

Contribution to the herpetofauna (Amphibia & Reptilia) of lower Neretva River (Croatia & Bosnia and Herzegovina)

Prilog poznavanju herpetofaune (Amphibia & Reptilia) donjeg dijela rijeke Neretve (Hrvatska i Bosna i Hercegovina)

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Abstract

In this paper we present newly collected data and historical overview of the herpetofauna of Neretva River Valley. During two consecutive years (2011, 2012) we collected new data about the presence of reptiles and amphibians in the area, on 25 sampling sites, of which 21 in Croatia and 4 in Bosnia and Herzegovina. During our survey we recorded the presence of 21 species of which 18 are listed in the IUCN Red list. The literature records added another 13 species, so the total number for amphibians and reptiles in the area is 34 species, 11 amphibian and 23 reptiles. With such a high diversity, the area of Neretva River is one of the hotspots of the amphibian and reptile diversity in Croatia. Lower Neretva Valley is now days under a strong anthropogenic influence, and most of the area is used for plantations and intensive agriculture. It is of a critical importance to conserve and protect the remaining natural habitat in the future.

Key words: amphibians, reptiles, diversity, conservation

Sažetak

U ovom radu predstavljamo novo prikupljene podatke, kao i povijesni pregled herpetofaune doline rijeke Neretve. Tijekom 2011. i 2012. godine prikupili smo podatke o prisutnosti vodozemaca i gmazova na 25 lokaliteta, od kojih se 21 nalazio u Hrvatskoj a 4 u Bosni i Hercegovini. Tijekom našeg istraživanja utvrdili smo prisutnost 21 vrste, od kojih je 18 navedeno na IUCN-ovom Crvenom Popisu. Literaturnim nalazima utvrdili smo prisutnost još 13 vrsta, tako da je poznati broj vrsta na području Neretve 34, od čega 11 vrsta vodozemaca i 23 vrste gmazova. Sa ovolikim brojem vrsta, područje rijeke Neretve može se smatrati vrućom točkom bioraznolikosti vodozemaca i gmazova u Hrvatskoj. Donji tok rijeke Neretve je danas pod snažnim antropogenim utjecajem, i veći dio se upotrebljava za plantaže i intenzivnu poljoprivredu. U budućnosti će biti od ključne važnosti očuvati preostala prirodna staništa toga područja.

Ključne riječi: vodozemci, gmazovi, raznolikost, zaštita

INTRODUCTION

The surveys of the amphibians and reptiles fauna of Croatia started more than 200 years ago, and a great number of papers were published since then. With three different macro regions, the Mediterranean, the mountainous and the continental region, the territory of Croatia is characterized by a rich fauna of amphibians and reptiles, and a total of 19 amphibians (Amphibia) and 39 reptiles (Reptilia) species are present in the country (Janev Hutinec *et al.*, 2006). However, the occurrences of some species like *Typhlops vermicularis* Merrem, 1820 and *Blanus strauchi* (Bedriaga, 1884) needs to be confirmed as it is based on a questionable records of only single individuals (Janev-Hutinec *et al.*, 2006). For many other species the number of records is small, and the knowledge of their distribution still incomplete. The most comprehensive amount of data can be found in the Red Book of Amphibians and Reptiles of Croatia (Janev-Hutinec *et al.*, 2006), but it contains only general distribution data, and only for species with accessed status. Also, no comprehensive atlas of amphibians and reptiles for regions or for the whole country exists, so it can be stated that the herpetofauna of Croatia is not sufficiently known. This confirms the large number of faunistic papers published during the last decades (e.g. Tóth *et al.* 2006; Koren *et al.*, 2011; Jelić *et al.* 2012; Jelić & Karaica, 2012), which greatly contributed to the knowledge of the herpetofauna of some areas. However, many areas still lack basic data about herpetofauna or the data is more than 100 years old and unusable for conservation purposes. No systematic surveys of amphibians and reptiles of Neretva River were ever done. Only several extensive papers exist (e.g. Werner, 1897; Bolkay, 1925; 1928; Bressi, 1999) while most other papers only contain one or few records (e.g. Radovanović, 1941; Werner, 1905).

The aim of this study is to give a first overview of the herpetofauna of lower Neretva Valley from the newly collected records, as well to address some conservation issues concerning the area. All literature data of the

amphibians and reptiles historically recorded in this area is also presented, so this work can serve as a concise guide to the amphibians and reptiles in the area.

STUDY AREA

Neretva River, with total length of 213 km, flows through Bosnia and Herzegovina and Croatia. Springs of river Neretva are located 5 km south of Jabučica hill, Zelengora Mountain (Soldo *et al.*, 2010). Climate of the area along Neretva River depends on distance from the sea. Lowland closer to the sea has a Mediterranean climate, middle part continental and upper part climate typical for Dinaridic Alps. Average precipitation is 1224 l/m² (Tab. 1), although during the summer droughts are common.

Neretva River was in the past known for malaria and rich biodiversity of bird and fish fauna. With extensive melioration, which took place 30 years ago, significant portion of area has been transformed from wetland into agricultural land.

Table 1. Climate data for Ploče, which represents the climate conditions in the area along the Neretva River; Meteorological and Hydrological Service 2002-2011.

Tablica 1. Klimatski podatci za Ploče, koja predstavlja klimatske uvijete područja istraživanja uz tok rijeke Neretve; DHMZ 2002-2011.

Month	Average air temperature (°C)	Precipitation (mm)
January	5.8	139.5
February	6.7	111.5
March	10.1	148.7
April	14.3	62.3
May	19.1	65.6
June	23.1	67.0
July	25.5	26.2
August	24.8	61.4
September	20.2	88.2
October	15.4	134.3
November	10.8	155.1
December	7.4	164.6
Σ; x	x=15.4	Σ =1224.5

Despite large-scale destruction and degradation of wetland in the area of Neretva River, especially its delta, still represents a biologically valuable area and is still insufficiently explored (Mužnić, 2007). The lower Neretva Valley, which stretches from Hutovo blato in Bosnia and Herzegovina toward the delta, near Opuzen, Croatia. Two main habitat divisions are recognized in the lower Neretva Valley; the mountains and the lowland areas. The mountains provide a range of habitats from bare upper regions with no vegetation through low scrub to the pinewoods. Original and once widespread natural woodland was Oak (*Quercus pubescens*) while woods on lower slopes consist of Aleppo Pine (*Pinus halepensis*), Cypress (*Cypripinus occidentalis*) and Stone Pine (*Pinus pinea*). The lowlands consist of mixture of marshes and lakes, pastures, riverine scrubs and woodland and estuary. Along Neretva river occurs usual riverine flora such as *Salix* sp. and *Populus* sp.. With a smaller areas of marsh and swamps, scattered along the area water meadows and waterlogged grazing and hayfield are associated (Sage, 1964).

MATERIALS AND METHODS

This field research took place in the southern parts of Neretva River, respectively lower Neretva Valley. Altogether we surveyed 25 sampling sites, of which 21 were located in Croatia and 4 in Bosnia and Herzegovina (Tab. 2, Fig. 1). The sampling was carried in several occasions, in the periods from 11 to 12.5.2007, 14.8.2009, 23.4.2011 to 1.5.2011, 3.7.2012 to 8.7.2012 and from 5.8.2012 to 7.8.2012. We spent altogether 18 days in the field.

The data about amphibians and reptiles of the area was collected in three ways: search for the road kills, active searching of species in favourable habitats and vocal recognition. All caught animals were identified to the species level, and released on the same location they were caught. All the animals were identified using standard field guide (Arnold & Oviden, 2002). The systematic follows Fauna Europaea (2011). To fully summarize all the known data about amphibians and reptiles in the area we checked all available literature. Data for each species were shown on empty map of Croatia and Bosnia and Herzegovina.

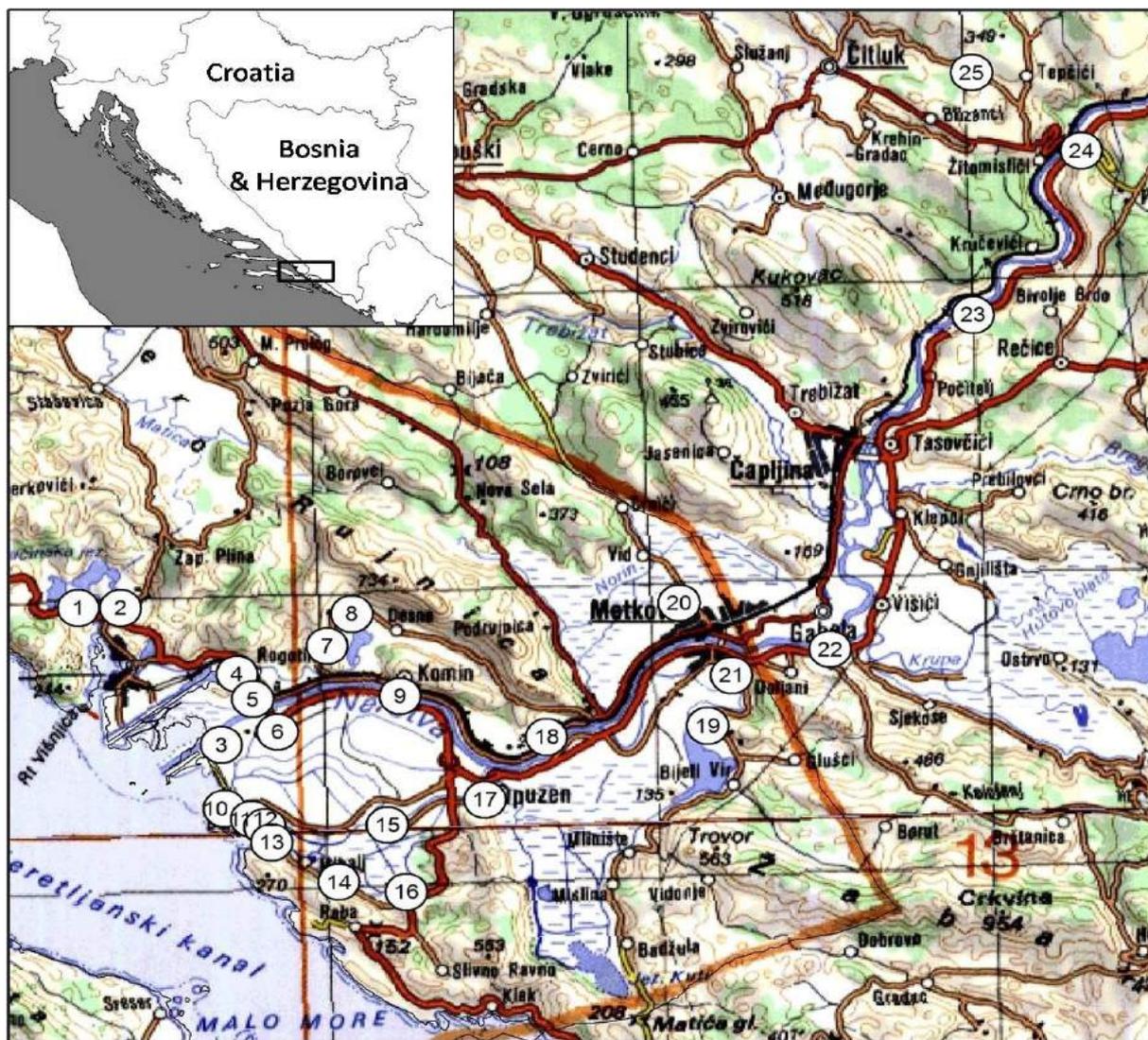


Figure 1. Surveyed localities along Neretva River. Number corresponds to the localities given in Materials and methods section.

Slika 1. Istraživani lokaliteti u okolini rijeke Neretve. Brojevi lokaliteta odgovaraju onima danima u Materijalima i metodama.

Table 2. List of surveyed localities, with the coordinates, altitudes and dates of visits.

Tablica 2. Popis istraživanih lokaliteta sa koordinatama, nadmorskim visinama i datumima obilaska.

	Locality	Country*	N	E	Altitude	Dates of visit
1	Bara	CRO	43,071389	17,419167	13 m	27.4.2011
2	Baćine, Baćinska lakes	CRO	43,071027	17,434690	7 m	27.4.2011, 28.4.2011
3	Dubrovica, 800 m W	CRO	43,028350	17,470133	0 m	7.7.2012
4	Rogotin	CRO	43,049949	17,476647	1 m	26.4.2011
5	Sestrun, Rogotin	CRO	43,042045	17,482153	1 m	28.4.2011
6	Markote, 800 m S	CRO	43,031917	17,490967	0 m	6.7.2012
7	Modro oko	CRO	43,057757	17,510141	9 m	11-12.5.2007, 28-29.9.2008, 28.4.2011
8	Vrijaci, Neretva	CRO	43,067477	17,519668	14 m	28.4.2011
9	Komin, Neretva	CRO	43,041889	17,536362	46 m	25.4.2011
10	Kamp Rio, Blace, Opuzen	CRO	43,008852	17,470401	0 m	14.8.2009, 23-28.4.2011, 8.7.2012
11	Opuzen, Blace	CRO	43,005334	17,480143	18 m	25.4.2011
12	Blace, Neretva	CRO	43,002811	17,485124	68 m	14.8.2009, 23-26.4.2011, 28.4.2011
13	Opuzen, Trn	CRO	42,998244	17,487272	35 m	23.4.2011, 25.4.2011
14	Tuštevac	CRO	42,985437	17,511593	10 m	23.4.2011
15	Vlaka	CRO	43,002513	17,529925	1 m	23.4.2011
16	Opuzen, Lovorje	CRO	42,981972	17,536089	13 m	28.4.2011
17	Opuzen, Podgradina	CRO	43,009527	17,566001	40 m	26.4.2011
18	Krvavac	CRO	43,028243	17,589613	70 m	25.4.2011
19	Dubravica 120 m s	CRO	43,030233	17,648700	20 m	7.7.2012
20	Vid, Metković	CRO	43,06801	17,639897	13 m	11.5.2007, 12.5.2007
21	Metković, Vidonje	CRO	43,045517	17,658150	11 m	30.4.2011, 7.7.2012
22	Metković	B&H	43,052556	17,694661	2 m	29.4.2011
23	Sevaš Njive	B&H	43,153884	17,751865	113 m	27.4.2011
24	Žitomislići	B&H	43,203067	17,793933	49 m	27.4.2011, 7.5.2012
25	Čitluk	B&H	43,227882	17,754494	306 m	29.4.2011

*CRO-Croatia, B&H-Bosna & Hercegovina

RESULTS AND DISCUSSION

In the surveyed literature we found the records of 11 amphibian and 23 reptile species for the area of lower Neretva Valley. The list of all new, as well as literature records is presented here. During this survey we managed to find, observe or catch 139 amphibians and

reptiles. Altogether 21 species were recognized, from which 4 amphibians and 17 reptiles (Tab. 3). This represents 36% of the herpetofauna of Croatia (Janev-Hutinec *et al.*, 2006). All recorded species were recorded in Croatia, but only 5 species were recorded in Bosnia and Herzegovina, due to the small number of field days (4 days) that we spend there.

Table 3. Systematic checklist of recorded species, the list of localities they were recorded and the number of observed road kills.

Tablica 3. Sistematski popis zabilježenih vrsta, popis lokaliteta na kojima su pronađene te broj opaženih prevoženih jedinki.

Species list		Locality*	Number of observed road kills
1.	<i>Bufo bufo</i> (Linnaeus, 1758)	12, 22, 23	2
2.	<i>Hyla arborea</i> (Linnaeus, 1758)	7, 10	/
3.	<i>Rana dalmatina</i> Fitzinger, 1838	2, 7	/
4.	<i>Pelophylaxridibundus</i> Pallas, 1771	5, 7, 10	5
1.	<i>Pseudopus apodus</i> (Pallas, 1775)	2, 5, 6-16, 18, 20, 21, 24	>20
2.	<i>Lacerta trilineata</i> Bedriaga, 1886	2, 5, 7, 11, 12, 13, 16, 17, 21	6
3.	<i>Podarcis melisellensis</i> (Braun, 1877)	2, 3, 5, 6, 10, 11, 12, 13, 16, 21, 22	2
4.	<i>Podarcis muralis</i> (Laurenti, 1768)	13	/
5.	<i>Dalmatolacerta oxycephala</i> Linnaeus, 1758	2, 7, 11, 12	/
6.	<i>Hemidactylus turcicus</i> (Linnaeus, 1758)	10, 12	/
7.	<i>Natrix natrix</i> (Linnaeus, 1758)	4, 5, 7, 10, 11, 20, 21	2
8.	<i>Natrix tessellata</i> (Laurenti, 1768)	2, 7, 10, 12, 13, 20	>20
9.	<i>Zamenis longissimus</i> Laurenti, 1768	2, 7, 20	/
10.	<i>Zamenis situla</i> (Linnaeus, 1758)	2	/
11.	<i>Elaphe quatuorlineata</i> (Lacepede, 1789)	1	/
12.	<i>Hierophis gemonensis</i> (Laurenti, 1768)	2, 7, 8, 11, 12, 21	2
13.	<i>Platycephalus najadum</i> (Eichwald, 1831)	14	1
14.	<i>Malpolon insignitus</i> Hermann, 1804	10, 15, 22	>20
15.	<i>Vipera amodytes</i> (Linnaeus, 1758)	7, 12, 20	/
16.	<i>Testudo hermanni</i> Gmelin, 1789	2, 8, 16, 24	1
17.	<i>Emys orbicularis</i> (Linnaeus, 1758)	12	/

*The locality list corresponds to the ones given in Materials and methods section.

SPECIES ACCOUNT

Lissotriton vulgaris (Linnaeus, 1758)

This species was previously recorded on many sites around Neretva river, including Čapljina (Bolkay, 1925), Čapljina field, Neretva river Valley & Mogorjelo by Čapljina (Bolkay, 1928), Opuzen & Metković (Schmidtler & Schmidtler, 1983), Norinska Kula-Metković (Krizmanić, 1997), Hutovo blato Domanović (Krizmanić, 1997) and Neretva river valley (Dragobratović, 2007) (Fig. 2). This species was not recorded during our survey, which can probably be the result of the lack of systematic surveys of ponds and channels in the area.



Figure 2. Records of *L. vulgaris* in the area of Neretva River. White dots represent literature records.

Slika 2. Nalazi vrste *L. vulgaris* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Salamandra salamandra (Linnaeus, 1758)

This salamander was previously recorded in general area of Neretva Valley (Bolkay, 1928; Dragobratović, 2007) (Fig 3). The area of Neretva is probably not an ideal habitat for this species, which needs small, clean streams for their development. No new records of this species were found, but the best habitat for this species should be the area from Baćinska lakes and the surroundings of Modro Oko. These areas are still rich in different habitat types, including forests. Such habitats have almost completely disappeared from the surroundings of river Neretva itself.

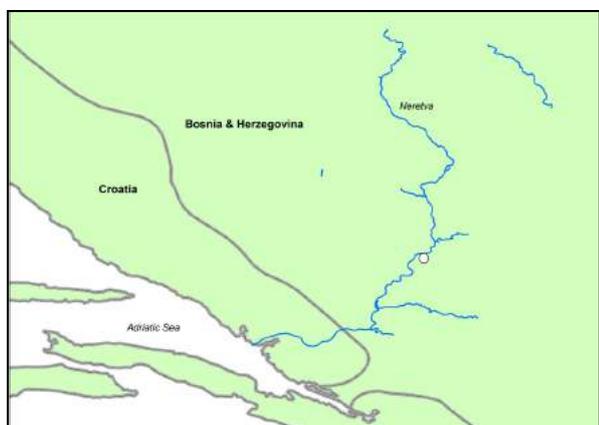


Figure 3. Records of *S. salamandra* in the area of Neretva River. White dots represent literature records.

Slika 3. Nalazi vrste *S. salamandra* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Proteus anguineus Laurenti, 1768

The Olm, *P. anguineus* is common in the area of Neretva River, and it has been recorded in many localities (Fig. 4). Literature records include Neretva Valley (Kolombatović, 1882; Kletečki et al., 1996; Dragobratović, 2008), Gabela, border (Werner, 1899), Neretva, spring (Brusina, 1908; Kletečki et al., 1996), Trebižat (B & H) (Bolkay, 1928, 1929), Momići village, Metković (Gluščević, 1969; Kletečki et al., 1996), Prud, spring of river Norin, Metković (Gluščević, 1969; Kletečki et al., 1996), Vid, Metković (Gluščević, 1969; Kletečki et al., 1996), Lower Neretva Valley (Rađa, 1980), Bijeli Vir (Kletečki et al., 1996), Doljana, Metković (Kletečki et al., 1996), Glušci (Kletečki et al., 1996), Crni vir, polje Jezero, Vrgorac (Tvrković &

Veen, 2006). In our survey we did not target springs, or underground caves, so this species was not recorded.

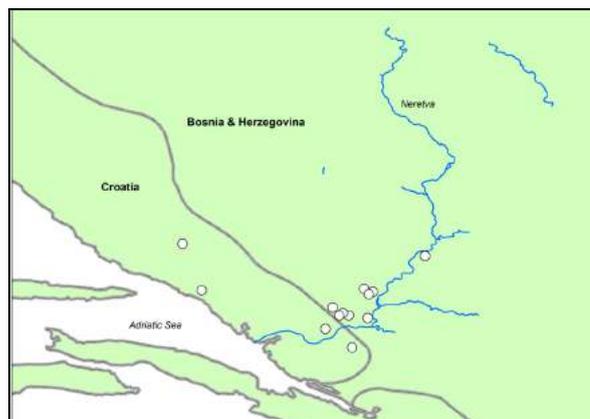


Figure 4. Records of *P. anguineus* in the area of Neretva River. White dots represent literature records.

Slika 4. Nalazi vrste *P. anguineus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Bombina variegata (Linnaeus, 1758)

Only a few records of this species from the area exist (Fig. 5). Bolkay (1928) reports its presence in the area from the river delta toward village Drežnice. Dragobratović (2007) also reports this species for the area, but without any precise locality. This species is in general pretty rare in Dalmatia, so such low number of records is not surprising. We also did not confirm its presence in the area.

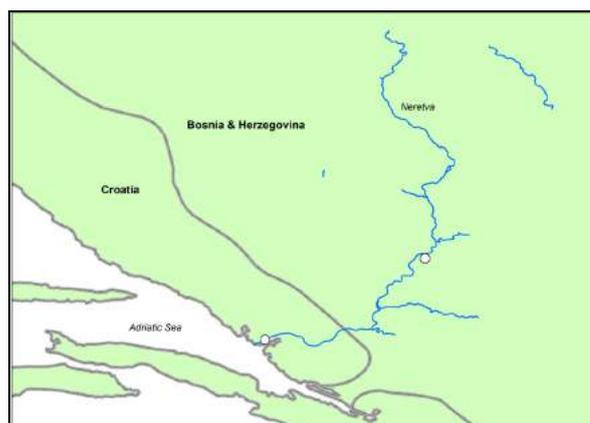


Figure 5. Records of *B. variegata* in the area of Neretva River. White dots represent literature records.

Slika 5. Nalazi vrste *B. variegata* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Bufo bufo (Linnaeus, 1758)

This species was previously been recorded in only two localities around Neretva: from the river delta toward

village Drežnice (Bolkay, 1928) and Neretva in general (Dragobratović, 2007). During our survey we encountered this species in three localities: Blace, Metković and Sevaš Njive.

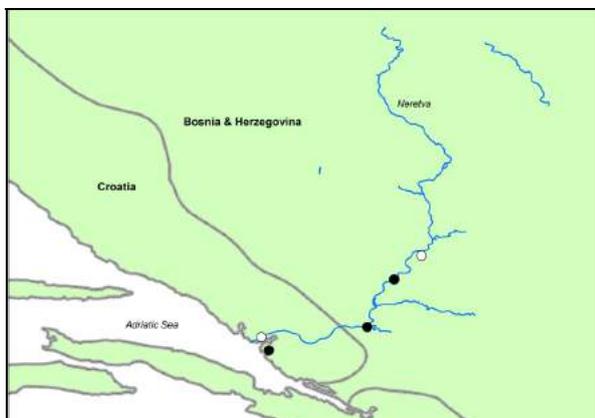


Figure 6. Records of *B. bufo* in the area of Neretva River.

White dots represent literature records, black dots represent new records.

Slika 6. Nalazi vrste *B. bufo* na području rijeke Neretve.

Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Bufo viridis (Laurenti, 1768)

This species is the most common species in the Adriatic islands (Jelić *et al.*, 2012) as well in the Adriatic coast. However, it seems that this species is not so common in the area of river Neretva. Only two literature records exist. Bolkay (1928) reports its presence in the area from the river delta toward village Drežnice. Dragobratović (2007) reports this species for the area (Fig. 7). This species can usually be easily recorded in the Mediterranean area, due to the fact that the adults are usually very active in the night and its vocalization can be easily heard and recognized. However, we did not manage to record it, even after an intensive listening to their vocalization.

Hyla arborea (Linnaeus, 1758)

The reports for this species originates from few localities already mentioned above, from the river delta toward village Drežnice (Bolkay, 1928) and Neretva in general (Dragobratović, 2007) (Fig. 8). We recorded it on two localities, Kamp Rio, Opuzen and around the lake Modro oko. Generally, this species is common in the Mediterranean region, and with *B. viridis*, also one of

rare amphibians present on the islands (Kryštufek & Kletečki, 2007).



Figure 7. Records of *B. viridis* in the area of Neretva River. White dots represent literature records.

Slika 7. Nalazi vrste *B. viridis* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

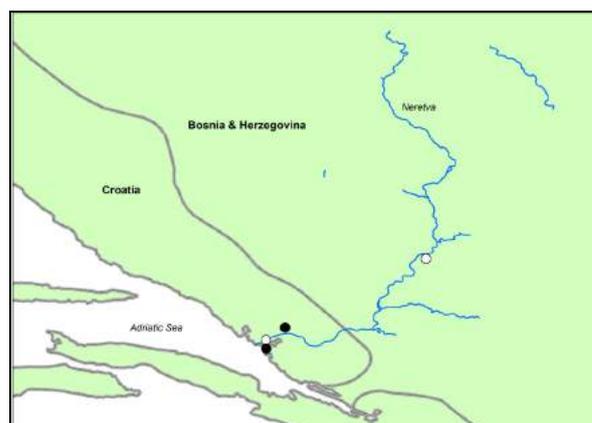


Figure 8. Records of *H. arborea* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 8. Nalazi vrste *H. arborea* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Pelophylax esculentus (Linnaeus, 1758)

Two papers mention this species for the area of Neretva River. Werner (1904) mentions its presence in around Gabela (Fig. 9), while Dragobratović (2007) lists it as a member of amphibians present in the area. However, in the beginning of the 20th century, this kleptospecies was considered to be a subspecies of *P. ridibundus*, so it is possible that Werner (1904) refers to *P. ridibundus* rather than *P. esculentus*. In either case, its presence should be checked in the future.

Pelophylax lessonae (Camerano, 1882)

Only Karaman (1921) mentions this species for Prud, Neretva (Fig. 10). However, this species inhabits only the northern parts of Croatia and Bosnia & Herzegovina, so its presence here is highly doubtful, and the record is probably result of misidentification with *P. ridibundus*.

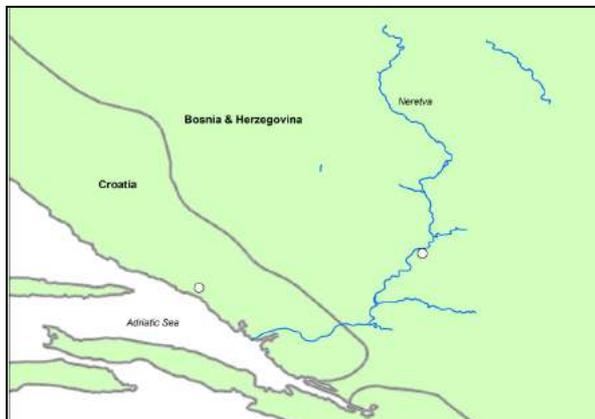


Figure 9. Records of *P. esculentus* in the area of Neretva River. White dots represent literature records.

Slika 9. Nalazi vrste *P. esculentus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Pelophylax ridibundus (Pallas, 1771)

This is the commonest species of green frogs in whole Croatia. It is common also in the area of Neretva River. Literature records include Neretva river valley (Bolkay, 1928; Dragobratović, 2007) and from the river delta toward village Drežnice (Bolkay, 1928). We recorded this species in Blace, Modro oko and Sestrin, Rogotin. However, this species is common in the whole river. Local inhabitants use it as a gastronomic delicacy.



Figure 10. Records of *P. lessonae* in the area of Neretva River. White dots represent literature records.

Slika 10. Nalazi vrste *P. lessonae* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

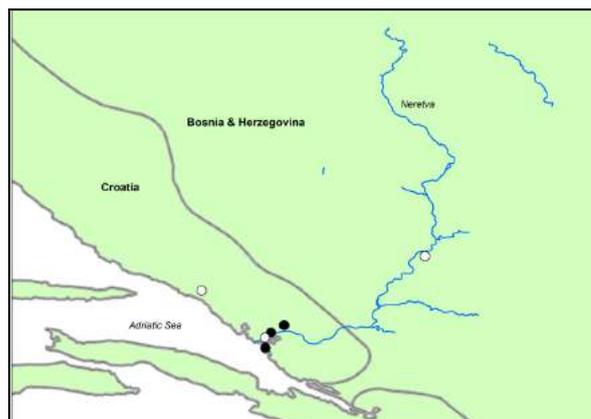


Figure 11. Records of *P. ridibundus* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 11. Nalazi vrste *P. ridibundus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Rana dalmatina Fitzinger in Bonaparte, 1838

Only two records of *R. dalmatina* are known from the Neretva river valley (Bolkay, 1928; Dragobratović, 2007) (Fig. 12). This species predominately inhabits forests and wet grasslands, which are rare in the area. We recorded *R. dalmatina* in two new localities, Baćinska lakes and Modro oko. Only one individual per locality was recorded. This species can be regarded as rare member of Neretva river fauna.

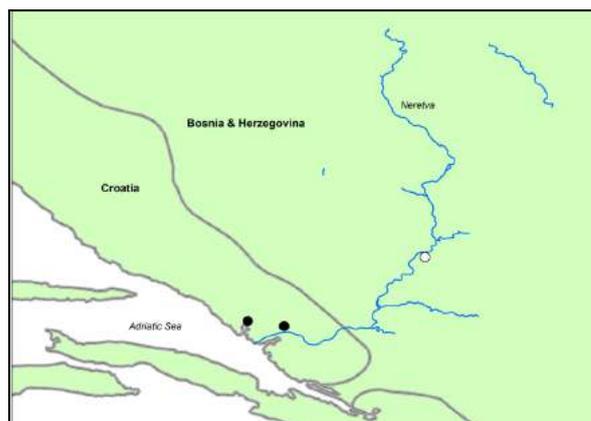


Figure 12. Records of *R. dalmatina* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 12. Nalazi vrste *R. dalmatina* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Caretta caretta (Linnaeus, 1758)

As with next species, this species is a marine animal, which only occasionally enters the brackish waters of the river delta. It was historically recorded in the Neretva river delta (Bolkay, 1924; De Lucaet al., 1990; Lazar & Tvrtković, 2000) and in the brackish waters of the river delta (Lazar & Tvrtković, 2000) (Fig. 13).

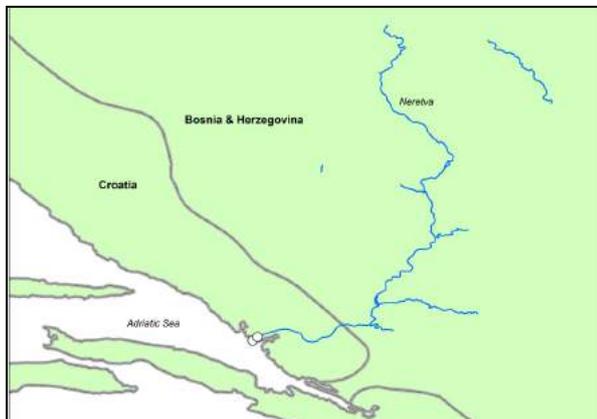


Figure 13. Records of *C. caretta* in the area of Neretva River. White dots represent literature records.

Slika 13. Nalazi vrste *C. caretta* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Chelonia mydas (Linnaeus, 1758)

The only record of this marine turtle originates from, Šolić & Jukić, 1993, who recorded it in Neretva channel (Fig. 14).



Figure 14. Records of *C. mydas* in the area of Neretva River. White dots represent literature records.

Slika 14. Nalazi vrste *C. mydas* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Testudo hermanni (Batsch, 1788)

This species is moderately common on all karstic areas in Dalmatia as well as in lower Neretva valley. Literature records include Neretva river valley (Bolkay, 1928),

from the river delta toward village Drežnice (Bolkay, 1928), Čapljina (Radovanović, 1941) and Ploče (Schweiger, 2002) (Fig. 15). We recorded this species in several localities: Lovorje, Baćinska lakes, Vrijaci, Žitomislići, Dubravica and Blace.

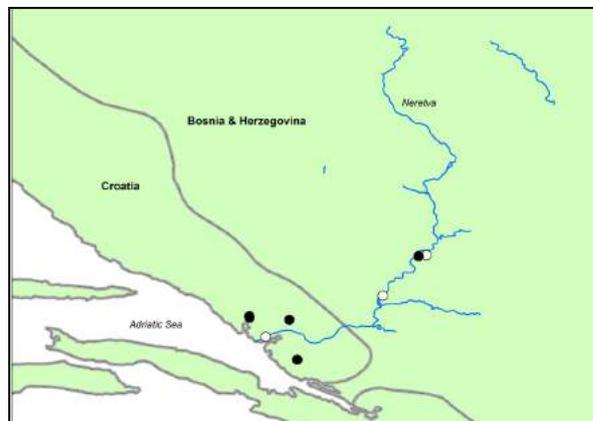


Figure 15. Records of *T. hermanni* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 15. Nalazi vrste *T. hermanni* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Emys orbicularis (Linnaeus, 1758)

Bolkay (1924) was the first who mentions the presence of this species in Metković. After that, it is mentioned in Neretva river valley (Bolkay, 1928; Fritz, 1992), the area from the river delta toward village Drežnice (Bolkay, 1928) (Fig. 16). This freshwater species is probably present in all water channels in the area of Neretva river valley. Our only record originates from a water channel, near Blace. There we found, among dead and discarded fishes, an almost dead male *E. orbicularis*. The fishes and this terrapins were probably discarded as a side catch of hunting pot. After few hours this individual regained conscience and was released in the same locality. Hunting pots are commonly used by local inhabitants to catch eels and other fishes across Neretva river valley. They usually leave the hunting pots in the water for one or few days, and in that period they commonly catch terrapins as a side catch, which are usually die before the hunting pot is checked.

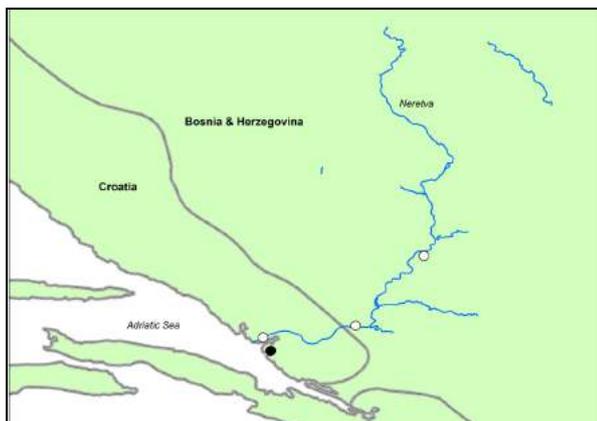


Figure 16. Records of *T. hermanni* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 16. Nalazi vrste *T. hermanni* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Hemidactylus turcicus (Linnaeus, 1758)

This is aside of *Tarentola mauritanica* (Linnaeus, 1758) the only gecko species present in Croatia. The presence of this species in Neretva river delta was first mentioned by Bolkay (1924) in his review of the herpetological collection stored in the Bosnia-Herzegovina museum in Sarajevo. Literature records include Gabela (Bolkay, 1928), Neretva river valley (Bolkay, 1928) and Opuzen (Bressi, 1999). We recorded it on two localities Blace and Kamp Rio (Fig. 17). On both localities it was common.

Dalmatolacerta oxycephala Dumeril & Bibron, 1839

This is one of endemic lizard species that can be found Dalmatia. The literature records include Dračevo by Metković (Werner, 1898; 1899), Neretva river valley (Bolkay, 1928; Fritz, 1992), the area from the river delta toward village Drežnice (Bolkay, 1928), Neretva spring (Radovanović, 1957) and Metković (Pavletić, 1964). We recorded this species in several localities: Blace, Opuzen, Baćinska lakes and Modro oko (Fig. 18). This is a predominately karstic species, which commonly enters cities and villages, and can be easily found on stone walls. In the Neretva river valley is moderately common in karstic habitats.

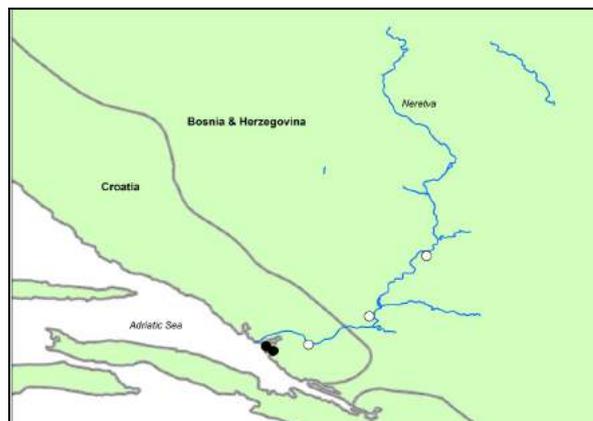


Figure 17. Records of *H. turcicus* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 17. Nalazi vrste *H. turcicus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

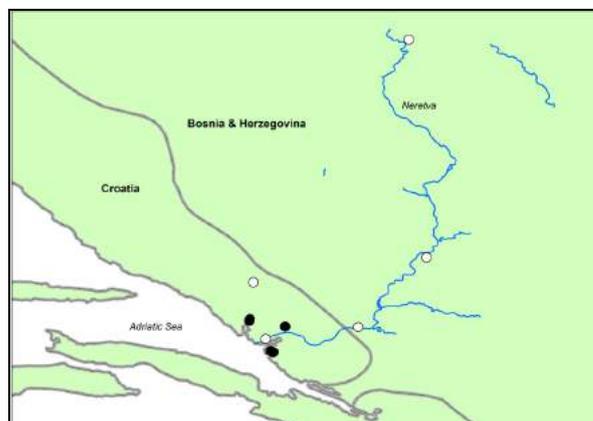


Figure 18. Records of *D. oxycephala* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 18. Nalazi vrste *D. oxycephala* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Lacerta agilis Linnaeus, 1758

This species is common in northern Croatia, while in the southern part it becomes more scarce and localized. In the area of Neretva River it was recorded only at Dračevo by Metković (Werner, 1898, 1899, 1904) (Fig. 19). During our survey we did not record this species. It would be interesting to see if the population of this species still exists at Dračevo, because it was last recorded 100 years ago (Werner, 1904).

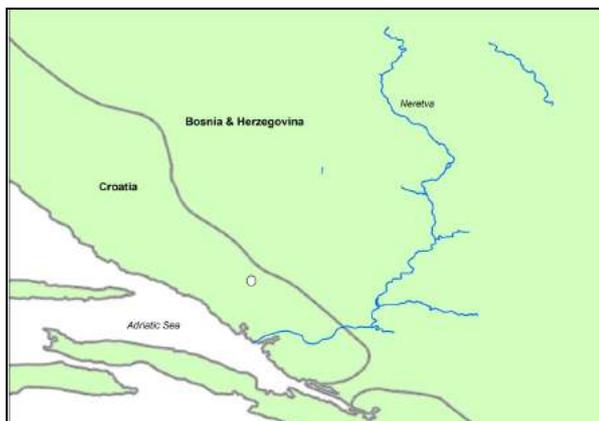


Figure 19. Records of *L. agilis* in the area of Neretva River. White dots represent literature records.

Slika 19. Nalazi vrste *L. agilis* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Lacerta trilineata Bedriaga, 1886

From the three species of green lizards, *L. trilineata* is one of the largest lizard species present in the area. There are 6 literature records of this species: Hum by Metković (Bolkay, 1924), Neretva Valley (Bolkay, 1928; Bressi, 1999), area from the river delta toward village Drežnice (Bolkay, 1928) and Opuzen (Bressi, 1999) (Fig. 20). This species is very common in the area and present almost everywhere. We recorded it on following localities: Blace, Vidonje by Metković, Modro oko, Lovorje, Podgradina, Trn, Baćinska lakes and Sestrun by Rogotin.

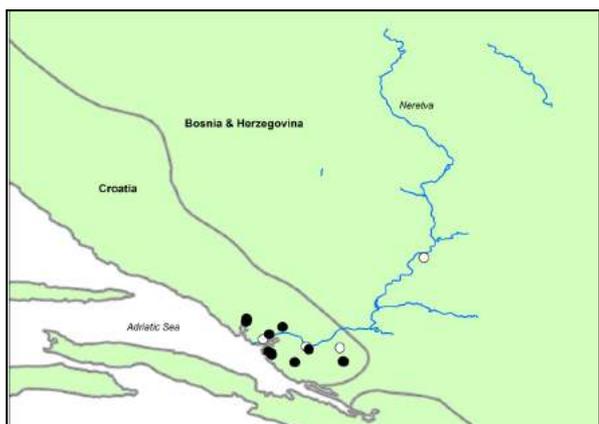


Figure 20. Records of *L. trilineata* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 20. Nalazi vrste *L. trilineata* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Podarcis melisellensis (Braun, 1877)

This is the commonest lizard species in the area, historically recorded on many localities. The first literature record originates from Metković (Werner, 1905). Bolkay (1924) reports it from Karaotok, Hutovo Blato, and later (Bolkay, 1928) from Mogorjelo, near Čapljina, Čapljina, Neretva river valley Čapljina and the area from the river delta toward village Drežnice. Radovanović (1941) also mentions it for Čapljina, and Bressi (1999) from the area of Neretva. We recorded it at Markote, Dubrovica, Kamp Rio near Opuzen, Blace, Vidonje, Lovorje, Trna, Baćinska lakes and Sestrun (Fig. 21).

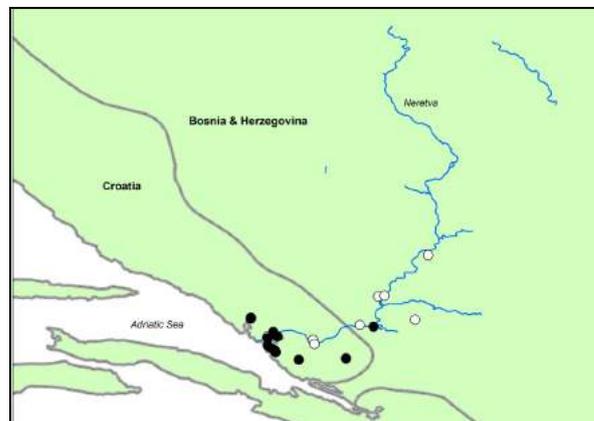


Figure 21. Records of *P. melisellensis* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 21. Nalazi vrste *P. melisellensis* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Podarcis muralis (Laurenti, 1768)

The wall lizard is widespread and moderately common in most parts of Croatia. The literature records include Metković (Werner, 1897), Dračevo by Metković (Werner, 1898; 1899), Čapljina (Boulenger, 1905) and Neretva river valley (Werner, 1905) (Fig. 22). We recorded this species at Trn, near Opuzen. As the last record is more than 100 years old (Werner, 1905) our record confirms that the species is still present in the area.

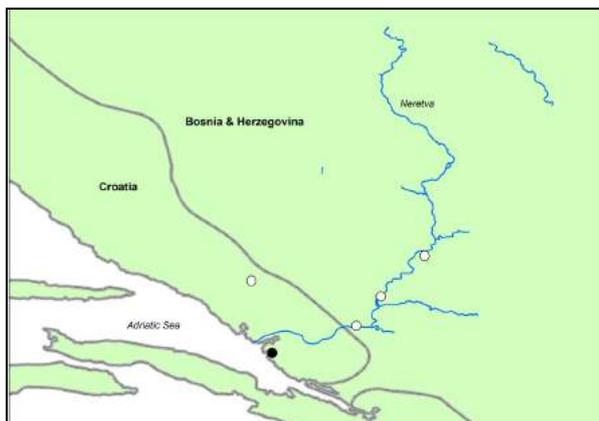


Figure 22. Records of *P. muralis* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 22. Nalazi vrste *P. muralis* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Anguis fragilis Linnaeus, 1758

While very common in northern Croatia, this species is rare in Dalmatia. In the area of Neretva it was recorded from Neretva river valley (Bolkay, 1928; Bressi, 1999), Metković (Džukić, 1972) and Opuzen (Bressi, 1999) (Fig. 23). We spent a lot of time in the field searching for this species, but we did not confirm its presence in the area.

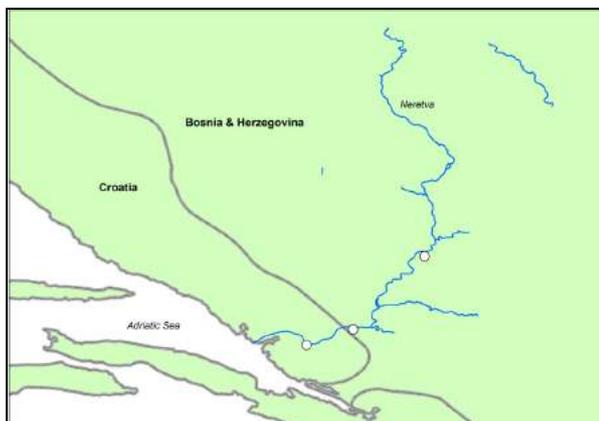


Figure 23. Records of *A. fragilis* in the area of Neretva River. White dots represent literature records.

Slika 23. Nalazi vrste *A. fragilis* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Pseudopus apodus (Pallas, 1775)

The glass lizard is the largest lizard species in Croatia. In the spring time it can be encountered almost everywhere. However, only a small number of literature records exist: from the river delta toward village Drežnice (Bolkay,

1928), Neretva river valley (Bolkay, 1928; Bressi, 1999) and Neretva delta (Werner, 1905). We recorded it on many localities, including Blace, Čitluk, Kamp Rio near Opuzen, Komin, Krvavac, Vidonje, Vid, Modro oko, Lovorje, Trn, Baćinska lakes, Sestrin, Vrijaci, Tuštevac and Žitomislčići (Fig. 24). What was surprising to us was the large number (>20) of juvenile specimens that we recorded in the area. Usually the adult's are very common and juveniles and sub adults very rare. It is common in the whole area.

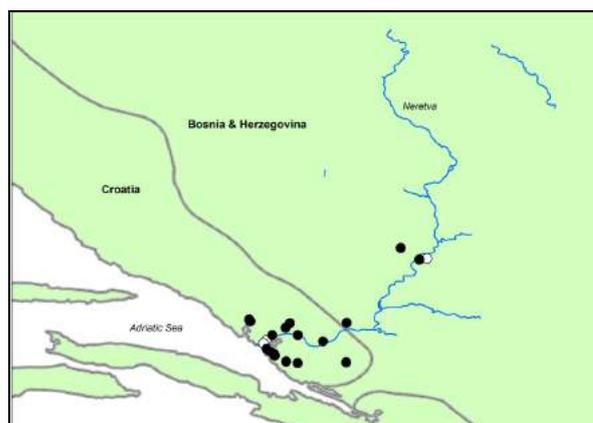


Figure 24. Records of *P. apodus* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 24. Nalazi vrste *P. apodus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Malpolon insignitus (Geoffroy Saint-Hilaire, 1827)

The Montpellier Snake was first time mentioned by Bolkay (1924) for the area of Metković. Later, Bolkay (1928) mentions the records from Neretva river valley, from the delta toward Drežnice. This species is very common in the area, but it is only seldom spotted. The easiest way to record its presence is by surveying the roads for carcasses. We recorded it at Kamp Rio by Opuzen, Metković and Vlaka (Fig. 25). More than 20 specimens were found run over on the roads. All specimens were adults larger than 90 centimetres. And while this species is usually associated with karstic habitats, on Neretva it can be found everywhere.

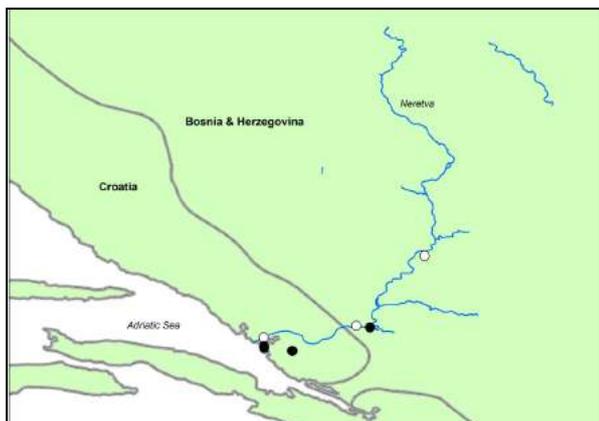


Figure 25. Records of *M. insignitus* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 25. Nalazi vrste *M. insignitus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Natrix natrix (Linnaeus, 1758)

With many water habitats, including rivers, streams and channels, the area of Neretva represents an ideal habitat for water snakes. Literature records include Metković (Bolkay, 1924), Neretva river valley (Bolkay, 1928), in the area from Drežnice village toward river delta (Bolkay, 1928) and Baćinska lakes (Janev-Hutinec & Mebert, 2011). We recorded this species at Kamp Rio by Opuzen, Vidonje, Vid, Modro oko, Blace, Rogotin and Sestrin (Fig. 26).

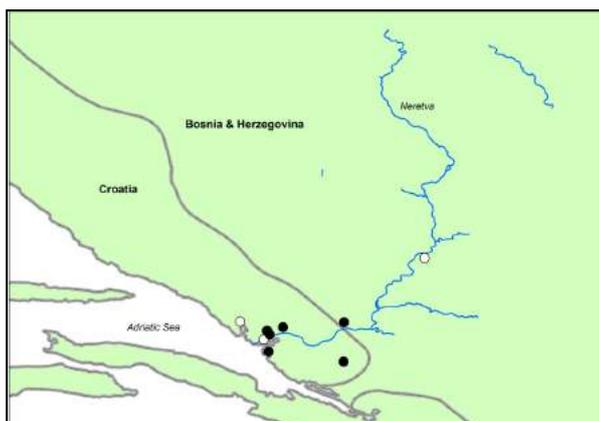


Figure 26. Records of *N. natrix* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 26. Nalazi vrste *N. natrix* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Natrix tessellata (Laurenti, 1768)

As well as *N. natrix* this area is quite suitable for *N. tessellata*. This species was recorded in Neretva river valley (Kolombatović, 1882; Werner, 1897; Bolkay, 1928), in the area from Drežnice village toward river delta (Bolkay, 1928) and Baćinska lakes (Janev-Hutinec & Mebert, 2011) (Fig. 27). During our survey we observed this species on many localities including Vidonje, Kamp Rio by Opuzen, Blace, Modro oko, Baćinska lakes, Trn and Vid. This is the commonest snake in the area, and many specimens (>30) were seen dead on road.

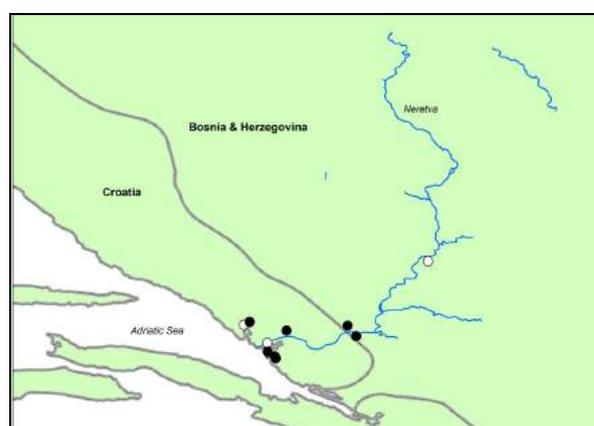


Figure 27. Records of *N. tessellata* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 27. Nalazi vrste *N. tessellata* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Coronella austriaca Laurenti, 1768

This species is very secretive and sometimes it is one of last species recorded in the area (Jelić, 2010; Hill, 2008). Few records exist for the area of Neretva: Dračevo by Metković (Werner, 1898; 1899), Neretva valley (Bolkay, 1928) and in the area from Drežnice village toward river delta (Bolkay, 1928) (Fig. 28). We did not confirm the occurrence of this rare species in the area.

Elaphe quatuorlineata (Bonnaterre, 1790)

This is probably one of the largest, but also timid snakes of Croatia. It inhabits the Mediterranean part of the country, including the Neretva river valley. There are several literature records of this species for the area: Neretva river valley (Werner, 1897; Bolkay, 1928),

Bračevac by Opuzen (Bolkay, 1924), Vid by Metković (Bolkay, 1924) and the area from Drežnice village toward river delta (Bolkay, 1928) (Fig. 29). We searched for this species in many favourable habitats, but were able to record only a single juvenile individual near the village Bara.

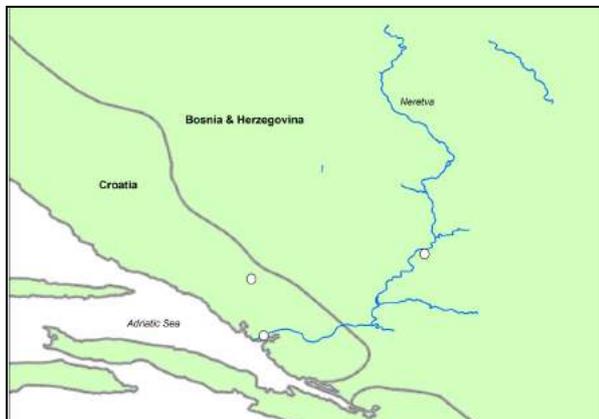


Figure 28. Records of *C. austriaca* in the area of Neretva River. White dots represent literature records.

Slika 28. Nalazi vrste *C. austriaca* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

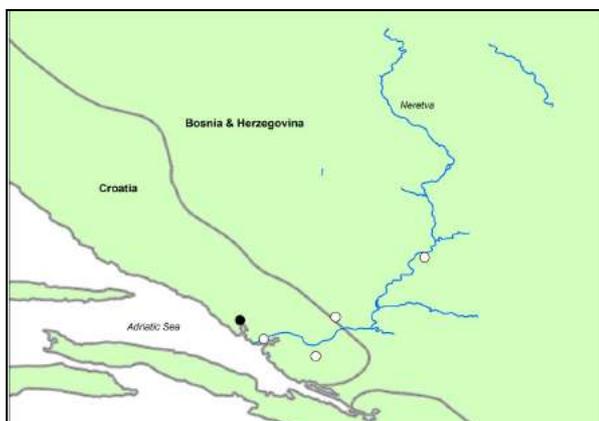


Figure 29. Records of *E. quatuorlineata* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 29. Nalazi vrste *E. quatuorlineata* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Hierophis gemonensis (Laurenti, 1768)

This is probably the commonest snake in whole Dalmatia. Many literature records exist, including Metković (Bolkay, 1924), Vid by Metković (Bolkay, 1924), Neretva river valley (Bolkay, 1928), the area from Drežnice village toward river delta (Bolkay, 1928) and Čapljina (Radovanović, 1941). We encountered many

specimens, in localities Blace, Vidonje, Modro oko, Blace, Baćinska lakes and Vrijaci (Fig. 30). It is common in the area of Neretva.

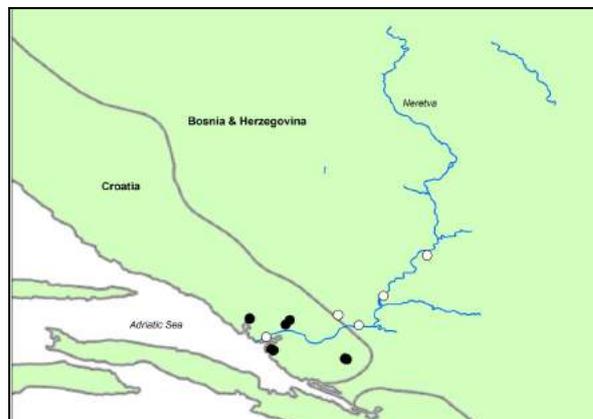


Figure 30. Records of *H. gemonensis* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 30. Nalazi vrste *H. gemonensis* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Platyceps najadum (Eichwald, 1831)

This species is very rarely encountered due to its slender body and great speed. Literature records include Neretva river valley (Werner, 1897; Bolkay, 1928) and the area from Drežnice village toward river delta (Bolkay, 1928). We did not manage to find any live specimens, but did find one run over male at Tuštevaca village (Fig. 31). This species is probably present only on the karstic habitats in the area.

Telescopus fallax (Fleischmann, 1831)

This is the only species of snakes that is predominately active in the evening and during the night. Literature records include Neretva river valley (Bolkay, 1928) and the area from Drežnice village toward river delta (Bolkay, 1928) (Fig. 32). The simplest way to record this species is to drive around by car in the evenings and during the night. In this way we searched almost whole areas, especially the roads from Ploče toward Rogotin and Opuzen, but did not manage to confirm its presence in the area.

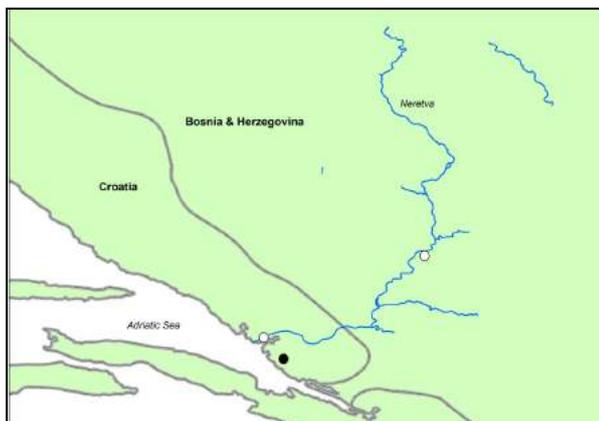


Figure 31. Records of *P. najadum* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 31. Nalazi vrste *P. najadum* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Zamenis longissimus (Laurenti, 1768)

This is one of few snake species that can be commonly found in the forests. Only three literature records exist for this species Neretva river valley (Bolkay, 1928) and the area from Drežnice village toward river delta (Bolkay, 1928). We recorded it on three new localities: Modro oko, Vid, and Baćinska lakes (Fig. 33).



Figure 32. Records of *T. fallax* in the area of Neretva River. White dots represent literature records.

Slika 32. Nalazi vrste *T. fallax* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze.

Zamenis situla (Linnaeus, 1758)

The leopard snake was recorded on two localities: Neretva river valley (Bolkay, 1928) and the area from Drežnice village toward river delta (Bolkay, 1928) (Fig. 34). We recorded this species only on single locality, Baćinska lakes.

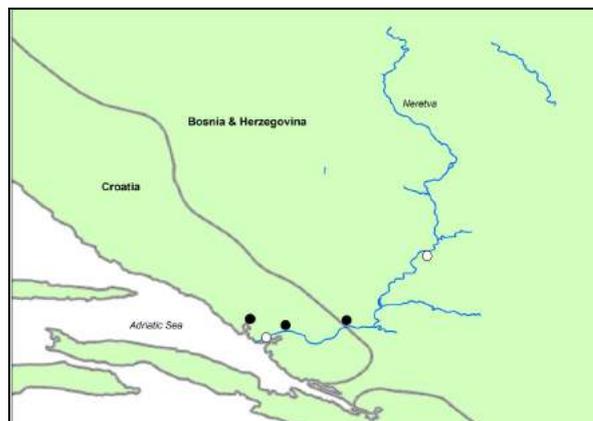


Figure 33. Records of *Z. longissimus* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 33. Nalazi vrste *Z. longissimus* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

Vipera ammodytes (Linnaeus, 1758)

From three poisonous snakes that are present in Croatia, this is the only one present in the area. Literature records include Metković (Werner, 1897; Bolkay, 1924), the area from the river delta toward village Drežnice (Bolkay, 1928), Neretva valley (Bolkay, 1928) and Baračevac Island by Opuzen (Bolkay & Čurčić, 1933). We recorded this species in three localities Vid, Modro oko and Blace. While the horned viper is present in the area, it is not common as in other parts of Dalmatia.

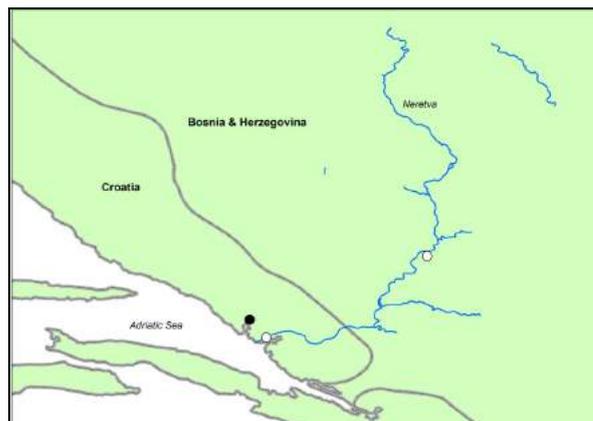


Figure 34. Records of *Z. situla* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 34. Nalazi vrste *Z. situla* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

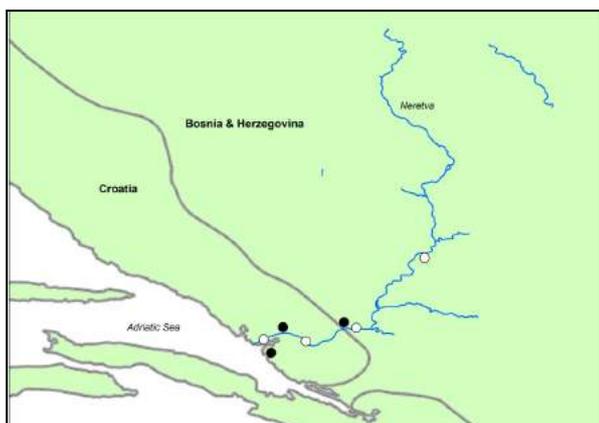


Figure 35. Records of *V. ammodytes* in the area of Neretva River. White dots represent literature records, black dots represent new records.

Slika 35. Nalazi vrste *V. ammodytes* na području rijeke Neretve. Bijele točke predstavljaju literaturne nalaze, crne točke predstavljaju nove nalaze.

DISCUSSION

The data collected during our field trips can be divided in two periods: spring time (April-May) and summer period (July-August). This is very important because the activity especially of reptiles vary greatly in the Mediterranean regions in different seasons. While in the spring, the temperatures are not so high, and the animals are more active, in the summer times the temperatures are very high, and most of the species are not active at all during the day. This can be clearly seen when a comparison between these two periods is done, bearing in mind that the hunting effort was more or less the same over both periods. In the spring time, we managed to record 20 species, while in the summer period only 11 species were recorded. The number of recorded specimens was also very different in both periods (Fig. 36).

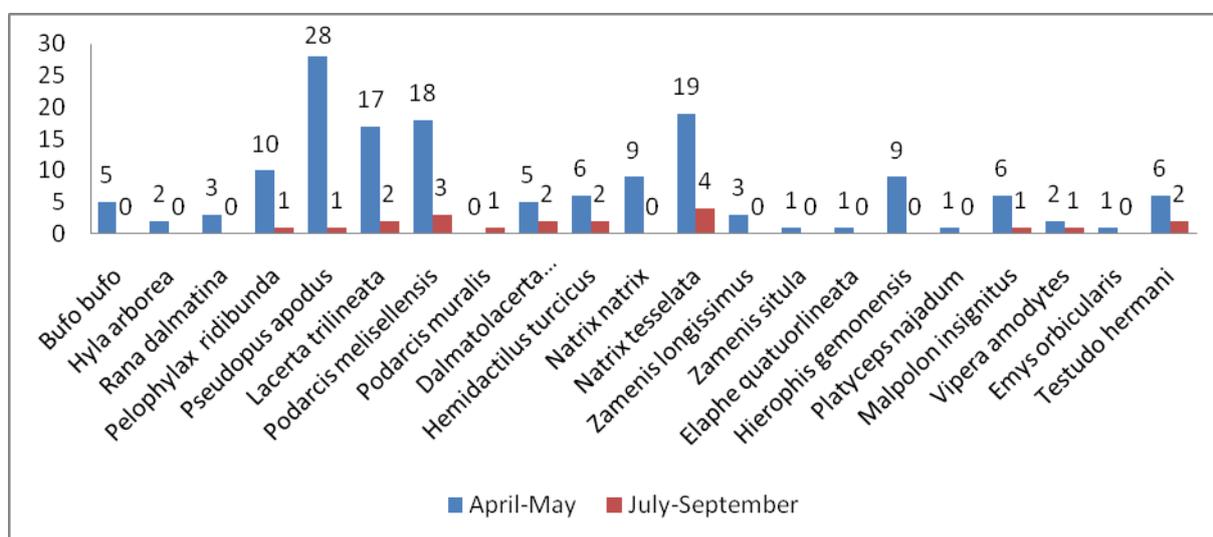


Figure 36. Differences in the spring and summer amphibians and reptiles fauna of Neretva River
Slika 36. Razlike u proljetnoj i ljetnoj fauni vodozemaca i gmazova rijeke Neretve.

From 21 recorded species during this survey, 18 are listed in the IUCN Red list, 4 as Near Threatened and 14 as Least Concern. In the Croatian Red List (Janev-Hutinec et al., 2006) only 6 species are listed of which 4 as Near Threatened and two as Data Deficient. Literature

records add another 13 species to the list. With a total of 34 recorded species, which is 58% of herpetofauna of Croatia.

The lowland area of the Neretva river is characterized by a large amount of water, which includes rivers, streams,

canals, ponds and lakes. This represents ideal habitats for amphibian species. Most literature data about this region is older than 50 years, so it is not suitable for conservation purposes. According to Dragobratović (2007) the amphibian fauna of Neretva river consists of 10 species, but he did not take into consideration the record of *P. lessonae* (Karaman, 1921). Unfortunately, the author only states that the list was compiled from literature data and personal observations, but without any cited literature. During our survey we recorded only 4 species, which is more than insufficient, but this can be explained by the nonsystematic surveys of water bodies. Our survey was generally done in karstic habitats, due to the high anthropogenic impact of the rivers surroundings. Until now no checklist of the reptiles of the area existed, and a total of 34 species shows the high diversity of the area.

CONSERVATION NOTES

While in the past lower Neretva Valley was a place full of biodiversity, nowadays it is under a strong anthropogenic influence. The delta itself, with the surface area of 120 km², is a wetland area protected by the Ramsar Convention. The melioration of this area began long in the past, but the most intensive process which modelled the today's delta was done in the period between the years 1950-1980. Nowadays, most of the area is covered in different kinds of plantations, including apples, peaches and different kinds of citrus. All the landscape is crisscrossed with water channels which local people use to access their plantations. With such an intensive agriculture, a great amount of pesticides is used in the area, which for sure has a great negative impact on the biodiversity, especially on the amphibians. This may also be the reason for such low number of observed species and specimens. Also, a high observed number of road kills, especially snakes (*M. insignitus*, *N. tessellata*) are due to have a significant impact to their populations. Such conditions are far from favourable for both amphibians and reptiles. The situation is much better in the surrounding karstic

habitats (small hills surrounding the river). Such habitats, due to their extremely rocky structure, were in the past used for pasture. The stone walls, which are still visible on the surrounding hills, were in the past used as cattle pens, but nowadays they are mostly abandoned, and left for succession (e.g. the area around Blace, and Rogotin). Nowadays such habitats are also used for agriculture, after they have been transformed, especially using heavy machinery to grind rocks. We did not observe such habitat degradation in the area of Neretva, but in other parts of Dalmatia it is becoming to be more common every day.

CONCLUSIONS

Neretva River represents a unique area, with two habitat types merging into an area of great biodiversity. From 21 species recorded during this survey, 18 are listed in the IUCN Red list, 4 as Near Threatened and 14 as Least Concern. In the Croatian Red List (Janev-Hutinec *et al.*, 2006) only 6 species are listed of which 4 as Near Threatened and two as Data Deficient. With additional 13 species recorded, a total of 34 species are recorded in the area, which represents 58% of herpetofauna of Croatia. With such high number this area is one of the hotspots of the amphibian and reptile diversity in Croatia. In the future it will be of a critical importance to conserve still remaining wetland habitats, such as Baćinska lakes and Modro oko, as well as surrounding karstic habitats.

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Appendix I. Systematic list of amphibians and reptiles in the area of Neretva River, along with their IUCN and Croatian Red List statuses, and the literature citations for each species.
Prilog I. Sistematski popis vodozemaca i gmazova područja rijeke Neretve, zajedno sa njihovim kategorijama prema IUCN-u i Crvenoj knjizi gmazova i vodozemaca Hrvatske te popisom literaturnih navoda za područje Neretve.

Species list		IUCN	Croatia	References
Amphibia				
1.	<i>Lissotriton vulgaris</i> (Linnaeus, 1758)	LC	EN	BOLKAY, 1925, 1928; SCHMIDTLER, 1983; KRIZMANIĆ, 1997; DRAGOBRATOVIĆ, 2007
2.	<i>Salamandra salamandra</i> (Linnaeus, 1758)	LC	/	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007
3.	<i>Proteus anguineus</i> Laurenti, 1768	VU	VU	KOLOMBRATOVIĆ, 1882; KLETEČKI ET AL., 1996; DRAGOBRATOVIĆ, 2007; WERNER, 1899; BRUSINA, 1908; BOLKAY, 1928
4.	<i>Bombina variegata</i> (Linnaeus, 1758)	/	DD	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007
5.	<i>Bufo bufo</i> (Linnaeus, 1758)	LC	/	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007; this survey
6.	<i>Bufo viridis</i> (Laurenti, 1768)	/	/	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007
7.	<i>Hyla arborea</i> (Linnaeus, 1758)	LC	NT	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007; this survey
8.	<i>Pelophylax esculentus</i> (Linnaeus, 1758)	LC	/	WERNER, 1904; DRAGOBRATOVIĆ, 2007
9.	<i>Pelophylax lessonae</i> (Camerano, 1882)	LC	I	KARAMAN, 1921
10.	<i>Pelophylax ridibundus</i> (Pallas, 1771)	/	/	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007; this survey
11.	<i>Rana dalmatina</i> Fitzinger& Bonaparte, 1838	LC	/	BOLKAY, 1928; DRAGOBRATOVIĆ, 2007; this survey
REPTILIA				
1.	<i>Caretta caretta</i> (Linnaeus, 1758)	EN	EN	BOLKAY, 1924; DE LUCA ET AL., 1990; LAZAR & TVRTKOVIĆ, 2000
2.	<i>Chelonia mydas</i> (Linnaeus, 1758)	EN	CR	ŠOLIĆ&JUKIĆ, 1993
3.	<i>Testudo hermanni</i> Gmelin, 1789	NT	NT	BOLKAY, 1928;RADOVANOVIĆ, 1941; SCHWEIGER, 2002; this survey
4.	<i>Emys orbicularis</i> (Linnaeus, 1758)	NT	NT	BOLKAY, 1924, 1928; FRITZ, 1992; this survey
5.	<i>Hemidactylus turcicus</i> (Linnaeus, 1758)	LC	/	BOLKAY, 1924,1928; BRESSI, 1999; this survey
6.	<i>Dalmatolacerta oxycephala</i> Dumeril & Bibron, 1839	NT	/	WERNER, 1898; 1899; BOLKAY, 1928; FRITZ, 1992;RADOVANOVIĆ, 1957; PAVLETIĆ, 1964; this survey
7.	<i>Lacerta agilis</i> Linnaeus, 1758	LC	/	WERNER, 1898, 1899, 1904
8.	<i>Lacerta trilineata</i> Bedriaga, 1886	LC	/	BOLKAY, 1924, 1928; BRESSI, 1999; this survey
9.	<i>Podarcis melisellensis</i> (Braun, 1877)	LC	NT	WERNER, 1905;BOLKAY, 1924, 1928; RADOVANOVIĆ, 1941; BRESSI, 1999; this survey
10.	<i>Podarcis muralis</i> (Laurenti, 1768)	LC	/	WERNER, 1897, 1898, 1899, 1905; BOULENGER, 1905; this survey
11.	<i>Anguis fragilis</i> Linnaeus, 1758	/	/	BOLKAY, 1928; BRESSI, 1999; DŽUKIĆ, 1972;
12.	<i>Pseudopus apodus</i> (Pallas, 1775)	LC	/	BOLKAY, 1928; BRESSI, 1999; WERNER, 1905; this survey
13.	<i>Malpolon insignitus</i> (Geoffroy Saint-Hilaire, 1827)	/	/	BOLKAY,1924, 1928; this survey
14.	<i>Natrix natrix</i> (Linnaeus, 1758)	LC	/	BOLKAY, 1924, 1928; JANEV-HUTINEC &MEBERT, 2011; this survey
15.	<i>Natrix tessellata</i> (Laurenti, 1768)	LC	DD	KOLOMBATOVIĆ, 1882; WERNER, 1897; BOLKAY, 1928; JANEV-HUTINEC &MEBERT, 2011; this survey
16.	<i>Coronella austriaca</i> Laurenti, 1768	/	/	WERNER, 1898; 1899; BOLKAY, 1928
17.	<i>Elaphe quatuorlineata</i> (Bonnaterre, 1790)	NT	/	WERNER, 1897; BOLKAY, 1924, 1928; this survey
18.	<i>Hierophis gemonensis</i> (Laurenti, 1768)	LC	/	BOLKAY, 1924, 1928; RADOVANOVIĆ, 1941; this survey
19.	<i>Platyceps najadum</i> (Eichwald, 1831)	/	/	WERNER, 1897; BOLKAY, 1928; this survey
20.	<i>Telescopus fallax</i> (Fleischmann, 1831)	LC	/	BOLKAY, 1928
21.	<i>Zamenis longissimus</i> (Laurenti, 1768)	LC	/	BOLKAY, 1928; this survey
22.	<i>Zamenis situla</i> (Linnaeus, 1758)	LC	DD	BOLKAY, 1928; this survey
23.	<i>Vipera ammodytes</i> (Linnaeus, 1758)	LC	/	WERNER, 1897; BOLKAY, 1920, 1924, 1928; BOLKAYI & ĆURČIĆ, 1933; this survey