



# International Rufford Small Grants Conference

27th – 28th September, 2018  
Silver Lake, Serbia  
Abstract Book



# Explore and protect the natural beauty of Balkans

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Conference

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**Banja Luka, 2018.**

26.09.2018.	ARRIVAL DAY
12:00-19:00	Participants arrival, check in, registration
19:00	Welcome dinner
27.09.2018.	DAY 1
07:00-09:00	Breakfast
09:00-09:15	Opening conference speech
09:15-10:00	Motivation speak: Nedim Kemer, PhD
10:00-11:45	Oral presentations I
11:45-12:45	Coffee break & Poster presentations I
12:45-13:45	Oral presentations II
14:00-15:00	Lunch break
15:30- 21:00	Conference field trip: Lepenski Vir; Visitor center Donji Milanovac, NP Đerdap
21:00	Light dinner and free time
28.09.2018.	DAY 2
07:00-09:00	Breakfast
09:00-10:45	Oral presentations III
10:45-12:00	Coffee break & Poster presentations II
12:00-12:35	Oral presentations IV
12:35-13:15	Plenary lecture: Slavica Vaselek, PhD
13:15-14:00	Lunch break
14:00-15:30	Red List Workshop: Miloš Popović, PhD, Dimitrije Radišić, Msc
16:00-21:00	Conference boat trip with dinner and closing ceremony
29.09.2018.	DEPARTURE DAY
09:00-11:00	Check out and travel home



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## Welcome to the Rufford conference in Serbia



Welcome to our 38<sup>th</sup> Rufford Small Grants conference.

In the 7 years since we started the conference programme we have seen in excess of 1500 recipients in attendance around the developing world. These have proved invaluable opportunities for networking, sharing ideas, discussing results and finding ways forward in Nature Conservation. We hope they are also fun and provide a solid forum to make new, like-minded friends.

The aims for the next few days are to share your projects, talk about your results, your achievements, difficulties and concerns and hopefully find solutions together.

We, at The Rufford Foundation hope you will find this is a wonderful opportunity and leave feeling enriched.

Josh

**Josh Cole**, the Rufford Small Grants Director



September, 2018

On the behalf of the organizing committee, it is our honor to welcome all participants and guests to the international Rufford Small Grants Conference entitled “Explore and protect the natural beauty of Balkans” at Silver Lake, Serbia. This is the 3<sup>rd</sup> Balkan Rufford Small Grant Conference connecting five neighbor countries: Serbia, Bosnia and Herzegovina, Montenegro, Kosovo and Republic of Macedonia.

Conference provides an ideal scientific platform for researchers to present the latest research findings, to share their experience, ideas and knowledge and to establish new connections and collaborations.

This conference has a great aim to continue connecting all RSG project winners and all nature conservationists, to improve networking and to emphasize the importance of collaboration in scientific world and nature conservation in the Balkans. We are aware that past two conferences had a great impact on all its participants and with this event we hope to enhance already established network of young and successful scientists.

With all your lectures, our guest speakers and through round table we hope our goal of network growing and great collaborations will be established, with the same goal of nature protection.

We wish you all the best in your careers. Welcome and enjoy your stay at Silver Lake!

RSG Serbia Conference Team

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13:20 - 13:30	JACIMOVIĆ, M. Can we use invasive alien fish species as a resource?
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<b>12:25 - 12:35</b>	STANKOVIĆ, J. Effects of fish farming on water quality in mountain springs and community structure of aquatic biota
<b>12:35 - 13:00</b>	Plenary lecture: VASELEK, S., PhD, Insect-parasite relation and their impact on wildlife
13:15-14:00	Lunch break
<b>14:00-15:30</b>	Red List Workshop: POPOVIĆ, M., PhD, RADIŠIĆ, D., Msc, A quick overview of the Red List assessment process
16:00-21:00	Conference boat trip with dinner and closing ceremony

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## Plenary lectures



Hermann's Tortoise (*Testudo hermanni*) is globally listed as Near Threatened species, occurring in southern parts of Europe. It has received several Rufford grants through the Balkans making it one of the most popular animals in here.



Golem Grad Island, Prespa Lake, Republic of Macedonia

# Social barriers to a fish conservation project in Turkey

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Conserving critical habitats and maintaining traditional harmony between humans and wildlife in working landscapes of less developed regions is an ongoing challenge. Deeply embedded customs and strict belief systems of traditional societies often constitute serious barriers for conservation efforts. And when such efforts attempt to introduce innovative instruments or suggest new methods of practice the resistance is even greater. A habitat conservation project was developed and introduced in a sensitive aquatic habitat of a typical Mediterranean working landscape in the Köprülü Kanyon National Park in South Turkey. The essence of the project was to collaborate with locals to irrigate responsibly by preventing fish par from swimming into dead-end irrigation channels during their reproduction cycle. The project consisted of two dimensions: one being physical - implementation of an innovative fish filtering device to prevent fish par from swimming into the agricultural trenches, and the second a social dimension - collaborating with the local people who acquire irrigation water from the aquatic habitat. The project was successfully implemented and operated for a couple of years in its physical dimension. Although the social dimension seemed to be satisfactory at the initiation of the project it eventually failed due to the eminent sociocultural barriers of a closed society. The project lost its local support and failed entirely due to: a) the strict Islamic life style that prevented the project from involving the women of the village; b) locals were worry because of earlier top down management issues between the National Park; c) they had lost their trust in outsiders in general since they did not believe anyone would do anything for them for free. This project is a good case to demonstrate that bio-physical solutions are in vain without strong support of social and cultural foundation. Although the project is being further developed on its physical aspects' the next phase is heavily concentrated on collaborating with the local communities first.

**Key words:** *fish filter, local participation, habitat conservation*



## Insect-parasite relation and their impact on wildlife

VASELEK, S.<sup>1,2</sup>

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Insects are the most diverse group of animals, they include more than a million described species which represent a half of all known living organisms. Many insects are beneficial to the environment and to humans (pollinators, decomposers, etc.) and their role in ecosystem is essential. In certain cultures some insects, such as cicades, present protein rich meals, while others insects are considered as dangerous pests (mosquitoes, sand flies, etc.). Insect, as well as all other living organisms, have their own parasites. These insect-parasite relation may be very complex and highly specific. Impact of the parasite on the insect host can greatly affect insects behavior, ability to reproduce, development and survival rate. These specific kind of relations between insect and parasites are of great importance, especially among the blood feeding insects that transmit diseases to the wild life. Populations of animals which live in the wild are regulated by several complex biotic and abiotic factors. Parasites and its vectors (insects) are one of these biotic factors. The dynamics of the certain wild animal populations may be partly or greatly regulated by the parasites/vectors and in many cases, it is very difficult to discriminate between the influence of parasite-vector and other influences. Nowadays, science is focused on determining these fine relations among insects-parasites affecting the human populations, while less or no attention is devoted on determining the impact of relations that affect wild life across the world. In this presentation more attention will be given to the role that parasite-insect relations have on the wild life and its conservation.

**Key words:** *insect, parasite, wild life*



## Oral presentations I



Balkan mountains are the places where biodiversity can be seen in all of its glory, shapes and colours. They host a variety of endemic and relict species preserved and it is not strange that many Rufford projects has been realised at the high altitudes.

 S utjeska National Park, Bosnia and Herzegovina



## Subotica spiders II: Further research and education on sandland spiders in Serbia

GRBIĆ, G.<sup>1</sup>, HÄNGGI, A.<sup>2</sup>, GAJIĆ, I.<sup>3</sup>, VASELEK, S.<sup>4</sup>

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The Subotica sandland is one of the very few continental sandlands in Europe today. It is situated in the far north of Serbia, close to the Hungarian border. The main value of this area is the high biological diversity, caused by the dynamism of the sandy substrate and the proximity of ground waters. According to the Natura 2000 project, it is highly rated as a disappearing habitat, endangered by human development. Concerning the spiders it was totally unexplored with not even some old literature findings. During the previous RSG project there, the first-ever inventory work has been made, and in this project that research work continuous. First we chose atypical locality: a wet place in a sandy area. That was a wet *Populus* sp. wood, a wet meadow and a field of *Carex* sp. Now we have chosen a more typical place: a sandy meadow, a mixed *Quercus-Populus* forest and *Acacia* shrubs on sand. The determination is not complete yet, but we will have approximately around 200 spider species. Considering the small diversity of habitats that we visited this shows the high diversity of spiders. New approaches on dissemination of knowledge were applied. Beside traditional workshops and lectures we decided to build up a new collection of spiders in a Museum and to organize a special event dedicated to spiders only. Till now, this zoological wet collection has 120 spider species (385 individuals) and represents an important legacy for future generations. Since it is deposited in the Natural History Museum, Belgrade, Serbia, it is open to the scientific public and could be used by anyone having an interest in Serbian spiders. The Spider Day was a one-day event. For adults, there were interesting popular lectures, as well as a photo and art exhibition. For children, workshops and art competitions were organized together with a live tarantula exhibition. The event was on 18<sup>th</sup> of November 2017, in the Institute and museum for Nature Conservation of Vojvodina Province in Novi Sad. According to the journalist reports and our box for compliments and complains, this event was a huge success.

**Key words:** *Araneae, Vojvodina, spider day, museum collection*

# Systematic harvesting and lack of population data challenges the conservation for the nose-horned viper in Serbia

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European Commission and IUCN have confirmed population declining trend for *Vipera ammodytes*. Nevertheless, this species continues to be harvested due the several factors: discrepancy in protection statuses in different countries, lack of population data, economical and political situation in Balkan countries and concentration of this viper in areas occupied by uneducated, low income people. The intensive harvesting in Serbia started two decades ago, and during 16 years, 9800 nose-horned vipers were sold to the Institute for Immunology and Virology “Torlak” in Belgrade where they later all died due to improper care. Besides, nose-horned vipers were collected for pet trade. In our interviews with local inhabitants at one location in Serbia, 30% of them stated that in the past Torlak’s employees and local collectors released vipers on that locality. One of the activities in our Rufford project was collecting samples for genetic analysis by non-invasive methods. We investigated phylogenetic relations among vipers whose samples were collected by us and by our colleagues, and have also included available sequences from GenBank. We used mtDNA sequence of the 16S rRNA gene collected from 25 (47 with sequences from GenBank) individuals at 15 localities. Results showed that one individual from the locality where vipers were harvested and released during nineties, clustered with north-western clade, while the remaining 5 individuals from same locality clustered with north-eastern clade. Also, one individual from another locality clustered with north-western clade. Based on the available literature, the north-western clade does not inhabit Serbian territory but exact boundaries of the distribution of clades are not defined due to the lack of samples. Our findings could imply that presence of this clade in Serbia could be due to the natural contact zone between two clades or those individuals originated from other countries and occurred here as a result of previous releasing out of the place of origin. In conclusion, it is essential to continue our work for further investigation. Even if this is natural contact zone and not result of the anthropogenic misconduct, it still further underlines importance of conservation measures as it is critical to maintain genetic diversity within species. As we have confirmed illegal harvesting, intentional killing, habitat fragmentation and pollution in Serbia and different responses on these threats in different populations often have a genetic component. Understanding genetic component with demographic data, will enable us to have insight in population differences and prioritize actions in conservation.

**Key words:** nose-horned viper, mitochondrial DNA, phylogeography, conservation, harvesting



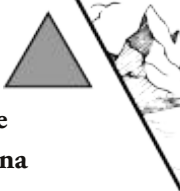
## True bugs (Heteroptera) of saline grasslands in Serbian Banat

ŠEAT, J.<sup>1</sup>

<sup>1</sup>HabiProt, Bulevar Oslobođenja 106/34, 11040 Belgrade, Serbia, jelena@habiprot.org.rs

The ecological and faunistic research from 2017 on true bugs in Banat is a continuation of the research from 2015, also supported by the Rufford Foundation. With this second project, the field study was expanded and it covered almost all areas with saline vegetation in the Pannonian Serbia, aiming to investigate possible differences among true bug communities from different parts of the region. Sampling was conducted monthly, from April to October 2017, on eight pastures (Jazovo, Okanj, Rusanda, Sečanj, Konak, Margita, Vlajkovac, Idvor) in Banat, and standard sweep-netting method was used for collecting specimens: in total 86 species of true bugs were recorded. Along with data gained from the previous project, 185 species of true bugs resides in halophytic habitats of the Vojvodina Province, which are now one of the best studied habitat types in Serbia for true bugs. Species *Phimodera flori* Fieber, 1863 was recorded for the first time in Serbian fauna on grasslands in the protected area of the Nature Park Rusanda and in the vicinity of village Idvor. Also, only one specimen of a rare stink bug, *Crypsinus angustatus* (Baerensprung, 1859), was collected near Idvor, and the last finding of the species in Serbia was recorded by Hungarian heteropterist dr Horváth more than a century ago. The results on distribution of saline specialists (*Henestaris halophilus* (Burmeister, 1835), *Conostethus hungaricus* Wagner, 1941, *Solenoxyphus fuscovenosus* (Fieber, 1864)) and other rare species were obtained, aiming to determine the most important locations for true bug diversity in Northern Serbia. Further, recorded data on faunistics and ecology of the true bugs could be used for planning conservation strategies of saline habitats, especially saline pastures of Banat which are mostly unprotected by law and often in very bad condition. Type and degree of disturbance of these grasslands were also evaluated during the fieldwork activities.

**Key words:** *Insecta, Hemiptera, alkaline grasslands, Hungarian plain*




**Population density and spatial distribution of martino snow vole  
(*Dinaromys bogdanovi* (Martino, 1922)) in Bosnia and Herzegovina  
(Rodentia: Cricetidae)**

ALADŽUZ, A.<sup>1</sup>, KALIMAN-ALADŽUZ, S.<sup>1</sup>, SIMONE, M.<sup>1</sup>

<sup>1</sup>Center for Karst and Speleology Sarajevo, Bosnia and Herzegovina, admir.aladjuz@gmail.com

During years 2016 and 2017 population density research on species Martino snow vole (*Dinaromys bogdanovi* (Martino, 1922)) was conducted on 10 selected mountains in Bosnia and Herzegovina: Trebević, Jahorina, Bjelašnica, Visočica, Prenj, Čvrsnica, Crvanj, Velež, Treskavica and Zelengora, in period from May to October. Research was done by trapping method, using only Sherman Live Folding Traps (SLFT-medium size) which were set up on limestone bedrock, on special karstic formations (alpine and subalpine calcareous grasslands, calcareous and calcsist screes of the montane to alpine levels and limestone pavements). Traps did not follow the fixed (transect) pattern and all of them were set in sites where the probability of capture is expected to be the highest. For trapping, we used 50 Sherman Life Folding Traps filled with two types of baits: the paraffin bait and bait with mix of seeds (cotton wick). A piece of apple was also put in traps to prevent dehydration of the individuals. In two year trapping nine individuals were caught on 4 out of 10 mountains. Most numerous trapping was on Mt. Bjelašnica in 2017 with four individuals captured. Average altitude of traps with captured individuals was 1766 meters above sea level (m.a.s.l.) with lowest recorded on Mt. Zelengora (1547 m.a.s.l.) and highest on Mt. Bjelašnica (1973 m.a.s.l.).

**Key words:** *Martino snow vole, trapping, karst, Bosnia and Herzegovina*



## Interactions of sharks with Montenegrin fisheries: Composition and abundance of their by-catch

ĆETKOVIĆ, I.<sup>1,2</sup>, NIKOLIĆ, M.<sup>2</sup>, RALEVIĆ, S.<sup>1,2</sup>

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Sharks within the Montenegrin coastal waters are affected by a wide range of fisheries types. Different species can be found regularly or occasionally in fishermen catches depends on their habitats and habits. The Southern Adriatic Sea is inhabited by several species of large pelagic predatory sharks, such as blue shark (*Prionace glauca*) and shortfin mako (*Isurus oxyrinchus*). Individuals of these species are threatened by fishing gears that are operating on the surface and pelagic zone of the territorial waters and nearby high seas. As a highly migratory species and apex predators of the ecosystem, they can be characterized as a very vulnerable to the intensive fishing pressure they are exposed to. On the other side, demersal species as smoothhounds, catsharks and spiny dogfish are caught in bottom trawling and with gillnets. The project tends to collect data on the composition and relative abundance of the shark by-catch in different segments of Montenegrin fishing fleet. Fleet segments that are covered are bottom trawling, pelagic longlines, gillnets and big game fishing for tuna and swordfish. Methodology of data collection covers the data on fishing activities (routes, types and characteristics of fishing gears) and biological data of found individuals. Since now, 264 individuals of sharks have been found. Small-spotted catshark (*Scyliorhinus canicula*) was the most abundant species and caught mainly in bottom trawling. Big game fishing and pelagic longlines have caught 2 individuals of shortfin mako shark and 1 individual of blue shark. An adult individual of bluntnose sixgill shark (*Hexanchus griseus*) was found as a by-catch in gillnets. These species were considered as a by-catch and were not commercially important for fisheries. As commercial, target species, found was common smoothhound (*Mustelus mustelus*) represented with a few individuals caught by trawlers. Conservation activities were undertaken and community education is continued from the past projects, both fishermen and general public. Project idea is promoted by both media stations and by social media networks. After data collection, project is predicted the producing of the study about the shark by-catch in Montenegrin waters and competent stakeholders engagement in the conservation activities.

**Key words:** *sharks, fisheries, Adriatic Sea, bycatch*

## Oral presentations II



Bryophytes are one of the most neglected groups of plants, although their diversity could be quite amazing. Rufford has financed a few projects in Montenegro in order to get better knowledge on moss flora, and conserve their valuable riverside habitats.

 R ipaljka Waterfall, Sokobanja, Serbia



## Biologer: Growth of a database

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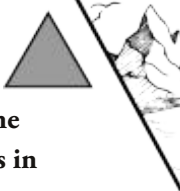
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Citizen science in Serbia left much to be desired, especially considering generally attractive and fascinating group – reptiles. This urged forming of Biologer, a database for collecting field observations about species distribution, which includes web site and mobile phone application. Basic functionality of the software was ready for use on late March 2018, which corresponded to lectures held for biology and ecology students at three Universities, in Niš, Belgrade and Novi Sad. First version of mobile phone application was launched in April, and was fast followed by novel, improved versions. In the beginning web software only allowed to record field observations, but already in May data became visible via maps of distribution given in 10×10 km squares, along with descriptions of species and photo galleries. Although database covers only several animal groups (reptiles, amphibians and butterflies), number of entries grows fast, reaching up to 7000 entries in period of first three months! In the same time period number of active users reached over 80, gathering experienced biologists as well as students and nature enthusiasts. This torrent of distributional data already enriched our knowledge about many species in Serbia. The software is open source and can easily be adopted for use in the other countries. In collaboration with colleagues from Croatian Herpetological Society Hyla, Biologer started expanding to one more data platform adapted for use in Croatia. The Serbian and Croatian Biologer databases are compatible, and could be, in future, united to pan-Balkan database. Also, there is room for expanding number of taxa covered by the database and hopefully the dragonflies will soon be included. Rufford Small Grant Foundation funded development of Biologer through two projects. It was started from turtle related project of Ana Golubović, and further supported by a butterfly oriented project granted to Miloš Popović. Constant expanding and development of the Biologer opens a great opportunity for collaborations among teams working on Rufford projects on different groups and further networking among Balkan countries.

**Key words:** *reptiles, turtles, butterflies, Balkans, Serbia*





# Monitoring of the highly endangered eel in Montenegro due to the assessment of the state and potential changes to the law on fisheries in accordance with EU

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Skadar Lake is located in the eastern part of Montenegro on the Montenegro-Albanian border. There are 48 species of fish in Skadar Lake, among which there is a Critically Endangered European eel, *Anguilla anguilla* (Linnaeus, 1758). It represents economically very important species in the whole world where it can be found, including Montenegro. Due to excessive overfishing, it has become Critically Endangered species on the global IUCN Red List of threatened species (IUCN, 2010). On the territory of our country, very little research has been carried out on eels. The only more detailed research was presented in the PhD dissertation by Hegedish, 2007. The dissertation presents the results describing the characteristics of migration and the basic characters of glass eels in the Bojana River. The research of the European eel and its capture started in April with the help of specially made eel collection tools - eel trap nets. The first site was the "Veliko Blato" where 4 individuals were caught. Due to ecological factors such as overgrown macrophyte vegetation in which the eel is hiding and the withdrawal of water levels, we moved to the new explored site - that is, the left bank of the Morača River. At this site, 40 eels were collected during a month of field work, and for these eels we done the measuring of the length and weight, which will show us the "conditional factor" of the caught eels is in the Skadar Lake. Considering that different localities maintain different ecological characteristics of the Skadar Lake, in the following period we plan to sample individuals at other sites planned by our project. Considering that the most present number of eels inhabit the Skadar Lake and River Crnojevica, this project would also have an impact in the preserving the quality and diversity of eels populations that inhabit these two ecologically important and necessary habitats. In the Skadar Lake, the number of researches are scarce, so this project will be the first comprehensive contribution to the knowledge of the European eel in the Skadar Lake, as well as laying the foundations for further research.

**Key words:** *Skadar Lake, European eel, conditional factors, research*



## Can we use invasive alien fish species as a resource?

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MARKOVIĆ, Z.<sup>3</sup>

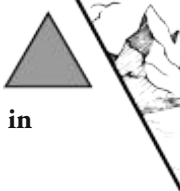
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The black bullhead (*Ameiurus melas*) is among the most abundant non-native fish species in freshwaters of Europe (including Serbia). It is often considered a harmful invasive species that forms dense populations and has a negative impact on the native fish fauna. A number of studies on this species and its population characteristics have indicated that physical removal could be a potential solution to the problem. However, there has been no field work so far to confirm or disprove this claim. In Serbia, several experimental removals had been organized, but without any scientific data about the effects on native fish fauna. This pilot project aims to quantify the population dynamics of both native and non-native fish fauna of the Ponjavica Nature Park after the removal of the black bullhead. A representative number of black bullhead specimens will be sampled for laboratory analyses of diet, resources allocation, general condition, and reproductive potential. So as not to waste the caught fish, the idea is to use it for human food. The black bullhead is a high quality, very nutritious, and tasty fish. The only problem is that in a natural environment it will reach the marketable size after a long time period. Thus, it is intended to experimentally rear some sampled individuals in the Centre for Fisheries and Applied Hydrobiology "Little Danube" on the experimental farm Radmilovac of the Faculty of Agriculture, University of Belgrade (CEFAH). The plan includes experimental rearing in fish mesocosm systems, cage, and tank systems, with different food combinations, in order to achieve the most optimal increase. Laboratory analyses of reared individuals (length, weight, resource allocation, general condition, size at sexual maturity, fecundity) are planned, as well as analyses of fatty acid composition of the muscle tissue. If this way of rearing proves to be cost-effective, then this approach (removal, stocking, and rearing of fry until it reaches a consumable size) would be sustainable. In that case, fishery managements in Serbia would be able to finance continued removals of this species. In return, they would acquire juvenile specimens and would not have to invest in the spawning and care of fry. If they could get high quality fish of consumable size in a couple of months, they would be able to market it at acceptable prices. Affected waterbodies would be continuously freed from this pest and, at the same time, high quality food would be produced for human nutrition.

**Key words:** *black bullhead, invasive species removals, population dynamics, experimental rearing*



## Population characteristics of Balkan terrapin (*Mauremys rivulata*) in Montenegro

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Aim of this study is to determine population structure and dynamic of Balkan terrapin, *Mauremys rivulata* (Valenciennes, 1833) as well as negative factors which exist on their habitats. Data about population characteristics are presented for three isolated populations along Montenegrin coast. During three year long Capture-Mark-Recapture study 179 individuals were caught on locality Mrcevo polje and 156 recaptured. Average straight carapace length in females was 153.92 mm and in males 136.32 mm. Average total weight was 544.54 g in females and 339.83 g in males. Average condition index in females was 1.36 and in males 1.18. Population size is estimated to be 208 individuals. Population estimation was done according to Schnabel (1938). On second locality, Tivatsko polje 110 individuals were caught and 85 recaptured. Average straight carapace length in females was 158.53 mm and in males 149.84 mm. Average total weight was 601.01 g in females and 419.53 g in males. Average condition index in females was 1.33 and in males 1.13. Population size is estimated to be 136 individuals. On third locality, Sutorina 268 individuals were caught and 235 recaptured. Average straight carapace length in females was 159.82 mm and in males 144.26 mm. Average total weight was 659.35 g in females and 426 g in males. Average condition index in females was 1.38 and in males 1.19. Population size is estimated to be 315 individuals. Also on all three localities significant differences in condition index and total weight were present between males and females. On Mrcevo polje and Sutorina, significant differences between straight carapace length in males and females were obtained as well as in number of males and females. On Tivatsko polje significant differences in number of males and females and significant differences between straight carapace length were not obtained. On all three localities negative antropogenic factors were recorded: habitat drying, urbanisation, illegal waste, channeling of waterways and waste waters. At the beginning of spring, turtles are the most common in canals, while during summer they can be found plunged into the mud or in other water habitats, such as rivers. Obtained data will help in future plan for remediation of some habitats, as well as for future action plan for Balkan terrapin protection which will be prepared in next period.

**Key words:** *Balkan terrapin, population structure, Montenegro*

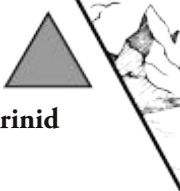
## Oral presentations III



Bog fritillary (*Boloria eunomia*) is a relict species found in the northern parts of Europe and Asia, but also in isolated mountain populations further in the south. These isolated habitats are affected by human pressure and climate change. Rufford is helping us to preserve bog fritillary in Serbia, despite ongoing destruction of butterfly habitat by ski infrastructure.



Žarkova Čuka, Stara Planina Mountain, Serbia




# Assessment of conservation units of the endemic and vulnerable Cyprinid species from the karst fields of Eastern Herzegovina

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Freshwater ecosystems of the Dinaric karst area are known as hotspots of biodiversity and endemism. Uniqueness and heterogeneity of the Karst landscape of Eastern Herzegovina (Bosnia and Herzegovina) can support the research of evolutionary history, biogeography and geoclimatic changes. Namely, precise identification of vulnerable ichthyofauna is essential for the assessment of conservation units. Hence, our general aim was to determine species boundaries and quantify molecular and phenotypic intra- and interspecies variability of the endemic cyprinids *Telestes metohiensis* and *T. dabar*. Using molecular markers of mitochondrial DNA (cytochrome b and cytochrome c oxidase subunits 1) the focal species were clearly identified and delimited. The specimens from Nevesinjsko field (Zalomka River) are determined as *T. metohiensis* and specimens from the Dabarsko field (Opačica, Pribitul, Vrijeka and Suški stream) are identified as *T. dabar*. We analyzed population structure based on molecular markers (cyt b and COI) of mtDNA and morphological parameters (linear measures and geometric morphometrics) of cyprinid minnows from four watercourses of the Dabarsko field as well. Monitoring of watercourses from Nevesinjsko and Dabarsko fields was carried out by measuring the physico-chemical parameters (pH waters, temperature, concentration and saturation of oxygen and turbidity). The measured parameters are compared between different watercourses and during different seasons. This allows us better insight into the fluctuations of external environmental factors, habitat status and influence of climate changes. However, in order to clearly distinguish species boundaries and determine conservation units, it is necessary to expand the territory of research. Differences in the results of previous research and incomplete data indicate the necessity of reviewing distribution of taxa because such information is important for improving understanding of spatial forms of freshwater species and for implementing a conservation strategy.

**Key words:** *endemic ichthyofauna, Telestes, species delimitation, molecular and phenotypic variability, biodiversity conservation*



## Conservation and population status evaluation of the strictly protected great capricorn beetle (*Cerambyx cerdo* L.) on Fruška Gora mountain (Serbia)

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*Cerambyx cerdo* (the Great Capricorn Beetle; Coleoptera: Cerambycidae) represents a globally Vulnerable saproxylic species which is strictly protected by the Serbian law. However, despite several surveys of longicorn beetle fauna in Serbia, its conservation status hasn't been assessed using any genetic approaches. Furthermore, when it comes to Fruška Gora Mt, *C. cerdo* has suffered a tremendous habitat loss due to the major conversion of high forests into coppice forms, expansion of linden (*Tilia* sp.), as well as the recent decline in number of *Q. petraea* trees. Therefore, the goal of the project was to evaluate the response of *C. cerdo* to the novel selection regime on Fruška Gora Mt., as well as to gain insight into the indices of its genetic variability – the essential component for the adaptive response. Although Great Capricorn Beetle's range of hosts can consist of several deciduous genera, it is primarily tied to the old and decaying oak (*Quercus* sp.) trees. Thus, we surveyed putative host trees for the emergence holes and adults of *C. cerdo* to determine whether the host range has changed due to the altered structure of Fruška Gora Mt's forests. Concerning genetic analyses, we implemented a DNA barcode approach based on mitochondrial cytochrome c oxidase subunit I locus (COI mtDNA) to inspect the presence of cryptic taxa and to determine the population parameters of genetic variability. The findings are discussed in the light of erroneous forest management practices which keep further endangering saproxylic beetles on a wider scale, while also elaborating on the possible translocations of *C. cerdo* individuals from more stable to relatively endangered populations by comparison of Fruška Gora Mt population with *C. cerdo* populations whose genetic structure is already described in literature.

**Key words:** *COI mtDNA, DNA barcode, host preference, saproxylic beetle, translocations*



## Movement and home range a young brown bear (*Ursus arctos*) at the edge of Dinaric-Pindos distribution in Serbia

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Among the European countries, diversity of brown bear populations is highest in Serbia. Three large European populations are represented in this area: Dinaric-Pindos, Carpathian and East Balkan population. The Carpathian and East Balkan populations used to be omitted from researchers' focus until now. Tracking of brown bear movement was only performed on the Dinaric-Pindos population, with focus on National Park Tara as the core area of distribution for this population. Capturing and collaring a brown bear on Jadovnik Mountain represents the first effort to extend this research to other parts of range of Dinaric-Pindos population. After two days of effort, a young male brown bear (three years old) was captured and collared at Jadovnik Mountain on September 27th, 2017. He was tranquilized with anesthetic rifle, measured and collared with Vectronic GPS/GSM collar. The bear was named Miloš. Collar fixation schedule is set up to one hour. 5510 fixations were received until June 15th. These records were used to calculate home ranges, seasonal and average daily traveled distances, by using ArcMap (ESRI, 2015). From collaring until mid-June 2018, the home range of young bear Miloš was 362.7 km<sup>2</sup>. In this period he traveled distance of 2061.4 km, with average daily distance of 7.8 km. His home range, seasonal and average daily traveled distances differed significantly among seasons of the year. The biggest home range was recorded in spring – 351.5 km<sup>2</sup>. The longest seasonal and average daily traveled distances were also recorded in spring (1183.6 km and 13 km respectively). The smallest home range (2.3 km<sup>2</sup>), seasonal and average daily traveled distances were recorded in winter (77.2 km and 0.9 km respectively). Even these preliminary results have contributed greatly both to knowledge of brown bear home range and movement and to conservation efforts at the edge of its Dinaric-Pindos distribution. Continued collaring and monitoring of Dinaric-Pindos brown bear population are recommended. Also, it is recommended to conduct similar research activities within the ranges of two other brown bear populations (Carpathian and East Balkan) in Serbia.

**Key words:** *brown bear, GPS telemetry, Serbia*



## Distribution and status of the European ground squirrel (*Spermophilus citellus*) populations in mountain regions of East and Southeast Serbia

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Despite the fact that the European ground squirrel (*Spermophilus citellus*) is a strictly protected species by Serbian law, the complete list of its habitats is missing and the majority of known populations are in danger as they are outside of protected areas. Especially vulnerable are the rare mountain populations which have already been isolated on mountain tops for a long period of time, and which are additionally affected by lack of the livestock grazing. Unlike lowland colonies from the northern part of Serbia, which have been quite well studied during the last several years, the data about the mountain populations are still scarce and outdated. The aim of this study was to examine the current distribution of the European ground squirrel populations in mountain regions of East and Southeast Serbia, to estimate the size of occupied habitat patches and to define the main threats. We found only 8 populations, from which only 3 were previously noted in literature. On two localities we found just a few single holes. The size of occupied patches ranged from less than 2 ha on locality Bukova glava (Vlasina Plateau), to the 68 ha on the locality Vrtibog (Stara Planina Mt). In all cases the size of potentially suitable habitat was much larger than the size of occupied patches. All recorded EGS habitats have been in bad condition and improvement of habitat quality is necessary on all localities. The main threats identified were succession caused by insufficient or completely absent grazing, and very frequent and uncontrolled fires. According to our results, the future of mountain populations of the European ground squirrel from Serbia is highly uncertain and without urgent management measures they will probably disappear in a very short period of time.

**Key words:** *European ground squirrel, distribution, threatening factors, mountain region, Serbia*



# Unraveling the hidden corners of Serbian nature

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European Union gives exceptional attention to water resources conservation, considering them sustainable development foundation of 21<sup>st</sup> century! In Serbia only larger rivers have been systematically studied, but smaller water bodies (such as springs, ponds, small lakes etc.) that are located within protected areas have never had enough conservation attention. Most of the protected areas in Serbia belong to the category of Nature monuments (currently 313), even though protected by law, many of them are unattended and often neglected by broad public and even researchers and conservation experts. With the project "Hidden corners of Serbia - Preserve our freshwaters from oblivion", supported by The Rufford Foundation, we want to emphasize the importance of different ecosystems and the water habitats within Monuments of Nature. We realized that keeping the peoples' attention and presenting the hidden corners of Serbian nature in the right way could be beneficial, even crucial, to their conservation. Through the original documentary series "Hidden Serbia" we will be rising campaign for biodiversity protection and provoking environmental action through banding together both common people and scientists. The insight of scientist in the huge importance of social ecology and local people involvement in nature conservation and nature management is insufficient, and so is the knowledge of common people about the importance of scientific research. But, to achieve the goal of protecting 10% total area of Serbia (306,000 acres) by 2025, as was planned by the government, everyone has to be involved. We want to emphasize the importance of preserving our freshwaters, nevertheless, collaboration with researchers from all other fields of interest is our future aim. This project is intended as a trigger for future scientific actions, with the idea to start a movie series that will follow our path of exploring all of Serbian nature and inspiring scientists to investigate more.

**Key words:** *nature monument, conservation, documentary, freshwaters*

## Oral presentations IV



Although sandy stiltball (*Battarrea phalloides*) is widely distributed its populations are small, localised and threatened in most of European countries. In the Republic of Macedonia the only extant population is surviving on a small island on Prespa lake. Rufford supported the conservation of this species along with other threatened mushroom of the Balkans.



Golem Grad Island, Prespa Lake, Republic of Macedonia



## Hidden dwellers on green frog's skin (*Pelophylax esculenta* complex)

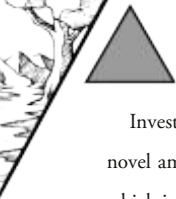
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Recent research of frog skin microbiota were mainly focused on presence of pathogens, especially *Batrachochytrium dendrobatidis*, as well as on describing the bacterial communities on their skin. The specialized amphibian lifestyle where frogs' skin is in intimate contact with the environment is of primary importance in determining frogs' resilience to external factors. Cutaneous microbiota is thus an indicator of both frog health as well as of environmental factors acting upon frogs. Many of these factors can be detrimental to frog fitness and it is expected that the first changes in frog fitness could be assessed by identifying the changes in diversity patterns of frog's skin epibiotic communities and/or isolating specific pathogens. Knowledge of these communities and patterns could contribute to more efficient conservation. Epibiotic communities of the green frog complex (*Pelophylax esculenta* complex), sampled on three localities in South Banat, Serbia (Stevanove Ravnice, Jaruga canal, Danube-Tisa-Danube Canal) were investigated using culture depended methods and microscopy techniques. Samples were collected using three sampling methods: 1) scraping by toothbrush for algal sample 2) swabbing with sterile cotton swabs for fungal sample and 3) nonaggressive adhesive tape method for both algal and fungal sample. The aim of this research was describing fungal and algal communities present on frogs' skin. Culture based methods showed high diversity of air- and soil-borne fungi (members of genera *Acremonium*, *Alternaria*, *Aspergillus*, *Bionectria*, *Bipolaris*, *Botrytis*, *Cladosporim*, *Epicoccum*, *Fusarium*, *Penicillium*, *Trichoderma*, *Ulocladium*, to name a few), which could be considered transients. However, microscopy techniques revealed spore germination, mycelia formation and sporulation directly on frog skin, of some typical soil-borne fungi eg. *Fonsecaea* sp., causative agent of amphibian chromomycoses as well as human phaeohyphomycosis. Microscopy analyses of samples taken or scraped from amphibians' skin showed the presence of morphological structures belonging to aeroaquatic hyphomycetes (eg. *Canalisporium* sp.) and stramenopiles, as well as high abundance of diatoms. Presence of c. 40 diatom genera was observed with dominance of mostly ubiquitous euryvalent species found in highly eutrophic waters (members of genera *Amphora*, *Craticula*, *Cymbella*, *Cymbopleura*, *Cymatopleura*, *Diploneis*, *Encyonema*, *Epithemia*, *Fallacia*, *Gomphonema*, *Luticola*, *Navicula*, *Neidium*, *Nitzschia*, *Pinnularia*, *Planothidium*, *Rhopalodia*, *Staurosira* and *Suirella*).



Investigation of microbial communities on frog skin is of great importance due to potential detection of novel amphibian pathogens, and also can lead to better understanding of amphibian-microbial interactions, which in further researches can be used as effective tool in amphibian protection.

**Key words:** *Pelophylax esculenta* complex, epibiotic communities, Serbia



# Effects of fish farming on water quality in mountain springs and community structure of aquatic biota

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The issue of water availability and quality has become one of the most important global problems since human population increased and technological development resulted in the increasing demand for water supplies. Since every water body is formed thanks to mountain springs, there is a need to pay more attention on this fragile habitats, as first line of defense against water pollution and destroying such ecosystems. They are unique and very interesting habitats, not only for ecological and biogeographical studies, but also for their characteristic fauna. Traditionally, they are considered as clean and pristine environments with high biological integrity. As population grows, new sources of food are needed. Because of this fact, many people started to build trout fish ponds near springs in the term of trout's demand for high concentration of oxygen and lower temperature, such as in mountain region. That is why it is important to estimate fish farming influence on the water quality as one of the most common point source pollutions on lotic systems, by assessing macroinvertebrate community in both spring and downstream sampling points – influenced by local fish farms. Within this project we aim to define the current ecological status of selected mountain springs with a special attention on the influence of trout farming on water quality and aquatic macroinvertebrate community within the investigated water sources. Moreover, the main goal is to establish a long-term monitoring system of these fragile habitats. We plan to interview local community as well as owners of trout's ponds about their knowledge on the importance of springs, their conservation and anthropogenic factors they are affected by.

**Key words:** *habitats, springs, macroinvertebrates, trout, fish pond, bioassessment*

## Poster presentations



The populations of European roller (*Coracias garrulus*) were almost completely destroyed in the Balkans by wood cutting practices that reduced the number of old trees with nesting holes. Putting the artificial nests has lead to drastic increase in the European roller populations and Rufford was there to support this initiative.

 **S**elevenj puszta, Vojvodina, Serbia



## Establishment of the regional monitoring program for the Dinaric populations of alpine salamanders

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Dinaric populations of alpine salamanders (*Salamandra atra prenjenensis*) are severely fragmented and restricted to isolated, high-altitude areas with a narrow vertical distribution. The number of occurrence areas along the Dinarides are still questionable. The peculiar biology and „slow“ lifestyle of these vulnerable animals question their ability to cope with climate change as the speed of adaptation seems to be outstripped by global warming. It is possible that some populations are already extinct such as the one from Mt. Treskavica, where presence of this species has not been (re)confirmed since the early 1900, despite extensive fieldwork research in the past three years. Additional threats to the survivorship of these populations are spreading amphibian pathogens. Within several individuals of alpine salamanders that were kept in captivity during the year 2016, we registered the dangerous Ranavirus, responsible for amphibian declines worldwide. The origin of the virus is unknown but the animals originated from Gorski Kotar (Croatia) and Mt. Čvrsnica (Bosnia and Herzegovina). Through this project we aim to set up a standardized monitoring program that will serve as the basis for a long-term demographic assessment of salamander populations in Croatia (Gorski Kotar) and Bosnia and Herzegovina (Mt. Prenj). We will conduct a Capture Mark Recapture (CMR) study using PIT tags (biochips with unique identifying code) that we insert permanently in the animals. The CMR study will help us to understand species response to changing environments and demographic changes through the years. During this project we will also screen captured animals for Rana virus using molecular techniques.

**Key words:** *terrestrial amphibian population ecology, PIT tags, vulnerable taxa, Rana virus*



## Conservation of freshwater oligotrophic habitats on Vranica mountain and establishment of long-term monitoring of biodiversity (Bosnia and Herzegovina)

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Vranica Mountain is characterized by an extremely high degree of oligotrophic freshwater habitats. Due to global climate change and intense anthropogenic activities, reduction and threatening of these types of habitats in the area of Vranica are increasing each day. In order to protect these habitat types and high diversity of species, it is necessary to assess their condition. In many cases, oligotrophic habitats are used as reference sites due to their high ecological status. A diversity of diatoms were taken as a tool for assessment of the state of oligotrophic freshwater habitats. The main aim of this study is to establish a database of abiotic and biotic parameters which will enable further action, especially towards their restoration, conservation and long-term monitoring of biodiversity. After the completion of all phases of this project five main practical conservation outputs will be derived: 1) identification and mapping of oligotrophic freshwater habitats in the wider area of Vranica Mountain; 2) developing robust field survey protocols for continuous and long-term monitoring of the biodiversity; 3) transfer of knowledge and training of young researchers in the field of restoration and conservation ecology; 4) dissemination of knowledge and raising of ecological awareness about the values and importance of oligotrophic freshwater habitats and 5) creating plans for the future restoration and conservation activities of oligotrophic freshwater habitats in Bosnia and Herzegovina. These project might help in establishing reference conditions not only for Bosnia and Herzegovina, but also for neighboring countries.

**Key words:** *oligotrophic habitats, diatoms, restoration, conservation, long-term monitoring.*






# Mycobiota of Mediteranetum Neum-Klek as important argument for area protection

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During last three years several short mycological field research have been organized in the Mediterranean part of Bosnia and Herzegovina. Most of the research activities have been conducted within boundaries of planned protected territory Mediteranetum Neum-Klek (area around city of Neum and in the Klek peninsula). Although this area have been identified as Key Biodiversity Area (KBA) or Special Botanical Reserve since 1965, there is not any kind of active formal and legal protection nowadays. Overall five field research have been organized and 36 species of fungi have been recorded in total. Mainly ascomycetous fungi have been investigated, collected and analyzed according to vital taxonomical principles. Still, seven species from the phylum Basidiomycota have been registered too. This is generally due to the fact that they were not main objects of interest in this study. Majority of determined species are fungi from order Pezizales (20 species, seven families). During field research some rare and endangered species of fungi have been discovered in this area. For some of the registered species Neum-Klek area represents only known habitat in the Balkan Peninsula so far. Sporadic mycological field research organized in different localities in this area reveals that this quite narrow and very limited Mediterranean corridor is of great importance for mycobiota of Bosnia and Herzegovina and for mycology in general as well. All registered findings clearly indicates that Mediterranean mycobiota in Bosnia and Herzegovina is quite diverse and that this small territory should be properly protected and managed in the future. The preliminary results should be considered just as partial projection of total fungal diversity in this area. In order to implement adequate conservation measures and enable formal and legal protection it is necessary to revise conservation status of this area. Existing revision studies about biological values of this area does not mention or consider fungal diversity at all, although solid number of different kind of scientific papers and exposures have been published recently. All published results should be included in the following revision process and should represent strong and important arguments for formal protection of the Neum-Klek bay area.

**Key words:** *Fungi, Bosnia and Herzegovina, Ascomycota, conservation, Mediterranean*




## Salt marshes in Serbia: The investigation of Macroinvertebrate community and the popularization of neglectet habitats

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Salt marshes are unique continental aquatic ecosystems whose water is enriched with high salt content. Despite representing internationally important habitats of specific flora and fauna (EU Habitat Directive), little attention has been given to them in Serbia, especially in the south-eastern part of the country. Moreover, the data of animal communities in these water bodies are scarce. Macroinvertebrates often represent the main component of animal biodiversity in small lentic ecosystems such as salt marshes. Furthermore, they play important role in many ecological processes and represent the reliable indicators of ecological conditions in their habitats due to the intermediate position in food chain. Bearing all this in mind we wanted to gain insight into the macroinvertebrate community composition in salt marshes in Serbia as well as to promote these unique habitats and educate public, especially local communities, about the importance of their conservation. For that purpose six localities were chosen, of which three were located in Vojvodina Province, the northern part of Serbia (NP “Rusanda”, SNR “Okanj Bara” and SNR “Slano Kopovo”), while the other three localities were situated in the south eastern part of Serbia (NM “Lalinačka slatina”, Oblačina and Bresničićka slatina). After a year of researching a list of macroinvertebrate groups which inhabit salt marshes was obtained. Although macroinvertebrates were not taxonomically diverse, which was expected due to the extreme conditions of these habitats, certain interesting taxa were recorded. Furthermore, during the investigation, students interested in hydrobiology were involved in field and laboratory work. At the end of field investigation a series of lectures was held to the local people as well as to the school children about the importance of salt marshes. Although we could not reach the great number of people at our lectures in every local community, considering the reactions of people and school children it could be said that an important step was made towards raising the awareness of public about the significance of salt marshes protection. Additionally, our promotional material, such as leaflets and calendars, as well as our web site ([www.saltmarshes.bddsp.org.rs/en/](http://www.saltmarshes.bddsp.org.rs/en/)) made a significant effect on reaching of public awareness and on promotion of these interesting habitats.

**Key words:** *wetlands, conservation, local communities, education*




## New record of the European Mudminnow (*Umbra krameri* Walbaum, 1792) in Bosnia and Herzegovina

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The European mudminnow (*Umbra krameri*) is the only autochthonous representative of the Umbridae family in Europe, and it is endemic to the Dunav and Dnjestar river basins. At a global level, the *Umbra krameri* population trend is in a sharp decline, especially over the past ten years, during which the European mudminnow already disappeared from many localities. Despite limited distribution, the main stated causes of its endangerment are: habitats loss and degradation, watercourses regulation, chemical pollution, as well as the introduced fish species. According to the IUCN, the conservation status of this species is Vulnerable (VU). Also, this species is internationally protected by the Berne Convention (Appendix II) and the Habitats Directive (Annex II). In accordance with the Red List of the Federation of Bosnia and Herzegovina, the species has the status of Endangered species (EN), and in the Republic of Srpska, it is included in the Decree on the Red List of protected species of flora and fauna. In the neighboring countries, this species has different conservation status. Croatia categorizes it as Endangered (EN), while in Serbia it is listed as Critically Endangered (CR). In Bosnia and Herzegovina, the first and until recently single known finding of the European mudminnow has been recorded in 2008, in swamp Gromiželj. Along with the European mudminnow population in the area of swamp Gromiželj, two more populations were recorded in the Sava River Basin: Šuma Žutica in Croatia and Bakreni Batar in Serbia. Recently, as the part of the Rufford Small Grant project “Assessment of distribution and conservation status of the European mudminnow (*Umbra krameri*) in Bosnia and Herzegovina”, we have recorded the second record of the European mudminnow (*Umbra krameri*) for Bosnia and Herzegovina, in the part where the Matura River meets its tributaries (the area of Gradiška and Srbac municipalities). This finding represents the fourth record of the species in the Sava River Basin. The newly discovered population occupies the central position among the well-known localities in the Sava River Basin, i.e. among Šuma Žutica population (Croatia) in the West, and Gromiželj population (BiH) and Bakreni Batar (SRB) in the East. The surface of the newly discovered habitat occupies about 3500 ha, which places the Matura River Basin in line with the biggest European mudminnow habitats in this region. Preservation of the natural habitat, especially in the localities with the biggest populations and genetic diversity of species, represents the best strategy for their further survival.

**Key words:** *European mudminnow, endangered species, new record, Matura River, Bosnia and Herzegovina*



## Micro world of the high mountains in Serbia: Specialized plant/aphid/parasitoid associations and its conservation

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High mountain parasitoids (Aphidiinae) and aphids (Aphididae) represent unique, yet still poorly investigated insect communities and their role in the maintenance of natural balance of fragile mountain ecosystems is very important. Due to specific habitat conditions of the high mountains, such as short summers with a brief period of optimal temperature for vegetation and aphid/parasitoid activity, these tritrophic interactions are often extremely specialized and restricted to certain parts of the mountains. Due to many negative changes, mostly caused by human impact, these high mountain areas are classified as endangered habitats. Our project had several main objectives, with the most important being: to create a check-list of tritrophic associations in the high mountain region (Tara, Kopaonik, Golija, Stara planina, Suva planina), to identify possible threatening factors at these locations and propose conservational measurements to the subject associations and finally to raise awareness among local and public communities. The field sampling was conducted during July-August 2016, followed by sample identification and final presentation of the results. The estimated parasitism rate from all sampling sites was around 40 %. The total number of parasitoid samples was 91, with 33 species that belong to 10 different genera. We recorded total of 87 different tritrophic parasitoid-aphid-plant associations and created a database with geographical coordinates and habitat/vegetation type of the sampling sites. Furthermore, we compared our findings with the previous data, and recorded numerous species and several genera which are new for these mountain locations. For the first time in Serbia in mountain habitats, we found the invasive and extremely competitive *Lysiphlebus testaceipes*, which indicates that this species is rapidly spreading and adjusting to habitats with cooler climate. More uniform plant composition, with some common, ruderal plant species was observed in the sampling sites where human influence was prominent, while undisturbed locations had significantly greater diversity of plant species that cannot be found in urban areas. Thus, rare and specialized tritrophic interactions are less likely to be found in sites that are disturbed due to human activity. We consider main threats to be the destruction of habitat and high traffic pollution in certain locations. One of the proposed conservation measurements was leaving patches of land with native vegetation, which could serve as a refuge for native and rare plants and their aphids and parasitoids. The second stage of research is focusing only on coniferous forests of the high mountains that are endangered due to several negative factors.

**Key words:** *tritrophic interactions, parasitoids, mountains, conservation*

# Carabids of the Iron Gates: Diversity assessment and conservation


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By number of species, arthropods represent the most dominant animal group on Earth. Majority of these species belong to insects, especially beetles. Ground beetles (Carabidae) are among the most speciose families of all animals and they have populated almost every land habitat. Carabids feed both on plant and animal food; they are good ecological indicators and important natural enemies of many invertebrate pest species. In Europe, the knowledge about carabids is biased towards species living in western and northern regions, while the southern part of the continent is less explored in this manner, despite having considerably richer carabid fauna. This is supported by the fact that even today, new endemic taxa (species or even genera) unknown to science are described from certain habitats of Serbia and other Balkan countries. This region is widely recognized as one of the Europe's biodiversity hotspots. Đerdap National Park in Serbia has a very rich flora and fauna, which is endorsed by the international recognition as an important habitat area for many species of plants, birds and butterflies. Our goal was to assess carabid diversity in the Đerdap since no such specifically targeted study is conducted in the past. We selected over a dozen localities in different habitats and collected ground beetles by pitfall trapping and manually from April to November 2017. In addition, we carried out a preliminary assessment of threatening factors during our field trips in order to establish the foundations for further conservational research of rare and endemic carabids in the mountains of eastern Serbia. Our results show rich ground beetle fauna in the park, since we have identified 141 species belonging to 56 genera and 13 subfamilies (check-list is based on one-season research funded by the Rufford Foundation). We located important local carabid populations such as *Carabus versicolor simulator* Kraatz, 1876 and *C. ulrichii arrogans* Schaum, 1858. Additionally, we found several other rare species, a few species with the first precise record(s) in Serbia, like *Chlaenius aeneocephalus* Dejean, 1826, and one species so far unregistered in Serbia. We recognized Golo brdo, Mt. Liškovac, Boljetinska reka Canyon and Poreč Bay as most valuable and protection worth localities of the park since we found many rare and endemic taxa on these sites. The main threatening factors for carabids can be deforestation, forest fires caused by human neglect and alteration of Danube riparian areas as well as the banks of the smaller tributaries.

**Key words:** Serbia, Đerdap National Park, ground beetles, biodiversity, conservation



## Stone crayfish *Austropotamobius torrentium* (Schrank, 1803) in Serbia: Distribution, population density, genetic diversity and conservation

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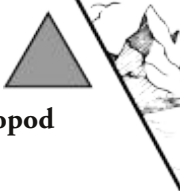
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*Austropotamobius torrentium* (Schrank, 1803) is native European crayfish, found in Central and South-Eastern Europe. Habitats destruction and invasive species caused populations decline in many parts of its distribution range. Balkan as a centre of species diversity is one of a few areas where this crayfish is still rather common, but also one of areas where this crayfish is poorly investigated. In order to obtain some more detailed data regarding this endangered taxon in Serbia, field investigations were conducted from June to October 2017 at 45 watercourses covering eight main drainages. Crayfish were captured manually or by LiNi traps according to standardized protocol. The presence of *Austropotamobius torrentium* was recorded at 21 localities, including eight watercourses where stone crayfish was recorded for the first time. A northernmost finding at the Fruška Gora Mountain should be singled out. A possibility of population overlapping between *A. torrentium* and another native crayfish species *Astacus astacus* Fabricius, 1775 found in close proximity in the river Kamenica on Divčibare mountain, could be interesting and will require an additional investigation. During field research necessary material for DNA analyses was collected, as well as data regarding population density and general habitat conditions. Obtained genetic data (haplotypes) will provide basis for better estimation of population diversity. This information accompanied by habitat data and estimated population densities, should provide better insight into population status of this crayfish. Although, according to recent hydroecological studies, a pollution of water habitats is not considered as a threat endangering this species in Serbia, it is necessary to point out the possible risk which could represent mini hydropower plants, whose construction has been expanding in the last decade. Fragmentation and degradation of the habitat pose a serious risk for the survival of the populations of this protected species, and therefore prolonged and standardized monitoring is necessary in order to better assess its status and level of vulnerability.

**Key words:** *Austropotamobius torrentium*, Serbia, new findings, endangerment



## Distribution and conservation of selected endemic freshwater Gastropod species in NW Bosnia and Herzegovina


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Representatives of freshwater gastropod species from Moitessieriidae family, *Bosnidilbia vrelana*, and Hydrobiidae family, *Graziana vrbasensis*, *Islamia dmitroviciana* and *Belgrandiella bozidarcurcici*, are known only from some springs and streams in NW Bosnia and Herzegovina. The aim of this study was to analyze the distributional patterns of these endemic gastropod taxa, to recognize the environmental factors that influence gastropod assemblages and to define conservation status and appropriate conservation strategies. Gastropods were collected with nets (250 µm mesh apertures), during 2016 and 2017, from all microhabitats of the investigated springs and streams (55 sites in total) of the Vrbas River basin and adjacent basins, and preserved in 96% ethanol. All site positions were recorded with GPS device. Characteristics of substrates were determined for all sites and environmental variables (discharge, water temperature, conductivity, oxygen concentration, pH value) were measured. These species of gastropods dominantly inhabited bottom of springs and some streams frequently covered by leaf litter, dead branches and sand. Water had alkaline pH value and oxygen concentration varied around a mean of 7.12 mg/l. All the other environmental variables showed a coefficient of variation greater than 15%. Representatives of species *Belgrandiella bozidarcurcici* and *Islamia dmitroviciana* were found on few new localities in springs and streams of Vrbas river basin. There were no new findings of *Bosnidilbia vrelana*. *Graziana vrbasensis* haven't been found even in springs from where it was originally collected and described, and it is possible that this species is extinct in the wild or extinct. Probable reason is the degradation of their habitats (spring capturing and water pollution). In this sense, it was worked on raising the local inhabitants' awareness, so they could be included in future conservation of these species and their habitats. All these endemic freshwater species of gastropods should be strictly protected and included into the regulation on strictly protected and protected species. Making this regulation is in progress.

**Key words:** *endemic freshwater gastropods, distribution, conservation*



## Relationship of skin microbial activity and body condition of green frogs (*Pelophylax esculenta complex*) in South Banat

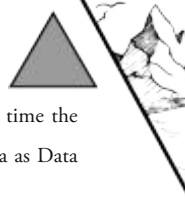
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During the years 2016 and 2017 we carried out a study in three localities in South Banat, Serbia. Selected localities are typical habitats of green frogs and represent areas with different levels of preserved natural features and anthropogenic activity and pressure. Also all three taxa of the complex are present in the area. A total of 317 adult individuals were collected and sampled. Using Body mass (W) and snout-vent length (SVL), we estimated phenotypic condition with 3 morphological condition indices that have been applied to frogs in the past. For each frog we estimated the Fulton condition factor (FCF mean  $\pm$  sd = 1.099  $\pm$  0.166) and the relative mass index (RMI mean  $\pm$  sd = 1.000  $\pm$  0.039) as indicators of animal's health and fitness. Additional statistical test were performed using the residual condition index (RCI mean  $\pm$  sd = 0.000  $\pm$  0.144). There were no statistically significant differences in the mean residual condition index between taxa as determined by one way ANOVA (F2, 311=0.25939, p=0.77169) and between sexes (F1, 311=0.02910, p=0.86466), but results indicated statistically significant differences between species and sex (F2, 311=3.0833, p=0.04721). The largest condition index within the complex had males of the first paternal species *Pelophylax ridibundus* (FCF mean  $\pm$  sd = 1.150  $\pm$  0.170) and the smallest condition index was of second paternal species *P. lessonae* (FCF mean  $\pm$  sd = 1.031  $\pm$  0.183). The results indicated significant differences in mean residual index scores between localities (F2, 311= 4.2278, p= 0.01543). The largest condition index was obtained on locality Jaruga (FCF mean  $\pm$  sd = 1.152  $\pm$  0.151) and the smallest on locality Danube-Tisa-Danube canal (FCF mean  $\pm$  sd = 1.073  $\pm$  0.137). We measured total microbial activity using rapid ATP-luminescence method (swab device – Lightning MVP BioControl Systems). Compared to manufacturer reference scales, frogs from all three localities showed high level of ATP activity – due to epibiotic communities inhabiting frogs' skins. Observed values (Overall mean ATP  $\pm$  sd = 6.085  $\pm$  0.331) were in the so - called “danger zone” (3.0 – 7.5). The Locality with highest microbial activity on frogs' skin (Mean ATP  $\pm$  sd = 6.206  $\pm$  0.332) was the Danube-Tisa-Danube canal. Parental species, *P. ridibundus* (Mean ATP  $\pm$  sd = 6.12  $\pm$  0.333) and *P. lessonae* (Mean ATP  $\pm$  sd = 6.143  $\pm$  0.341) had higher microbial activity than hybrid taxon, *P. esculentus* (Mean ATP  $\pm$  sd = 6.067  $\pm$  0.333). The results indicate that highest microbial activity and the lowest conditional index were obtained on the locality which is a completely artificial habitat






maintained by anthropogenic activity and on the parental species *P. lessonae* which is at the same time the smallest taxon and the only taxon from the complex that is listed in Red Book of Fauna of Serbia as Data Deficient (DD).

**Key words:** *Pelophylax esculenta* complex, condition indices, microbial activity, Serbia





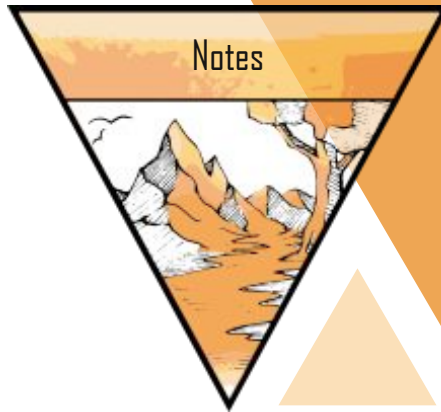
## Living on cultivated surfaces: The importance of Amphibian species in lowland agroecosystems of Bosnia and Herzegovina

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Agricultural surfaces occupy large territory of Bosnia and Herzegovina (B&H) as they play an important role in the state economy. The most important fact, in the biological aspect, is that they represent a biotope for many animal species which are under constant anthropogenic pressures. The biggest anthropogenic impact in agricultural ecosystems of B&H is the intensive usage of different types of chemicals (e.g. pesticides, insecticides) which significantly decrease biodiversity, disrupt, and contaminate food webs. A major topic in our long-term study on amphibians is their role in food webs (role as predators and prey) in agroecosystems. In this study, we analysed selected population of European common spadefoot toad, *Pelobates fuscus* (Laurenti, 1768) living in cultivated ecosystems in the following ecological aspects: (1) the population density, (2) the sex ratio and sexual size dimorphism characteristics, (3) (micro)habitat preferences and (4) the diet habits. This study has shown that arable land near aquatic ecosystems can represent favourable habitats for amphibian populations, especially for *P. fuscus* – species that can potentially be used for integrated pest management programs.

**Key words:** *Pannonian plain, agriculture, ecology, biodiversity, food web*



The gray wolf (*Canis lupus*) and other large mammals were hunted in Europe for centuries and their populations are nowadays limited both in size and distribution. Photo shows the gray wolf captured by a camera trap during one of many Rufford projects aiming to preserve mammal species across the Balkans.

 Kupreška river, Republic of Srpska, Bosna and Herzegovina













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