

Addition to the vascular flora of Jarun (Zagreb, Croatia)

short scientific communication / kratko znanstveno priopćenje

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Twenty new vascular plant species were recorded on Jarun Recreational and Sports Centre during vegetation seasons 2011, 2012 and 2015. Those species had not been noted neither in systematic floristic investigations in the frames of the project „Countdown towards 2010 in

Zagreb“ nor earlier. New record of rare orchid *Epipactis nordeniorum* Robatsch and records of two endangered hydrophytes, *Hippuris vulgaris* L. and *Hottonia palustris* L., are particularly interesting. In total, vascular flora of Jarun now comprises 343 species and subspecies.

Keywords: new records, Jarun Recreational and Sports Centre, life forms, chorotypes**Čičmir, R., Boršić, I. (2016): Dodatak vaskularnoj flori Jaruna (Zagreb, Hrvatska). Glas. Hrvat. bot. druš. 4(2): 32-36.****Sažetak**

Tijekom vegetacijskih sezona 2011, 2012 i 2015 na području Rekreativno-sportskog centra Jarun zabilježeno je 20 novih biljnih vrsta koje ovdje nisu bile zabilježene niti tijekom sustavnih florističkih istraživanja u okviru projekta “Countdown towards

2010 in Zagreb”, a niti ranije. Pri tome se posebno ističu novi nalaz rijetke orhideje *Epipactis nordeniorum* Robatsch te dvije ugrožene vodene vrste, *Hippuris vulgaris* L. i *Hottonia palustris* L. Ukupna vaskularna flora Jaruna sada broji 343 vrste i podvrste.

Ključne riječi: novi nalazi, Rekreativno-sportski centar Jarun, životni oblici, florni elementi**Introduction**

Jarun Recreational and Sports Centre is situated in the south-western part of the city of Zagreb (central Croatia). With an area of 235 ha it includes six islands (Otok Trešnjevka, Otok Univerzijade, Otok divljine, Otok hrvatske mladeži, Otok ljubavi and Otok veslača) on two artificial lakes (Veliko jezero and Malo jezero) which are connected by regatta course, and surrounding land (Sabolić 2003).

Since it was constructed and landscaped in 1987 it was only sporadically investigated for its flora. However, systematic floristic investigations of this complex were conducted in the frames of the project “Countdown towards 2010 in Zagreb”, with the results which were subsequently published by Vuković et al. (2013). According to those investigations, the flora of Jarun comprises 323 plant taxa from 70 families in total. However, we have recorded several new species for this area and find it interesting to publish our findings.

Material and methods

Numerous field trips to Jarun Recreational and Sports Centre in the vegetation seasons 2011, 2012 and

2015 yielded some interesting floristic observations. For the identification of plant species standard determination keys and iconographies were used (e.g. Tutin et al. 1968-1980, Jávorka & Csapody 1991, Tutin et al. 1993, Domac 1994, Rothmaler 2000). The nomenclature of taxa was adjusted according to the Flora Croatica Database (Nikolić 2016). Chorological types and life-forms were determined in the same way as in Vuković et al. (2013). Furthermore, IUCN categories were determined according to the Red Book of Vascular Flora of Croatia (Nikolić & Topić 2005). Species listed in the Ordinance on Strictly Protected Species (Official Gazette 144/2013) of the Nature Protection Act (Official Gazette 80/2013) were identified as strictly protected plants.

The area of Jarun extends over eight grid cells of new reference grid 1x1 km (Tab. 1, Fig. 1). It is a reference grid developed by European Environment Agency (EEA) for each EEA member country and for Europe as a whole. Beside the grid resolution of 1 km, for each country grid resolutions of 10 km and 100 km are also available (Peifer 2011). Particular species has been assigned to a grid cell in which it was recorded.



Figure 1. Grid cells of new reference grid 1x1 km (red lines) of Jarun Recreational and Sports Centre (pink line). For the explanation of numbers of grid cells see Tab. 1.

Table 1. Grid cells of new reference grid 1x1 km of Jarun Recreational and Sports Centre.

Grid cell name	Map label
1kmE4780N2537	1
1kmE4781N2537	2
1kmE4782N2537	3
1kmE4783N2537	4
1kmE4780N2536	5
1kmE4781N2536	6
1kmE4782N2536	7
1kmE4783N2536	8

Results and discussion

During our floristic investigations 20 new vascular plant species were recorded for the area of Jarun (Tab. 2). Vascular flora of Jarun now comprises 343 species and subspecies in total. With only minor changes, order of the most abundant plant families has mostly remained the same as previously reported. The most dramatic change happened with the family Violaceae which now contains seven species in the flora of Jarun, while previously only one species was recorded (cf. Vuković et al. 2013).

Table 2. Newly recorded vascular plant species for Jarun. Chor – chorological types (1-Mediterranean (med), 3-South-European (S-europ), 5-Central-European (C-europ), 6-European (europ), 7-Euro-Asiatic (euro-asiat), 8-Circum-Holarctic (circ-holarct), 9-Cosmopolites (cosmop)), LF – life forms (G-Geophytes, H-Hemicryptophytes, Hy-Hydrophytes, T-Therophytes), IUCN – threat status (DD-Data Deficient, EN-Endangered), P – legal protection (sp-Strictly protected), Distr – cells in which the species was recorded.

Plant taxon	Chor	LF	IUCN	P	Distr
subclass Magnoliidae					
Asteraceae <i>Centaurea jacea</i> L.	7	H			1,5
Boraginaceae <i>Anchusa officinalis</i> L.	6	H			5,6,7

Plant taxon	Chor	LF	IUCN	P	Distr
Gentianaceae					
<i>Blackstonia perfoliata</i> (L.) Huds.	1	T			6
<i>Centaureum pulchellum</i> (Sw.) Druce (Fig. 2)	7	T			2
Hippuridaceae					
<i>Hippuris vulgaris</i> L.	8	Hy	EN		2,7
Lamiaceae					
<i>Prunella laciniata</i> (L.) L.	3	H			5,6
Onagraceae					
<i>Ludwigia palustris</i> (L.) Elliott	9	H	DD		7
Primulaceae					
<i>Hottonia palustris</i> L.	6	Hy	EN		7
<i>Samolus valerandi</i> L.	9	H			1,2,6,7
Saxifragaceae					
<i>Saxifraga tridactylites</i> L.	9	T			2
Violaceae					
<i>Viola alba</i> Besser	3	H			6,7
<i>Viola hirta</i> L.	7	H			1,5,6,7
<i>Viola odorata</i> L.	6	H			1,2,6,7
<i>Viola reichenbachiana</i> Jord. ex Boreau	5	H			6,7
<i>Viola riviniana</i> Rchb.	6	H			6
<i>Viola suavis</i> M.Bieb.	3	H			6,7
subclass Liliidae					
Amaryllidaceae					
<i>Allium carinatum</i> L.	3	G			7
Cyperaceae					
<i>Eleocharis acicularis</i> (L.) Roem. et Schult.	9	H			2,6,7
Orchidaceae					
<i>Epipactis nordeniorum</i> Robatsch	5	G		sp	7
Poaceae					
<i>Brachypodium sylvaticum</i> (Huds.) P.Beauv.	7	H			7



Figure 2. Habit of *Centaureum pulchellum* (Sw.) Druce (A) and upper part of the plant (B) (Photo: R. Čičmir).

In comparison with the data from Vuković et al. (2013), life-form spectrum for the flora of Jarun remained almost the same (Fig. 3). Predominance of hemicryptophytes, followed by therophytes, geophytes and phanerophytes, with the lowermost share of hydrophytes and chamaephytes, remains in accordance with other researched areas in NW Croatia (e.g. Stančić 1994, Mitić et al. 2007, Hudina et al. 2012, Alegro et al. 2013).

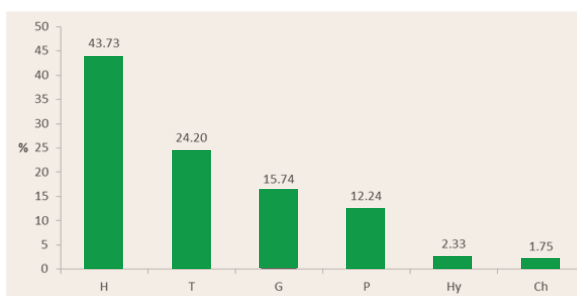


Figure 3. Life-form spectrum for the flora of Jarun.

Likewise, phytogeographical spectrum for the flora of Jarun (Fig. 4) does not show distinct differences from previously reported in Vuković et al. (2013). The Euro-Asiatic chorotype is still by far the most prevalent chorological type, followed by adventive, Mediterranean, cosmopolites, South-European and European chorotypes which have almost the same share in the flora of Jarun.

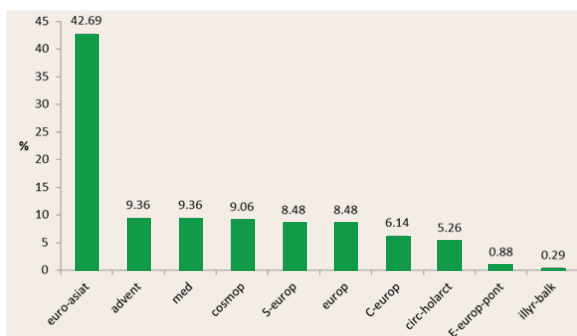


Figure 4. Phytogeographical spectrum for the flora of Jarun.

Especially interesting are records of rare and/or threatened vascular plant species, which are discussed in more detail.

Species *Epipactis nordeniorum* (Fig. 5) is a rare orchid with only several localities in the continental part of Croatia. It grows in forest habitats on the mountains of Ivanščica, Strahinjščica, Maceljjska and Petrova gora, but was also found in the city of Daruvar. Its populations mostly consist of few individuals. In Jarun it was recorded in the southern part of the lake in grid cell 7 growing in dense shrub area close to the water. One flowering and one sterile stem were recorded. Like all other orchid taxa in Croatia, it is strictly protected by the Nature Protection Act (Official Gazette 80/2013) i.e. it is listed in Ordinance on Strictly Protected Species (Official Gazette 144/2013).



Figure 5. *Epipactis nordeniorum* Robatsch in its habitat (A) and its flowers (B) (Photo: R. Čičmir).

Two newly recorded species, which are considered to be endangered (EN) in Croatia (Nikolić & Topić 2005) are *Hippuris vulgaris* and *Hottonia palustris*. Both species are more widely distributed than it was previously thought, thus their threat categories should be revised. However, they grow on wet habitats, which are in general under pronounced anthropogenic pressure.

Species *Ludwigia palustris* (Fig. 6) has several localities in central Croatia but was listed as Data Deficient (DD) in the Red Book of Vascular Flora of Croatia (Nikolić & Topić 2005). In Jarun it was recorded at south-eastern part of the lake with shallow water, in area which is usually exposed during the summer months due to the lower water level.



Figure 6. Habit of *Ludwigia palustris* (A) and its flower (B) (Photo: R. Čičmir).

Species *Samolus valerandi* (Fig. 7) was recorded in abundance at the water's edge along regatta course and Veliko jezero. This is, as far as we know, the first locality of this species in continental Croatia, while it is more frequently found on predominantly halophytic habitats in the Mediterranean part of Croatia (cf. Nikolić 2016). In the whole area of its distribution it usually grows in temporarily inundated areas, near lakes and rivers, as well as in salt marshes (Stähl 2004). Although the species grows throughout Europe, it is listed as Near Threatened in Hungary and Critically Endangered in Czech Republic (Lansdown 2013). Its populations are often impermanent so this might be the reason why it was not recorded earlier. Furthermore, it is often used in aquaristics so this population might stem from introduced individuals, previously grown in aquariums.



Figure 7. *Samolus valerandi* L. – habit (A), in flower (B) and in fruit (C) (Photo: R. Čičmir).

Intensive interest in the genus *Viola* of the first author yielded several records of *Viola* species for the area, which were obviously overlooked in previous investigations (Fig. 8). This is especially true for common and widely distributed species *V. alba* and *V. odorata*. In Jarun all recorded *Viola* species grow on similar habitats, which are mostly shaded, like woods, woodland edges or roadsides. Thus it is not surprising to find different *Viola* species on such a small area.

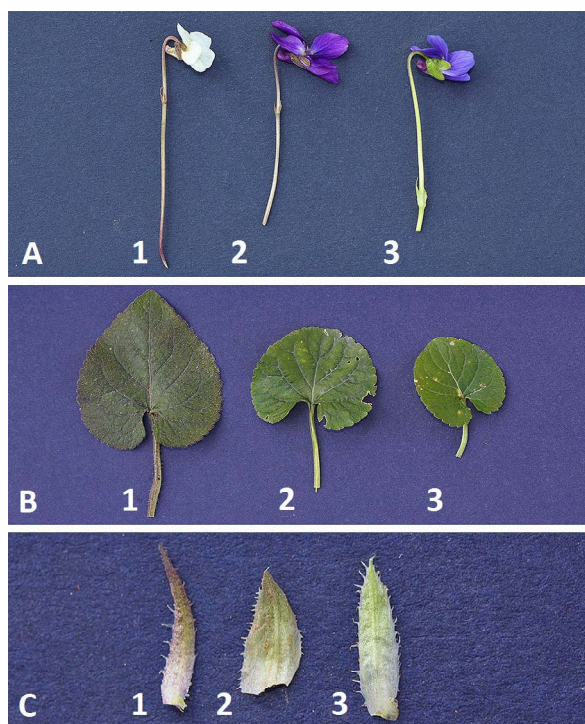


Figure 8. Flowers (A), leaves (B) and stipules (C) of *Viola alba* Besser (1), *Viola odorata* L. (2) and *Viola suavis* M.Bieb. (3) (Photo: R. Čičmir).

Conclusion

Jarun is floristically even richer than previously thought and the documented diversity of its vascular flora emphasises natural and semi-natural habitats in urban areas as habitats for diverse and even some rare and/or threatened species.

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