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NEW DISTRIBUTION DATA FOR *Alburnus sava* Bogutskaya, Zupančič, Jelić, Diripasko & Naseka, 2017 AND *Telestes souffia* (Risso, 1827) IN THE WESTERN BALKANS

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ABSTRACT

The distribution data of *Alburnus sava* and *Telestes souffia* has been updated in Croatia in comparison to the previously known data. *Alburnus sava* is much more widespread in the Sava drainage and also occurs in the River Sava near the town of Županja, rivers Drina and Bosna. *Telestes souffia* has a much more restricted range in Croatia than previously believed and is only known from the Bregana, small, right tributary of the River Sava on the Croatian-Slovenian border. Both species are poorly known and threatened.

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INTRODUCTION

The conservation status of freshwater fish is strongly linked to the size of their distribution range and how many independent populations can be distinguished. But still, the distribution of many European freshwater fish is very incompletely known. This problem becomes even more pronounced in species such as *Telestes souffia* (Risso, 1827) and *Alburnus sava* Bogutskaya, Zupančič, Jelić, Diripasko & Naseka, 2017 that live over very large general area (Danube drainage) but prefer very specific microhabitats, have potamodromous behaviour (including vertical movement in water column) and can be considered elusive. In addition, *A. sava* is a species that prefers deep clear water where it patrols in shoals under the surface and easily registers approaching threats (ichthyologists) and retreats into the

depths. This behaviour makes it almost impossible to catch during classical electrofishing.

An update on the distribution of two cyprinid species, both being considered as threatened in Croatia (source), has been presented here.

Balkan shemaya (*Alburnus sava*) is a medium-sized cyprinid fish. The distribution of this species is fragmented in several largely disjunctive areas along the upper and middle Danube drainage (Mrakovčić et al., 2006). Kottelat and Freyhof (2007) report *A. sava* (as *A. sarmaticus*) to be almost extirpated in the Danube and its tributaries and to survive in few localities in the River Kupa (Kolpa) in the upper Sava drainage (Croatia and Slovenia). Bogutskaya et al. (2017) describe the population from the upper Sava (Danube drainage) as a separate species (*A. sava*), but only individuals from the River Kupa (Croatia and Slovenia) were

available for examination. Other Danube populations are assumed to belong to the same species. In Croatia, *A. sava* (as *A. sarmaticus*) is assessed as Vulnerable (VU), following the IUCN criteria by Mrakovčić et al. (2006). Though, distribution data for this species is insufficient, especially in Croatia where *A. sava* is a rare species, and it has not been mentioned in the previous research of the Sava drainage in Croatia by Habeković et al. (1997) and Simonović et al. (2015). Additional data on the actual state of populations and their distribution is needed for its vulnerability and actual conservation status. Our work on distribution of Balkan shemaya in Croatia and parts of our neighbouring countries (Slovenia, Bosnia and Serbia) has been presented here. This paper was based on field research where live specimens were caught, as well as literature and web research. With the help from local fishermen from all over Croatia, Bosnia and Serbia, we tried to determine present distribution and possible localities where Balkan shemaya can be found, but was previously unknown. These new data can show us new insight on the distribution of this endangered species, which can be used for further protection of Balkan shemaya, as well as areas where it is distributed. *Alburnus sava* has still not been globally assessed by IUCN Red List, but as part of *A. sarmaticus* it was listed globally as LC (Least Concern) (Freyhof and Brooks, 2011).

In Croatia, western vairone *Telestes souffia* inhabits rivers of the Danube drainage, especially their upper water courses and smaller tributaries. It has been found in the River Sava (Habeković et al., 1997) and some of its tributaries, especially in Slovenia (River Ljubljanica, River Savinja, River Krka, River Sutla) (Simonović et al., 2015), as well as in the River Kupa, River Mura (Mora) and River Drava (Mrakovčić et al., 2006). Dubut et al. (2012) found *T. souffia* usually to occur in ~5 m wide rivers, ~10 km downstream of the source. The species is rare or absent in large rivers and its dispersal abilities are believed to be limited (give source). *Telestes souffia* is considered to be adapted to relatively small rivers and cold waters (Dubut et al., 2012). Corrections to the distribution of western vairone in Croatia have been presented here.

MATERIALS AND METHODS

Extensive field mapping was done between 2010 and 2015 on the River Kupa and the majority of continental Croatian rivers in order to find these two elusive fish species. Localities were selected based on ecological preference of these species, relative distance from the known habitats and by following the observations of local fishermen. Research was also conducted using existing literature and available databases in Croatia and adjacent countries, as well as information that was collected from local fishermen

(data on when and where live specimens of Balkan shemaya were caught, photographs, measurements, etc.). Additional data was collected from „grey literature“, using several fishing web blogs and forums, and personal contact with fishermen from Croatia, Bosnia and Herzegovina, Serbia and Slovenia. We searched for fish that were determined as *A. alburnus*, but with a total length (TL) over ≈160 mm which implied it could be Balkan shemaya and authors were asked to provide photographs for identification. Also we looked for fish that were determined by the fishermen as „*pegunica*“, „*pegunca*“, „*bucovčić*“ (Serbia), „*beovica*“ (Srebia, Bosnia and Herzegovina), „*pliska*“ or „*velika pliska*“ (Croatia) – all local names for Balkan shemaya. Only records supported by photographs of caught specimen were taken into account. More extensive field research on western vairone was conducted between 2013 and 2015. Sampling sites included the River Sava and its right tributary – the River Bregana, as this area is the only designated Natura 2000 site for western vairone in Croatia (HR201506 „Sava uzvodno od Zagreba“). Additional samplings were done on the River Dobra, River Kupa, River Korana and River Mrežnica to cover all possible distribution sites of western vairone in Croatia. Standard fishing equipment was used, according to the size and depth of a specific water body. SAMUS 725MP backpack device for electrofishing was used for fish sampling. It produces pulse direct electric current with 650 W maximum power (1000 V, 10-20 A). All fish specimens were identified (Vuković and Ivanović, 1971; Povž and Sket, 1990; Maitland, 2000; Kottelat and Freyhof, 2007), measured and released at the same spot. Microsoft Excel (Microsoft Office 2010) was used for numeric data analysis and tables. ArcGIS v10.2 (Environmental Systems Research Institute 2009) was used for geographical analysis and production of distribution maps.

RESULTS

New data shows, alongside the data derived from past works (Table 1 A and B), several localities where Balkan shemaya is present, but previously were unknown (Table 1 C, D, E, F and G).



Fig 1. Balkan shemaya from Ozalj, River Kupa, 218 mm SL (photo by Alexander Naseka)

Our data shows very narrow distribution of western vairone in Croatia (Fig. 2). Riffle dace is present only in the River Bregana, small, right tributary of the River Sava on the Croatian-Slovenian border (Table 2). This species was the focus of our research for the last six years in Croatia and more than 400 localities throughout the country have been checked but no other population has been found. These localities all belong to riverine habitats that should generally

be suitable for western vairone and they were mapped selectively looking for cold-water species like *Cottus gobio* Linnaeus, 1758 and *Phoxinus phoxinus* (published in Jelić, 2011 and Vucić et al., pers. comm.). During this research, several specimens of riffle dace were also caught in the River Sava, near the confluence of the River Bregana (Table 2). In the River Kupa, River Korana and River Mrežnica, no specimens of western vairone were caught.

Table 1. Localities where Balkan shemaya specimens were caught

	Locality	° E	° N	n	Date	Method
A	Kupa, Ozalj	15.47842	45.61415	1	06.2012.	fishermen
B	Kupa, Kamanje	15.41548	45.64826	3	01.07.2012.	electrofishing
C	Sava, Slavonski Brod - 1	18.00964	45.15194	1	07.2012.	fishermen
D	Sava, Slavonski Brod - 2	18.04249	45.13848	1	17.10.2011.	fishermen
E	Sava, Županja	18.68609	45.08402	many	27.05.2010.	fishermen
F	Drina, Zvornik	19.10689	44.38878	many	12.06.2012.	fishermen
G	Bosna, Zenica	17.91630	44.21109	many	14.09.2012.	fishermen

Table 2. Localities where western vairone specimens were caught

	Locality	° E	° N	n	Date	Method
A	Bregana 1	15.68695	45.84253	many	2014.-2016.	electrofishing
B	Bregana 2	15.65995	45.83578	many	2014.-2016.	electrofishing
C	Confluence Bregana into Sava	15.71139	45.84261	many	05.05.2015. 18.06.2016. 27.09.2016.	electrofishing
D	Bregana 7	15.68048	45.84252	many	2014.-2016.	electrofishing
E	Bregana 8	15.70676	45.8436	many	2014.-2016.	electrofishing
F	Bregana 9	15.70036	45.84556	many	2014.-2016.	electrofishing
G	Bregana 11	15.70549	45.84502	many	2014.-2016.	electrofishing
H	Bregana 13	15.68015	45.84249	many	2014.-2016.	electrofishing
I	Sava, Samoborski otok	15.72519	45.84183	many	18.06.2016. 27.09.2016.	electrofishing
J	Sava, 100 meters upstream from Bregana confluence	15.71149	45.84211	many	18.06.2016.	electrofishing

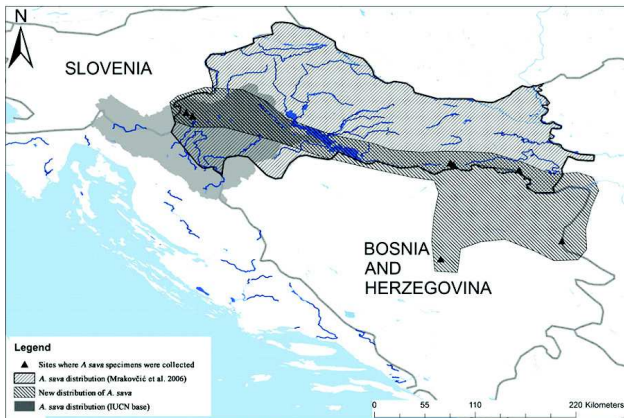


Fig 2. The distribution map of Balkan shemaya

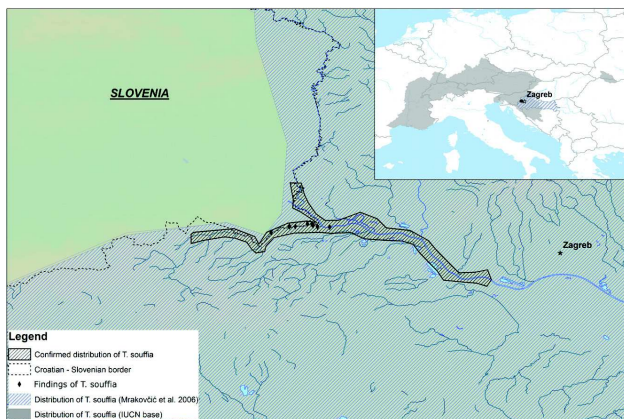


Fig 3. The distribution of western vairone

DISCUSSION

Copy-paste of old or unreliable data or lack of systematic and taxonomically precise mapping can become a problem when presenting rare species distribution range data. Both species in this paper (Balkan shemaya and western vairone) had previously been presented with a wrong distribution range. Based on literature data, distribution range of western vairone is wide, covering parts of western (France) and central Europe (Germany, Austria, Slovenia, Croatia) (Kottelat and Freyhof, 2007). Habitat of western vairone has been narrowed here to less than 10% of its previously suggested distribution in Croatia (Mrakovčić et al., 2006), from the Danube drainage system in Croatia to only several localities in the small River Bregana and a small section of the River Sava. Our recent studies (2016-2017) indicate that this species is present in the Sava River downstream from Bregana, especially after large flood events. Areas downstream from Zagreb were not surveyed but we

suppose there is a long drift zone (Fig. 3). Individuals drifting from the Bregana into the Sava are trying to get back into smaller tributaries and can be expected in the estuary of the River Sutla, as the habitat there seems favourable. Local fishermen in the River Sutla region confirmed they catch this species, but it was not recorded during our research. The overview of historical scientific and grey literature only provided further general data that this species is present in the “rivers of the Danube Basin”, especially in the River Sava drainage (Habeković et al., 1997; Simonović et al., 2015). Habeković et al. (1997) found only 6 specimens in the River Sava. Most were caught in the confluence of the Gradna Stream into the River Sava, 5 kilometres downstream from the confluence of the River Bregana into the River Sava. The results are scarce but indicate that this species used to be more widespread, at least in the Sava River drainage. Available data from Slovenia also indicates a decline in the number of populations and general population size (Povž, 1996; Marijan Govedič, pers. commun., 2016). This supports our result and thesis that western vairone can be only found in the River Bregana and a small part of the River Sava near the confluence of the River Bregana. Simonović et al., 2015 also mentioned western vairone in the River Kupa, but it has not been found in this research. Huge overestimation of the range of this species in Mrakovčić et al. (2006) also had long-term consequences on conservation activities and legislation as National Red Books are used as the main source of data for endangered species and habitats. This problem was also addressed during the establishment of Natura 2000 ecological network when Croatia had to justify why, from the whole distribution presented in Mrakovčić et al. (2006), only the River Bregana was declared as a site where western vairone is a target species for conservation. In the current context of global climate change, Dubut et al. (2012) suggest a potential risk of population decline for western vairone in the near future, which can lead to additional degradation to already fragile Croatian population. Known common threats are water contamination and watercourse regulation, which caused populations to decline. Because it is a very sensitive species which prefers clean, flowing waters, any kind of contamination or temperature increase has a major impact on western vairone populations (Mrakovčić et al., 2006).

In contrast, distribution of *A. sava* is much larger than previously believed. Our data expanded its range from few localities in the River Kupa (Kottelat and Freyhof, 2007) to possibly the whole Sava River drainage. Rheophile species, species that inhabit large rivers, elusive and cryptic (such as *A. sava*) are often hard to find and recognize (Thompson, 2006). It is suspected that in the upper Danube drainage, *A. sava* has a very specific

ecology that makes it very hard to catch with conventional ichthyological methods (like gill nets and electrofishing). These methods are not so effective in deep and very clear, fast flowing waters, whereas sport fly-fishing is. This is supported by the data collected from fly-fishers on rivers Kupa, Bosna and Drina where this fish is caught regularly. Naturally, identification of the species is a second challenge as it holds strong resemblance to *A. alburnus*, especially in juvenile and sub-adult individuals. During our study on the River Kupa we found these two species living in sympatry and this was also confirmed to us by fishermen for all other localities presented here. The ratio of *A. alburnus* and *A. sava* in the Kupa exceeded 500:1. Both problems (hard to catch and hard to identify) are probably reasons why *A. sava* is not found and mentioned in previous relevant publications (Habeković et al., 1997; Simonović et al., 2015).

With this publication we demonstrate that it is important to continue to publish updated species distribution data and to regularly update commonly used sources (like atlases, National Red Books, etc.). Correct and up-to-date distribution data is very important in a local and global perspective. Its deficiency can lead to wrong conclusions and decisions, mainly in the field of conservation and species management.

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Sažetak

NOVI DISTRIBUCIJSKI PODACI ZA VRSTE *Alburnus sava* Bogutskaya, Zupančić, Jelić, Diripasko & Naseka, 2017 I *Telestes souffia* (Risso, 1827) U ZAPADNOM BALKANU

Ažurirane su distribucije *Alburnus sava* i *Telestes souffia* za područje Hrvatske u odnosu na prethodno poznate podatke. *A. sava* je mnogo rašireniji u slijevu rijeke Save nego se to prije mislilo i također se javlja u rijeci Savi kod Županje, rijekama Drini i Bosni. Rasprostanjenost *T. souffia* u Hrvatskoj je znatno ograničenija nego što se ranije mislilo, a rasprostanjena je samo u potoku Bregani, desnom pritoku rijeke Save na granici između Hrvatske i Slovenije. Obje vrste su slabo poznate i ugrožene.

Ključne riječi: *Alburnus sava*, *Telestes souffia*, distribucijski podaci, velika pliska, zapadni Balkan, blistavac

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