



TOWARDS A CHECKLIST OF THE VASCULAR FLORA OF THE NERETVA RIVER DELTA (CROATIA)

PETER GLASNOVIĆ^{1,2}, ŠPELA NOVAK³, SANJA BEHRIČ⁴ & NATAŠA FUJS^{2*}

¹Science and Research Centre, University of Primorska, SI-6000 Koper, Garibaldijeva 1, Slovenia
(peter.glasnovic@zrs.upr.si)

^{2,2*}(student) Faculty of Mathematics, Natural Sciences and Information Technologies,
University of Primorska, SI-6000 Koper, Glagoljaška 8, Slovenia

³Museum of Natural History, Prešernova cesta 20, 1001 Ljubljana

⁴Šubljeva ulica 28, SI-1234 Mengeš, Slovenia

Glasnović, P., Novak, Š., Behrič, S. & Fujs, N.: Towards a checklist of the vascular flora of the Neretva River Delta (Croatia). *Nat. Croat.*, Vol. 24, No. 2., 163–190, Zagreb, 2015.

The Neretva River Delta is considered one of the 96 important plant areas of Croatia and as an important wetland is listed as a Ramsar site. In this paper we provide data on habitat and floristic diversity recorded during a field study carried out in April 2011. We surveyed 10 localities and identified 18 habitat types, 12 of which are included in Annex I of the EU Habitat Directive. Out of 458 identified vascular plant taxa, 32 are included in the Red Book of Vascular Flora of Croatia as Endangered (5 taxa), Vulnerable (10 taxa), and Near threatened (11), while 6 taxa are regarded as Data Deficient. In addition, we recorded two invasive alien species and 12 endemic species for the Dinaric area, and discuss their conservation and biogeographical importance. We added 160 records from literature sources to our data, which resulted in 618 identified (recorded) taxa for the study region.

Key words: flora, habitats, nature conservation, Neretva River Delta, Croatia

Glasnović, P., Novak, Š., Behrič, S. & Fujs, N.: Prema stvaranju popisa vaskularne flore ušća rijeke Neretve (Hrvatska). *Nat. Croat.*, Vol. 24, No. 2., 163–190, Zagreb, 2015.

Delta rijeke Neretve jednn je od 96 botanički važnih područja u Hrvatskoj i nalazi se na popisu lokaliteta Ramsarske konvencije. U radu prikazujemo podatke o staništima i florističkoj raznolikosti prikupljenima tijekom terenskih istraživanja u travnju 2011. Na 10 istraživanih lokaliteta utvrdili smo 18 tipova staništa od kojih se 12 nalazi u Dodatku I Direktive o staništima EU. Među 458 svojti vaskularne flore, 32 vrste su uključene u Crvenu knjigu vaskularne flore Hrvatske kao ugrožene svojte (pet vrsta), osjetljive (10) ili gotovo ugrožene (11), dok je status šest svojti nedovoljno poznat (DD). Uz to, zabilježili smo dvije invazivne i 12 endemičnih svojta te dali osvrt na njihov konzervacijski i biogeografski značaj. Prikupljenim podacima dodali smo 160 literaturnih nalaza, pa je ukupna raznolikost flore u istraživanom području 618 svojta.

Ključne riječi: flora, staništa, očuvanje prirode, delta rijeke Neretve, Hrvatska

INTRODUCTION

The Mediterranean basin has been recognized as one of the global biodiversity hotspots (MYERS *et al.*, 2000). The Balkan Peninsula, especially its mountainous western part, represents one of the European biodiversity hotspots (POLUNIN, 1997; GRIFFITHS *et al.* (eds.), 2004). Thus, the 230 km long Neretva River, the longest in the Dinaric mountain range, can be considered a link between these two "hotspots", connecting the inner areas of the Balkan Peninsula with the great Mediterranean basin.

The Neretva River rises in the central, mountainous area of Bosnia and Herzegovina, continuing its course through narrow and deep valleys towards the Adriatic Sea. Most of the river length is in Bosnia and Herzegovina, and only its final 22 km are in the Republic of Croatia where the Neretva River forms a large alluvial plain, one of the largest and most important wetlands of the eastern Adriatic coast. Due to urbanization and intensive agriculture the whole area was significantly modified in the last century. Wetland habitats have been largely confined within smaller areas and are today under protection (JASPRICA in ALEGRO *et al.*, 2010). Since 1993 the Neretva River Delta has been listed under the Ramsar Convention as internationally important. Although small and unconnected protected areas already exist, recently, an initiative has been launched to declare the whole delta region a protected area and to establish a public institution for its proper management (eg. RADOVIĆ *et al.*, 2007).

The Neretva River Delta is located within an area characterised by the Mediterranean climate, with mild and rainy winters (mean temperature of the coldest month is 9.2 °C in Dubrovnik and 9.1°C in Hvar) and hot and dry summers (mean temperature of the warmest month is 24,6°C in Dubrovnik and 25°C in Hvar). The mean amount of precipitation is around 1000 mm (1064 mm in Dubrovnik and 713 in Hvar), with highest peaks during winter months (for periods between 1961–1990 and 1971–2000, ZANINOVIĆ *et al.*, 2008). The alluvial plain is bounded by calcareous hills in the north and south. The landscape diversity is reflected in the diversity of habitats which leads to species diversity. The area harbours a number of rare and endangered plant species and has consequently been recognized as one of 94 important plant areas of Croatia (JASPRICA in NIKOLIĆ *et al.* (Eds.), 2010). Knowledge about the plant life of the Neretva River Delta can be gathered in different works on the topic (HORVATIĆ, 1954; LOVRIĆ & RAC, 1987; LOVRIĆ & RAC, 1988; TOPIĆ, 1995; JASPRICA & BUNTIĆ, 2003; JASPRICA & KOVAČIĆ, 2005; TRINAJSTIĆ, 2002) and in works dealing with singular floristic findings (HORVATIĆ, 1949; HODAK, 1956; ILJANIĆ & HEĆIMOVIĆ, 1983; TOPIĆ *et al.*, 1996; SMITAL *et al.*, 1998; ŠILIC & ŠOLIĆ, 2002). Although there is no published systematic checklist of the vascular flora of the Neretva River Delta, JASPRICA, according to data from Flora Croatica Database (NIKOLIĆ *et al.* (Eds.), 2010), in a summing up said that 820 vascular plants taxa were already known for this area.

A compilation of biodiversity data is essential in systematic conservation planning and represents its first step (MARGULES & PRESSEY, 2000). With this paper we wish to contribute towards a comprehensive knowledge of the vascular flora of the Neretva River Delta for its proper future protection.

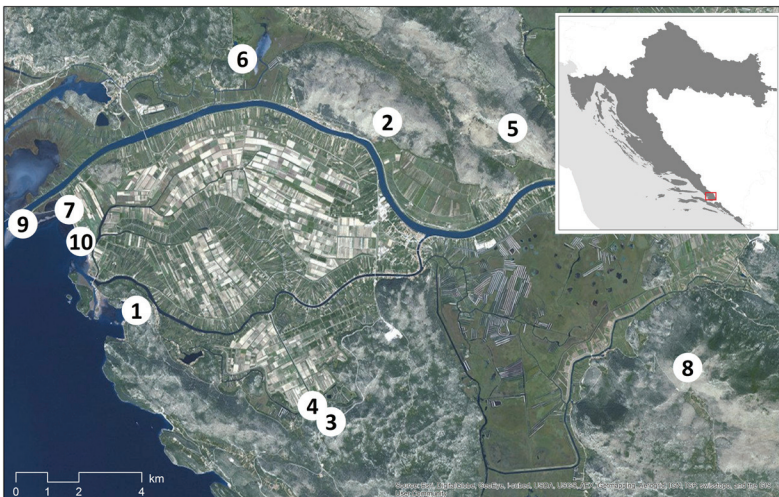
METHODS

We surveyed the vascular flora of the wider Neretva River Delta during six days of field work in the period from 24th to 30th April 2011 at 10 localities indicated in Table 1 and Fig. 1.

Localities were selected so as to ensure that as many different habitats as possible were reviewed. We surveyed the floristic diversity of coastal and saline habitats (Localities 1, 2, 3 and 4), freshwater habitats (Localities 7 and 9), degraded stages of sclerophyllous Mediterranean forest vegetation (Localities 1, 5, 6, 8, 9 and 10), semi-natural grasslands (Localities 2, 5, 8 and 10), rocky habitats (Localities 5, 8 and 10) and habitats within and in the proximity of human settlements (Localities 1, 8 and 10). At each locality we further classified terrestrial habitat types according to the PHYSIS typology which follows the Palearctic habitat classification (DEVILLERS & DEVILLERS-TERSCHUREN, 2000; TOPIĆ & VUKELIĆ, 2009).

Tab. 1. Surveyed localities.

No.	Locality	Locality description	N	E
1	Blace 1	Village of Blace and its surroundings	43.00	17.47
2	Komin	Slopes of hills Umac (315 m) and Kovač (255 m) hills above the village of Komin	43.04	17.56
3	Pižinovac 1	Rocky slopes above the village of Pižinovac	42.98	17.55
4	Pižinovac 2	Fresh-water habitats within agricultural land in the proximity of the village of Pižinovac	42.98	17.53
5	Krvavac	Rocky slopes of hills Kablina (450 m) and Bobalj (265 m) above the church "Gospa od Karmela" in the proximity of the village of Krvavac	43.04	17.59
6	Banja – Modro oko	Area surrounding the village Banja and the Modro oko lake	43.06	17.51
7	Blace 2	Galičak hill (32 m), 1,5 km north-west from the village of Blace	43.02	17.46
8	Vidonje	Village of Vidonje with Marin vijenac (507 m) hill and its southern slopes	42.99	17.64
9	Blace 3	Neretva river mouth 4,5 km north-west from the village of Blace	43.02	17.45
10	Blace 4	Sandy beach 2 km north-west from the village of Blace	43.01	17.47

**Fig. 1.** Research area with indicated surveyed localities

Most plant taxa were identified in the field, while taxonomically complicated taxa were determined using a stereomicroscope and the proper literature (PIGNATTI, 1983; TUTIN *et al.*, 2001; DOMAC, 2002; MARTINČIĆ *et al.*, 2007; BLAMEY & GREY-WILSON, 2004; DELFORGE, 2006; KOVAČIĆ *et al.*, 2008). The nomenclature has been adjusted according to the Flora Croatica Database (NIKOLIĆ (ed.), 2010). Voucher specimens are stored at the Natural History Museum Rijeka (NHMR).

Taxa listed in the Red Book of Vascular Flora of Croatia (NIKOLIĆ & TOPIĆ (eds.), 2005) are marked according to their conservation status (CR – Critically endangered, EN – Endangered, VU – Vulnerable, DD – Data deficient). Additionally, taxa protected by the Nature Protection Law (ANONYMOUS, 2013) are marked as **SP** (if listed as Strictly Protected). Taxa considered to be invasive alien taxa according to BORŠIĆ *et al.* (2008) are marked with **IAS**.

RESULTS

Within the surveyed areas we identified 18 habitat types, 12 of which are included in Annex I of the EU Habitat Directive (Council Directive 92/43/EEC on the Conservation of Natural Habitats and the Wild Fauna and Flora) (Tab. 2).

During our fieldwork we recorded 458 different vascular plant taxa, listed in Tab. 3. Furthermore, we report on additional 160 taxa referred to from the lower Neretva River or Neretva River Delta in different literature sources but not recorded during our fieldwork. Altogether the list consists of 618 different taxa.

Tab. 2. Habitat types at surveyed localities. Habitat types are defined according to the Palearctic habitat classification – PHYSIS. Habitats included in the EU Habitat Directive are emphasized with bold characters.

No.	Locality (LOC)	Terrestrial habitat types
1	Blace 1	18.22 Tethyan sea-cliff communities (<i>Crithmo – Limonietea</i>) 15.6 Mediterranean saltmarsh scrubs (<i>Sarcocornietea fruticosae</i>) 34.5; Mediterranean xeric grasslands (<i>Thero-Brachypodietea ramosi</i>) 45.1 Olive-carob forests 7.2; Ruderal communities 83.11 Olive groves
2	Komin	32.131 Prickly juniper arborescent matorral 34.75 Eastern sub-Mediterranean dry grasslands (<i>Scorzoneretalia villosae</i>) 45.3 Holm-oak forest 62.10 Calcicolous chasmophyte communities (<i>Centaureo-Campanuletalia</i>)
3	Pižinovac 1	34.5 Mediterranean xeric grasslands (<i>Thero-Brachypodietea ramosi</i>) 83.16 Citrus orchards 89.2 Fresh water industrial lagoons and canals
4	Pižinovac 2	22.41 Free-floating vegetation (<i>Potametea; Lemnetea</i>)
5	Krvavac	32.131 Prickly juniper arborescent matorral 34.75 Eastern sub-Mediterranean dry grasslands (<i>Scorzoneretalia villosae</i>) 34.5 Mediterranean xeric grasslands (<i>Thero-Brachypodietea ramosi</i>) 45.3 Holm-oak forest 62.10 Calcicolous chasmophyte communities (<i>Centaureo-Campanuletalia</i>) 7.2 Ruderal communities
6	Banja – Modro oko	22.3 Amphibious macrophyte communities 22.42 Rooted submerged vegetation 22.41 Free-floating vegetation (<i>Potametea; Lemnetea</i>) 44.4 Mixed oak-elm-ash forests of great river
7	Blace 2	34.5 Mediterranean xeric grasslands (<i>Thero-Brachypodietea ramosi</i>)
8	Vidonje	32.131 Prickly juniper arborescent matorral 34.75 Eastern sub-Mediterranean dry grasslands (<i>Scorzoneretalia villosae</i>) 45.3 Holm-oak forest 62.10 Calcicolous chasmophyte communities (<i>Centaureo-Campanuletalia</i>) 7.2 Ruderal communities
9	Blace 3	13.2 Estuaries
10	Blace 4	15.1 Annual salt pioneer swards (<i>Thero-Salicornietalia</i>)

Tab. 3. List of recorded taxa from fieldwork and literature. The presence of each taxon at individual localities is indicated in the table. Conservation status and other remarks are indicated with abbreviations; see the chapter methods for the full text.

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Acer monspessulanum</i> L.			x	x					x		
<i>Acinos arvensis</i> (Lam.) Dandy		x	x			x	x		x		
<i>Aegilops geniculata</i> Roth						x		x			
<i>Aethionema saxatile</i> (L.) R. Br.		x	x	x		x	x		x		
<i>Agrostis stolonifera</i> agg.		Lower Neretva (HORVATIĆ, 1949, 1954)									
<i>Ailanthus altissima</i> (Mill.) Swingle	IAS	x		x							
<i>Ajuga chamaepitys</i> (L.) Schreb.						x					
<i>Alisma lanceolatum</i> With.							x				
<i>Alisma plantago-aquatica</i> L.					x						
<i>Alkanna tinctoria</i> Tausch			x	x		x					
<i>Allium ampeloprasum</i> L. var. <i>lussinense</i>		Neretva River Delta (JASPRICA, 2007)									
<i>Allium roseum</i> L.						x					
<i>Allium subhirsutum</i> L.		x		x				x			
<i>Alnus glutinosa</i> (L.) Gaertner							x				
<i>Alnus glutinosa</i> subsp. <i>elliptica</i> (Req.) Nyman		Lower Neretva River (LOVRIĆ <i>et al.</i> , 1988)									
<i>Alopecurus aequalis</i> Sobol	VU; SP	Neretva River Delta (ALEGRO IN NIKOLIĆ & TOPIĆ, 2005; JASPRICA IN ALEGRO <i>et al.</i> , 2010)									
<i>Alopecurus myosuroides</i> Huds.							x				
<i>Althaea officinalis</i> L.		x									
<i>Alyssum alyssoides</i> L. (L.)				x		x	x				
<i>Alyssum montanum</i> L. ssp. <i>pagense</i> (Baumgartner) Hayek		Neretva River Delta (JASPRICA, 2007)									
<i>Alyssum simplex</i> Rudolphi		x		x		x	x	x			
<i>Ambrosia artemisiifolia</i> L.	IAS	Neretva River Delta (JASPRICA, 2007)									
<i>Anacamptis pyramidalis</i> (L.) Rich.	SP	x		x							
<i>Anagallis arvensis</i> L.		x									
<i>Anagallis foemina</i> Mill.			x			x					
<i>Anthemis arvensis</i> L.						x					
<i>Anthemis cotula</i> L.		Lower Neretva (HORVATIĆ, 1954)									
<i>Anthoxanthum odoratum</i> L.			x						x		
<i>Anthyllis vulneraria</i> L. subsp. <i>praepropera</i> (A.Kern.) Bornm.	SP	x	x			x					
<i>Anthyllis vulneraria</i> L. ssp. <i>weldeniana</i> (Rchb.) Cullen	SP	Neretva River Delta (JASPRICA, 2007)									
<i>Apium repens</i> (Jacq.) Lag.	DD; SP	Lower Neretva (HORVATIĆ, 1954)									

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Arabis hirsuta</i> (L.) Scop.		x	x			x	x	x	x		
<i>Arabis turrita</i> L.				x			x				
<i>Arabis verna</i> (L.) R. Br.		x		x			x				
<i>Arbutus unedo</i> L.							x				
<i>Arenaria serpyllifolia</i> agg.		x	x	x		x	x	x	x		
<i>Argyrobolium zanonii</i> (Turra) P. W. Ball			x			x					
<i>Arisarum vulgare</i> O.Targ.Tozz.		x									
<i>Aristolochia clematitis</i> L.					x		x				
<i>Aristolochia rotunda</i> L.							x				
<i>Artemisia absinthium</i> L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kutu, Modro oko, Bačina and spring Norin (TOPIĆ,1995); Banks of the Velika Neretva, southeast of Ploče (TOPIĆ <i>et al.</i> , 1996)									
<i>Artemisia verlotiorum</i> Lamotte	IAS	Rogotin, near Ploče (SMITAL <i>et al.</i> , 1998)									
<i>Arthrocnemum fruticosum</i> (L.) Moq.		x						x			
<i>Arum italicum</i> Mill.		x	x		x	x	x		x		
<i>Arum nigrum</i> Schott	NT	x	x						x		
<i>Arundo donax</i> L.											x
<i>Asparagus acutifolius</i> L.		x	x	x		x	x	x	x		
<i>Asperula scutellaris</i> Vis.	SP	Neretva River Delta (JASPRICA, 2007)									
<i>Asphodeline lutea</i> (L.) Rchb.						x			x		
<i>Asphodelus aestivus</i> Brot.		x		x				x			
<i>Asphodelus fistulosus</i> L.		x									
<i>Asplenium ceterach</i> L.		x	x	x		x	x		x		
<i>Asplenium onopteris</i> L.					x						
<i>Asplenium ruta-muraria</i> L.									x		
<i>Asplenium trichomanes</i> L.		x	x	x		x		x	x		
<i>Aster tripolium</i> L.											x
<i>Aster squamatus</i> (Spreng.) Hieron.	IAS	Neretva River Delta (TRINAJSTIĆ, 2002)									
<i>Asterolinon linum-stellatum</i> (L.) Duby			x			x			x		
<i>Astragalus hamosus</i> L.		x	x			x	x	x	x		
<i>Aurinia sinuata</i> (L.) Griseb.	SP					x		x			
<i>Avena barbata</i> Pott ex Link		x	x	x		x	x	x	x		
<i>Avena sterilis</i> L.		x			x	x	x	x			
<i>Atriplex prostrata</i> Boucher ex DC. in Lam. et DC.		Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995); Opuzen (TRINAJSTIĆ, 2002)									
<i>Baldellia ranunculoides</i> (L.) Parl.	EN; SP	Lower Neretva (HORVATIĆ, 1949, 1954); Aquatic vegetation of lakes Kutu, Modro oko and Bačina (TOPIĆ,1995); Neretva River Delta (NIKOLIĆ & TOPIĆ, 2005, (JASPRICA IN ALEGRO <i>et al.</i> , 2010)									

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Barlia robertiana</i> (Loisel.) Greuter	SP	x									
<i>Bellis perennis</i> L.		x							x		
<i>Berteroa mutabilis</i> (Vent.) DC.							x				
<i>Berula erecta</i> (Huds.) Coville	Marshland and aquatic vegetation of Neretva river, canals and lakes Kutli, Modro oko, Bačina and spring Norin (TOPIĆ, 1995)										
<i>Biscutella cichorifolia</i> Loisel.						x					
<i>Bidens bipinnata</i>	Ploče (ILIJANIĆ & HEČIMOVIĆ, 1983)										
<i>Bidens tripartita</i> L.	Lower Neretva (HORVATIĆ, 1954); Aquatic vegetation of lakes Kutli, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Bituminaria bituminosa</i> (L.) Stirton		x	x	x		x	x		x		
<i>Blackstonia perfoliata</i> (L.) Huds.		x									
<i>Bombycilaena erecta</i> (L.) Smoljan.			x				x		x		
<i>Botomus umbellatus</i> L.	Neretva river in Croatia (JASPRICA, 1998)										
<i>Butomus umbellatus</i> L. var. <i>junceus</i> (Turcz.) Micheli	Neretva River Delta (LOVRIĆ & AL, 1988; RAC <i>et al.</i> , 1988)										
<i>Brachypodium distachyon</i> (L.) P.Beauv.		x				x	x				
<i>Brachypodium retusum</i> (Pers.) P.Beauv.		x	x	x		x	x		x		
<i>Brachypodium rupestre</i> (Host) Roem. et Schult.									x		
<i>Briza maxima</i> L.		x	x	x		x	x		x		
<i>Bromus diandrus</i> Roth		x					x				
<i>Bromus erectus</i> Huds. ssp. <i>condensatus</i> (Hack.) Asch. et Graebn.			x								
<i>Bromus hordeaceus</i> L.		x			x				x		
<i>Bromus madritensis</i> L.		x	x	x		x	x	x	x		
<i>Bromus sterilis</i> L.			x			x			x		
<i>Bryonia alba</i> L.							x				
<i>Bryonia cretica</i> ssp. <i>dioica</i> (Jacq.) Tutin	Lower Neretva River (LOVRIĆ <i>et al.</i> , 1988)										
<i>Bunias erucao</i> L.						x			x		
<i>Bunium ferulaceum</i> S.S.			x						x		
<i>Caldesia parnassifolia</i> (L.) Parl.	Regionally extinct; SP	Lower Neretva River (LOVRIĆ <i>et al.</i> , 1988)									
<i>Calepina irregularis</i> (Asso) Thell.					x		x				
<i>Calystegia sepium</i> (L.) R. Br.		x			x						
<i>Campanula erinus</i> L.		x	x			x		x	x		
<i>Campanula pyramidalis</i> L.		x	x			x	x	x	x		
<i>Campanula lingulata</i> Waldst. & Kit.			x			x	x		x		
<i>Capsella bursa-pastoris</i> (L.) Medik.		x							x		
<i>Cardamine hirsuta</i> L.		x							x		

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Cardamine maritima</i> Port. ex DC.	SP					x					
<i>Carduus macrocephalus</i> Desf.								x			
<i>Carduus pycnocephalus</i> L.	SP	x		x			x	x	x		
<i>Carex acuta</i> L.							x				
<i>Carex divisa</i> Huds.	EN; SP	Metković (ILJANIĆ IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Carex divulska</i> Stokes		x				x			x		
<i>Carex elata</i> All.					x						
<i>Carex extensa</i> Gooden.	EN; SP										x
<i>Carex flacca</i> Schreb.			x								
<i>Carex hallerana</i> Asso		x	x			x	x	x			
<i>Carex hirta</i> L.							x				
<i>Carex limosa</i> L.		Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Carex otrubae</i> Podp.					x		x				
<i>Carex pendula</i> Huds.							x				
<i>Carex punctata</i> Gaudin					x						
<i>Carex riparia</i> Curtis	VU; SP						x				
<i>Carex rostrata</i> Stokes ex With.	VU; SP	Neretva River Delta (ALEGRO IN NIKOLIĆ & TOPIĆ, 2005; JASPRICA IN ALEGRO <i>et al.</i> , 2010)									
<i>Carlina corymbosa</i> L.		x	x	x		x		x	x		
<i>Carthamus lanatus</i> L.								x			
<i>Celtis australis</i> L.			x	x		x	x		x		
<i>Centaurea glaberrima</i> Tausch	SP	Neretva River Delta (JASPRICA, 2007)									
<i>Centaureum erythraea</i> Rafn.			x								
<i>Centaureum pulchelum</i> (Sw.) Druce		Lower Neretva (HORVATIĆ, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Centaureum spicatum</i> (L.) Fritsch		Aquatic vegetation of lakes Kuti, Modro oko and Bačina and vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995); Neretva river mouth (TRINAJSTIĆ, 2002)									
<i>Cerastium brachypetalum</i> Pers.		x	x	x			x	x	x		
<i>Cerastium fontanum</i> Baumg.							x				
<i>Cerastium glomeratum</i> Thuill						x					
<i>Cerastium pumilum</i> Curtis ssp. <i>glutinosum</i> (Fries) Jalas		x	x			x					
<i>Ceratophyllum submersum</i> L.		Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Chaerophyllum coloratum</i> L.		Neretva River Delta (JASPRICA, 2007)									
<i>Chelidonium majus</i> L.							x				
<i>Chenopodium album</i> agg.									x		
<i>Chouardia litardierei</i> (Breistr.) Speta	SP	Lower Neretva River (LOVRIĆ & AL, 1988)									

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Ephedra fragilis</i> Desf. ssp. <i>campylopoda</i> (C. A. Mayer) Asch. et Graeb.	NT		x	x		x			x		
<i>Equisetum fluviatile</i> L.					x						
<i>Equisetum hyemale</i> L.	VU; SP						x				
<i>Equisetum palustre</i> L.							x				
<i>Eriophorum angustifolium</i> Honck	CR; SP	Neretva (KUMBARIĆ IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Erodium acaule</i> (L.) Becherer et Thell.						x					
<i>Erodium cicutarium</i> (L.) L Hér.		x									
<i>Erodium malacoides</i> (L.) L Hér.		x		x				x			
<i>Erophila verna</i> agg.				x				x	x		
<i>Eryngium amethystinum</i> L.						x			x		
<i>Eryngium campestre</i> L.									x		
<i>Erysimum odoratum</i> Ehrh.						x					
<i>Eupatorium cannabinum</i> L.							x				
<i>Euphorbia characias</i> L. ssp. <i>wulfenii</i> (Hoppe ex Koch) A. M. Sm.				x		x			x		
<i>Euphorbia exigua</i> L.		x	x			x			x		
<i>Euphorbia falcata</i> L.							x		x		
<i>Euphorbia fragifera</i> Jan						x					
<i>Euphorbia helioscopia</i> L.		x		x		x	x	x	x		
<i>Euphorbia palustris</i> L.										x	
<i>Euphorbia peplus</i> L.		x	x	x		x	x		x		
<i>Euphorbia spinosa</i> L.			x			x			x		
<i>Fallopia convolvulus</i> (L.) Á.Löve		Neretva river Delta (TRINAJSTIĆ, 2002)									
<i>Festuca arundinacea</i> Schreb.							x				
<i>Festuca pratensis</i> Huds.		x			x		x				
<i>Ficus carica</i> L.		x	x	x			x	x			
<i>Filaginella uliginosa</i> (L.) Opiz		Lower Neretva (HORVATIĆ, 1954)									
<i>Foeniculum vulgare</i> Mill.		x					x		x		
<i>Frangula alnus</i> Mill.							x				
<i>Frangula rupestris</i> (Scop.) Schur.									x		
<i>Fraxinus angustifolia</i> Vahl							x				
<i>Fraxinus ornus</i> L.		x	x	x					x		
<i>Fritillaria messanensis</i> Raf. ssp. <i>gracilis</i> (Ebel) Rix	VU; SP								x		
<i>Fumana ericoides</i> (Cav.) Gand.			x			x			x		
<i>Fumaria capreolata</i> L.								x			

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Fumaria officinalis</i> L.		x	x	x					x		
<i>Fimbristylis bisumbellata</i> (Forssk.) Bubani	CR; SP	Lower Neretva (HORVATIĆ, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995); Neretva River Delta (TOPIĆ IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Fimbristylis illyrica</i> M.G.		Neretva River Delta (LOVRIĆ <i>et al.</i> , 1988; RAC & AL, 1988)									
<i>Galium aparine</i> L.		x	x	x		x		x			
<i>Galium corrudifolium</i> Vill.									x		
<i>Galium palustre</i> L.		Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Galium rotundifolium</i> L.									x		
<i>Genista sylvestris</i> Scop. ssp. <i>dalmatica</i> (Bartl.) H. Lindb.	SP					x					
<i>Geranium columbinum</i> L.			x			x	x		x		
<i>Geranium dissectum</i> L.					x		x		x		
<i>Geranium lucidum</i> L.				x		x	x	x	x		
<i>Geranium purpureum</i> Vill.		x	x	x		x	x	x	x		
<i>Geranium pusillum</i> Burm. f.		x				x					
<i>Geranium robertianum</i> L.							x				
<i>Geranium rotundifolium</i> L.			x	x		x					
<i>Gladiolus illyricus</i> W.D.J.Koch	SP					x					
<i>Glaucium flavum</i> Crantz	VU; SP	Neretva River Delta (ŠEĀULJA IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Glechoma hirsuta</i> Waldst. et Kit.		x									
<i>Glyceria plicata</i> (Fr.) Fr.	VU; SP						x				
<i>Glycyrrhiza echinata</i> L.		Neretva River Delta (TRINAJSTIĆ, 2002; JASPRICA, 2007)									
<i>Gratiola officinalis</i> L.		Lower Neretva (HORVATIĆ, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Halimione portulacoides</i> (L.) Aellen		x						x			
<i>Hedera helix</i> L.		x		x		x	x		x		
<i>Hedypnois cretica</i> (L.) Dum.Cours.						x					
<i>Helianthemum nummularium</i> (L.) Mill.			x						x		
<i>Helianthus tuberosus</i> L.	IAS	Neretva River Delta (JASPRICA, 2007)									
<i>Helichrysum italicum</i> (Roth) G.Don		x				x			x		
<i>Helictotrichon convolutum</i> (C.Presl) Henrard		x	x	x		x			x		
<i>Herniaria hirsuta</i> L.				x							
<i>Hesperis laciniata</i> All.						x			x		
<i>Hippocrepis comosa</i> L.			x						x		
<i>Hippocrepis unisiliquosa</i> L.		x									
<i>Hippuris vulgaris</i> L.	EN; SP						x				

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		1	2	3	4	5	6	7	8	9	10
<i>Lagurus ovatus</i> L.		x					x	x			
<i>Lamium amplexicaule</i> L.		x	x						x		
<i>Lamium purpureum</i> L.							x		x		
<i>Lathyrus aphaca</i> L.		x	x	x		x	x	x	x		
<i>Lathyrus cicera</i> L.		x	x	x		x		x	x		
<i>Lathyrus setifolius</i> L.			x								
<i>Lathyrus sphaericus</i> Retz.		x	x					x	x		
<i>Laurus nobilis</i> L.		x		x		x	x	x			
<i>Lavatera cretica</i> L.		x									
<i>Legousia hybrida</i> (L.) Delarbre			x			x	x	x	x		
<i>Lemna minor</i> L.					x						
<i>Lemna trisulca</i> L.	Lower Neretva (HORVATÍĆ, 1949); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPÍĆ, 1995)										
<i>Lens nigricans</i> (M.Bieb.) Godr.		x	x			x		x			
<i>Leontodon autumnalis</i> L.	Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPÍĆ, 1995)										
<i>Leontodon crispus</i> Vill.			x	x					x		
<i>Leontodon hispidus</i> L.	Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPÍĆ, 1995)										
<i>Leontodon hispidus</i> L. var. <i>glabratus</i>	Lower Neretva (HORVATÍĆ, 1954)										
<i>Leucojum aestivum</i> L.							x				
<i>Limonium angustifolium</i> (Tausch) Degen		x						x			
<i>Limonium cancellatum</i> (Bernh. ex Bertol.) Kuntze	Neretva River Delta (JASPRICA, 2007)										
<i>Linaria vulgaris</i> Mill.	Neretva river Delta (TRINAJSTIĆ, 2002)										
<i>Lithospermum arvense</i> L.			x								
<i>Lolium rigidum</i> Gaudin ssp. <i>rigidum</i> Gaudin											x
<i>Lolium rigidum</i> Gaudin ssp. <i>lepturoides</i> (Boiss.) Sennen et Mauricio		x		x			x	x			
<i>Lophochloa cristata</i> (L.) Hyl.		x		x		x		x			
<i>Lotus corniculatus</i> L.		x	x			x					
<i>Lotus ornithopodioides</i> L.		x				x					
<i>Lotus glaber</i> Mill.	Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Bačina and spring Norin (TOPÍĆ, 1995)										
<i>Lotus uliginosus</i> Schkuhr					x					x	
<i>Ludwigia palustris</i> (L.) Elliott	Lower Neretva (HORVATÍĆ, 1949, 1954)										
<i>Lunaria annua</i> L.				x		x					
<i>Luzula campestris</i> (L.) DC.									x		
<i>Lycopus europaeus</i> L.					x		x				
<i>Lysimachia nummularia</i> L.							x				

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		1	2	3	4	5	6	7	8	9	10
<i>Lythrum hyssopifolia</i> L.		Lower Neretva (HORVATIĆ, 1954)									
<i>Lythrum salicaria</i> L.					x		x				
<i>Lythrum tribracteatum</i> Salzm. ex Spreng.	EN	Lower Neretva (HORVATIĆ, 1954)									
<i>Malva sylvestris</i> L.						x	x	x			
<i>Marrubium incanum</i> Desr.			x						x	x	
<i>Marrubium vulgare</i> L.		x								x	
<i>Marsilea quadrifolia</i> L.	VU	Lower Neretva (HORVATIĆ, 1949, 1954); Neretva River Delta (JASPRICA IN ALEGRO <i>et al.</i> , 2010)									
<i>Medicago arabica</i> (L.) Huds.		x								x	
<i>Medicago disciformis</i> DC.						x					
<i>Medicago lupulina</i> L.						x					
<i>Medicago minima</i> (L.) Bartal.		x	x			x					
<i>Medicago orbicularis</i> (L.) Bartal.		x		x		x			x		
<i>Medicago rigidula</i> L. (All.)										x	
<i>Medicago sativa</i> L.		x									
<i>Melica ciliata</i> L.						x					
<i>Melilotus italica</i> (L.) Lam.						x					
<i>Melilotus officinalis</i> (L.) Lam.		Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995); Neretva River Delta (TRINAJSTIĆ, 2002)									
<i>Mentha aquatica</i> L.					x		x				
<i>Mentha pulegium</i> L.		Lower Neretva (HORVATIĆ, 1949, 1954); Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Mercurialis annua</i> L.		x	x	x		x	x		x		
<i>Micromeria juliana</i> (L.) Benth. Ex Rchb		x	x	x		x	x	x	x		
<i>Minuartia mediterranea</i> (Link.) K. Malý				x		x		x	x		
<i>Myriophyllum</i> sp.							x				
<i>Misopates orontium</i> (L.) Raf.		x									
<i>Moltkia petraea</i> (Tratt.) Griseb.	SP					x			x		
<i>Muscari neglectum</i> Guss ex Ten.									x		
<i>Muscari botryoides</i> (L.) Mill.						x					
<i>Muscari comosum</i> (L.) Mill.		x					x	x	x		
<i>Myosotis arvensis</i> (L.) Hill						x		x			
<i>Myosotis ramosissima</i> Rochel	DD; SP	x					x		x		
<i>Myriophyllum spicatum</i> L.		Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995); Opuzen (TRINAJSTIĆ, 2002)									
<i>Myriophyllum verticillatum</i> L.		Lower Neretva (HORVATIĆ, 1949)									
<i>Najas graminea</i> Delile		Neretva River Delta (LOVRIĆ & AL., 1988; RAC <i>et al.</i> , 1988)									
<i>Najas marina</i> L.		Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)									

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		1	2	3	4	5	6	7	8	9	10
<i>Nasturtium officinale</i> R. Br.							x				
<i>Nigella damascena</i> L.			x			x		x	x		
<i>Nuphar lutea</i> Sibth. et Sm.							x				
<i>Nymphaea alba</i> L.					x						
<i>Nymphaea lotus</i> L. forma <i>thermalis</i> (DC.) Tuzson		Neretva River Delta (LOVRIĆ & AL., 1988; RAC <i>et al.</i> , 1988)									
<i>Nymphoides peltata</i> (S. G. Gmelin) Kuntze		Lower Neretva (HORVATIĆ, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Oenanthe silaifolia</i> M. Bieb.										x	
<i>Olea europea</i> L.		x				x					
<i>Ononis ornithopodioides</i> L.						x					
<i>Ononis reclinata</i> L.						x					
<i>Onosma echioides</i> L.	SP					x			x		
<i>Ophrys apifera</i> Huds	EN; SP	Ploče (JASPRICA IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Ophrys scolopax</i> Cav.	DD; SP	x							x		
<i>Ophrys sphaegodes</i> Mill.	VU; SP	x									
<i>Opopanax chironium</i> (L.) Koch				x		x					
<i>Opuntia vulgaris</i> Miller							x				
<i>Orchis coriophora</i> L.	VU; SP	Neretva River Delta (VRBEK IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Orchis italica</i> Poir.	EN; SP	x									
<i>Orchis laxiflora</i> Lam.	NT; SP						x				
<i>Orchis morio</i> L.	NT; SP								x		
<i>Orchis provincialis</i> Balb. ssp. <i>pauciflora</i> (Ten.) Camus	DD; SP								x		
<i>Orchis purpurea</i> Huds.	VU; SP								x		
<i>Orchis quadripunctata</i> Cirillo ex Ten.	VU; SP	x	x	x					x		
<i>Orchis tridentata</i> Scop.	VU; SP								x		
<i>Orlaya grandiflora</i> (L.) Hoffm.		x	x	x		x			x		
<i>Ornithogalum gussonei</i> Ten.		x				x	x		x		
<i>Orobanche mutelii</i> F.W.Schultz											x
<i>Orobanche alba</i> Stephan ex Willd.			x								
<i>Orobanche minor</i> Sm.			x								
<i>Orobanche ramosa</i> L.						x					
<i>Ostrya carpiniifolia</i> Scop.									x		
<i>Osyris alba</i> L.		x	x			x					
<i>Oxalis corniculata</i> L.		x									
<i>Paliurus spina-christi</i> Mill.		x	x	x		x	x	x	x		

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		1	2	3	4	5	6	7	8	9	10
<i>Pallenis spinosa</i> (L.) Cass.		x						x			
<i>Papaver rhoeas</i> L.						x	x				
<i>Parapholis incurva</i> (L.) C. E. Hubb.	VU; SP										x
<i>Parietaria judaica</i> L.		x	x	x		x	x	x	x		
<i>Paspalum distyichum</i> L.	Lower Neretva (HORVATIĆ 1949, 1954; HODAK, 1956); Aquatic vegetation of lakes Kutli, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Paspalum paspalodes</i> (Michx.) Scribn.	IAS	Neretva River Delta (TRINAJSTIĆ, 2002; JASPRICA, 2007)									
<i>Periploca graeca</i> L.	EN; SP				x		x			x	x
<i>Petrorhagia saxifraga</i> (L.) Link				x		x		x	x		
<i>Phalaris arundinacea</i> L.	Marshland and aquatic vegetation of Neretva river, canals and lakes Kutli, Modro oko, Bačina and spring Norin (TOPIĆ, 1995); Banks of the Velika Neretva, southeast of Ploče (TOPIĆ <i>et al.</i> , 1996)										
<i>Phillyrea latifolia</i> L.		x	x	x		x	x		x		
<i>Phleum echinatum</i> Host								x			
<i>Phragmites australis</i> (Cav.) Trin ex Steud		x			x		x				
<i>Picris hieracioides</i> L.							x				
<i>Picris hispidissima</i> (Bartl.) Koch	Neretva river Delta (TRINAJSTIĆ, 2002)										
<i>Pinus halepensis</i> Mill.		x	x			x					
<i>Pinus pinea</i> L.			x								
<i>Piptatherum miliaceum</i> (L.) Coss.		x				x			x		
<i>Pistacia lentiscus</i> L.		x	x			x	x	x	x		
<i>Pistacia terebinthus</i> L.		x	x	x		x	x	x	x		
<i>Plantago afra</i> L.				x							
<i>Plantago coronopus</i> L.						x		x			
<i>Plantago holosteum</i> Scop.	Neretva River Delta (JASPRICA, 2007)										
<i>Plantago indica</i> L.	CR	Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995)									
<i>Plantago lanceolata</i> L.		x				x	x		x		
<i>Plantago major</i> L.		x			x		x				
<i>Plantago major</i> L. forma <i>pauciflora</i> (Hayek) Pilger	Lower Neretva (HORVATIĆ, 1954)										
<i>Poa annua</i> L.		x			x	x					
<i>Poa bulbosa</i> L.		x	x	x					x		
<i>Poa pratensis</i> L.									x		
<i>Poa trivialis</i> L. ssp. <i>sylvicola</i> (Guss.) H. Lindb.		x					x				
<i>Polygonum tetraphyllum</i> (L.) L.		x									
<i>Polygala nicaensis</i> Risso ex Koch									x		

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		1	2	3	4	5	6	7	8	9	10
<i>Polygonum aviculare</i> L.	Lower Neretva (HORVATIĆ, 1954); Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995)										
<i>Polygonum lapathifolium</i> L.	Lower Neretva (HORVATIĆ, 1954)										
<i>Polygonum persicaria</i> L.	Lower Neretva (HORVATIĆ, 1954)										
<i>Polygonum lapathifolium</i> L. ssp. <i>incanum</i> (F.W.Schmidt) Schubl. et Mart.	Lower Neretva (HORVATIĆ, 1954)										
<i>Polypogon maritimus</i> Willd.	Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995)										
<i>Polypodium cambricum</i> L.		x		x							
<i>Populus alba</i> L.	Neretva River Delta (TRINAJSTIĆ, 2002)										
<i>Populus nigra</i> L. forma <i>italica</i>	Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Populus nigra</i> L.					x		x				
<i>Potamogeton crispus</i> L.	Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Potamogeton gramineus</i> L.	Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Potamogeton lucens</i> L.							x				
<i>Potamogeton nodosus</i> Poir.							x				
<i>Potamogeton perfoliatus</i> L.	Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Potamogeton siculus</i> Tineo	Neretva River Delta (LOVRIĆ <i>et al.</i> , 1988; RAC <i>et al.</i> , 1988)										
<i>Potentilla recta</i> L.									x		
<i>Potentilla reptans</i> L.		x			x		x				
<i>Prasium majus</i> L.		x	x				x	x			
<i>Prunella vulgaris</i> L.	Aquatic vegetation of lakes Kutí, Modro oko and Bačina (TOPIĆ, 1995)										
<i>Prunus mahaleb</i> L.			x	x		x			x		
<i>Pseudognaphalium luteoalbum</i> (L.) Hilliard et B.L.Burt	Lower Neretva (HORVATIĆ, 1954)										
<i>Puccinellia fasciculata</i> (Torr.) Bicknell	NT										x
<i>Pulicaria dysenterica</i> (L.) Bernh.	Lower Neretva (HORVATIĆ, 1954); Marshland and aquatic vegetation of Neretva river, canals and lakes Kutí, Modro oko, Bačina and spring Norin (TOPIĆ, 1995)										
<i>Pulicaria odora</i> (L.) Rchb.	Neretva River Delta (TRINAJSTIĆ, 2002)										
<i>Punica granatum</i> L.		x	x	x		x	x	x	x		
<i>Pyrus amygdaliformis</i> Vill.		x	x	x		x			x		
<i>Quercus ilex</i> L.		x	x			x	x				
<i>Quercus pubescens</i> Willd.		x	x	x					x		
<i>Quercus virgiliana</i> (Ten.) Ten.	Neretva River Delta (JASPRICA, 2007)										
<i>Ranunculus acris</i> L.							x				
<i>Ranunculus chius</i> DC.		x									
<i>Ranunculus ficaria</i> L.									x		

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		1	2	3	4	5	6	7	8	9	10
<i>Ranunculus lingua</i> L.	EN; SP	Marshland and aquatic vegetation of Neretva river, canals and lakes Kutı, Modro oko, Baćina and spring Norin (TOPIĆ,1995); Neretva River Delta (LIBER IN NIKOLIĆ & TOPIĆ, 2005; JASPRICA IN ALEGRO <i>et al.</i> , 2010)									
<i>Ranunculus ophioglossifolius</i> Vill.	EN; SP	Neretva River Delta (JELASKA IN NIKOLIĆ & TOPIĆ, 2005; JASPRICA IN ALEGRO <i>et al.</i> , 2010)									
<i>Ranunculus millefoliatus</i> Vahl.			x	x			x		x		
<i>Ranunculus neapolitanus</i> Ten.		x						x	x		
<i>Ranunculus repens</i> L.							x				
<i>Ranunculus sardous</i> Crantz					x	x	x	x			
<i>Reichardia picroides</i> (L.) Roth		x	x	x		x		x	x		
<i>Reseda lutea</i> L.						x					
<i>Reseda phyteuma</i> L.						x	x				
<i>Rhagadiolus stellatus</i> (L.) Gaertn.		x	x	x		x	x	x	x		
<i>Rhamnus saxatilis</i> Jacq.									x		
<i>Rorippa pyrenaica</i> (Lam.) Reichenb.									x		
<i>Rorippa sylvestris</i> (L.) Besser		Lower Neretva (HORVATIĆ, 1954); Aquatic vegetation of lakes Kutı, Modro oko and Baćina (TOPIĆ,1995)									
<i>Rosa canina</i> agg.			x		x		x				
<i>Rosa sempervirens</i> L.		x							x		
<i>Rubia peregrina</i> L.		x	x			x	x	x			
<i>Rubus ulmifolius</i> Schott		x	x	x		x	x	x			
<i>Rumex crispus</i> L.		x									
<i>Rumex pulcher</i> L.			x					x	x		
<i>Ruppia cirrhosa</i> (Petagna) Grande	SP	Neretva River Delta (LOVRIĆ <i>et al.</i> , 1988; RAC <i>et al.</i> , 1988)									
<i>Ruscus aculeatus</i> L.		x	x	x		x	x				
<i>Ruta chalepensis</i> L.		x									
<i>Salicornia europaea</i> L.											x
<i>Salix alba</i> L.							x				
<i>Salix caprea</i> L.							x				
<i>Salix cinerea</i> L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kutı, Modro oko, Baćina and spring Norin (TOPIĆ,1995)									
<i>Salix fragilis</i> L.					x		x				
<i>Salix purpurea</i> L.							x				
<i>Salsola kali</i> L.	NT; SP	Neretva River Delta (JASPRICA, 2007)									
<i>Salsola soda</i> L.	NT; SP	Neretva River Delta (JASPRICA, 2007)									
<i>Salvia bertolonii</i> Vis.		Neretva River Delta (JASPRICA, 2007)									
<i>Salvia officinalis</i> L.		x	x			x			x		

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Salvia verbenaca</i> L.						x		x	x		
<i>Samolus valerandi</i> L.	Lower Neretva (HORVATIĆ, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995); Blaca (TRINAJSTIĆ, 2002)										
<i>Satureja montana</i> L.		x	x	x		x	x	x	x		
<i>Saxifraga tridactylites</i> L.		x		x			x	x			
<i>Scabiosa ucrainica</i> L.	Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995)										
<i>Scandix pecten-veneris</i> L.	NT	x		x			x		x		
<i>Scirpus holoschoenus</i> L.	NT									x	
<i>Scirpus holoschoenus</i> L. var. <i>australis</i> W.D.J. Koch	Neretva River Delta (LOVRIĆ & AL, 1988; RAC & AL, 1988)										
<i>Scirpus lacustris</i> L. ssp. <i>lacustris</i>	Lower Neretva (HORVATIĆ, 1949); Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Bačina and spring Norin (TOPIĆ, 1995); Bačina (TRINAJSTIĆ, 2002)										
<i>Scirpus lacustris</i> L. ssp. <i>tabernaemontani</i> (C.C.Gmel.) Syme	DD; SP				x		x				
<i>Scirpus maritimus</i> L.	NT	x									
<i>Scirpus maritimus</i> L. f. <i>compactus</i> (Hoffm.)	Lower Neretva (HORVATIĆ, 1954)										
<i>Scirpus mucronatus</i> L.	Neretva River Delta (JASPRICA IN ALEGRO <i>et al.</i> , 2010)										
<i>Scorpiurus muricatus</i> L.		x	x				x				
<i>Scorzonera villosa</i> Scop.			x						x		
<i>Scrophularia canina</i> L.			x			x		x	x		
<i>Scrophularia nodosa</i> L.							x				
<i>Securigera cretica</i> (L.) Lassen		x	x			x	x		x		
<i>Securigera securidaca</i> (L.) Degen et Dörfel.		x	x				x		x		
<i>Sedum hispanicum</i> L.							x		x		
<i>Sedum ochroleucum</i> Chaix				x							
<i>Sedum rubens</i> L.		x									
<i>Sedum telephium</i> L. ssp. <i>maximum</i> (L.) Krock.						x					
<i>Senecio vulgaris</i> L.		x		x					x		
<i>Seseli tomentosum</i> Vis.	SP	Neretva River Delta (JASPRICA, 2007)									
<i>Sesleria autumnalis</i> (Scop.) F.W.Schultz				x							
<i>Sesleria robusta</i> Schott, Nyman et Kotschy						x					
<i>Setaria pumila</i> (Poir.) Schult.	Lower Neretva (HORVATIĆ, 1954); Neretva River Delta (TRINAJSTIĆ, 2002)										
<i>Setaria verticillata</i> (L.) P.Beauv.								x			
<i>Sherardia arvensis</i> L.		x	x			x	x		x		
<i>Silene conica</i> L.		x									x
<i>Silene vulgaris</i> (Moench) Garcke		x									
<i>Sisymbrium officinale</i> L. Scop.		x	x		x		x		x		

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Sium latifolium</i> L.		Lower Neretva (HORVATIĆ, 1949)									
<i>Smilax aspera</i> L.		x	x	x		x	x	x			
<i>Sonchus oleraceus</i> L.		x	x	x				x	x		
<i>Sonchus asper</i> (L.) Hill				x			x		x		
<i>Sonchus oleraceus</i> L.		x				x					
<i>Sonchus maritimus</i> L.		Neretva river Delta (TRINAJSTIĆ, 2002)									
<i>Sonchus palustris</i> L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Bačina and spring Norin (TOPIĆ, 1995); Banks of the Velika Neretva, southeast of Ploče (TOPIĆ <i>et al.</i> , 1996)									
<i>Sorghum bicolor</i> (L.) Moench		Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Sparganium erectum</i> L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Bačina and spring Norin (TOPIĆ, 1995); Neretva River Delta (JASPRICA, 2007); Bačina (TRINAJSTIĆ, 2002)									
<i>Spartium junceum</i> L.		x	x			x					
<i>Spergularia salina</i> J. Presl et C. Presl		Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995)									
<i>Spirodela polyrhiza</i> (L.) Schleiden		Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Stachys cretica</i> L.			x	x		x	x	x			
<i>Stachys menthifolia</i> Vis.	SP	Vina (South of Vrgorac) (30-130 m) and Plina near Ploče (60 m) (ŠILIĆ & ŠOLIĆ, 2002)									
<i>Stachys spinulosa</i> Sibth. et Sm.								x			
<i>Stellaria neglecta</i> Weihe, Bluff et Fingerh.		x									
<i>Succisella petteri</i> (J.Kern. et Murb.) Beck	DD; SP	Lower Neretva River (LOVRIĆ <i>et al.</i> , 1988)									
<i>Suaeda maritima</i> (L.) Dumort.	VU; SP	Vegetation of coastal muds at the Neretva river mouth (TOPIĆ, 1995); Neretva River Delta (KOVAČIĆ IN NIKOLIĆ & TOPIĆ, 2005)									
<i>Symphytum officinale</i> L.							x				
<i>Symphytum tuberosum</i> L.									x		
<i>Tamarix</i> sp.		x							x		
<i>Tamarix dalmatica</i> Baum		Neretva River Delta (JASPRICA, 2007)									
<i>Tamus communis</i> L.		x	x	x		x	x		x		
<i>Tanacetum cinerariifolium</i> (Trevir.) Sch.Bip.	SP								x		
<i>Taraxacum officinale</i> agg.			x	x					x		
<i>Taraxacum tenuifolium</i> Hoppe		Neretva River Delta (LOVRIĆ <i>et al.</i> , 1988; RAC <i>et al.</i> , 1988)									
<i>Teucrium arduini</i> L.	DD; SP	Neretva River Delta (JASPRICA, 2007)									
<i>Teucrium chamaedrys</i> L.		x	x	x		x	x	x	x		
<i>Teucrium montanum</i> L.									x		
<i>Teucrium polium</i> L.		x	x			x	x		x		
<i>Teucrium scordium</i> L.		Lower Neretva (HORVATIĆ, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (TOPIĆ, 1995)									
<i>Theolygonum cynocrambe</i> L.		x	x			x	x		x		

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Thelypteris palustris</i> Schott		Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Bačina and spring Norin (Topić, 1995)									
<i>Thymus longicaulis</i> C.Presl			x						x		
<i>Tordylium apulum</i> L.		x	x	x		x	x	x	x		
<i>Tragopogon dubius</i> Scop.				x							
<i>Tragopogon porrifolius</i> L.		x				x		x	x		
<i>Trifolium angustifolium</i> L.		x	x			x					
<i>Trifolium arvense</i> L.		x									
<i>Trifolium campestre</i> Schreber		x	x	x		x	x	x			
<i>Trifolium fragiferum</i> L.		Lower Neretva (HORVATÍĆ, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina and Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)									
<i>Trifolium nigrescens</i> Viv.									x		
<i>Trifolium pratense</i> L.							x				
<i>Trifolium repens</i> L.					x		x				
<i>Trifolium resupinatum</i> L.	VU; SP								x		
<i>Trifolium scabrum</i> L.			x	x		x					
<i>Trifolium stellatum</i> L.		x		x		x	x	x	x		
<i>Trifolium striatum</i> L.		x		x			x	x			
<i>Trifolium subterraneum</i> L.			x			x					
<i>Trifolium tomentosum</i> L.				x		x		x			
<i>Triglochin laxiflorum</i> Guss.		Neretva River Delta (LOVRÍĆ <i>et al.</i> , 1988; RAC <i>et al.</i> , 1988)									
<i>Trigonella esculenta</i> Willd.		x				x	x	x	x		
<i>Tulipa sylvestris</i> L.	NT								x		
<i>Typha angustifolia</i> L.							x				
<i>Typha domingensis</i> (Pers.) Steud.		Neretva River Delta (LOVRÍĆ <i>et al.</i> , 1988; RAC <i>et al.</i> , 1988)									
<i>Typha latifolia</i> L.							x				
<i>Umbilicus horizontalis</i> (Guss.) DC.		x		x			x	x			
<i>Urospermum picroides</i> (L.) Scop. ex F.W.Schmidt		x	x			x	x	x	x		
<i>Utricularia australis</i> R. Br.	SP				x						
<i>Valantia muralis</i> L.		x	x	x		x	x	x			
<i>Valeriana tuberosa</i> L.			x						x		
<i>Valerianella carinata</i> Loisel.								x			
<i>Valerianella dentata</i> f. <i>dasycarpa</i> (L.) Pollich			x	x							
<i>Valerianella locusta</i> (L.) Laterrade		x									
<i>Valerianella muricata</i> (Stiven ex M. Bieb.) J.W.Loudon		x				x					

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
<i>Vallisneria spiralis</i> L.	SP						x				
<i>Verbascum phoeniceum</i> L.									x		
<i>Verbascum pulverulentum</i> Vill.						x					
<i>Verbascum blattaria</i> L.		Neretva River Delta (JASPRICA, 2007)									
<i>Verbascum sinuatum</i> L.		Neretva River Delta (JASPRICA, 2007)									
<i>Verbascum thapsus</i> L.									x		
<i>Verbena officinalis</i> L.									x		
<i>Veronica anagallis-aquatica</i> L.					x		x				
<i>Veronica anagalloides</i> Guss.		Lower Neretva (HORVATIĆ, 1949)									
<i>Veronica arvensis</i> L.		x		x		x		x	x		
<i>Veronica austriaca</i> L. ssp. <i>jacquini</i> (Baumg.) Eb.Fisch.			x						x		
<i>Veronica beccabunga</i> L.		Lower Neretva (HORVATIĆ, 1954)									
<i>Veronica cymbalaria</i> Bodard		x		x		x		x			
<i>Veronica persica</i> Poir.	IAS	x			x	x	x				
<i>Viburnum tinus</i> L.		x									
<i>Vicia cracca</i> L.		x				x		x	x		
<i>Vicia grandiflora</i> Scop.								x			
<i>Vicia hirsuta</i> (L.) Gray		x									
<i>Vicia hybrida</i> L.		x					x		x		
<i>Vicia loisleurii</i> (M. Bieb.) Litv.						x					
<i>Vicia melanops</i> Sm.		x		x					x		
<i>Vicia parviflora</i> Cav.		x	x			x		x			
<i>Vicia sativa</i> L.	SP	x	x			x	x	x			
<i>Vicia serratifolia</i> Jacq.									x		
<i>Vincetoxicum hirundinaria</i> Medik. ssp. <i>adriaticum</i> (Beck) Markgr.	SP		x						x		
<i>Viola suaveavis</i> M.Bieb. ssp. <i>adriatica</i> (Freyn) Haesler	SP	Neretva River Delta (JASPRICA, 2007)									
<i>Viola arvensis</i> Murray									x		
<i>Vitex agnus-castus</i> L.		x	x			x		x	x		
<i>Vitis vinifera</i> L.		x		x			x				
<i>Vulpia ciliata</i> Dumort.		x				x		x	x		
<i>Vulpia fasciculata</i> (Forssk.) Samp.	NT										x
<i>Xanthium strumarium</i> L. ssp. <i>italicum</i> (Moretti) D.Löve	IAS										x
<i>Zannichellia palustris</i> L.		Neretva River Delta (LOVRIĆ <i>et al.</i> , 1988; RAC <i>et al.</i> , 1988)									

DISCUSSION

Although the flora and vegetation of the Neretva River Delta is relatively well studied, no comprehensive check-list of vascular flora exists so far. JASPRICA (2010), who extensively studied the flora and the vegetation of this area in recent years, reported that about 820 taxa were present. Flora and vegetation of aquatic habitats are especially well-known (HORVATIĆ, 1954; LOVRIĆ & RAC, 1987; LOVRIĆ & RAC, 1988; TOPIĆ, 1995; JASPRICA & BUNTIĆ, 2003; JASPRICA & KOVAČIĆ, 2005; TRINAJSTIĆ, 2002), while knowledge about floral and vegetation diversity of terrestrial habitats, especially in the rocky karstic surrounding, is still poor (JASPRICA, 2007).

Our work aimed to get information about the floral diversity of different habitats inside the delta region and on its outskirts. We recorded 458 taxa at 10 different localities, which represent more than half of the number reported by JASPRICA (2010). Since we were limited to a short period at the end of the month of April, our data represents only a part of all potential floristic data. Taxa with flowering period in the winter or in late summer were recorded only if determination was possible according to their vegetative parts or remnants of inflorescence. During the period of our investigation we were able to observe the flowering maximum of therophytes and orchids, which is typical for the Mediterranean regions.

The presence of rare and threatened species and habitats led to the inclusion of this area in the list of 92 important plant areas of Croatia. The nature conservation value of the Neretva River Delta also is accentuated by our results. The great majority of natural or semi-natural habitat types that we recorded are considered of European community importance and thus have to be included in the Natura 2000 network. Even though some of these habitats remain only in fragments due to past transformation, the area is still of extreme importance for their conservation since lowland wet environments are rare in the eastern Adriatic coast. The floristic diversity also points to the importance of this area. During our field work we noted 39 plant species listed as Strictly Protected in the Nature Protection Law of Croatia (Tab. 2). The area also harbours several species included in the Red book of vascular flora of Croatia (NIKOLIĆ & TOPIĆ (eds.), 2005). We recorded five Endangered (EN) taxa: *Carex extensa*, *Cynanchum acutum*, *Hippuris vulgaris*, *Orchis italica*, *Periploca graeca*; 10 Vulnerable (V) taxa: *Carex riparia*, *Equisetum hyemale*, *Fritillaria messanensis* ssp. *gracilis*, *Glyceria plicata*, *Ophrys sphaegodes*, *Orchis purpurea*, *Orchis quadripunctata*, *Orchis tridentata*, *Parapholis incurva*, *Trifolium resupinatum*; 11 Near threatened (NT): *Arum nigrum*, *Cyclamen repandum*, *Ephedra fragilis* ssp. *campylopoda*, *Orchis laxiflora*, *Orchis morio*, *Puccinellia fasciculata*, *Scandix pecten-veneris*, *Scirpus holoschoenus*, *Scirpus maritimus*, *Tulipa sylvestris*, *Vulpia fasciculata*. Additionally, six taxa are regarded as Data deficient (DD). The major threat to vascular plant taxa in Croatia is habitat loss (NIKOLIĆ & TOPIĆ (eds.), 2005). In the last century, the Neretva River Delta was subjected to major changes and many freshwater habitats were turned into agricultural land. However, the majority (12) of conservation-concern taxa that we recorded can be associated with different categories of semi-natural grassland habitats. These are habitats that considerably contribute to the biological and landscape diversity of the region (RADNOVIĆ, 2000) but were largely subjected to overgrowing in the last decades due to land abandonment and new agricultural practices (TOPIĆ in HERCEG, 2008). Another group of habitats, subjected to past changes are marine and saline habitats. During our survey, eight conservation-concern taxa thriving in these habitats were noted. For some of them, for example *Periploca graeca*, the Neretva River Delta is one of the few known localities

in Croatia. Fresh water habitats also harbour an important number of species of conservation concern. Although we report only about 6 of them, the flora and vegetation of those habitats are relatively well studied and much more data has been published.

Additionally we gathered records for 151 taxa from different literature sources that we did not confirm during our fieldwork. The majority of available sources report about research on the vegetation and flora of aquatic habitats. Some authors report about taxa that were not considered in recent conservation revisions, for example, HORVATÍĆ (1954) reports on *Apium repens*, a species of European conservation concern included in the II Annex of the Habitat Directive.

We recorded only tree invasive alien species: *Ailanthus altissima*, *Veronica persica* and *Xanthium strumarium* ssp. *italicum*. VREŠ (1996), SMITAL *et al.* (1998), TRINAJSTIĆ (2002) and JASPRICA (2007) reported on numerous invasive alien species (see Table 3) that already have had an impact on habitats, especially those altered by human activity. Since the majority of European neophytes are late summer- or autumn-flowering species, a targeted survey in that period would be greatly appreciated and would probably reveal the state of the art.

Endemic species have an important role in the biogeographical characterization of an area since they are often suitable objects in studying the geographical history of flora in a region. Although endemic species are not necessarily rare or endangered, they usually play an important role in nature conservation strategies. Some endemics have a small range, while others can be found on larger geographically defined areas. There are no strict endemic species of the Neretva River Delta (JASPRICA, 2007). Southern Dalmatia, within the central and coastal Dinarides is characterized by a large number of species that could be identified as endemic. Only a few of them are wetland species. For example, *Chouardia litardierei* (Breistr.) Speta and *Edraianthus dalmaticus* (A.DC.) A.DC. are endemic to the karstic poljes of internal Dinarides. None of them were found during our survey or known from literature data in the studied area. LOVRIĆ *et al.* (1988) report on *Chouardia litardierei* from the Lower Neretva. The exact location for this record is unknown; moreover it is not even clear whether the data correspond to Croatia or to Bosnia and Hercegovina. All endemics found in our survey are species thriving in terrestrial habitats, mainly rocky habitats and grasslands. Some of them are endemics restricted to a limited area of the central and southern coastal Dinarides (*Genista sylvestris* ssp. *dalmatica*, *Hyacinthella dalmatica*, *Moltkia petraea*, *Iris pseudopallida*, *Tanacetum cinerariifolium*, *Vincetoxicum hirundinaria* ssp. *adriaticum*), while some others have a wider range in the Dinarides in some case partly penetrating into the Alps, Apennines or the Hellenic mountains (*Campanula pyramidalis*, *Cardamine maritima*, *Euphorbia characias* ssp. *wulfenii*, *Euphorbia fragifera*, *Fritillaria messanensis* ssp. *gracilis*, *Sesleria autumnalis*) (NIKOLIĆ *et al.*, 2015).

CONCLUSIONS

Despite major past changes that led to the loss of many habitats, the Neretva River Delta is still one of the most important areas for biodiversity conservation on the eastern Adriatic coast. This is emphasized by our results and by existing literature data. Major efforts should be addressed to further research of the biodiversity of this area and for a design of the most efficient conservation strategy.

ACKNOWLEDGMENTS

This paper is a result of the fieldwork carried out during the “Ekosistemi Jadrana” field excursion, organized by the Association of the Students of Biology of the University of Ljubljana. We would like to thank Nenad Jasprica for providing valuable literature, Boštjan Surina for comments that improved our manuscript, Nejc Jogan and Tinka Bačić for fieldwork advice and Živa Fišer Pečnikar and Bojan Lazar for proofreading. We thank two anonymous reviewers for helpful comments.

Received July 9, 2014

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SUMMARY

Prema stvaranju popisa vaskularne flore ušća rijeke Neretve (Hrvatska).

P. Glasnović, Š. Novak, S. Behrić & N. Fujs

The last 22 km of the Neretva River Delta are inside Croatian territory (surface area of ca 120 km²), where it forms a large alluvial plain. This area is considered one of biggest and most important wetland environments on the eastern Adriatic coast. The Neretva River Delta is listed in the Ramsar Convention on Wetlands of International Importance and considered one of the 96 important plant areas (IPA) of Croatia. In the paper we report on habi-

tat and floristic diversity recorded during field work carried out in the late April of 2011. We surveyed 10 localities where we identified 18 habitat types according to the Palearctic habitat classification, 12 of which are included in the Annex I of the EU Habitat Directive. In the surveyed localities we recorded 458 different vascular plant taxa. We added 160 records from literature sources to our data, which resulted in 618 identified (recorded) taxa for the study region. A further analysis of the conservation importance of the area according to the presence of habitats and taxa of conservation concern, revealed a number of plant taxa included in Red Book of Vascular Flora of Croatia. Five taxa are considered Endangered (EN): *Carex extensa*, *Cynanchum acutum*, *Hippuris vulgaris*, *Orchis italica*, *Periploca graeca*, ten are included in the red book as Vulnerable: *Carex riparia*, *Equisetum hyemale*, *Fritillaria messanensis* ssp. *gracilis*, *Glyceria plicata*, *Ophrys sphaegodes*, *Orchis purpurea*, *Orchis quadripunctata*, *Orchis tridentata*, *Parapholis incurva*, *Trifolium resupinatum*, eleven as Near threatened (NT): *Arum nigrum*, *Cyclamen repandum*, *Ephedra fragilis* ssp. *Campylopoda*, *Orchis laxiflora*, *Orchis morio*, *Puccinellia fasciculata*, *Scandix pecten-veneris*, *Scirpus holoschoenus*, *Scirpus maritimus*, *Tulipa sylvestris*, *Vulpia fasciculata*, additionally six species are regarded as Data deficient (DD). We recorded two invasive alien species: *Ailanthus altissima* and *Xanthium strumarium* ssp. *italicum*. We also emphasized the importance of endemic species. Some of them are endemics restricted to a limited area of central and southern coastal Dinarides (*Genista sylvestris* ssp. *dalmatica*, *Hyacinthella dalmatica*, *Moltkia petraea*, *Iris pseudopallida*, *Tanacetum cinerariifolium*, *Vincetoxicum hirsutinaria* ssp. *adriaticum*), while some others have a wider range in the Dinarides in some case partly penetrating in the Alps, Apennines or in the Hellenic mountains (*Campanula pyramidalis*, *Cardamine maritima*, *Euphorbia characias* ssp. *wulfenii*, *Euphorbia fragifera*, *Fritillaria messanensis* ssp. *gracilis*, *Sesleria autumnalis*).