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

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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 biogeographycal 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

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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 floističkoj 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 thess 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; Ilijanić & Hećimović, 1983; Topić *et al*., 1996; Smital *et al*., 1998; Šilić & 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 Tabe 1 and Fige 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

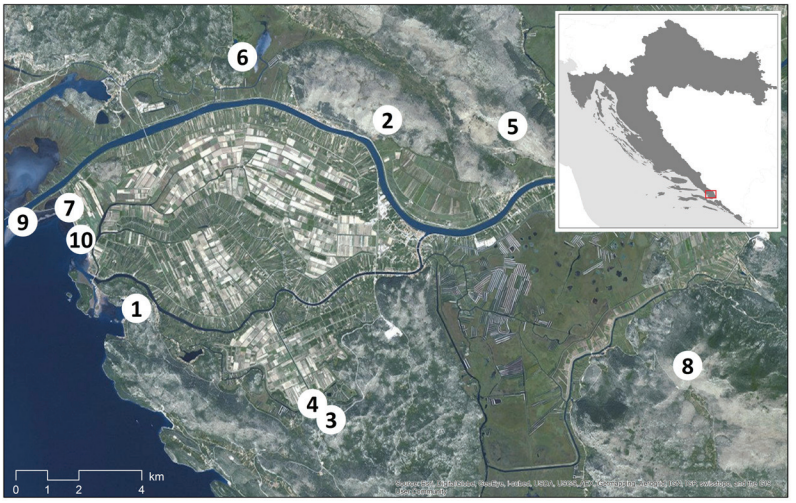

Fig. 1. Research area with indicated surveyed localities

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; Martinčič *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 (*Crithmo – Limonietea*) 15.6 Mediterranean saltmarsh scrubs (*Sarcocornietea fruticosae*) 34.5; Mediterranean xeric grasslands (*Thero-Brachypodietea ramosi*) 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 (*Scorzoneretalia villosae*) 45.3 Holm-oak forest 62.10 Calcicolous chasmophyte communities (*Centaureo-Campanuletalia*)
3	Pižinovac 1	34.5 Mediterranean xeric grasslands (*Thero-Brachypodietea ramosi*) 83.16 Citrus orchards 89.2 Fresh water industrial lagoons and canals
4	Pižinovac 2	22.41 Free-floating vegetation (*Potametea; Lemnetea*)
5	Krvavac	32.131 Prickly juniper arborescent matorral 34.75 Eastern sub-Mediterranean dry grasslands (*Scorzoneretalia villosae*) 34.5 Mediterranean xeric grasslands (*Thero-Brachypodietea ramosi*) 45.3 Holm-oak forest 62.10 Calcicolous chasmophyte communities (*Centaureo-Campanuletalia*) 7.2 Ruderal communities
6	Banja – Modro oko	22.3 Amphibious macrophyte communities 22.42 Rooted submerged vegetation 22.41 Free-floating vegetation (*Potametea; Lemnetea*) 44.4 Mixed oak-elm-ash forests of great river
7	Blace 2	34.5 Mediterranean xeric grasslands (*Thero-Brachypodietea ramosi*)
8	Vidonje	32.131 Prickly juniper arborescent matorral 34.75 Eastern sub-Mediterranean dry grasslands (*Scorzoneretalia villosae*) 45.3 Holm-oak forest 62.10 Calcicolous chasmophyte communities (*Centaureo-Campanuletalia*) 7.2 Ruderal communities
9	Blace 3	13.2 Estuaries
10	Blace 4	15.1 Annual salt pioneer swards (*Thero-Salicornietalia*)

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
Acer monspessulanum L.			x	x					x		
Acinos arvensis (Lam.) Dandy		x	x			x	x		x		
Aegilops geniculata Roth						x		x			
Aethionema saxatile (L.) R. Br.		x	x	x		x	x		x		
Agrostis stolonifera agg.	Lower Neretva (Horvatić, 1949, 1954)										
Ailanthus altissima (Mill.) Swingle	IAS	x		x							
Ajuga chamaepitys (L.) Schreb.						x					
Alisma lanceolatum With.							x				
Alisma plantago-aquatica L.					x						
Alkanna tinctoria Tausch			x	x		x					
Allium ampeloprasum L. var. *lussinense*	Neretva River Delta (Jasprica, 2007)										
Allium roseum L.						x					
Allium subhirsutum L.		x		x				x			
Alnus glutinosa (L.) Gaertner							x				
Alnus glutinosa subsp. *elliptica* (Req.) Nyman	Lower Neretva River (Lovrić *et al*., 1988)										
Alopecurus aequalis Sobol	VU; SP	Neretva River Delta (Alegro in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Alopecurus myosuroides Huds.							x				
Althaea officinalis L.		x									
Alyssum alyssoides L. (L.)				x		x	x				
Alyssum montanum L. ssp. *pagense* (Baumgartner) Hayek	Neretva River Delta (Jasprica, 2007)										
Alyssum simplex Rudolphi		x		x		x	x	x			
Ambrosia artemisiifolia L.	IAS	Neretva River Delta (Jasprica, 2007)									
Anacamptis pyramidalis (L.) Rich.	SP	x		x							
Anagallis arvensis L.		x									
Anagallis foemina Mill.			x			x					
Anthemis arvensis L.						x					
Anthemis cotula L.	Lower Neretva (Horvatić, 1954)										
Anthoxanthum odoratum L.			x						x		
Anthyllis vulneraria L. *subsp. praepropera* (A.Kern.) Bornm.	SP	x	x			x					
Anthyllis vulneraria L. ssp. *weldeniana* (Rchb.) Cullen	SP	Neretva River Delta (Jasprica, 2007)									
Apium repens (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
Arabis hirsuta (L.) Scop.		x	x			x	x	x	x		
Arabis turrita L.				x			x				
Arabis verna (L.) R. Br.		x		x			x				
Arbutus unedo L.							x				
Arenaria serpyllifolia agg.		x	x	x		x	x	x	x		
Argyrolobium zanonii (Turra) P. W. Ball			x			x					
Arisarum vulgare O.Targ.Tozz.		x									
Aristolochia clematitis L.					x		x				
Aristolochia rotunda L.							x				
Artemisia absinthium L.	Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Banks of the Velika Neretva, southeast of Ploče (Topić *et al*., 1996)										
Artemisia verlotiorum Lamotte	IAS	Rogotin, near Ploče (Smital *et al*., 1998)									
Arthrocnemum fructicosum (L.) Moq.		x						x			
Arum italicum Mill.		x	x		x	x	x		x		
Arum nigrum Schott	NT	x	x						x		
Arundo donax L.											x
Asparagus acutifolius L.		x	x	x		x	x	x	x		
Asperula scutellaris Vis.	SP	Neretva River Delta (Jasprica, 2007)									
Asphodeline lutea (L.) Rchb.						x			x		
Asphodelus aestivus Brot.		x		x				x			
Asphodelus fistulosus L.		x									
Asplenium ceterach L.		x	x	x		x	x		x		
Asplenium onopteris L.					x						
Asplenium ruta-muraria L.									x		
Asplenium trichomanes L.		x	x	x		x		x	x		
Aster tripolium L.											x
Aster squamatus (Spreng.) Hieron.	IAS	Neretva River Delta (Trinajstić, 2002)									
Asterolinon linum-stellatum (L.) Duby			x			x			x		
Astragalus hamosus L.		x	x			x	x	x	x		
Aurinia sinuata (L.) Griseb.	SP					x		x			
Avena barbata Pott ex Link		x	x	x		x	x	x	x		
Avena sterilis L.		x			x	x	x	x			
Atriplex prostrata Boucher ex DC. in Lam. et DC.	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995); Opuzen (Trinajstić, 2002)										
Baldellia ranunculoides (L.) Parl.	EN; SP	Lower Neretva (Horvatić, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995); Neretva River Delta (Nikolić & Topić, 2005, (Jasprica in Alegro *et al*., 2010)									

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

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Cardamine maritima Port. ex DC.	SP					x					
Carduus macrocephalus Desf.								x			
Carduus pycnocephalus L.	SP	x		x			x	x	x		
Carex acuta L.							x				
Carex divisa Huds.	EN; SP	Metković (Ilijanić in Nikolić & Topić, 2005)									
Carex divulsa Stokes		x				x			x		
Carex elata All.					x						
Carex extensa Gooden.	EN; SP										x
Carex flacca Schreb.			x								
Carex hallerana Asso		x	x			x	x	x			
Carex hirta L.							x				
Carex limosa L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Carex otrubae Podp.					x		x				
Carex pendula Huds.							x				
Carex punctata Gaudin					x						
Carex riparia Curtis	VU; SP						x				
Carex rostrata Stokes ex With.	VU; SP	Neretva River Delta (Alegro in Nikolić & Topić, 2005; Jasprica in Alegro *et al.*, 2010)									
Carlina corymbosa L.		x	x	x		x		x	x		
Carthamus lanatus L.								x			
Celtis australis L.			x	x		x	x		x		
Centaurea glaberrima Tausch	SP	Neretva River Delta (Jasprica, 2007)									
Centaurium erythraea Rafn.			x								
Centaurium pulchelum (Sw.) Druce	Lower Neretva (Horvatić, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Centaurium spicatum (L.) Fritsch	Aquatic vegetation of lakes Kuti, Modro oko and Baćina and vegetation of coastal muds at the Neretva river mouth (Topić, 1995); Neretva river mouth (Trinajstić, 2002)										
Cerastium brachypetalum Pers.		x	x	x			x	x	x		
Cerastium fontanum Baumg.							x				
Cerastium glomeratum Thuill						x					
Cerastium pumilum Curtis ssp. *glutinosum* (Fries) Jalas		x	x			x					
Ceratophyllum submersum L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Chaerophyllum coloratum L.	Neretva River Delta (Jasprica, 2007)										
Chelidonium majus L.							x				
Chenopodium album agg.									x		
Chouardia litardierei (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
Cichorium intybus L.	Lower Neretva (Horvatić, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995), Neretva River Delta (Trinajstić, 2002)										
Cistus incanus L.							x				
Cistus salvifolius L.			x			x					
Cirsium vulgare (Savi) Ten.	Neretva river mouth (Trinajstić, 2002)										
Cladium mariscus (L.) Pohl					x						
Clematis flammula L.		x	x	x		x	x	x			
Clematis vitalba L.							x				
Clematis viticella L.									x		
Clinopodium vulgare L.				x		x		x			
Clypeola jonthlaspi L.		x		x		x			x		
Colutea arborescens L.		x	x			x		x			
Convolvulus althaeoides L. ssp. *tenuissimus* (Sibth. et Sm.) Stace			x			x		x	x		
Convolvulus arvensis L.							x		x		
Convolvulus cantabrica L.			x			x	x		x		
Conyza canadensis (L.) Cronquist	Lower Neretva (Horvatić, 1954)										
Cornus mas L.									x		
Coronilla emerus L. ssp. *emeroides* Boiss. et Spruner		x	x	x		x	x	x			
Coronilla scorpioides (L.) Koch		x	x			x	x		x		
Crataegus monogyna Jacq.		x	x								
Crepis neglecta L.								x			
Crepis sancta (L.) Babc.		x		x		x	x	x	x		
Crithmum maritimum L.		x									
Cruciata laevipes Opiz.							x				
Crupina crupinastrum (Moris) Vis.				x							
Crypsis alopecuroides (Piller et Mitterp.) Schrad.	Lower Neretva (Horvatić, 1954)										
Crypsis schoenoides (L.) Lam.	Lower Neretva (Horvatić, 1954); Neretva River Delta (Lovrić & al, 1988; Rac *et al*., 1988)										
Cupressus sempervirens L.			x								
Cyclamen repandum Sibth. et Sm.	NT	x	x		x	x					
Cymbalaria muralis P.Gaertn., B.Mey. et Scherb.							x				
Cynanchum acutum L.	EN; SP								x		x
Cynodon dactylon (L.) Pers.				x		x					
Cynoglossum columnae Ten.						x	x		x		
Cynoglossum creticum Mill.		x									

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Cynoglossum officinale L.			x			x					
Cyperus flavescens L.	VU; SP	Lower Neretva (Horvatić, 1949, 1954); Neretva River Delta (Alegro in Nikolić & Topić, 2005)									
Cyperus flavescens L. forma *monostachyus*		Lower Neretva (Horvatić, 1954)									
Cyperus fuscus L.	VU; SP	Lower Neretva (Horvatić, 1949, 1954); Neretva River Delta (Alegro in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Cyperus longus L.	VU	Lower Neretva (Horvatić, 1949, 1954); Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Neretva River Delta (Alegro in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010); Baćina (Trinajstić, 2002)									
Cyperus michelianus (L.) Link	VU; SP	Lower Neretva (Horvatić, 1954); Neretva River Delta (Alegro in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Cyperus serotinus Rottb.	VU (DD)	Lower Neretva (Horvatić, 1954); Neretva River Delta (Alegro in Nikolić & Topić, 2005)									
Dactylis glomerata L.		x	x			x	x	x			
Dasypyrum villosum (L.) P.Candargy		x	x	x		x	x		x		
Daucus carota L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995), Neretva River Delta (Trinajstić, 2002)									
Desmazeria rigida (L.) Tutin		x		x		x	x	x	x	x	
Digitaria sanguinalis (L.) Scop.		Lower Neretva (Horvatić, 1954)									
Diplotaxis tenuifolia (L.) DC.		x									
Dittrichia viscosa (L.) Greuter		x				x	x	x			
Dorycnium rectum (L.) Ser.	EN; SP	Swamp and ruderal vegetation in the surroundings of Ploče, near the mouth of the Neretva river and near the Baćina lakes (Topić *et al*., 1996); Banks of the Velika Neretva, southeast of Ploče (Topić *et al*., 1996); Neretva River Delta (Topić in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Ecballium elaterium (L.) A. Rich.	DD	x							x		
Echinochloa crus-galli (L.) P.Beauv.		Lower Neretva (Horvatić, 1949, 1954)									
Echinophora spinosa L.	CR; SP	Neretva River Delta (Mihelj in Nikolić & Topić, 2005)									
Echium italicum L.				x		x					
Edraianthus tenuifolius (Waldst. et Kit.) A. DC.	**SP**	Neretva River Delta (Jasprica, 2007)									
Eleocharis acicularis (L.) Roem. et Schult.		Lower Neretva (Horvatić, 1954)									
Eleocharis carniolica Koch	EN; SP	Lower Neretva (Horvatić, 1954); Neretva River Delta (Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Eleocharis palustris agg.										x	
Eleusine indica (L.) Gaertn.	IAS	Neretva River Delta (Vreš, 2006)									
Elymus farctus (Viv.) Runemark ex Melderis	CR; SP	Neretva River Delta (Alegro in Nikolić & Topić, 2005)									
Elymus pycnanthus (Godr.) Melderis		Neretva river Delta (Trinajstić, 2002)									
Elymus repens (L.) Gould		x									

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

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

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Hordeum hystrix Roth (syn. *Hordeum maritimum* ssp. *gussoneanum* (Parl.) Asch. et Graebn.)	SP	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)									
Hordeum marinum Huds.	VU; SP	Neretva River Delta (Alegro in Nikolić & Topić, 2005)									
Hordeum murinum L. ssp. *leporinum* (Link) Arcang.		x				x		x			x
Hordeum secalinum Schreb.	EN	Neretva River Delta (Alegro in Nikolić & Topić, 2005)									
Hornungia petraea (L.) Rchb.									x		
Hottonia palustris L.	EN; SP	Neretva River Delta (Jasprica, 2007)									
Humulus lupulus L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Banks of the Velika Neretva, southeast of Ploče (Topić *et al*., 1996)									
Hyacinthella dalmatica (Baker) Chouard	**DD; SP**		x								
Hydrocharis morsus-ranae L.		Lower Neretva (Horvatić, 1949); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995); Neretva River Delta (Jasprica, 2007)									
Hydrocotyle vulgaris L.	EN; SP	Neretva River Delta (Regula-Bevilacqua in Nikolić & Topić, 2005; Jasprica, 2007; Jasprica in Alegro *et al*., 2010)									
Hymenocarpos circinnatus (L.) Savi						x					
Hyparrhenia hirta (L.) Stapf			x	x		x					
Hypericum perforatum L.			x								
Inula britannica L.		Lower Neretva (Horvatić, 1949, 1954)									
Inula chritmoides L.		x						x			x
Inula verbascifolia (Willd.) Hausskn.		x	x	x		x			x		
Iris pseudacorus L.	SP	x			x		x			x	
Iris pseudopallida Trinajstić	SP					x			x		
Juncus acutiflorus Ehrh. ex Hoffm.	**DD; SP**						x	x			
Juncus acutus L.		x						x			x
Juncus articulatus L.		Lower Neretva (Horvatić, 1949, 1954)									
Juncus buffonius L.		Lower Neretva (Horvatić, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)									
Juncus compressus Jacq.		Lower Neretva (Horvatić, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Bačina (Topić,1995)									
Juncus conglomeratus L.		Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)									
Juncus effusus L.							x				
Juncus inflexus L.							x				
Juncus maritimus Lam.											x
Juniperus oxycedrus L. ssp. *oxycedrus*		x	x	x		x	x		x		
Juniperus phoenicea L.			x			x			x		
Kickxia elatinae (L.) Dumort.		Lower Neretva (Horvatić, 1954)									
Koeleria sp.		x	x					x	x		
Lactuca serriola L.		x									

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

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Lythrum hyssopifolia L.	Lower Neretva (Horvatić, 1954)										
Lythrum salicaria L.					x		x				
Lythrum tribracteatum Salzm. ex Spreng.	EN	Lower Neretva (Horvatić, 1954)									
Malva sylvestris L.						x	x	x			
Marrubium incanum Desr.			x					x	x		
Marrubium vulgare L.		x							x		
Marsilea quadrifolia L.	VU	Lower Neretva (Horvatić, 1949, 1954); Neretva River Delta (Jasprica in Alegro *et al*., 2010)									
Medicago arabica (L.) Huds.		x							x		
Medicago disciformis DC.						x					
Medicago lupulina L.						x					
Medicago minima (L.) Bartal.		x	x			x					
Medicago orbicularis (L.) Bartal.		x		x		x		x			
Medicago rigidula L. (All.)									x		
Medicago sativa L.		x									
Melica ciliata L.						x					
Melilotus italica (L.) Lam.						x					
Melilotus officinalis (L.) Lam.	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995); Neretva River Delta (Trinajstić, 2002)										
Mentha aquatica L.					x		x				
Mentha pulegium L.	Lower Neretva (Horvatić, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Mercurialis annua L.		x	x	x		x	x		x		
Micromeria juliana (L.) Benth. Ex Rchb		x	x	x		x	x	x	x		
Minuartia mediterranea (Link.) K. Malý				x		x		x	x		
Myriophyllum sp.							x				
Misopates orontium (L.) Raf.		x									
Moltkia petraea (Tratt.) Griseb.	SP					x			x		
Muscari neglectum Guss ex Ten.									x		
Muscari botryoides (L.) Mill.						x					
Muscari comosum (L.) Mill.		x					x	x	x		
Myosotis arvensis (L.) Hill						x		x			
Myosotis ramosissima Rochel	**DD; SP**	x					x		x		
Myriophyllum spicatum L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995); Opuzen (Trinajstić, 2002)										
Myriophyllum verticillatum L.	Lower Neretva (Horvatić, 1949)										
Najas graminea Delile	Neretva River Delta (Lovrić & al, 1988; Rac *et al*., 1988)										
Najas marina L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Nasturtium officinale R. Br.							x				
Nigella damascena L.			x			x		x	x		
Nuphar lutea Sibth. et Sm.							x				
Nymphaea alba L.					x						
Nymphaea lotus L. forma *thermalis* (DC.) Tuzson	Neretva River Delta (Lovrić & al, 1988; Rac *et al.*, 1988)										
Nymphoides peltata (S. G. Gmelin) Kuntze	Lower Neretva (Horvatić, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Oenanthe silaifolia M. Bieb.										x	
Olea europea L.		x				x					
Ononis ornithopodioides L.						x					
Ononis reclinata L.						x					
Onosma echioides L.	SP					x			x		
Ophrys apifera Huds	EN; SP	Ploče (Jasprica in Nikolić & Topić, 2005)									
Ophrys scolopax Cav.	**DD; SP**	x							x		
Ophrys sphaegodes Mill.	VU; SP	x									
Opopanax chironium (L.) Koch				x		x					
Opuntia vulgaris Miller							x				
Orchis coriophora L.	VU; SP	Neretva River Delta (Vrbek in Nikolić & Topić, 2005)									
Orchis italica Poir.	EN; SP	x									
Orchis laxiflora Lam.	NT; SP						x				
Orchis morio L.	**NT; SP**								x		
Orchis provincialis Balb. ssp. *pauciflora* (Ten.) Camus	**DD; SP**								x		
Orchis purpurea Huds.	VU; SP								x		
Orchis quadripunctata Cirillo ex Ten.	**VU; SP**	x	x	x					x		
Orchis tridentata Scop.	**VU; SP**								x		
Orlaya grandiflora (L.) Hoffm.		x	x	x		x			x		
Ornithogalum gussonei Ten.		x				x	x		x		
Orobanche mutelii F.W.Schultz											x
Orobanche alba Stephan ex Willd.			x								
Orobanche minor Sm.			x								
Orobanche ramosa L.						x					
Ostrya carpinifolia Scop.									x		
Osyris alba L.		x	x			x					
Oxalis corniculata L.		x									
Paliurus spina-christi Mill.		x	x	x		x	x	x	x		

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

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Polygonum aviculare L.	Lower Neretva (Horvatić, 1954); Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)										
Polygonum lapathifolium L.	Lower Neretva (Horvatić, 1954)										
Polygonum persicaria L.	Lower Neretva (Horvatić, 1954)										
Polygonum lapathifolium L. ssp. *incanum* (F.W.Schmidt) Schubl. et Mart.	Lower Neretva (Horvatić, 1954)										
Polypogon maritimus Willd.	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)										
Polypodium cambricum L.			x		x						
Populus alba L.	Neretva River Delta (Trinajstić, 2002)										
Populus nigra L. forma *italica*	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Populus nigra L.						x		x				
Potamogeton crispus L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Potamogeton gramineus L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Potamogeton lucens L.								x				
Potamogeton nodosus Poir.								x				
Potamogeton perfoliatus L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Potamogeton siculus Tineo	Neretva River Delta (Lovrić *et al*., 1988; Rac *et al*., 1988)										
Potentilla recta L.										x		
Potentilla reptans L.			x			x		x				
Prasium majus L.			x	x				x	x			
Prunella vulgaris L.	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Prunus mahaleb L.				x	x		x			x		
Pseudognaphalium luteoalbum (L.) Hilliard et B.L.Burtt	Lower Neretva (Horvatić, 1954)										
Puccinellia fasciculata (Torr.) Bicknell	NT										x
Pulicaria dysenterica (L.) Bernh.	Lower Neretva (Horvatić, 1954); Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995)										
Pulicaria odora (L.) Rchb.	Neretva River Delta (Trinajstić, 2002)										
Punica granatum L.			x	x	x		x	x	x	x		
Pyrus amygdaliformis Vill.			x	x	x		x			x		
Quercus ilex L.			x	x			x	x				
Quercus pubescens Willd.			x	x	x					x		
Quercus virgiliana (Ten.) Ten.	Neretva River Delta (Jasprica, 2007)										
Ranunculus acris L.								x				
Ranunculus chius DC.			x									
Ranunculus ficaria L.									x			

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Ranunculus lingua L.	EN; SP	Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Neretva River Delta (Liber in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Ranunculus ophioglossifolius Vill.	EN; SP	Neretva River Delta (Jelaska in Nikolić & Topić, 2005; Jasprica in Alegro *et al*., 2010)									
Ranunculus millefoliatus Vahl.			x	x			x		x		
Ranunculus neapolitanus Ten.		x						x	x		
Ranunculus repens L.							x				
Ranunculus sardous Crantz					x	x	x	x			
Reichardia picroides (L.) Roth		x	x	x		x		x	x		
Reseda lutea L.						x					
Reseda phyteuma L.						x	x				
Rhagadiolus stellatus (L.) Gaertn.		x	x	x		x	x	x	x		
Rhamnus saxatilis Jacq.									x		
Rorippa pyrenaica (Lam.) Reichenb.									x		
Rorippa sylvestris (L.) Besser		Lower Neretva (Horvatić, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)									
Rosa canina agg.			x		x		x				
Rosa sempervirens L.		x							x		
Rubia peregrina L.		x	x			x	x	x			
Rubus ulmifolius Schott		x	x	x		x	x	x			
Rumex crispus L.		x									
Rumex pulcher L.			x					x	x		
Ruppia cirrhosa (Petagna) Grande	SP	Neretva River Delta (Lovrić *et al*., 1988; Rac *et al*., 1988)									
Ruscus aculeatus L.		x	x	x		x	x				
Ruta chalepensis L.		x									
Salicornia europaea L.											x
Salix alba L.							x				
Salix caprea L.							x				
Salix cinerea L.		Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995)									
Salix fragilis L.					x		x				
Salix purpurea L.							x				
Salsola kali L.	NT; SP	Neretva River Delta (Jasprica, 2007)									
Salsola soda L.	NT; SP	Neretva River Delta (Jasprica, 2007)									
Salvia bertolonii Vis.		Neretva River Delta (Jasprica, 2007)									
Salvia officinalis L.		x	x			x			x		

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Salvia verbenaca L.						x		x	x		
Samolus valerandi L.	Lower Neretva (Horvatić, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995); Blaca (Trinajstić, 2002)										
Satureja montana L.		x	x	x		x	x	x	x		
Saxifraga tridactylites L.		x		x			x	x			
Scabiosa ucrainica L.	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)										
Scandix pecten-veneris L.	NT	x		x			x		x		
Scirpus holoschoenus L.	NT									x	
Scirpus holoschoenus L. var. *australis* W.D.J. Koch	Neretva River Delta (Lovrić & al, 1988; Rac & al, 1988)										
Scirpus lacustris L. ssp. *lacustris*	Lower Neretva (Horvatič, 1949); Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Baćina (Trinajstić, 2002)										
Scirpus lacustris L. ssp. *tabernaemontani* (C.C.Gmel.) Syme	**DD; SP**				x		x				
Scirpus maritimus L.	**NT**	x									
Scirpus maritimus L. f. *compactus* (Hoffm.)	Lower Neretva (Horvatić, 1954)										
Scirpus mucronatus L.	Neretva River Delta (Jasprica in Alegro *et al*., 2010)										
Scorpiurus muricatus L.		x	x				x				
Scorzonera villosa Scop.			x						x		
Scrophularia canina L.			x			x		x	x		
Scrophularia nodosa L.							x				
Securigera cretica (L.) Lassen		x	x			x	x		x		
Securigera securidaca (L.) Degen et Dörfl.		x	x				x		x		
Sedum hispanicum L.							x		x		
Sedum ochroleucum Chaix				x							
Sedum rubens L.		x									
Sedum telephium L. ssp. *maximum* (L.) Krock.						x					
Senecio vulgaris L.		x		x					x		
Seseli tomentosum Vis.	SP	Neretva River Delta (Jasprica, 2007)									
Sesleria autumnalis (Scop.) F.W.Schultz				x							
Sesleria robusta Schott, Nyman et Kotschy						x					
Setaria pumila (Poir.) Schult.	Lower Neretva (Horvatić, 1954); Neretva River Delta (Trinajstić, 2002)										
Setaria verticillata (L.) P.Beauv.								x			
Sherardia arvensis L.		x	x			x	x		x		
Silene conica L.		x									x
Silene vulgaris (Moench) Garcke		x									
Sisymbrium officinale 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
Sium latifolium L.	Lower Neretva (Horvatić, 1949)										
Smilax aspera L.		x	x	x		x	x	x			
Sonchus arvensis L.		x	x	x				x	x		
Sonchus asper (L.) Hill				x			x		x		
Sonchus oleraceus L.		x				x					
Sonchus maritimus L.	Neretva river Delta (Trinajstić, 2002)										
Sonchus palustris L.	Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Banks of the Velika Neretva, southeast of Ploče (Topić *et al*., 1996)										
Sorghum bicolor (L.) Moench	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Sparganium erectum L.	Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995); Neretva River Delta (Jasprica, 2007); Baćina (Trinajstić, 2002)										
Spartium junceum L.		x	x			x					
Spergularia salina J. Presl et C. Presl	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)										
Spirodela polyrhiza (L.) Schleiden	Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Stachys cretica L.			x	x		x	x	x			
Stachys menthifolia Vis.	SP	Vina (South of Vrgorac) (30-130 m) and Plina near Ploče (60 m) (Šilić & Šolić, 2002)									
Stachys spinulosa Sibth.et Sm.								x			
Stellaria neglecta Weihe, Bluff et Fingerh.		x									
Succisella petteri (J.Kern. et Murb.) Beck	DD; SP	Lower Neretva River (Lovrić *et al*., 1988)									
Suaeda maritima (L.) Dumort.	VU; SP	Vegetation of coastal muds at the Neretva river mouth (Topić, 1995); Neretva River Delta (Kovačić in Nikolić & Topić, 2005)									
Symphytum officinale L.							x				
Symphytum tuberosum L.									x		
Tamarix sp.		x						x			
Tamarix dalmatica Baum	Neretva River Delta (Jasprica, 2007)										
Tamus communis L.		x	x	x		x	x		x		
Tanacetum cinerariifolium (Trevir.) Sch.Bip.	SP								x		
Taraxacum officinale agg.			x	x					x		
Taraxacum tenuifolium Hoppe	Neretva River Delta (Lovrić *et al*., 1988; Rac *et al*., 1988)										
Teucrium arduini L.	DD; SP	Neretva River Delta (Jasprica, 2007)									
Teucrium chamaedrys L.		x	x	x		x	x	x	x		
Teucrium montanum L.									x		
Teucrium polium L.		x	x			x	x		x		
Teucrium scordium L.	Lower Neretva (Horvatić, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina (Topić,1995)										
Theligonum cynocrambe L.		x	x			x	x		x		

Taxa	CONSERVATION STATUS AND OTHER REMARKS	Localities (LOC)									
		1	2	3	4	5	6	7	8	9	10
Thelypteris palustris Schott	Marshland and aquatic vegetation of Neretva river, canals and lakes Kuti, Modro oko, Baćina and spring Norin (Topić,1995)										
Thymus longicaulis C.Presl			x						x		
Tordylium apulum L.		x	x	x		x	x	x	x		
Tragopogon dubius Scop.				x							
Tragopogon porrifolius L.		x				x		x	x		
Trifolium angustifolium L.		x	x			x					
Trifolium arvense L.		x									
Trifolium campestre Schreber		x	x	x		x	x	x			
Trifolium fragiferum L.	Lower Neretva (Horvatić, 1949, 1954); Aquatic vegetation of lakes Kuti, Modro oko and Baćina and Vegetation of coastal muds at the Neretva river mouth (Topić, 1995)										
Trifolium nigrescens Viv.									x		
Trifolium pratense L.							x				
Trifolium repens L.					x		x				
Trifolium resupinatum L.	VU; SP								x		
Trifolium scabrum L.			x	x		x					
Trifolium stellatum L.		x		x		x	x	x	x		
Trifolium striatum L.		x		x			x	x			
Trifolium subterraneum L.			x			x					
Trifolium tomentosum L.				x		x		x			
Triglochin laxiflorum Guss.	Neretva River Delta (Lovrić *et al*., 1988; Rac *et al*., 1988)										
Trigonella esculenta Willd.		x				x	x	x	x		
Tulipa sylvestris L.	**NT**								x		
Typha angustifolia L.							x				
Typha domingensis (Pers.) Steud.	Neretva River Delta (Lovrić *et al*., 1988; Rac *et al*., 1988)										
Typha latifolia L.							x				
Umbilicus horizontalis (Guss.) DC.		x		x			x	x			
Urospermum picroides (L.) Scop. ex F.W.Schmidt		x	x			x	x	x	x		
Utricularia australis R. Br.	SP				x						
Valantia muralis L.		x	x	x		x	x	x			
Valeriana tuberosa L.			x						x		
Valerianella carinata Loisel.								x			
Valerianella dentata f. *dasycarpa* (L.) Pollich			x	x							
Valerianella locusta (L.) Laterrade		x									
Valerianella muricata (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
Vallisneria spiralis L.	SP						x				
Verbascum phoeniceum L.									x		
Verbascum pulverulentum Vill.						x					
Verbascum blattaria L.	Neretva River Delta (Jasprica, 2007)										
Verbascum sinuatum L.	Neretva River Delta (Jasprica, 2007)										
Verbascum thapsus L.								x			
Verbena officinalis L.								x			
Veronica anagallis-aquatica L.					x		x				
Veronica anagalloides Guss.	Lower Neretva (Horvatić, 1949)										
Veronica arvensis L.		x		x		x		x	x		
Veronica austriaca L. ssp. *jacquinii* (Baumg.) Eb.Fisch.			x						x		
Veronica beccabunga L.	Lower Neretva (Horvatić, 1954)										
Veronica cymbalaria Bodard		x		x		x		x			
Veronica persica Poir.	IAS	x			x	x	x				
Viburnum tinus L.		x									
Vicia cracca L.		x				x		x	x		
Vicia grandiflora Scop.								x			
Vicia hirsuta (L.) Gray		x									
Vicia hybrida L.		x					x		x		
Vicia loisleurii (M. Bieb.) Litv.						x					
Vicia melanops Sm.		x		x					x		
Vicia parviflora Cav.		x	x			x		x			
Vicia sativa L.	SP	x	x			x	x	x			
Vicia serratifolia Jacq.									x		
Vincetoxicum hirundinaria Medik. ssp. *adriaticum* (Beck) Markgr.	SP		x						x		
Viola suavis M.Bieb. ssp. *adriatica* (Freyn) Haesler	SP	Neretva River Delta (Jasprica, 2007)									
Viola arvensis Murray									x		
Vitex agnus-castus L.		x	x			x		x	x		
Vitis vinifera L.		x		x			x				
Vulpia ciliata Dumort.		x				x		x	x		
Vulpia fasciculata (Forssk.) Samp.	NT										x
Xanthium strumarium L. ssp. *italicum* (Moretti) D.Löve	IAS										x
Zannichellia palustris L.	Neretva River Delta (Lovrić *et al*., 1988; Rac *et al*., 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 (Radović, 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, Horvatić (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) reportedon 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.

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SUMMARY

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

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The last 22 km of the Neretva River Delta are inside Croatian territory (surface area of ca 120 km^2), 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 hirundinaria* 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*).