarič *et al.* (2006) that anthropogenic clearances in the karst terrain were necessarily associated with soil erosion, especially on slopes, and that they consequently create a dryer, warmer microclimate. This supports also the general conclusion, drawn by Eastwood (2004), which sees deforestation across the Mediterranean during the last 2000 years as having contributed to the aridity of the current climate.

The shift toward anthropogenically-driven thermophily probably includes shifts in species distributional patterns, especially at the edge of their distribution ranges. Therefore we should assume that the most thermophytic species, the Euro-Mediterranean species, are more linked to the secondary, disturbed habitats rather than to natural habitats. This argument is also supported by other authors, e.g., Plazar & Jogan (2001) or Jogan *et al.* (1999). They found thermophytic species, mainly annuals also in special conditions (e.g., along railways, street corridors) far outside the Sub-Mediterranean area. Mediterranean therophytes could establish temporarily or occasionally in disturbed dry habitats, but in the course of succession, they rarely persist for a longer period. In this study we record some new localities of rare species in Slovenia – all found in the territory of Slovenian Istria, which is the zone bordering the Mediterranean – and discuss their distributional ranges along with their habitat preferences.

## MATERIAL AND METHODS

New localities of interesting species were identified during the course of field excursions, carried out in the years 2005, 2006, 2007 and 2008. The nomenclature for taxa follows Martinčič *et al.* (2007) and Aeschmann *et al.* (2004); for syntaxa, Poldini (1989).

## RESULTS AND DISCUSSION

*Ophrys bertolonii* Moretti

On 25<sup>th</sup> May, 2006 one of the taxa from the aggregate *O. bertolonii* (Fig. 1) was found for the first time in Slovenian territory. According to old botanical data (Pospichal, 1897-99; Marchesetti, 1896-97), *O. bertolonii* never appeared in Istria northern of Rovinj other than in the sclerophilous evergreen Mediterranean vegetation belt. It was found in the relatively mesophytic karst meadows above the Kraški rob in the known botanical locality "Na Plasi" (370 m a.s.l.) near Podpeč. Only one exemplar was found in 2006, which didn't flower in 2007, but flowered again in 2008 and remained without flowers in 2009. The site was not visited between 2010 and 2012. On the surface of a few square metres around the plant, the following species has been recorded: *Achillea collina*, *Brachypodium rupestre*, *Bromus erectus*, *Coronilla coronata*, *Dorycnium pentaphyllum* subsp. *germanicum*, *Festuca rupicola*, *Hieracium cymosum*, *Onobrychis arenaria*, *Orchis morio*, *Lotus corniculatus*, *Melampyrum carstiense*, *Quercus pubescens*, *Pinus nigra*, *Rinanthus glacialis*, *Rhamnus rupestris*, *Sanguisorba minor* subsp. *minor*, *Scorzonera villosa*.



Fig. 1/Sl. 1: *Ophrys bertolonii*.

*Opopanax chironium* (L.) Koch

In 2006 and 2007, two localities of this species were found in the surroundings of Rakitovec. The tall umbelliferous plant was successfully flowering and producing fruits in the abandoned or recently mowed meadows within the Rakitovec plateau western of the village. Then, in 2007, more localities were found in the same plateau, but east of Rakitovec as far as the border with Croatia. It appears in mesic to moderately dry stands. Otherwise, this Mediterranean species, mostly distributed in the montane belt of the Dinarides, SW Alps, Apennines and Pyrenees, prefers the saum vegetation belonging to the association order *Galio-Alliarietalia*. The meadows, colonised by *Opopanax chironium* belong to the regularly mown meadows of *Arrhatheretum elatioris* and the Sub-Mediterranean-Illyrian semi-dry meadows of the *Danthonio-Scorzoneretum villosae* association. It is accompanied by the following species: *Knautia illyrica*, *Arrhenatherum elatior*, *Bromus erectus*, *Vicia cracca*, *Pastinaca sativa*, *Lathyrus latifolius*, *Salvia pratensis*, *Scorzonera villosa* and *Galium verum*. This is thought to be the only known population in Slovenia and comprises several thousand of exemplars. However, it will probably tend to spread further due to the abandonment of hay meadows in that altitudinal belt. According to the Slovenian red list, this species is "not sufficiently known", and its detailed conservational status has never been estimated. The only data available about its distribution in Slovenia refers to Pospichal (1897-99); he cites the localities of Černotiči, Rakitovec and Kavčice. It was also reported by Martini (2009) near Podpeč; however, the authors of this paper were not able to reconfirm it in this location.

*Adonis flammea* subsp. *cortiana* Jacq.

This thermophytic segetal terophyte, a rather common species in the past, was treated as already extinct (Wraber & Skoberne, 1989), but it was lately re-discovered by Wraber (1990) and Kaligarič (2001). This species was found near Krkavče above the Dragonja valley in 1989 and 1990 but after this time it was not reported as being present in those particular localities. It was again re-discovered near the village Krkavče in 2007 at the edge of a vegetable field in a vegetation stand 10 metres long and one metre wide, which could be easily classified as association *Galio tricornuti-Ranunculetum arvensis* where the following species were present: *Galium tricornutum*, *Ranunculus arvensis*, *Conslida regalis*, *Bifora radians*, *Legousia speculum-veneris*, *Anthriscum minus*, *Myagrum perfoliatum*, *Papaver rhoeas*, *Anthemis arvensis*, *Viola arvensis*, *Diplotaxis muralis*, *Chenopodium album*, *Anagalis arvensis*, *Rapistrum rugosum*, *Fallopia convolvulus*, *Veronica persica*, *Mercurialis annua* and *Kickxia spuria*. This stand developed in the absence of the main culture in which it usually appears –

wheat. It seems to be a spring-off of the seed bank that was previously accumulated within a now practically defunct wheat culture. This population was renewed over the course of two successional years: in 2007 there were 18 flowering exemplars, but the plants did not produce seeds. In 2008 only 2 exemplars remained, which produced fruits. It was not found any more in 2009. It could be concluded that this species will only sporadically appear in the future and that the seed bank will become impoverished in forthcoming years. In such cases "ex situ" conservation seems to be a suitable way to maintain its presence in the Slovenian flora.

#### ***Adonis annua* subsp. *cupaniana* (Guss.) Steinberg**

This annual was also considered to be extinct in the red data book from 1989 (Wraber & Skoberne, 1989) but was re-discovered at Stena in Dragonja valley in 1989 (Wraber, 1990), an "island" of Eu-Mediterranean flora, surrounded with Sub-Mediterranean flora. It was found again only in 2007, but this time in the young olive grove growing near Krkavče. In the olive grove the following additional taxa were found: *Cirsium arvense*, *Anthemis arvensis*, *Myagrum perfoliatum*, *Sinapis arvensis*, *Sorghum halepense*, *Papaver rhoeas*, *Avena barbata*, *Vicia sativa*, *Conyza canadensis*, *Sonchus oleraceus* and *Fumaria officinalis*. Also in this case the occurrence of this rare annual was a spring-off from the seed bank, accumulated at the abandoned wheat field, which was converted to olive growing but ploughed in the previous year (2006), which activity created suitable conditions for the germination of this species. The exemplars produced many seeds in 2007 but since the olive grove was not ploughed in the autumn, no spring-offs occurred in the following year. Also in this case the ex-situ conservation, with occasional re-introductions in the proper habitats, should be the appropriate way to maintain the Slovenian population(s) in future.

#### ***Nepeta pannonica* L.**

Pospichal (1897-99) cites many localities in Goriško region and in Brkini, but also near Krvavi Potok, Marija Snežna above Črni Kal and on mountains Kojnik and Kavčič. This species has not been recorded since then in the territory of Slovenia over a longer period. It was re-discovered in 2006; the localities above Rakitovec are between 680 and 750 m a.s.l. This perennial has Eastern-European and Western-Asiatic distribution; it appears on forest edges and in grasslands in reforestation, mainly within the *Onopordion acanthi* alliance. The population is not very large, consisting of not more than 50 exemplars, but it is stable and was able to be followed regularly every year.

#### ***Linaria angustissima* (Loisel.) Borbas**

For this species only two localities had ever been previously recorded (Martinčič *et al.*, 2007) – Ocizla and Černotiči; the latter probably refers to the same population as given in Pospichal (1897-99). This Mediterranean species was found in 2009 on the rocky grassland just by the road between Movraž and Rakitovec. A small population of around ten exemplars was flowering and already producing seeds. The finding of this species in the southern, very warm and dry part of Slovenian karst shows a typical pattern of periodic occurrence of Mediterranean annuals, which occasionally grow also beyond their typical distributional range.

#### ***Trigonella gladiata* Steven ex M. Bieb.**

The only Slovenian locality of this Mediterranean annual is mentioned as being Podpeč near Črni kal (Martinčič *et al.*, 2007), where species grows on dry grassland below the rocks in a very warm microclimate. This species was found under very similar conditions in 2009 (and confirmed in 2010 and 2011) in the calcareous hill in Hrastovlje (behind the church). The population seems to be quite large, since exemplars are not clustered together but scattered across the entire rocky grassland. The occurrence of this species follows the same distributional pattern as the previous one.

#### ***Eryngium campestre* L.**

This xerophytic grassland species of eastern origin was found decades ago in the eastern Slovenia (Martinčič *et al.*, 2007), but it is very likely that it is not present here anymore. It was also found near Ljubljana in the past, but its occurrence is considered as secondary (Martinčič *et al.*, 2007). It was found in 2008 and 2009 by the old road from Škofije to Rižana. Only a few exemplars were found, but successfully flowering and producing seeds. This is the first record of this species in the Sub-Mediterranean part of Slovenia, but we consider its occurrence as secondary. It is likely that the seeds were dispersed from Eastern Europe by tracks.

### CONCLUSIONS

It could be summarized that only two species are clearly-detectable perennials, tall herbs, which were neglected due to lack of botanical investigations. However, those two – *Opopanax chironium* and *Nepeta pannonica* – are present in a limited area in a very distinguished vegetation belt in the upper zone of deciduous oaks and lower zone of beech forests. Then, there are two anthropophytes – the two *Adonis* species, which are really on the edge of its extinction due to changed agricultural practices. *Ophrys bertolonii*, *Linaria angustissima* and *Trigonella gladiata* are typical cases

for three Eu-Mediterranean species, which occur here on the edge of their distributional ranges. Those species, however, do not occur in strongly disturbed habitats, but in extensively mowed grasslands (*Ophrys*) or in abandoned pastures, now mixed scrub and stony grasslands. Only *Eryngium campestre* was found in strongly disturbed habitats and its occurrence should be classified as not constant. In conclusion, we should emphasize that a great deal of botanical rarities discussed in this

paper strongly depends on human activities, which keep certain disturbance regime in the forms of plugging, mowing or grazing. As stated also from previous authors (e.g. Wraber, 1975), flysch substrate can't sustain establishment and persistence of Eu-Mediterranean species in Slovenian litoral due to its properties (retaining water and lower temperature). Thus, the occurrence of Eu-Mediterranean species is limited to less permanent and disturbed (ruderal) stands, derived from human activities.

## BOTANIČNE REDKOSTI IZ SLOVENSKE ISTRE: VPLIV SREDOZEMSKEGA ROBA

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### POVZETEK

V zadnjih letih je bilo v slovenski Istri odkritih osem botaničnih redkosti: dve vrsti, visoki stebliki, sta bili doslej prezrti zaradi pomanjkanja botaničnih raziskovanj – *Opopanax chironum* in *Nepeta pannonica* – prisotni sta na omejenem območju v določenem vegetacijskem pasu. Dva antropofita – dve vrsti iz rodu *Adonis* (*A. flammea*, *A. annua*) – sta na pragu lokalnega izumrtja zaradi spremenjene kmetijske prakse. *Ophrys bertolonii*, *Linaria angustissima* in *Trigonella gladiata* so trije tipični primeri evmediteranskih vrst, ki se tukaj pojavljajo na severnem robu svojega areala. Uspevajo na ekstenzivno gojenih traviščih (*Ophrys*) ali na opuščeni traviščih, danes grmiščih, in na kamnitih traviščih. Le vrsta *Eryngium campestre* je bila najdena v močno motenem habitatu in njeno pojavljanje lahko ocenimo kot periodično. Tako lahko zaključimo, da je večji del botaničnih redkosti, obravnavanih v tem članku, odvisen od človekovih dejavnosti, ki vzdržujejo stalno motnjo v obliki oranja, košnje ali pašne.

**Ključne besede:** redke vrste, Slovenija, areali, izbira habitata

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