

The Distribution of Astacidae (Decapoda) Fauna in Kosovo and Metohija, Serbia

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Abstract

Extensive regulatory monitoring programs have been conducted in Europe aiming at the protection and risk assessment of crayfish. In this sense, the paper presents data on the distribution of crayfish in Kosovo and Metohija. We analyzed data from the period between 1992-2012. Two of the four species reported for the Republic of Serbia were found in Kosovo and Metohija: *Austropotamobius astacus* and *Astacus torrentium*. A total of 33 sites were investigated that have swept all three sea watersheds: the Adriatic, Aegean and Black Sea. The species *A. astacus* prefers lowland water. The species *A. torrentium* inhabits mountainous ecosystems with water of oligo- to beta- mezosaprobic level of water quality. The site altitude of distribution of the *A. torrentium* species was at over 700m. Lowland parts of the investigated rivers were populated with individuals of *A. astacus*.

Keywords: Crayfish, distribution, Kosovo and Metohija, Serbia.

Introduction

Many studies were carried out on the distribution of the species of the family Astacidae in Europe (Holdich, 2002a) and other parts of the world (Brodsky, 1977; Starobogatov, 1995). Studies of freshwater crayfish have given good results in various explored approaches: commercial (Skurdal & Taugbøl, 2002), economic (Laurent, 1988) and morphological (Holdich, 2002b), evolutionary and phylogenetic (Scholtz, 2002), anatomical (Vogt, 2002), growth and reproduction (Reynolds, 2002), ecological (Nyström, 2002), taxonomic and protection of native species (Taylor, 2002), behavior (Gherardi, 2002), genetic variability (Fetzner & Crandall, 2002), physiological (McMalon, 2002), agents of diseases, parasites and commensals (Evans & Edgerton, 2002), immunological (Söderhal & Söderhal, 2002), as well as on the analysis of DNA (Huber & Shubert, 2004). The European continent is inhabited by five native freshwater crayfish species from the Astacidae family: *Astacus astacus* (Linnaeus, 1758), river or noble crayfish, *Astacus leptodactylus* Eschscholtz 1823, Danube, Turkish or swamp crayfish, *Astacus*

pachypus Rathke 1837, *Austropotamobius pallipes* (Lereboullet 1858) white-leg or coastal crab and *Austropotamobius torrentium* (Schrank, 1803) rocky crayfish or steam crayfish (Holdich et al., 1999). All native species from the genus *Astacus* Pallas 1772 and *Austropotamobius* Skorikow 1908 are listed in the Red List (IUCN, 2010). In European countries, native species are differently distributed. Four native species from the family Astacidae: *A. astacus*, *A. leptodactylus*, *A. torrentium* and *A. pallipes* are characteristic for the area of the Balkans (Obradović, J. 1984; Maguire et al., 2004 Karaman, 1976; Bedjanič, M. 2004; Simic et al., 2008; Rajkovic, 2007; Trožić-Borovac, 2011). In Serbia, the presence of three native species *A. astacus*, *A. leptodactylus*, *A. torrentium* is recorded. The status of the species *A. astacus* and *A. torrentium* according to IUCN criteria (IUCN, 2010), was designated as "Lower Risk / Near Threatened" ("LR / nt"), which is lower than the international level of this species "Vulnerable" (Simić, et al., 2008). Studies of freshwater crayfish fauna in Kosovo and Metohija have so far been rare, and as a part of the environmental watercourses studies (Živić, 1998). This work was undertaken with the aim to show the presence of

the species from the family Astacidae in Kosovo and Metohija and to contribute to the knowledge of their distribution in order to protect them in the Balkans and Europe.

Material and Methods

Data on the distribution of crayfish species in Kosovo and Metohija originated from a number of studies carried out in the period 1992-2012. These researches implicated sites in the aquatic ecosystems of three catchments: the Adriatic, Aegean and the Black Sea. Crayfish were collected using different nets, improvised traps, as well as by hand capture. The numerous sites have been investigated, but only the sites where representatives of freshwater crayfish were found are presented in this work. During the sampling, in order to register the presence of crayfish species, a maximum of six individuals were collected, preferably both sexes of the same species. Other captured individuals were returned into their habitat. Representatives of crayfish species were found at the 33 sites tested. Determination of caught animals was performed according to the keys for the family Astacidae (Bott, 1972; Karaman, 1961, 1963; Holdich et al., 2006; Parvulescu, 2008; Zaikov, 2010). The territory of Kosovo and Metohija covers an area of 10,887 km² and lies between 41°50'58" and 43°15'42" north latitude and 20°01'30" and 21°43'10" east longitude. This area has a relatively poor surface hydrographic network and its lack of water, especially during the summer. The problem of dense human population is reflected in the lack of water for drinking and hygiene needs. Water flows are burdened with wastewater of industrial and urban origin.

Results and Discussion

Distribution of river crayfish fauna has its cause-effect relationships. From their centers of origin, the Ponto-Caspian Basin, the freshwater crayfish population from the family of Astacidae is expanding their distribution area throughout Europe (Karaman, 1962, 1963). In the long process of adjustment many species have become native to certain areas. In recent years, native crayfish species are in a constant struggle for their survival. Violation of the physical and chemical characteristics of the ecosystem, intentional introduction of alien species or the appearance of invasive potential species has impact on reducing the populations of native crayfish species (Gherardi and Holdich, 1999, Taylor, 2002). Knowing the distribution of crayfish species from the family Astacidae contributes to their conservation and survival. Out of the five native crayfish species that live in fresh water in Europe, three are registered in the Republic of Serbia: *A. astacus*, *A. leptodactylus* and *A. torrentium*. Distribution of freshwater crayfish species is poorly researched on the territory of Kosovo and Metohija. A partial view of the river crayfish fauna of this area was encountered in the study of epibionts from the family Branchiobdellidae (Annelida, Oligochaeta) (Karaman, 1967), and Hydrobiological study of the Sitnica River basin (Živić, 1998). During long term research, two crayfish species were recorded: *A. astacus* (Linnaeus, 1758), river or noble crayfish and *A. torrentium* (Schränk, 1803), rocky cancer or steam cancer inhabited watercourses in Kosovo and Metohija. Both species are listed in the Red List (IUCN, 2010) and their habitats in the Habitat Directive. Investigated sites mainly include the entire territory of Kosovo and Metohija. The presence of individuals of these species was recorded at 33 sites. *A. torrentium* was found in 14, while *A. astacus* was found at 19 sites (Tab. 1).

Table 1: Finding locations of crayfish on Kosovo and Metohija

<i>Austropotamobius torrentium</i>					
m	f	Date	Habitat, Site	Altitude (m a.s.l.)	Geographic coordinates
2	2	12.05.2012.	Doljenska River, villege of Srbovac	619	N 42°57'11.54" E 20°51'14.30"
1	2	12.05.2012.	Kotliče River, village of Srbovac	636	N 42°57'42.46" E 20°50'29.40"
	2	11.06.2011.	Jošanička River, Laposavić	501	N 43°04'42.23" E 20°47'04.89"
	3	07.07.2012.	Klina River, village of Gornji Strmac, Zubin Stream	753	N 42°52'19.54" E 20°43'19.10"
1	2	20.11.1996.	Istočka River, village of Donji Istok	452	N 42°46'36.05" E 20°28'45.19"
2	3	20.11.1996.	Pećka Bistrica, Patriarchy of Peć	552	N 42°39'33.94" E 20°16'06.08"
1	2	19.11.1996.	Prizrenska Bistrica, Dušanov Grad	452	N 42°12'23.19" E 20°45'19.17"

2	2	25.05.2011.	Vičanski Stream , village of Viča, Šarplanina	806	N 42°16'05.42" E 21°05'03.20"
6	2	24.07.2013.	Budanački Stream, village of Brezovica, Šarplanina	944	N 42°13'58.16" E 20°59'39.75"
1	1	27.07.2011.	Đuranovska River, village of Brezovica, Šarplanina	977	N 42°13'34.18" E 21°02'26.03"
2	4	27.07.2011.	Bolovanski Stream, village of Brezovica, Šarplanina	1039	N 42°13'01.73" E 21°01'53.82"
1	3	19.11.1996.	Lepenac, village of Jažince	978	N 42°12'36.59" E 20°58'23.17"
1	3	11.06.2011.	Vračanski Stream, village of Vračevo	578	N 43°10'16.34" E 20°39'19.44"
1	1	22.05.2013.	Lab, Stream source on Kopaonik		N 43°06'26.85" E 21°03'20.25"
3		15.08.2011.	Kriva River, Kosovska Kamenica		N 43°34'49.26" E 21°34'02.50"

Astacus astacus

m	f	Date	Habitat, Site	Altitude (m a.s.l.)	Geographic coordinates
1	1	04.06.2011.	Gračaničko Lake, village of Gračanica	670	N 42°37'06.81" E 21°14'09.97"
	4	12.06.2012.	Gračanička River, village of Gračanica	621	N 42°36'44.04" E 21°13'19.38"
2	3	29.08.2012.	Sitnica, Lipljan	574	N 42°30'56.35" E 21°06'35.42"
	3	17.06.1992.	Sitnica, village of Skulanevo	539	N 42°33'28.66" E 21°04'33.59"
	4	15.06.2012.	Sitnica, village of Radevo	537	N 42°34'22.47" E 21°03'25.83"
1	6	17.06.1992.	Sitnica, village of Vragolija	536	N 42°36'29.53" E 21°03'41.73"
1	5	18.07.1996.	Sitnica, village of Vragolija	537	N 42°36'49.00" E 21°03'58.65"
4	1	11.05.1994.	Lab, village of Lužane	526	N 42°44'09.10" E 21°01'52.20"
2	3	28.07.2009.	Lab, village of Prilužje	526	N 42°44'09.10" E 21°01'52.20"
1		28.07.2009.	Sitnica, village of Prilužje	524	N 42°43'38.31" E 21°00'56.47"
	1	20.11.1996.	Drenica, village of Glogovac	572	N 42°37'08.05" E 21°54'06.40"
2	3	10.06.2009	Pečka Bistrica, village of Goraždevac	454	N 42°38'54.41" E 20°22'38.48"
	2	20.11.1996.	Ereniku, Bistražin Bridge	324	N 42°21'35.84" E 20°30'38.14"
1	1	20.11.1996.	Beli Drim, village of Našec	308	N 42°15'13.13" E 20°38'54.09"
3	6	06.06.1997.	Nerodimka, village of Donja Grlica	531	N 42°18'51.16" E 21°12'01.01"
4	11	06.06.1997.	Nerodimka, village of Stari Kačanik	524	N 42°17'43.98" E 21°14'05.30"
3	6	06.06.1997.	Nerodimka, village of Varoš	553	N 42°20'50.91" E 21°10'08.57"
1	2	15.08.2011.	Binačka Morava, village of Rani Lug	435	N 42°29'50.07" E 21°36'03.96"

The conducted study did not have a quantitative approach, so the number of individuals found was not relevant. The history of collection of crayfish species in this area is long-lasting. In the period between 1982-1996, the author and his associates caught dozens of individuals *A. astacus* for lab exercises with students, in the river Nerodimka at the site of Donja Grlica village. Some specimens have weighed up to 300 g, and have been up to 30 cm in length. By inflow of waste water from Uroševac Town in the Nerodimka River, the *A. astacus* population withdrew to the upstream parts of the river. The expansion of *A. torrentium* in hydrogeographic networks of Europe was suppressed by the phylogenetically younger population of species *A. astacus*, inhabiting waters of Eastern Europe and the Balkan Peninsula. Suppressed from the lowlands the *A. torrentium* species retreated into mountain streams and rivers. The adaptive plasticity of *A. torrentium* enabled it to adapt to high mountain river ecosystems. This species was found in the source branches of all three hydrographic basins: the Adriatic, Aegean and the Black Sea. This zonation in the species distribution of the populations of *A. astacus* and *A. torrentium* registered in streams in the region of Kosovo and Metohija which was in accordance with similar habitats in the neighboring countries (Rajkovic, 2007; Parvulescu, 2008; Zaikov, 2010; Trožić-Borovac, 2011). It was found that species *A. torrentium* inhabits mountain streams and small rivers, the source branches of lowland rivers. Water rich in oxygen, moderate to low temperatures and rocky bottom are the characteristics of these habitats. It was found that these watercourses were characterized by an oligo saprobic level of water quality. The site altitude of the distribution of this species was to over 700m. Lowland parts of the investigated rivers were populated with individuals of *A. astacus*. The most important habitat of this species was a hydrographic basin of the Sitnica River, the major river of the Kosovo Valley (Fig. 1).

Based on previous research, the water quality of finding sites of *A. Astacus* was assessed as beta-mezosaprobic (Urošević, 1989; Živić, 1997, 1998). Large expansion of the human population is evident at the investigated area. It is followed by a large urban, industrial and agro-technical change. Therefore, crayfish have reduced and fragmented areals. *A. astacus* native species and *A. torrentium* are listed in the Red List (IUCN, 2010) in Europe while their habitats in the Habitat Directive. Therefore, ecosystems that they inhabit in Kosovo require a special conservation approach and research to ensure their protection and biodiversity conservation, similar to other regions in Europe (Fyrededer et al., 2004).



Figure 1: Hydrographic network of crayfish distribution.

Conclusion

The undertaken research has shown that the water bodies in the territory of Kosovo and Metohija are populated by native populations of the two species of freshwater crayfish – *Astacus astacus* and *Austropotamobius torrentium*. Their presence was confirmed at 33 sites. Individuals of *A. torrentium* inhabit mountain streams and rivers of oligosaprobic water quality. Populations of *A. astacus* occupy lowland parts of the rivers with a beta meszosaprobic level of water quality. Site altitude of the distribution of this *A. torrentium* species was to over 700m. Lowland parts of the investigated rivers were populated with individuals of *A. astacus*.

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