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THE DRAGONFLY (INSECTA, ODONATA) FAUNA OF THE BANOVINA REGION, CROATIA

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In all, 32 dragonfly species were recorded between August 2010 and September 2011 at 21 localities in the Banovina region of Croatia, almost half of the total number known in Croatia. The most abundant species was *Platycnemis pennipes* while the rarest was *Coenagrion ornatum.* Ten of the recorded species are at a certain level of conservation concern and thus it is important to protect their habitats in region.

Keywords: dragonflies, Banovina, fauna, distribution

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U razdoblju između kolovoza 2010. i rujna 2011. godine na 21 postaji na području Banovine utvrđene su 32 vrste vretenaca, gotovo polovina broja vrsta prisutnih u Hrvatskoj. Najčešća zabilježena vrsta je *Platycnemis pennipes* dok je najrjeđa *Coenagrion ornatum*. Među zabilježenim vrstama vretenaca, deset ih je pod određenim stupnjem zaštite zbog čega se ističe važnost očuvanja i zaštite njihovih staništa na području Banovine.

Ključne riječi: vretenca, Banovina, fauna, rasprostranjenost

INTRODUCTION

Although the first studies on the dragonfly fauna of Croatia are from the second half of the 19th century (Carrara, 1846), there is still relatively little published information. Fortunately, our knowledge began to increase during the last quarter of the 20th century (see Belančić *et al*., 2008).

The Banovina region is poorly urbanized and becoming depopulated, and thus its natural resources are still in a good condition. Because of the habitat richness and good conservation state of the forests, meadows, rivers and streams, this area should be preserved in its natural state, and the stability, health and integrity of freshwater ecosystems can conveniently be indicated by dragonfly populations. Due to their sensitivity to human disturbances such as forestry and farming and due to the species' complex habitat requirements, their presence and abundance can indicate the value and conservation status of the sites they inhabit (Corbet, 1999; Franković, 1999; Hawking & New, 2002; Sàhlen, 2005; Bogdanović *et al*., 2008; Koch *et al*., 2013). Their conspicuousness and sensitivity to small-scale environmental changes makes them valuable for the rapid

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assessment of freshwater ecosystem quality (Moore, 1997; Mortimer *et al*., 1998) and thus they have been widely used to monitor habitat and water quality as well as the extent of the recovery of restored habitats (Clausnitzer, 2003; Suhling *et al*., 2006; Simaika & Samways, 2008). As dragonfly species richness is connected to the diversity of the freshwater habitats in a given area, it is essential to protect the variety of their habitats for high species numbers to persist (Suh & Samways, 2005). Research (Kučinić *et al*., 2010; Mihoci *et al*., 2010; Maguire & Jelić, 2010; Perović & Tvrtković, 2010; Bučar *et al*., 2010) conducted in the Banovina region into caddisflies, butterflies, crayfish and fish has shown great diversity, thus the freshwater habitats here may also be important for biodiversity conservation in Croatia and Europe. However, the dragonfly fauna of this area is still poorly known. The first data were provided by Koča (1925), who recorded 10 dragonfly species in the Banovina region. More recent studies were conducted at the Una River by Franković & Vilenica (2009) and the bog Blatuša by Franković & Bogdanović (2008), reporting 21 and 18 species respectively. Additionally, several data from public collections were published in a study conducted by Franković & Bogdanović (2008) (Tab. 1). The main objective of this study was to provide an overview of the dra-

Tab. 1. Literature overview of the dragonfly fauna in the Banovina region. Legend: CNMH – COL = Collection of the Croatian Natural History Museum, Zagreb; FOS-COL = Collection of the Faculty of Science, University of Zagreb. * RE – regionally extinct species (see Belančić et al., 2008)

Species	Locality	Date	Reference
Calopteryx splendens	Glina River in Glina	May, 1904	Koča, 1925
	Čemernica stream in Glina	May, 1904	Koča, 1925
	Čemernica stream	21/6/2008, 9/8/2008	Franković & Bogdanović, 2008
	Una River in Dvor, Donji Dobretin	8/6/2009	Franković & Vilenica, 2009
	Una River in Struga	8/6/2009	Franković & Vilenica, 2009
	Una River in Kozibrod	8/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Kostajnica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una River, gravel pit	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Calopteryx virgo	Glina	10/5/1904	Koča, 1925
	Čemernica stream	15/5/2008, 21/6/2008, 9/8/2008, 14/9/2008	Franković & Bogdanović, 2008
	Una River in Dvor, Donji Dobretin	8/6/2009	Franković & Vilenica, 2009
	Una River in Divuša, Čatlan stream	10/5/2009	Franković & Vilenica, 2009
	Una River in Dvor, next to the Žirovnica stream	10/5/2009	Franković & Vilenica, 2009

	Danković klada stream	17/4/2007, 1/5/2008, 15/5/2008, 21/6/2008, 9/8/2008, 14/9/2008	Franković & Bogdanović, 2008
	canal to the east of the bog Blatuša	21/6/2008, 14/9/2008	Franković & Bogdanović, 2008
Coenagrion ornatum	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
Coenagrion puella	Glina	16/5/1904	Koča, 1925
	canal to the east of the bog Blatuša	21/6/2008, 9/8./008, 14/9/2008	Franković & Bogdanović, 2008
	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Erythromma lindenii	Čemernica stream	14/9/2008	Franković & Bogdanović
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Gvozd / Vrginmost	1/8/1973	FOS - COL
Erythromma najas	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Ischnura elegans	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Ischnura pumilio	bog Blatuša	9/8/2008, 14/9/2008	Franković & Bogdanović, 2008
Pyrrhosoma nymphula	Čemernica stream	15/5/2008, 21/6/2008	Franković & Bogdanović, 2008
	Una River in Dvor, Donji Dobretin	8/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
	Una River in Dvor, next to the Žirovnica stream	10/5/2009	Franković & Vilenica, 2009
Platycnemis pennipes	Čemernica stream in Glina	13/5/1904	Koča, 1925
	Čemernica stream	15/5/2008, 21/6/2008, 9/8/2008	Franković & Bogdanović, 2008
	canal to the east of the bog Blatuša	9/8/2008	Franković & Bogdanović, 2008
	Una River in Dvor, Donji Dobretin	8/6/2009	Franković & Vilenica, 2009
	Una River in Struga	8/6/2009	Franković & Vilenica, 2009
	Una River in Kozibrod	8/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Kostajnica	9/6/2009	Franković & Vilenica, 2009

	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una River, gravel pit	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Aeshna cyanea	Danković klada stream	9/8/2008	Franković & Bogdanović, 2008
	Pujakovac - stream in the *Alnus* sp. forest	9/8/2008	Franković & Bogdanović, 2008
	Pujakovac - Čemernica stream	14/9/2008, 16/10/2008	Franković & Bogdanović, 2008
	Čemernica stream	16/10/2007	Franković & Bogdanović, 2008
Aeshna isoceles	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Anax imperator	Una River in Hrvatska Kostajnica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Brachytron pratense	ponds between Glina and Topusko	16/5/1904	Koča, 1925
	bog Blatuša	15/5/2007	Franković & Bogdanović, 2008
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Cordulegaster heros	Danković klada stream	17/4/2007	Franković & Bogdanović, 2008
	Čemernica stream	9/8/2008	Franković & Bogdanović, 2008
	Una River, Prokres stream in Kirišnica	16/5/2008	Franković & Vilenica, 2009
Cordulia aenea	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Somatochlora meridionalis	Čemernica stream	21/6/2008	Franković & Bogdanović, 2008
	Danković klada stream	17/4/2007	Franković & Bogdanović, 2008
	canal to the east of the bog Blatuša	9/8/2008	Franković & Bogdanović, 2008
*Somatochlora metallica**	Glina	16/5/1904	Koča, 1925
	Glina	17/5/1904	Koča, 1925
Epitheca bimaculata	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Gomphus vulgatissimus	Glina, Čemernica stream	16/5/1904	Koča, 1925
	Glina, Pogledić forest	18/5/1904	Koča, 1925
	Čemernica stream	9/8/2008	Franković & Bogdanović, 2008
	Una River in Dvor, Donji Dobretin	8/6/2009	Franković & Vilenica, 2009
	Una River in Kozibrod	8/6/2009	Franković & Vilenica, 2009
	Una River, gravel pit	9/6/2009	Franković & Vilenica, 2009
	Una River in Divuša, Čatlan stream	10/5/2009	Franković & Vilenica, 2009
	Una River in Dvor, next to the Žirovnica stream	10/5/2009	Franković & Vilenica, 2009
Onychogomphus forcipatus	Čemernica stream	9/8/2008	Franković & Bogdanović, 2008
	Zrinska gora, Dvor - Rujevac, Majdan	11/7/1987	CNHM - COL

	Una River in Dvor, Donji Dobretin	8/6/2009	Franković & Vilenica, 2009
	Una, Struga	8/6/2009	Franković & Vilenica, 2009
	Una River in Kozibrod	8/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Kostajnica	9/6/2009	Franković & Vilenica, 2009
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una River, gravel pit	9/6/2009	Franković & Vilenica, 2009
Crocothemis erythraea	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
Libellula depressa	canal to the east of the bog Blatuša	21/6/2008, 9/8/2008	Franković & Bogdanović, 2008
	Glina	16/5/1904	Koča, 1925
	Zrinska gora - Majdan	11/7/1987	CNHM - COL
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Libellula fulva	Glina, Viduševac, Pokule forest	13/5/1904	Koča, 1925
Libellula quadrimaculata	bog Blatuša	17/4/2007, 1/5/2008, 15/5/2008	Franković & Bogdanović, 2008
Orthetrum albistylum	Glina, Čemernica stream	16/5/1904	Koča, 1925
	Una River in Hrvatska Dubica	9/6/2009	Franković & Vilenica, 2009
	Una oxbow in Tanac	9/6/2009	Franković & Vilenica, 2009
Orthetrum brunneum	Glina	16/5/1904	Koča, 1925
	Una River in Hrvatska Kostajnica, stream Kostajničica	9/6/2009	Franković & Vilenica, 2009
Orthetrum coerulescens	bog Blatuša	17/4/2007, 1/5/2008, 21/6/2008, 9/8/2008, 14/9/2008	Franković & Bogdanović, 2008
	canal to the east of the bog Blatuša	9/8/2008	Franković & Bogdanović, 2008
Sympetrum sanguineum	canal to the east of the bog Blatuša	9/8/2008, 14/9/2008, 16/10/2008	Franković & Bogdanović, 2008
	Zrinska gora - Majdan	21/7/1987	CNHM - COL
Sympetrum striolatum	canal to the east of the bog Blatuša	21/6/2008, 9/8/2008, 14/9/2008, 16/10/2008	Franković & Bogdanović, 2008

gonfly fauna present in the Banovina region. Additional objectives were to assess its relevance for dragonfly conservation in the Croatian context, to determine species' distribution and habitat preferences, and to assess differences in dragonfly composition of the researched sites.

MATERIALS AND METHODS

Study area

The Banovina region (Fig. 1) is situated in central Croatia between the Sava River and the lower reaches of the Kupa, Una and Glina Rivers. Its hilly landscape is dominated by forests with small streams, covering an area of 1803 km², with an average altitude around 300 m. The highest peak (615 m) is at Zrinska gora. The region has a mild continental climate with an average annual temperature between 12 and 15 °C and an average annual precipitation between 800 and 1000 mm. Summers are moderately warm, winters relatively mild and rainy with regular snows. The hills mainly consist of neogenic sands and marl silts. The area is rich in freshwater springs, streams and rivers but as it is a hilly area covered with forests, it has only few natural standing waters (Matas & Brajčić, 2010; Crkvenčić *et al*., 1974).

Data collection

Data were collected between August 2010 and September 2011 at 21 sites (Fig. 2). The visits were under optimal circumstances and lasted until no additional species were found for half an hour. The main focus was on the adult stage. Larvae and exuviae were

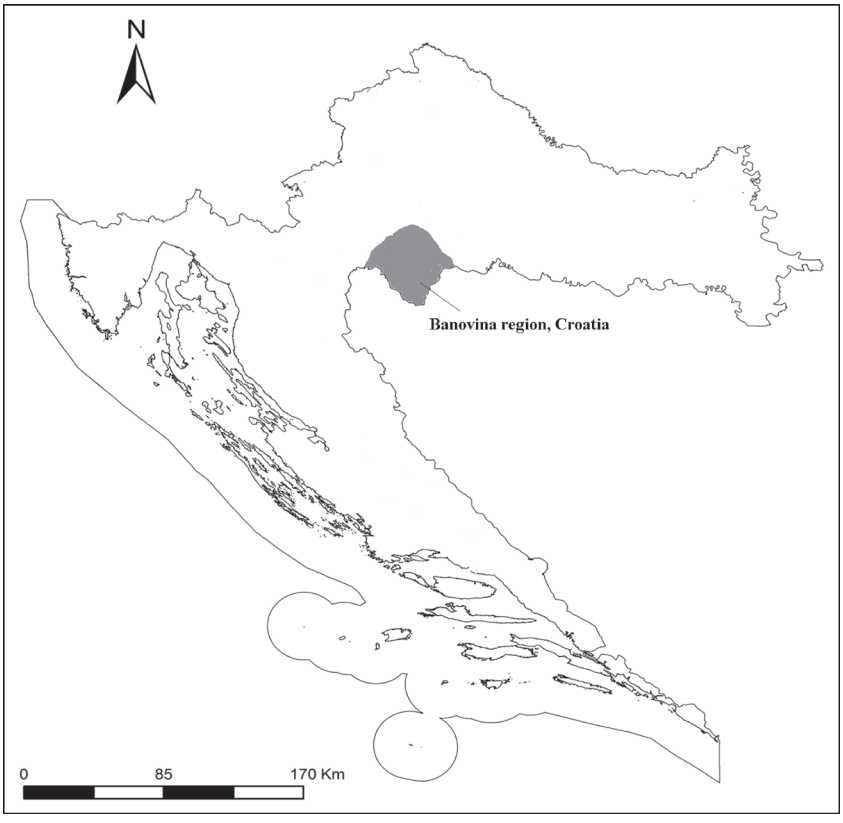

Fig. 1. Banovina region, Croatia.

sampled only as a supplementary method. Adult specimens were sampled using an entomological net and larvae using a scoop net. The exuviae were collected from the surrounding vegetation and banks. Captured adult specimens were identified in the field, photographed and released, while larvae were conserved in 96% ethanol and identified in the laboratory. Identifications were made with Dijkstra & Lewington (2006) and Askew (2004), and the taxonomy follows Dijkstra & Lewington (2006). Reproductive behaviour of the adult specimens was recorded as well.

Data analyses

Data were statistically analysed using the PRIMER 6 software package (Clarke & Warwick, 2001). Similarity among the researched study sites was determined using the Bray-Curtis similarity index (Bray & Curtis, 1957). For estimation of similarity and differences in dragonfly species composition among the study sites, hierarchical cluster analysis was used (Dytham, 2003). Records were treated as categorical binary variables, with 0 indicating the absence and 1 indicating the presence of a species at a certain locality.

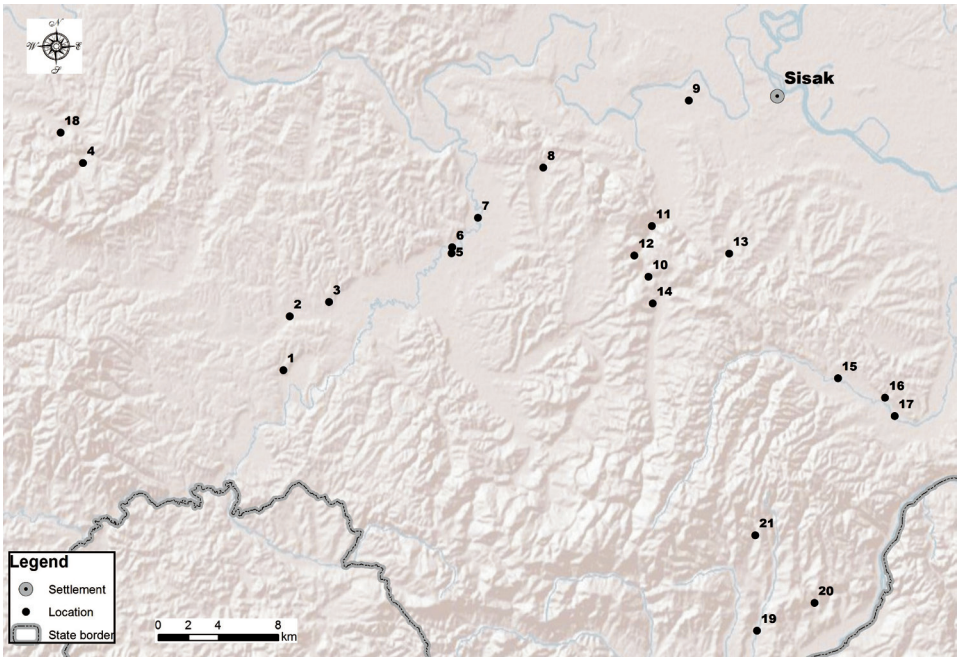

Fig. 2. Study sites in the Banovina region, Croatia.

Legend: 1 = pond in Topusko, 2 = Čemernica River in Topusko, 3 = bog Plavnica in Šatornja, 4 = Utinja River, 5= canal in Brijoni (Prekopa), 6 = Glina River in Brijoni (Prekopa), 7 = Glina River in Marin Brod, 8 = Šanja River in Gora, 9 = artificial lake in Nova Drenčina, 10 = Petrinjčica River-Prnjavor Čuntićki, 11 = Petrinjčica River-bridge/Oblaković stream, 12 = flow-through pond in Zeleni dol, 13 = stream in Moštanica, 14 = pond in Jabukovac, 15 = Sunja River in Umetići, 16 = Sunja River in Kostreši Bjelovački, 17 = Sunja River in Kukuruzari, 18 = pond in Križ, 19 = Jakinovac River in Kepčije, 20 = Čatlan River in Oraovica, 21 = Zrinčica River in Zrin

RESULTS

In 21 researched study sites, 32 dragonfly species were recorded (Tabs 2, 3.). Seven species were recorded for the first time in the Banovina region.

A through-flowing pond in Zeleni dol had the greatest number (53%) of recorded species. Cluster analysis (Fig. 3) showed that the Čatlan and Zrinčica are the two most similar study sites. On the other hand, two stagnant habitats, an artificial lake in Nova Drenčina and a pond in Topusko, were distinct from all other study sites. The most abundant species was *Platycnemis pennipes.* Twelve species were recorded at only one study site, the smallest number of specimens being found in the case of *Coenagrion or-*

Tab. 2. New dragonfly records from the Banovina region, Croatia.

Legend: im=imago, lar=larva, ex=exuvia; t=tandem, c=copulation, o=oviposition; 1=single specimen (♀ or ♂), 3=several specimens (♀ and ♂ together) (1-20); 5=lots of specimens (♀ and ♂ together) (20<); ♀=female, ♂=male

Species	Locality	Date	N	E	Life cycle stage
Calopteryx splendens (Harris, 1782)	Petrinjčica River-Prnjavor Čuntićki	16/8/2010	45°21′04′′	16°16′58′′	5 im♂♀ 3 lar
	Petrinjčica River-bridge/ Oblaković stream	11/5/2011	45°22′53′′	16°17′11′′	5 im♂♀ c
		22/5/2011			5 im♂♀
		12/8/2011			5 im♂♀
	a flow-through pond in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	3 im♂♀
	stream in Moštanica	13/6/2011	45°21′51′′	16°21′06′′	3 im♂♀
	Sunja River in Kukuruzari	13/6/2011	45°15′54′′	16°29′24′′	3 im♂♀ 3 lar
	Sunja River in Kostreši Bjelovački	12/8/2011	45°16′34′′	16°28′56′′	3 im♂♀
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	3 im♂♀
	Utinja River	15/6/2011	45°25′25′′	15°48′09′′	3 im♂♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	5 im♂♀
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	1 im♂
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	3 im♂♀
	Glina River in Brijoni (Prekopa)	21/6/2011	45°22′14′′	16°06′58′′	5 im♂♀
	Glina River in Marin Brod	21/6/2011	45°23′17′′	16°08′18′′	5 im♂♀
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	5 im♂♀
Calopteryx virgo (Linnaeus, 1758)	Petrinjčica River-Prnjavor Čuntićki	11/5/2011	45°21′04′′	16°16′58′′	5 im♂♀ 3 lar
		22/5/2011			5 im♂♀ c
	Petrinjčica River-bridge/ Oblaković stream	11/5/2011	45°22′53′′	16°17′11′′	5 im♂♀
	a flow-through pond in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	5 im♂♀

		13/6/2011			5 im♂♀
	stream in Moštanica	13/6/2011	45°21′51′′	16°21′06′′	5 im♂♀
	Sunja River in Umetići	13/6/2011	45°17′18′′	16°26′33′′	3 im♂♀
	Sunja River in Kukuruzari	13/6/2011	45°15′54′′	16°29′24′′	5 im♂♀ 3 lar
	Sunja River in Kostreši Bjelovački	12/8/2011	45°16′34′′	16°28′56′′	3 im♂♀
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	5 im♂♀
	Utinja River	15/6/2011	45°25′25′′	15°48′09′′	5 im♂♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	5 im♂♀ c
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	5 im♂♀
	Čatlan River in Oraovica	6/8/2011	45°09′14′′	16°25′09′′	5 im♂♀
	Zrinčica River in Zrin	6/8/2011	45°11′42′′	16°22′12′′	5 im♂♀ 1 lar
	Jakinovac River in Kepčije	6/8/2011	45°08′16′′	16°22′12′′	3 im♂♀
Coenagrion ornatum (Selys, 1850)	stream in Moštanica	13/6/2011	45°21′51′′	16°21′06′′	1 im♀
Coenagrion puella (Linnaeus, 1758)	Petrinjčica River-Prnjavor Čuntićki	11/5/2011	45°21′04′′	16°16′58′′	5 im♂♀t o
	a flow-through pond in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	5 im♂♀t
		13/6/2011			5 im♂♀t
	Sunja River in Kukuruzari	13/6/2011	45°15′54′′	16°29′24′′	1 im♂
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	5 im♂♀
	Utinja River	16//.2011	45°25′25′′	15°48′09′′	3 im♂♀
	Šanja River in Gora	17/6/2011	45°25′03′′	16°11′41′′	5 im♂♀ c
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	5 im♂♀
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	5 im♂♀
	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	5 im♂♀ t o
	Čemernica River in Topusko	22/6/2011	45°19′49′′	15°58′38′′	5 im♂♀
	Jakinovac River in Kepčije	6/8/2011	45°08′16′′	16°22′12′′	3 im♂♀
Erythromma lindenii (Selys, 1840)	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	5 im♂♀ t
	Glina River in Brijoni (Prekopa)	21/6/2011	45°22′14′′	16°06′58′′	3 im♂♀
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	3 im♂♀
	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	3 im♂♀ t o
Erythromma viridulum (Charpentier, 1840)	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	5 im♂♀
Ischnura elegans (Vander Linden, 1820)	artificial lake in Nova Drenčina	22/4/2011	45°27′23′′	16°19′10′′	5 im♂♀ t c

		18/5/2011			5 im♂♀
	a flow-through in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	5 im♂♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	3 im♂♀
	Jakinovac River in Kepčije	6/8/2011	45°08′16′′	16°22′12′′	3 im♂♀
	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	5 im♂♀
Ischnura pumilio (Charpentier, 1825)	artificial lake in Nova Drenčina	22/4/2011	45°27′23′′	16°19′10′′	3 im♂♀
	a flow-through pond in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	1 im♂
	Petrinjčica River-bridge/ Oblaković stream	11/5/2011	45°22′53′′	16°17′11′′	3 im♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	5 im♂♀ t
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	5 im♂♀
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	5 im♂♀
	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	3 im♂♀
	stream in Moštanica	13/6/2011	45°21′51′′	16°21′06′′	5 im♂♀ t
Pyrrhosoma nymphula (Sulzer, 1776)	a flow-through pond in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	3 im♂♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	1 im♂
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	1 im♂
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	1 im♂
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	1 im♀
Lestes dryas Kirby, 1890	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	5 im♂♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	1 im♂
Lestes parvidens Artobolevskii, 1929	a flow-through pond in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	3 im♂♀ t c
Lestes virens (Charpentier, 1825)	a flow-through pond in Zeleni dol	17/8/2010	45°21′50′′	16°16′16′′	5 im♂♀ t c
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	3 im♂♀
Sympecma fusca (Vander Linden, 1820)	pond in Jabukovac	12/4/2011	45°20′06′′	16°17′10′′	5 im♂♀
Platycnemis pennipes (Pallas, 1771)	a flow-through pond in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	5 im♂♀ t c
		13/6/2011			5 im♂♀ t c
	Petrinjčica River-Prnjavor Čuntićki	16/8/2010	45°21′04′′	16°16′58′′	5 im♂♀ c
		11/5/2011			3 im♂♀t
	Petrinjčica River-bridge/ Oblaković stream	12/8/2011	45°22′53′′	16°17′11′′	5 im♂♀
	artificial lake in Nova Drenčina	22/4/2011	45°27′23′′	16°19′10′′	5 im♂♀

	stream in Moštanica	13/6/2011	45°21′51′′	16°21′06′′	3 im♂♀
	Sunja River in Kukuruzari	13/6/2011	45°15′54′′	16°29′24′′	5 im♂♀ t 3 lar
	Utinja River	16/6/2011	45°25′25′′	15°48′09′′	5 im♂♀
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	5 im♂♀
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	5 im♂♀ t
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	3 im♂♀
	Glina River in Brijoni (Prekopa)	21/6/2011	45°22′14′′	16°06′58′′	5 im♂♀ c
	Glina River in Marin Brod	21/6/2011	45°23′17′′	16°08′18′′	5 im♂♀
	Čatlan River in Oraovica	6/8/2011	45°09′14′′	16°25′09′′	3 im♂♀
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	1 im♂
	Jakinovac River in Kepčije	6/8/2011	45°08′16′′	16°22′12′′	3 im♂♀
	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	5 im♂♀ t c
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	5 im♂♀
Aeshna cyanea (Müller, 1764)	flow-through pond in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	5 im♂♀ o
		13/6/2011			5 im♂♀
	Petrinjčica River-Prnjavor Čuntićki	16/8/2010	45°21′04′′	16°16′58′′	3 im♀
Aeshna grandis (Linnaeus, 1758)	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	1 im♂
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	3 im♂♀
Aeshna isoceles (Müller, 1767)	a flow-through pond in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	3 im♂♀ t
	artificial lake in Nova Drenčina	18/5/2011	45°27′23′′	16°19′10′′	3 im♂
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	1 im♂
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	3 im♂♀
Anax imperator Leach, 1815	a pond with a stream running through it in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	3 im♂♀
		13/6/2011			3 im♂
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	3 im♂♀
	Glina River in Brijoni (Prekopa)	21/6/2011	45°22′14′′	16°06′58′′	1 im♂
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	3 im♂♀
	Utinja River	16/6/2011	45°25′25′′	15°48′09′′	1 im♂
	pond in Topusko	21/6/2011	45°17′53′′	15°58′16′′	5 im♂♀
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	1 im♂
Brachytron pratense (Müller, 1764)	artificial lake in Nova Drenčina	22/4/2011	45°27′23′′	16°19′10′′	5 im♂

	canal in Brijoni (Prekopa)	21/6/2011	45°22′01′′	16°06′56′′	1 im♀
Cordulegaster heros Theischinger, 1979	a flow-through pond in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	1 im♂
	stream in Moštanica	13/6/2011	45°21′51′′	16°21′06′′	3 im♂ 3 lar
	Čatlan River in Oraovica	6/8/2011	45°09′14′′	16°25′09′′	1 lar
	Zrinčica River in Zrin	6/8/2011	45°11′42′′	16°22′12′′	3 im♂ 3 lar
Cordulia aenea (Linnaeus, 1758)	artificial lake in Nova Drenčina	18/5/2011	45°27′23′′	16°19′10′′	3 im♂
Somatochlora meridionalis Nielsen, 1935	Petrinjčica River-Prnjavor Čuntićki	16/8/2010	45°21′04′′	16°16′58′′	3 im♂
	a flow-through pond in Zeleni dol	16/8/2010	45°21′50′′	16°16′16′′	3 im♂
		13/6/2011			3 im♂
	Utinja River	15/6/2011	45°25′25′′	15°48′09′′	3 im♂♀ 1 lar
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	1 im♂
	Čatlan River in Oraovica	6/8/2011	45°09′14′′	16°25′09′′	3 im♂♀ o
	Zrinčica River in Zrin	6/8/2011	45°11′42′′	16°22′12′′	1 im♀ o
	Čemernica River in Topusko	21/6/2011	45°19′49′′	15°58′38′′	3 im♂♀
	Jakinovac River in Kepčije	6/8/2011	45°08′16′′	16°22′12′′	3 im♂♀
Gomphus vulgatissimus (Linnaeus, 1758)	Petrinjčica River-Prnjavor Čuntićki	11/5/2011	45°21′04′′	16°16′58′′	3 ex
	Sunja River in Umetići	13/6/2011	45°17′18′′	16°26′33′′	1 im♂
	Sunja River in Kukuruzari	13/6/2011	45°15′54′′	16°29′24′′	3 im♂
	Sunja River in Kostreši Bjelovački	12/8/2011	45°16′34′′	16°28′56′′	3 im♂ 3 lar
	Utinja River	15/6/2011	45°25′25′′	15°48′09′′	3 im♂♀ 3 lar
	Šanja River in Gora	15/6/2011	45°25′03′′	16°11′41′′	3 im♂♀t
	Glina River in Marin Brod	21/6/2011	45°23′17′′	16°08′18′′	5 im♂♀ 3 lar
Onychogomphus forcipatus (Linnaeus, 1758)	Petrinjčica River-Prnjavor Čuntićki	11/5/2011	45°21′04′′	16°16′58′′	3 lar
	Petrinjčica River-bridge/ Oblaković stream	22/5/2011	45°22′53′′	16°17′11′′	5 im♂♀ t o 3 lar
	a flow-through pond in Zeleni dol	13/6/2011	45°21′50′′	16°16′16′′	3 im♂♀
	Sunja River in Kukuruzari	13/6/2011	45°15′54′′	16°29′24′′	5 im♂♀ 3 lar 3 ex
	Utinja River	15/6/2011	45°25′25′′	15°48′09′′	3 im♂♀ 3 lar
	pond in Križ	15/6/2011	45°26′31′′	15°47′01′′	1 im♂
	bog Plavnica in Šatornja	21/6/2011	45°20′19′′	16°00′38′′	1 im♂

	Glina River in Brijoni (Prekopa)	21/6/2011	45°22′14″	16°06′58″	3 im♂♀ t
	Glina River in Marin Brod	21/6/2011	45°23′17″	16°08′18″	3 im♂♀ 3 lar
	Čatlan River in Oraovica	6/8/2011	45°09′14″	16°25′09″	3 im♂
	Zrinčica River in Zrin	6/8/2011	45°11′42″	16°22′12″	1 im♂
Crocothemis erythraea (Brulle, 1832)	pond in Topusko	21/6/2011	45°17′53″	15°58′16″	5 im♂♀
Libellula depressa Linnaeus, 1758	Petrinjčica River-bridge/ Oblaković stream	22/5/2011	45°22′53″	16°17′11″	5 im♂♀ c
	a flow-through pond in Zeleni dol	13/6/2011	45°21′50″	16°16′16″	3 im♂♀ o
	stream in Moštanica	13/6/2011	45°21′51″	16°21′06″	1 im♀
	Šanja River in Gora	15/6/2011	45°25′03″	16°11′41″	5 im♂♀
	bog Plavnica in Šatornja	21/6/2011	45°20′19″	16°00′38″	5 im♂♀
	Utinja River	15/6/2011	45°25′25″	15°48′09″	1 im♀
	pond in Križ	15/6/2011	45°26′31″	15°47′01″	5 im♂♀
	canal in Brijoni (Prekopa)	21/6/2011	45°22′01″	16°06′56″	3 im♂♀
Libellula quadrimaculata Linnaeus, 1758	bog Plavnica in Šatornja	21/6/2011	45°20′19″	16°00′38″	5 im♂♀
Orthetrum albistylum (Selys, 1848)	pond in Topusko	21/6/2011	45°17′53″	15°58′16″	5 im♂♀
Orthetrum brunneum (Fonscolombe, 1837)	Šanja River in Gora	15/6/2011	45°25′03″	16°11′41″	3 im♂♀ t
Orthetrum cancellatum (Linnaeus, 1758)	artificial lake in Nova Drenčina	22/4/2011	45°27′23″	16°19′10″	3 im♂♀
Orthetrum coerulescens (Fabricius, 1798)	Šanja River in Gora	15/6/2011	45°25′03″	16°11′41″	3 im♂♀
Sympetrum sanguineum (Müller, 1764)	a flow-through pond in Zeleni dol	16/8/2010	45°21′50″	16°16′16″	3 im♂ o
	bog Plavnica in Šatornja	21/6/2011	45°20′19″	16°00′38″	1 im♀

natum. Ten of the recorded dragonfly species are of conservation concern: eight are listed as protected or strictly protected by the Croatian Nature Protection act, seven of which are on the Red List of Croatian dragonflies and two of which in the EU Habitats Directive in Appendix II and IV. Additionally, four species are listed on the European and/or Mediterranean Red List (Tab. 4).

DISCUSSION

This study recorded 32 dragonfly species for the Banovina region, which represents 48% of the total number of 67 (regionally extinct and unreliable species excluded) known from Croatia (Belančić *et al*., 2008; Franković, 1999). Combined with the literature data, the total number of dragonfly species for this area rose to 36 (doubtful data excluded), which represents around 55% of the Croatian dragonfly fauna.

Tab. 3. Recorded dragonfly species and their distribution in the Banovina region, Croatia.

Species / Study site		PPČ	PB-OS	ZD	ND	SKB	SU	SK	SM	ŠG	U	PK	PJ	BPS	CB	GB	GMB	čo	ZZ	JK	PT	CT
Zygoptera																						
Calopterygidae	*Calopteryx splendens*	*	*	*		*		*	*	*	*	*		*	*	*	*					*
	Calopteryx virgo	*	*	*		*	*	*	*	*	*	*						*	*	*		*
Coenagrionidae	*Coenagrion ornatum*								*													
	Coenagrion puella	*		*				*		*	*	*		*	*					*	*	*
	Erythromma lindenii									*						*					*	*
	Erythromma viridulum																				*	
	Ischnura elegans			*	*					*										*	*	
	Ischnura pumilio		*	*	*				*	*				*	*						*	
	Pyrrhosoma nymphula			*						*		*			*							*
Lestidae	*Lestes dryas*									*				*								
	Lestes parvidens			*																		
	Lestes virens			*										*								
	Sympecma fusca												*									
Platycnemididae	*Platycnemis pennipes*	*	*	*	*			*	*	*	*	*		*	*	*	*	*		*	*	*
Anisoptera																						
Aeshnidae	*Aeshna cyanea*	*		*																		
	Aeshna grandis													*		*						
	Aeshna isoceles			*	*									*	*							

	Anax imperator			*						*	*			*		*					*	*
	Brachytron pratense				*										*							
Cordulegastridae	*Cordulegaster heros*			*					*									*	*			
Corduliidae	*Cordulia aenea*				*																	
	Somatochlora meridionalis	*		*							*	*						*	*	*		*
Gomphidae	*Gomphus vulgatissimus*	*				*	*	*		*	*						*					
	Onychogomphus forcipatus	*	*	*				*			*	*		*		*	*	*	*			
Libellulidae	*Crocothemis erythraea*																				*	
	Libellula depressa		*	*					*	*	*	*		*	*							
	Libellula quadrimaculata													*								
	Orthetrum albistylum																				*	
	Orthetrum brunneum									*												
	Orthetrum cancellatum				*																	
	Orthetrum coerulescens									*												
	Sympetrum sanguineum			*										*								
Number of species		8	6	17	7	3	2	6	7	14	9	8	1	13	8	6	4	5	4	5	9	8

Legend: PPČ- Petrinjčica River in Prnjavor Čuntićki, PB-OS - - Petrinjčica River bridge/Oblaković stream, ZD – through-flowing pond in Zeleni dol, ND – artificial lake in Nova Drenčina, SKB – Sunja River in Kostreši Bjelovački, SU – Sunja River in Umetići, SK – Sunja River in Kukuruzari, SM – stream in Moštanica, ŠG – Šanja River in Gora, U – Utinja River, PK – pond in Križ, PJ – pond in Jabukovac, BPŠ – bog Plavnica in Šatornja, CB – canal in Brijoni (Prekopa), GB – Glina River in Brijoni (Prekopa), GMB – Glina River in Marin Brod, ČO – Čatlan River in Oraovica, ZZ – Zrinčica River in Zrin, JK – Jakinovac River in Kepčije, PT – pond in Topusko, ČT – Čemernica River in Topusko.

Tab. 4. Protected and endangered dragonfly species recorded for the Banovina region, Croatia.

Species	Croatian Red List	Mediterranean Red List	European Red List	Croatian Nature Protection Act	EU's Habitats directive
Coenagrion ornatum	NT	NT	NT	Strictly protected Taxa	Appendix II
Lestes dryas	NT			Protected Taxa	
Lestes parvidens	DD			Protected Taxa	
Lestes virens	VU			Strictly protected Taxa	
Aeshna grandis	EN			Strictly protected Taxa	
Aeshna isoceles	NT			Protected Taxa	
Orthetrum coerulescens	DD			Protected Taxa	
Brachytron pratense		NT			
Cordulegaster heros		VU	NT	Strictly protected Taxa	Appendix II, IV
Cordulia aenea		NT			

Five species found in previous research were not recorded in this study. One of them, *Somatochlora metallica*, recorded in 1904 by Kočа (1925), is classified as a regionally extinct species (RE). This information is doubtful and the recorded species is most probably *S. meridionalis*.

Epitheca bimaculata and *Erythromma najas*, species that prefer bigger standing water bodies and oxbows with rich aquatic vegetation (Belančić *et al*., 2008), were found at the Una River oxbow (Franković & Vilenica, 2009), a site that was not visited during our research. Also, we did not visit artificial ponds and canals around the bog Blatuša where *Sympetrum striolatum* was previously recorded (Franković & Bogdanović, 2008).

Libellula fulva inhabits slow-flowing, meandering rivers and large dykes (Dijkstra & Lewington, 2006). Although the species has not been found around the Glina River since 1904 (Kočа, 1925), it could possibly still be there.

On the other hand, our research covered a wider range of habitats and sites, thus adding seven species for the Banovina region: *Erythromma viridulum, Sympecma fusca, Lestes dryas, L. parvidens, L. virens, Aeshna grandis,* and *Orthetrum cancellatum*.

Among the recorded species, *Platycnemis pennipes* was present at most of the study sites. It inhabits a wide range of habitat types, but prefers running water. Since most of the habitats researched were rivers and streams it is not surprising this species was the most numerous. In addition, it has quite a long flight season, from early May until late September.

Coenagrion ornatum was the rarest species, recorded with only one specimen. It is uncommon in Croatia and inhabits sunny and shallow streams and flowing ditches with dense and well developed aquatic and riparian vegetation. The study site where it was recorded, a sunny stream with rich vegetation (Fig. 4), matches this description. Human

impacts on all kinds of freshwater habitats have increased and it is assumed that in central Europe populations of *C. ornatum* have declined. This species has rather specialized habitat preferences and it is threatened by intensive agriculture. Organic pollution and the clearing of the vegetation from these small streams degrade the environmental conditions required by *C. ornatum* (Belančić *et al*., 2008; Boudot *et al*., 2009). Therefore this species is under international and national protection and listed on the European, Mediterranean and Croatian Red Lists as near-threatened (NT).

The distribution of another important and protected species that was found during this research, *Cordulegaster heros* (Fig. 5), is also quite scattered because of the specific habitat requirements. It inhabits shaded brooks in mountainous areas (Boudot *et al*., 2009). We recorded it in the small streams on the slopes of the hill Zrinska gora. In the Mediterranean region its populations are decreasing due to habitat destruction (such as deforestation), desiccation of streams and climate change (Boudot *et al*., 2009). Thus the species is listed on the European Red List as near-threatened (NT) and as vulnerable (VU) on the Mediterranean Red List.

Three of the recorded species, *Brachytron pratense, Cordulia aenea* and *Aeshna grandis*, are widespread in the temperate regions of Europe but become rare towards the south. Thus the first two are listed as near-threatened on the Mediterranean Red List (Boudot *et al*., 2009) while the latter as endangered (EN) dragonfly species in the Croatian Red List (Belančić *et al*., 2008).

Due to the habitat degradation as water management activities, disappearance of the ponds and wetlands, additional two of the recorded species are listed in the Croatian Red List: *Lestes virens* as vulnerable (VU) and *L. dryas* as near-threatened (NT) dragonfly species (Belančić *et al*., 2008).

Since this area has such a number of the threatened and protected dragonfly species, it is important to preserve the habitats in the Banovina region in their natural state.

Of all visited sites, the number of species was the highest at the flow-through pond in Zeleni dol (Tab. 3). Here conditions for dragonflies were favourable due to the presence of diverse vegetation such as reeds and aquatic and floating plants. In addition, the stream flowing from the surrounding forest runs through the sunny pond, enriching the water with oxygen and improving the water quality. These two different but connected habitats were suitable for species that prefer sunny standing water like *Aeshna isoceles, Libellula depressa*, *Lestes* species and *Coenagrion puella*, as well as for species like *Calopteryx virgo, Somatochlora meridionalis* and *C. heros* that inhabit more shaded running waters (Dijkstra & Lewington, 2006; Askew, 2004). Different types of habitats with diverse vegetation and perching spots may allow many species to co-exist (Suh & Samways, 2005).

At the pond in Jabukovac only one species, *Sympecma fusca*, was observed. This was the only habitat visited in early April, when this species is most active but other species have yet to emerge. This study site was not revisited and therefore excluded from the statistical analysis. Additionally, two more study sites were excluded from the statistical analysis: the Sunja River in Umetići and the Sunja River in Kostreši Bjelovački. They were unreachable to the researchers because of the dense bushes and trees on the river banks. Consequently, only two and three species were observed, respectively.

The research included three quite large rivers: Sunja, Petrinjčica and Glina River. The Sunja River was investigated at three different points, the Petrinjčica and Glina Rivers at two, where altogether six, ten and seven species were recorded respectively. All three

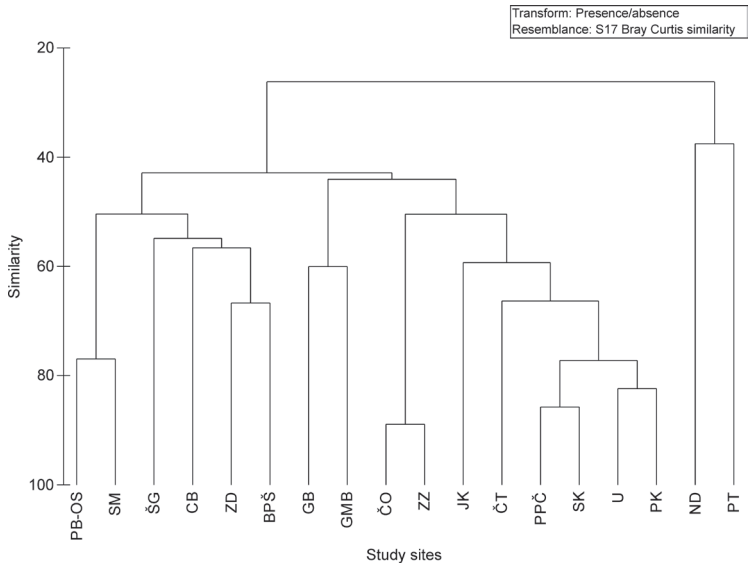

Fig. 3. Cluster analysis. Similarity and differences in dragonfly composition among the researched sites in the Banovina region. Abbreviations of localities are given in Tab. 3.

Fig. 4. Stream in Moštanica where *Coenagrion ornatum* and *Cordulegaster heros* occur (photo taken by K.-D. B. Dijkstra).

Fig. 5. Larva of *Cordulegaster heros* with distinctive reddish head (photo taken by D. Kulijer, in Zrinčica River)

Fig. 6. Zrinčica River. Typical stream habitat on the slopes of Zrinska gora hill, which is poor in dragonfly species diversity but inhabited by *Cordulegaster heros* (photo taken by D. Kulijer).

habitats are quite shallow and fast flowing rivers with gravel and rocks as substrate. Rich aquatic vegetation, as favoured by most dragonfly species (Corbet, 1962; Askew, 2004), is largely absent. Thus it is not surprising the dragonfly fauna mainly consisted of typical running-water species (e.g. as *S. meridionalis, O. forcipatus, G. vulgatissimus, C. virgo*).

The smallest number of species was recorded at three small fast-flowing forest rivers: the Zrinčica (Fig. 6), Čatlan and Jakinovac. The first two were the two most similar sites in the study (Fig. 3). The species present (*C. virgo*, *C. heros*, *O. forcipatus* and *S. meridionalis*) are typical of cool running waters, exactly like these small and shaded forest streams on the slopes of Zrinska gora hill.

Two stagnant habitats, an artificial lake in Nova Drenčina and a pond in Topusko, were distinct from all other sites. Their assemblages consisted of very common species with wide ranges of habitat requirements, as well as species typical of standing waters. Cluster analysis (Fig. 3) showed that these two sites had the smallest number of shared species. Although both are standing water habitats, they differed in other habitat characteristics. The lake in Nova Drenčina was quite eutrophied, with lots of surrounding vegetation but few aquatic macrophytes (mostly only reeds), while the pond in Topusko was shallower and richer in reeds, as well as in hygro- and hydrophytes like flowering-rush, sedges, water lily and duckweed.

The number and composition of the recorded dragonfly species compared to the total number in Croatia indicates the natural condition of the study area with a variety of habitats supporting many and ecologically diverse dragonfly species. Habitat type and vegetation structure are among the main characteristics limiting dragonflies. It makes them vulnerable to the disappearance of habitats such as richly vegetated ponds and small forest rivers. That is why it is very important to preserve these habitats in their natural condition. Since not all freshwater habitats of the Banovina region were investigated, more species may be recorded in the future.

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SAŽETAK

Fauna vretenaca (Insecta, Odonata) područja Banovine

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Vretenca se koriste kao bio-indikatori kvalitete i zdravlja slatkovodnih ekosustava. Zbog specifičnih zahtjeva pojedinih vrsta za okolišnim čimbenicima, prisutnost i brojnost vrsta vretenaca ukazuje na raznolikost i očuvanost područja u kojem žive. Kako sistematsko istraživanje faune vretenaca na različitim tipovima slatkovodnih staništa Banovine do sada nije provedeno, cilj ovog istraživanja bio je dati popis vrsta vretenaca ovog područja. U vremenskom razdoblju između kolovoza 2010. i rujna 2011. godine na 21 postaji utvrđene su 32 vrste vretenaca, što je gotovo polovina broja vrsta prisutnih u Hrvatskoj te ukazuje na raznolikost tipova slatkovodnih staništa područja Banovine. Zbog toga je vrlo važno očuvati ovo područje u njegovom prirodnom obliku. Za statističku obradu podataka korištena je klaster analiza. Vrsta sa širokom ekološkom valencijom, *Platycnemis pennipes*, zabilježena je na najvećem broju lokacija, dok je rijetka i ugrožena vrsta *Coenagrion ornatum* zabilježena samo na jednoj i to u najmanjem broju jedinki. Protočna lokva u Zelenom dolu, bogata različitim tipovima vodene i močvarne vegetacije koja pogoduje razvitku najvećeg broja vrsta vretenaca, imala je i najveći broj zabilježenih vrsta. Najmanji broj vrsta, vrlo sličnog sastava zajednica, zabilježen je za tipična staništa gorskih predjela Banovine, potoke na obroncima Zrinske gore. Prema sastavu zajednica vrsta vretenaca, od svih istraživanih lokacija posebno su se odvojile dvije stajaćice, šljunčara u Novoj Drenčini i lokva u Topuskom. Osam od zabilježenih vrsta zakonski su zaštićene na državnoj, dok su dvije vrste, *C. ornatum* i *Cordulegaster heros* zaštićene na međunarodnoj razini. Kako je ovim istraživanjem obuhvaćen samo dio svih slatkovodnih staništa područja Banovine, budućim istraživanjima popis faune vretenaca područja Banovine mogao bi biti proširen.