NERETVA SCIENCE WEEK 2023

Preliminary Report

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SCIENTISTS
for Balkan Rivers

NSW

2023

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We would especially like to thank the residents of Ulog, who warmly welcomed us and looked after us. It was a pleasure for us. Last but not least, we thank our BiH co-organisers, Centar za životnu sredinu (Center for Environment), for all their work.

Manfred-Hermsen-Stiftung
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NERA–ETWA

Flowing Divinity

It is believed that the name Neretva has its origins in the Illyrian Nera–Etwa, meaning heavenly water or flowing divinity.

With a length of 230 km and with an exceptional network of tributaries, the Neretva River is one of the most biodiverse river ecosystems in Europe. At the same time, it might be the most threatened river on the continent. More than 55 new hydropower plants are projected in the basin. The Upper Neretva (Bosnian: Gornja Neretva) with its karstic valley is widely regarded as a natural heritage of international significance. However, 24 HPPs are planned on the Upper Neretva and its tributaries, including one under construction (HPP Ulog).

Within the campaign "Save the Blue Heart of Europe", two Science Weeks took place at the Upper Neretva River, in 2022 and 2023. The results of these events will be presented to political decision makers, local communities and also to legal experts who will use the data in their work to oppose the dam projects legally. Besides gathering the data, the Science Weeks also created public attention. Journalists from all over the world joined the unusual event. The Science Week approach is a unique concept to combine science with public awareness to make more visible what is at stake.

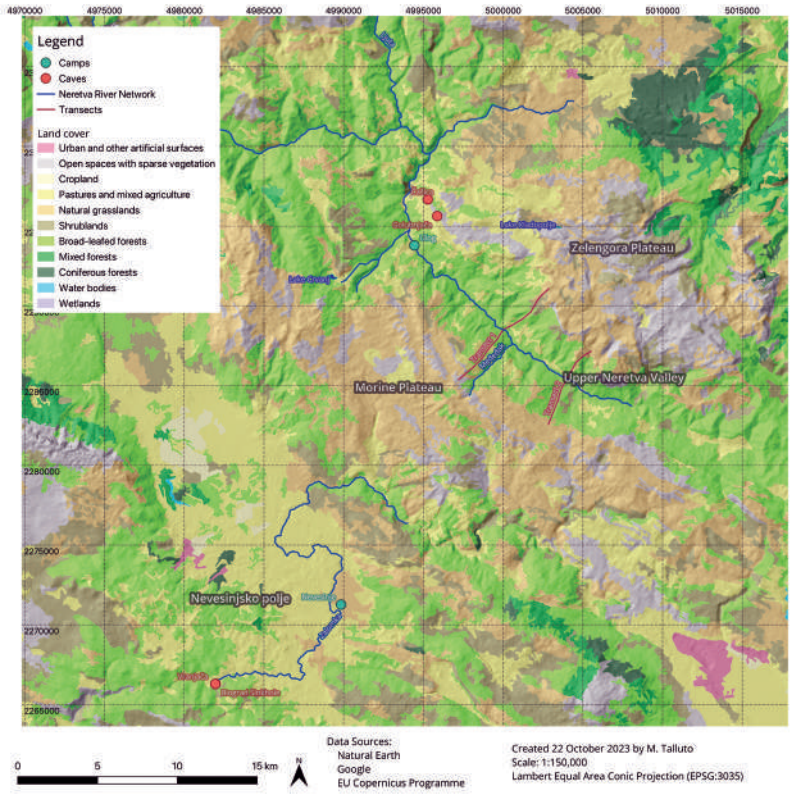
Map of Bosnia and Herzegovina, with marked Neretva River and study area.

Results in a nutshell

The following results are still preliminary, since not all researchers and research groups finalized their tasks. This is particularly true for NSW 2023. Scientific work needs time. However, the results at hand clearly underline the exceptional value of the Upper Neretva River System and the irrecoverable damage dams would cause.

Neretva Science Week 2022

In 2022, the Neretva Science Week was organized with a focus on the river and its immediate terrestrial vicinity from its source to Konjic, where the first reservoir starts. In total, more than 1,000 species have been identified in that week. Seven species were new to science, 24 new to Bosnia-Herzegovina and two have been re-discovered after 100 years. More than 40 species are protected by Natura 2000 legislation (i.e. listed in annexes of the European Habitats Directive or Birds Directive), and around 65 are protected by law in the Republika Srpska. The results of the NSW22 are presented in the Preliminary Report[1] and several scientific papers[2][3][4]. A series of scientific papers will be published soon in a special issue of the journal Natura Sloveniae.



Study Area: Upper Neretva Valley and Nevesinjsko Polje.

[1] Knook et al. (2022) Preliminary Report https://balkanrivers.net/uploads/files/3/NSW-PreliminaryReport-Final-Web.pdf
[2] Ivković (2023) Nat. Croat., 32(1) https://hrcak.srce.hr/file/435078
[3] Kolcsár et al. (2023) ZooKeys (1157) https://doi.org/10.3897/zookeys.1157.98997
[4] Pešićet et al. (2023) Int. J. Acarol., 49(5-6) 10.1080/01647954.2023.2258137

Lake Kladopolje on the Zelengora plateau. Waters from plateaus on both sides of the valley flow into the Neretva. Photo: Vladimir Tadić

Neretva Science Week 2023

In 2023, the scientists returned to study not only the river system, but the entire valley with its extended forests on the slopes.This objective is a direct consequence of the earlier impression, that the unique value of the Upper Neretva is the combination of intact forest and living rivers. In addition, the Nevesinjsko polje was assessed briefly.

There was a concern that repeating the Science Week at the same location would not produce significant results. This couldn't be farther from the truth! While detailed results are not yet available, the extension of studied taxonomic groups and research areas resulted in at least another 1000 species, thus doubling the taxonomic diversity of the area. For the first time scientists studied the age and structure of pristine forests, and extensively researched fauna of the Upper Neretva. Several endangered, endemic, or protected species were newly observed, especially from the groups not studied before, like fungi, grasshoppers, and spiders. A number of species potentially new for science were found in these groups.
Given that only two weeks of research already yielded such extraordinary biodiversity, the overall number of species in the area may still be much higher.

Broader impact of Neretva Science Weeks

An important consequence of the two Neretva Science Weeks, which only became clear post-festum, is the effect that the events had on local inhabitants. Recognition of their homeland as a globally important natural heritage by foreign scientists is changing their perception of the natural values of their surroundings. Once a year, an almost abandoned settlement had come to life again, under the spotlight of international media. Local guides shared their knowledge with the visitors and discussed their future.

The Upper Neretva is still a wild and intact river and exceptionally biodiverse. Photo: Ursi Seibert

Jezernica, tributary to Neretva, threatened by four hydropower projects. Photo: Ursi Seibert

Međeđak canyon. Photo: Brais Palmás

Zalomka is a karst river of Nevesinjsko Polje. It then sinks in the cave and reappears on the surface as Buna and Bunica springs that flow to Neretva. Photo: Vladímir Ruček

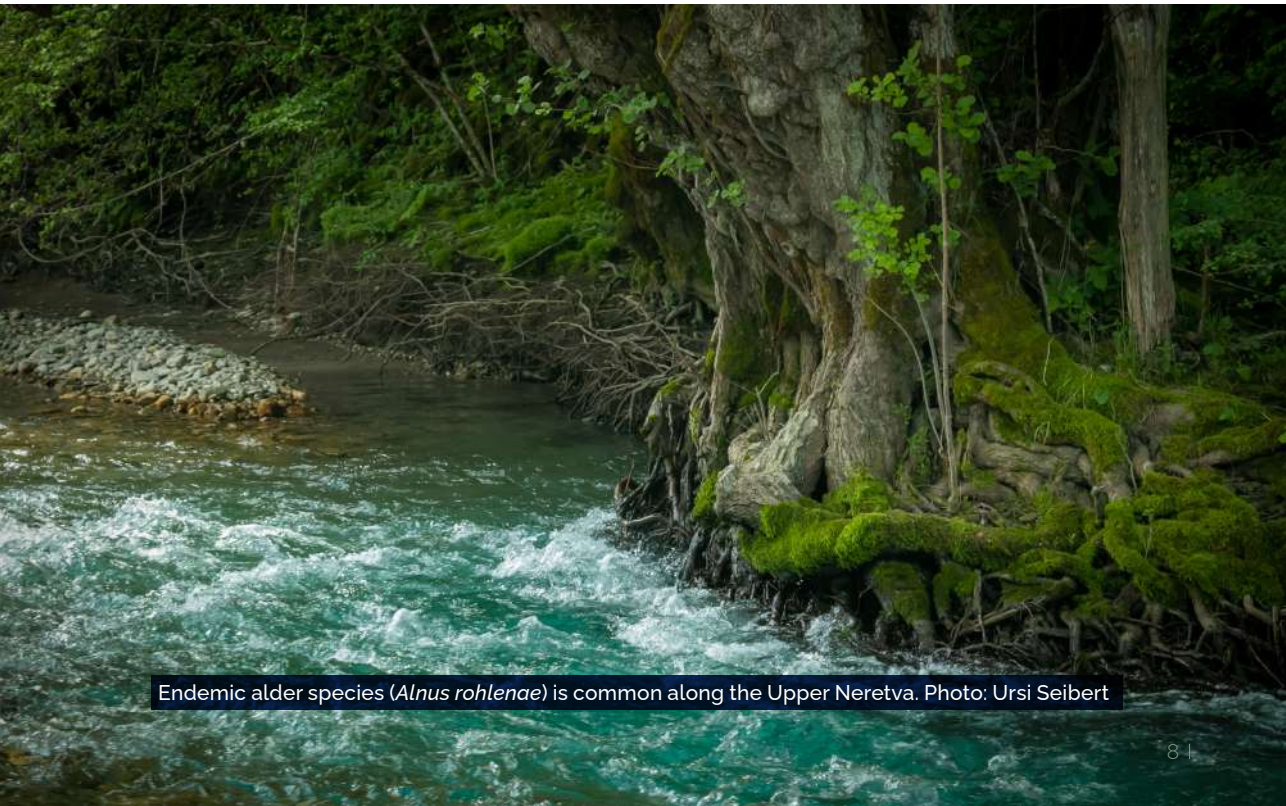
One may hope that this leads locals to a proactive approach towards shaping the future of the area - if so, then this should be seen as an important contribution of the Neretva Science Weeks to protection of this exceptional area.

The Neretva Science Week 2023: Approach and studied areas

In total, 62 scientists from 16 countries participated in the NSW 23. In addition, 30 journalists, artists, photographers, lawyers and activists joined the event in the small village of Ulog, from 30 May to 6 June 2023.

After the initial survey of Upper Neretva's biodiversity in 2022, the second Science Week in 2023 covered the following groups of organisms: aquatic invertebrates, terrestrial insects, reptiles and amphibians, fish, mammals, birds, bats, subterranean fauna, vegetation, mosses, fungi, old-growth forests, and soil fauna of agricultural land. They aimed to capture as much of the biodiversity of the Upper Neretva Valley as possible. Such landscape-scale biodiversity is to a large extent contained in environmentally distinct and remotely located habitats that host variously differentiated communities. Thus, significant effort was spent to reach remotely located special habitats.

In addition to the Upper Neretva River itself, the scientists studied the beech and oak forests on the slopes of the whole valley and the grasslands of the karstic plateaus above: Zelengora on the north and Morine on the south. Here, they visited the lakes Crvanj (Bosnian: Crvanjsko jezero) and Kladopolje (Bosnian: Kladopoljsko jezero). They explored remote and inaccessible tributaries like the canyon of Međeđak and the Ljuta River. Finally, they spent one day sampling a hidden tributary of the Neretva River: the intermittent Zalomka River, which flows through Nevesinjsko Polje, sinks completely into a cave called Biograd Ponor and reappears again as Buna and Bunica springs, two tributaries of the Lower Neretva River downstream of Mostar.



Endemic alder species (*Alnus rohlenae*) is common along the Upper Neretva. Photo: Ursi Seibert

The importance of the free-flowing Zalomka River for the Neretva may not be seen at first glance. The ongoing "Upper Horizons" hydropower project will divert water away from the sinkhole, with likely devastating impacts on Buna, Bunica and finally on the downstream section of Neretva River flowing into Croatia and the Adriatic Sea.

NSW23 extended its objectives with one more aspect: In addition to the biodiversity focus, socio-cultural aspects of the Neretva River were studied. Scientists addressed two questions. First, they interviewed locals to explore their relationships and connections with the river, the landscape, and hydropower development. Second, scientists collected experiences from the Neretva Science Week participants themselves to learn about the personal and scientific challenges of translating research into real-world impact. Hopefully, we will be able to use these results to improve future Science Weeks.

Here, we gathered the preliminary results of Neretva Science Week 2023, again in a broadly accessible document. The following chapters present 19 studies or fields of expertise that were covered at the event. They reflect the enthusiasm of involved scientists as well as convey an impression of the extraordinary value of the Upper Neretva River and Valley.

Scientists searching for rare softmouth trout. This species lives only in a few rivers on the Balkans, including Neretva. Photo: Brais Palmás

Scientists at work. During NSW mini field laboratories were established on the banks of Neretva. Photos: Ivana Milaković, Vladimir Tadić

On the Science Week, the work of scientists was documented also by journalists, photographers and videographers. Photo: Vladimir Tadić

The center of the science week. In Ulog, right next to the Neretva was the campsite and the "main station" where participants had their meals and where they worked. Photo: Vladimir Tadić

Almost 70 scientists from 17 countries participated in the NSW 23. About 40 journalists, activists and artists joined them. Photo: Vladimir Tadić


ENTISTS
Balkan Rivers

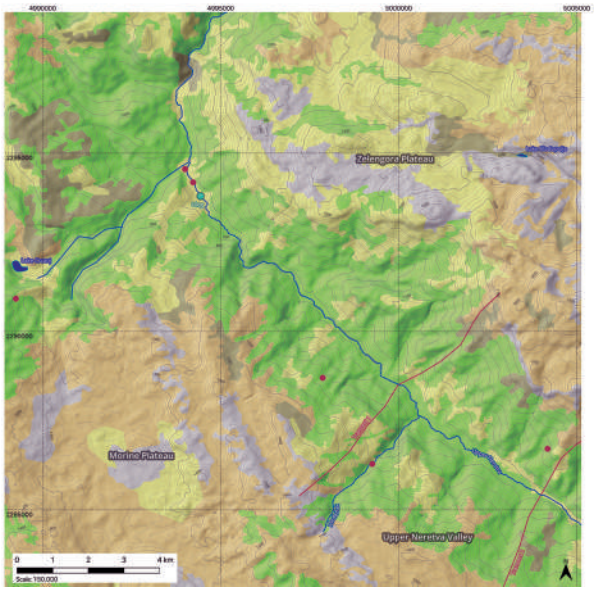
THE FORESTS OF THE NERETVA VALLEY: A MOSAIC THAT PROMOTES BIODIVERSITY

Rhiannon Gloor, Michal Frankovič, Martin Mikoláš

Czech University of Life Sciences Prague

"We were blown away by the diversity of the Upper Neretva, where numerous forest types exist side-by-side to create a uniquely heterogeneous forest mosaic. Excitingly, we discovered old-growth patches within a matrix of mature forest. These untouched forests are extremely rare in Europe. They provide numerous ecosystem services, such as carbon sequestration and storage, water purification, and are home to a number of threatened species. Only conserving a larger area of the Upper Neretva Valley would safeguard this natural heritage."

Rhiannon Gloor



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Our goal was to map forests of conservation importance in the Upper Neretva Valley and around Lake Crvanj, with a focus on identifying old-growth forests. Potential sites of interest were chosen based on satellite imagery and situated along the valley slopes between the river and plateaus or along the river. Four locations dominated by European beech (*Fagus sylvatica*) and sessile oak (*Quercus petraea*) were surveyed, as well as one flood-plain forest. To assess age and management history of the different forest patches, we used visually observable structural indicators including deadwood diversity, heterogenous age and diameter structure, and certain indicator species. Age assessment included dendrochronology, for which we extracted tree cores from 30 of the potentially oldest trees using increment borers.

Preliminary results

Within the five areas inspected and sampled, ten forest types were identified. The complex topography of the area promoted high heterogeneity of forests, which was further promoted by the influence of past management (e.g. coppicing, pollarding, grazing) across various spatial and temporal scales. Forest types ranged from cooler beech forests to thermophilic, drier oak forests on the northern- and southern-facing slopes, respectively, each varying in historical management intensity. The dendrochronological samples revealed that most of the canopy trees in these formerly managed forest patches were from 150-250 years old, indicating a similar duration without significant human intervention.

Excitingly, two small patches of old-growth beech forest and old-growth oak forest were identified, with the trees exceeding an age of 250 years, and surrounded by mature secondary growth forest, abandoned and left to natural development. We note that dendrochronological dating is limited by wood condition; as the oldest trees are often rotten, maximum age cannot be accurately determined, yet we can confidently diagnose the presence of older trees. Along the river, mature riparian *Alnus* forests were present, with large deadwood volumes and actively involved in the natural river morphological dynamics. We note that the Western Balkans were found to host a newly described *Alnus* species (*Alnus rohlenae*), which occurs along the Upper Neretva.

Across all forest types, we found the old-growth indicator species *Lobaria pulmonaria* – a rare lichen extremely sensitive to air pollution and associated with habitat continuity. This indicates immense conservation value of the entire landscape; only a few more decades are required until the forests develop the full array of old-growth characteristics. Unfortunately we could witness development into the opposite direction with the construction of the Ulog dam. By visual inspections we estimate that many of the trees felled for dam construction exceeded 150 years of age. These largest and oldest trees had numerous microhabitats present; essential structures for many species that take decades or centuries to form once lost.

Highlights

Two small patches of old-growth forest, dominated by either beech or oak, and surrounded by mature secondary forest, indicate high conservation value of the entire landscape. These forests qualify for strict conservation as mandated by the European Biodiversity Strategy for 2030. This should occur swiftly, as veteran trees have already been felled for dam construction.

Deadwood is an essential component of old-growth forests, supporting numerous species from beetles, fungi to birds. Both downed and standing deadwood is largely absent from managed forests. Top left and bottom right: Oak (*Quercus petraea*). Top right and bottom left: Beech (*Fagus sylvatica*).
Photo: Rhiannon Gloor

Lobaria pulmonaria - a threatened lichen species sensitive to air pollution and habitat continuity, it is a useful old-growth forest indicator species. Photo: Rhiannon Gloor

The Upper Neretva is very diverse. Along the mostly narrow valley of the river you have dynamic alluvial forest sections. Photo: Gabriel Singer

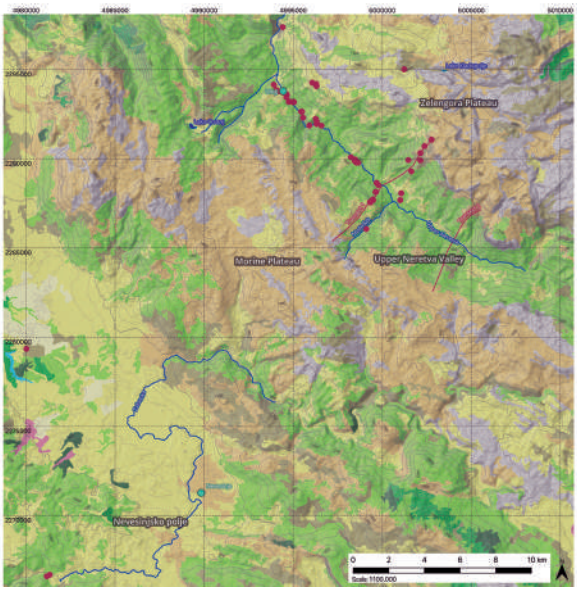
FLORA OF THE UPPER NERETVA: FROM RIVER TO MOUNTAINTOPS

Đorđije Milanović[1], Simona Strgulc Krajšek[2], Jugoslav Brujić[1], Ivan Juraj Čehulić[3], Valentin Heimer[4,5], Dragan Koljanin[1], Marija Kravanja[2], Ivana Rešetnik[3], Peter Schönswetter[4], Vladimir Stupar[1], Božo Frajman[4]

[1]University of Banja Luka, Bosnia and Herzegovina; [2]University of Ljubljana, Slovenia; [3]University of Zagreb, Croatia; [4]University of Innsbruck, Austria; [5]Eurac Research, Bozen/Bolzano, Italy

"A colourful composition of plant species in a mosaic of diverse habitats renders the Upper Neretva Valley an area of high conservation value. Let's protect this biodiversity for future generations!"

Valentin Heimer



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

We explored flora and vegetation of the Upper Neretva River catchment. During field excursions conducted over five days we registered (or collected for later identification) all bryophytes and vascular plants observed along three transects spanning from the bed of the Neretva River up to the upper montane belt. We also explored flora in the area of Lake Kladopolje and mosses at the Vranjača cave entry in the Nevesinjsko Polje. In the forests covering the slopes above the Neretva River and on river banks we conducted vegetation surveys.

Preliminary results

The Neretva River valley upstream of Ulog is characterised by a high diversity of habitats and vegetation types, ranging from riverine forests dominated by willows (*Salix* spp.) or alder (*Alnus rohlenae*), over thermophilous oak (*Quercus cerris* and *Q. petraea)* forests at lower elevations and mostly south-exposed slopes, over mesophilous beech (*Fagus sylvatica*) forests at higher elevations, to different grassland types exhibiting high diversity, including various orchids. We registered over 800 vascular plant species, of which 28 are strictly protected and 78 are protected in the Republic of Srpska. Approximately 60 species are rare and endangered (according to Šilić 1996) in Bosnia and Herzegovina, while 25 species are endemic to the Balkans. Two species from Annex 2 of the Habitat Directive are present in the research area: *Scilla litardierei* and *Anacamptis pyramidalis*, while *Galanthus nivalis* is listed in Annex 4 of the Directive. In addition, 29 habitat types from Annex 1 of the Habitat Directive were registered, among them seven with conservation priority. This qualifies the Upper Neretva River catchment for designation as a Natura 2000 site. Finally, we collected several bryophyte samples, in which up to now we have identified 94 taxa, with several samples still awaiting analysis.

Around the Vranjača cave entrance we identified 28 bryophytes, among them two new species for Bosnia and Herzegovina (*Fissidens gracilifolius* and *Sphenolobus minutus*) and one from the Data Deficient category of the European Red List (*Seligeria trifaria*).

Highlights

The mosaic of different vegetation types in the Upper Neretva River catchment is home to over 800 plant species of which numerous are rare and endangered. Seven habitat types are of European conservation priority, rendering the area of high conservation value. It should thus be protected for future generations.

Cerastium grandiflorum is one of the representatives of the endemic Balkan fora in the Upper Neretva Valley. Photo: Đorđije Milanović

Iris reichenbachii is one of the vulnerable species occurring in the Upper Neretva Valley.
Photo: Valentin Heimer

View of the Upper Neretva Valley with *Globularia cordifolia*. Photo: Valentin Heimer

View into the Upper Neretva Valley. The composition of pristine forests surrounding an intact river system is something we have lost in most of Europe. Photo: Valentin Heimer

Scilla litardierei occurring in the Upper Neretva Valley is a species from Annex II of the EU Habitats Directive. Photo: Đorđije Milanović

FUNGAL BIODIVERSITY

Linda Majdanová[1], Adam Polhorský[2]

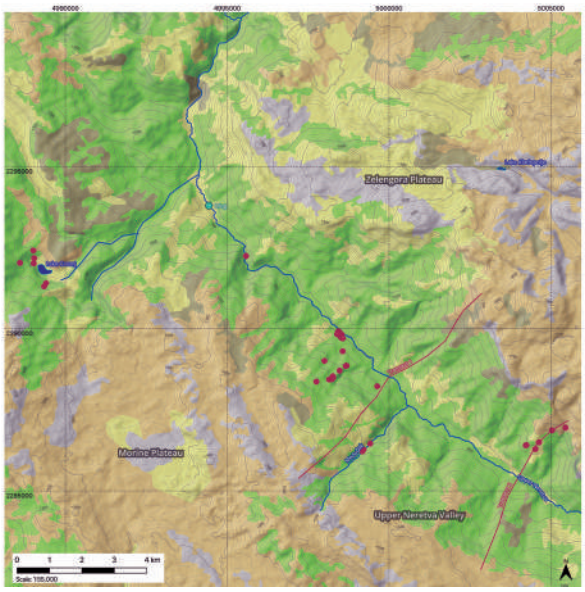
[1]Department of Forest Ecology, Faculty of Forestry and Wood Sciences, Czech University of Life Sciences Prague, Czech Republic; [2]Constantine the Philosopher University in Nitra, Slovakia

"It was fascinating to see how preserved and at the same time heterogeneous the landscape of the Upper Neretva River is. This amazing valley, which creates a habitat for many rare fungal species, clearly deserves to be preserved as a whole and further explored. Especially since the mycoflora of Bosnia and Herzegovina is still poorly understood."

Linda Majdanová

"Each day brought us numerous exciting findings, of which many turned out to be rarely recorded taxa or species new for the country."

Adam Polhorský



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

We investigated the diversity of fungi visible by naked eye or with the help of a hand lens, including all morphological groups (Corticiaceae s.l., Polyporales s.l., Agaricales s.l., Discomycetes, Pyrenomycetes, etc.) and with the intention to record as many species as possible. During our survey, we used only the fruit body-based approach. Taxa were identified directly in the field or material was collected for further microscopic/genetic determination. We tried to follow bottom-top transects starting at the riverbank and moving uphill, but this was often not possible due to daily thunderstorms followed by heavy rain, so our work was limited to shorter time and segments. However, we more or less covered all forest and grassland habitat types with different intensity of management present on the location.

Preliminary results

So far, we have identified more than a hundred species, including rare species and species not yet found in the country. Despite the fact that the season during which the research was done is not ideal for capturing the highest diversity of fungi, we were surprised by the number of fruiting species, especially in habitats closer to the bottom of the Upper Neretva Valley. The river presumably creates favourable microclimate conditions for fungi even during early summer, while the slopes higher above the river were already relatively dry with scarcer occurrence of fruiting bodies. Little is known about the mycoflora of Bosnia and Herzegovina, so we believe our data will help to create a better picture of local fungal diversity in general.

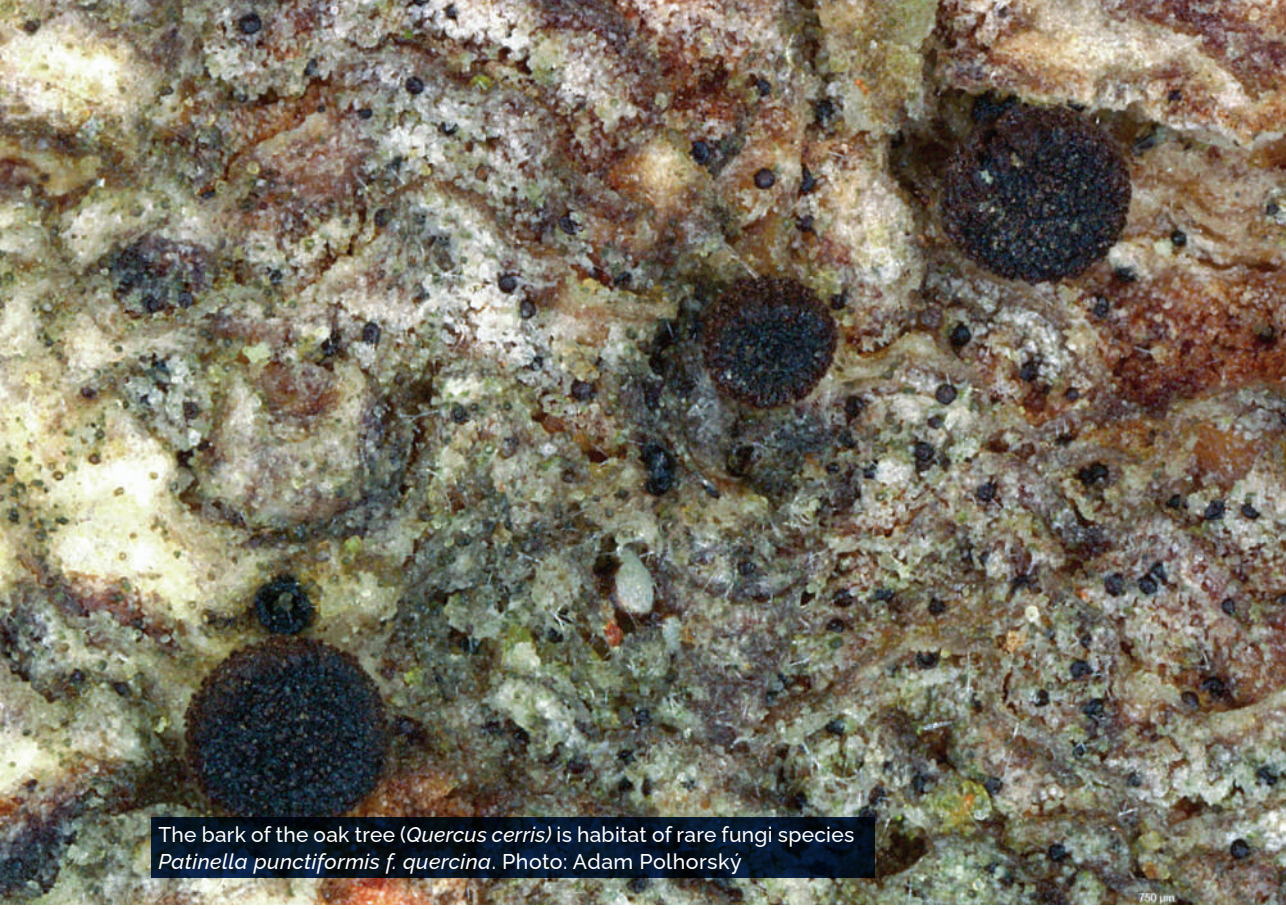
Highlights

During our study several species previously unknown for Bosnia and Herzegovina were recorded. So far, we have identified *Ophiocordyceps stylophora*, an entomopathogenic fungus known only from a few countries around the world, with the most southern findings in Europe now located in the Neretva Valley; *Xerombrophila crystallifera*, a widespread, but rarely collected species growing on *Salix* spp., with the riparian forest in the Neretva Valley representing the southernmost known locality of this species; the widespread but rare discomycetes *Orbilia lentiformis* or *Patinella punctiformis* f. *quercina*, up to now only known from its type locality in Luxembourg. Typical, but rarely encountered xerotolerant inhabitants of oak bark, *Proliferodiscus tricolor* and *Triblidium caliciiforme*, were also found for the first time in Bosnia and Herzegovina. We recorded many other rare and less common species, such as *Perrotia flammea*, *Guepiniopsis buccina, Peziza polaripapulata, Crustomyces subabruptus* or *Porotheleum fimbriatum,* some of which point to the old-growth character of forests here. There is also the possibility of some specimens collected during NSW'23 to represent new taxa, but this requires further phylogenetic study.

Crustomyces subabruptus on dead *Fagus sylvatica* log. Photo: Linda Majdanová

Adam Polhorský collecting *Lasiobelonium variegatum* during fieldwork near Dubrava in the Neretva Valley. Photo: Linda Majdanová

The fungi specialists discovered more than 100 species during the SW. Photo: Adam Polhorský



The bark of the oak tree (*Quercus cerris)* is habitat of rare fungi species *Patinella punctiformis f. quercina*. Photo: Adam Polhorský

Peziza polaripapulata on dead *Carpinus* log. Photo: Linda Majdanová

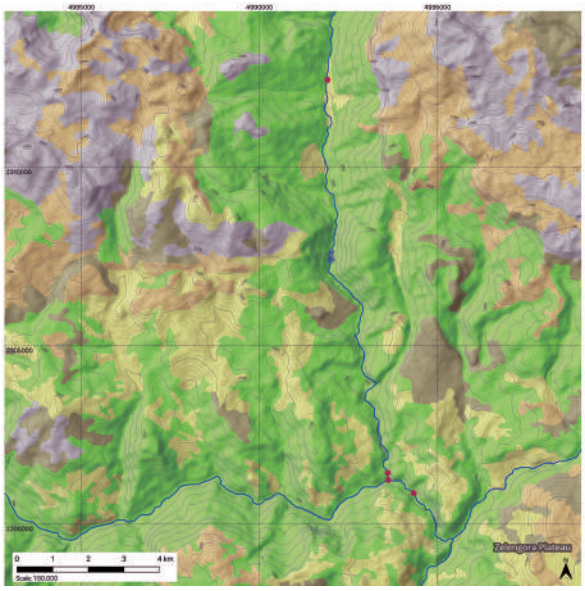
FISH OF LJUTA RIVER

Avdul Adrović[1], Elisabeth Haring[2], Kurt Pinter[3], Isat Skenderović[1]

[1]Faculty of Science and Mathematics, University of Tuzla, Bosnia and Herzegovina; [2]Natural History Museum Vienna, Austria; [3]University of Natural Resources and Life Sciences, Vienna, Austria

" The extremely rare softmouth trout is a highly endangered and equally enigmatic fish species whose detection demands great effort. Its occurrence in the Neretva represents one of the last important distribution areas, the protection of which is of utmost importance."

Kurt Pinter



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

To assess the fish stock of the Ljuta, electrofishing was carried out in one upstream located 50 m long reach of the Ljuta river (Gornja Ljuta village). To investigate whether the softmouth trout (*Salmo obtusirostris*) occurs in the Ljuta area, eDNA samples were taken in the Ljuta just before the confluence with Neretva and at two locations in the Neretva downstream of the confluence.

Preliminary Results

During electrofishing in the Ljuta, 15 individuals of Adriatic brown trout (*Salmo farioides*) were caught. The identity of the species was confirmed visually in the field, and later according to the manual of Kottelat & Freyhof (2007). We measured the total and standard body length of the caught individuals with an ichthyometer before returning the individuals to the water. The total body length of the Adriatic brown trout ranged from 92 to 178 mm with a mean value of 142 ± 2.59 mm.

The values of standard body length ranged between 79 and 154 mm with a mean value of 12.51 ± 2.11 mm. The analysed individuals thus belong to younger age classes and are in good condition. No other species of fish were caught, likely due to the upstream location of the research site.

Analysis of eDNA samples was performed at the Central Research Laboratories of the Natural History Museum Vienna. Both samples from the Neretva and also the sample in the lower reaches of the Ljuta contained fragments of softmouth trout DNA, thus documenting the presence of the species in both waters.

Highlights

An exciting highlight of this year's sampling is the detection of softmouth trout DNA in all three eDNA samples. This confirms the reports of local fishermen that the softmouth trout occurs as far upstream as the vicinity of the village of Ulog. The detection in the lower reaches of the Ljuta suggests that this fish species uses the tributaries in the Upper Neretva basin for reproduction.

Adriatic trout caught in the headwaters of the Ljuta river. Photo: Avdul Adrović

Where Ljuta meets the Neretva. Scientists proved the appearance of softmouth trout in this area. The Ljuta could be a spawning site for this rare species. Photo: Joshua D. Lim

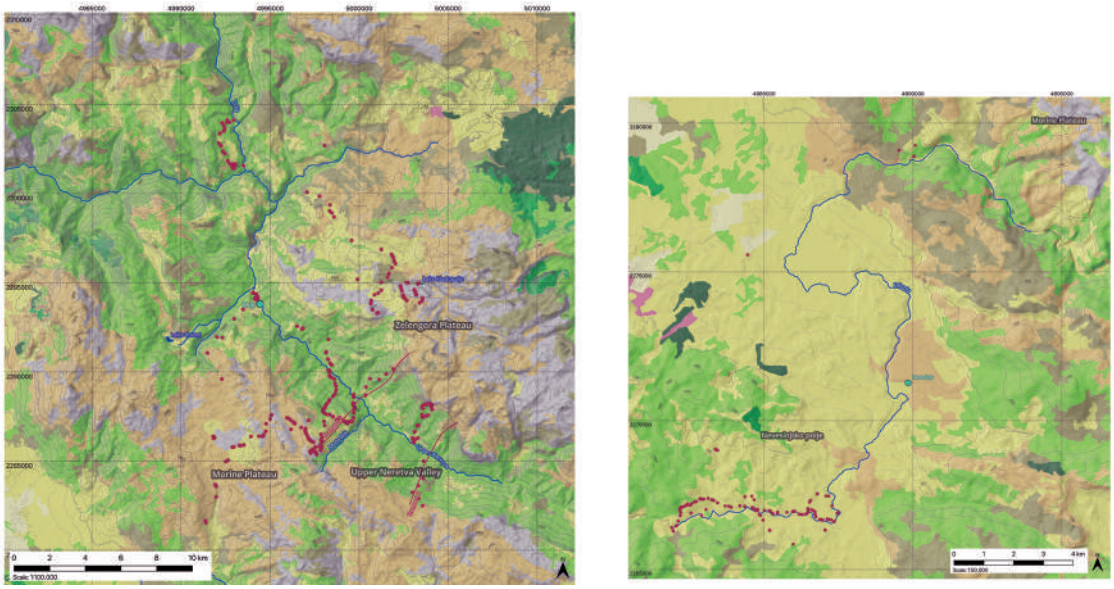
BIRDS ALONG THE SLOPES OF THE UPPER NERETVA VALLEY

Piotr Bednarek[1], Matthew Talluto[2], Julia Schlick-Steiner[2], Andrey Ralev[3], Szymon Czyżewski[4], Karina Ciepichał[5], Lara Mołoniewicz[5]

[1]Jagiellonian University in Kraków / Wolne Rzeki, Poland; [2]University of Innsbruck, Austria; [3]CEE Bankwatch Network, Bulgaria; [4]Aarhus University, Denmark; [5]Wolne Rzeki, Poland

"Neretva Valley seems to be a very interesting place for breeding birds, but not specifically the ones strictly connected with rivers. While there were some observations of Grey Wagtails, Dippers and Common Sandpipers in the river channel, the most interesting observations were made at the slopes of this deep valley. Rock Partridges, Golden Eagles, Short-toed Eagles, Eagle owls, Rock Thrushes – all these species were easily observed in the research area – and they're really hard to observe in any non-protected areas in Europe."

Piotr Bednarek



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

We investigated birds along the altitudinal gradient of the Upper Neretva Valley, starting from the river, ending at the top of the mountains/plateaus. The approach was to count all birds over 10-15 minutes at points located along multiple transects. Additionally, the plateaus on both sides of the Neretva Valley were searched specifically for raptors and other rare species (but still, all birds were noted). Also, we observed birds in the valleys of the Ljuta and Zalomka Rivers. We observed birds with binoculars and identified them in the field, and documented our findings with photos or sound recordings. 20% of all observations were made in late April and 80% during the Science Week in May/June, so we covered a part of the breeding season.

Preliminary results

We found a total of 105 species. There were several interesting species observed, among them some listed in higher categories of the IUCN Red List: Rock Partridge (NT, observed in the mountains on both banks of Neretva), European Turtle-dove (VU, observed in Zalomka River Valley), Montagu's Harrier (VU in the Mediterranean area, BiH population estimated at 100-150 breeding pairs, observed on the Morine plateau). Other rare species observed were: Golden Eagles (observed in valleys of Neretva and Ljuta; the breeding population in BiH estimated <50 pairs), Short-toed Eagles (observed twice on the plateau on the left bank of Neretva; BiH population 50-150 pairs), Eagle Owl (observed in the Neretva Valley). The quite rare White-backed Woodpecker, a species typical for primaeval and natural forests, was observed in old-growth forests on the right bank of the Neretva Valley.

Short-toed Snake Eagle, Neretva Valley. Photo: Piotr Bednarek

Golden Eagle, Neretva Valley. Photo: Piotr Bednarek

Species list

Symbol * denotes species on Bird Habitat Directive Annex I. Symbol ! denotes Near Threatened species and !! Vulnerable species according to IUCN. Areas where species were observed are coded as follows: Upper Neretva Valley (N), Ljuta Valley (L), Zalomka Valley (Z), Morine Plateau (MP), Zelengora Plateau (ZP).

Anatidae
Anas platyrhynchos | Mallard | Z,ZP
Phasianidae
Alectoris graeca | Rock Partridge | *! | N,Z,MP
Coturnix coturnix | Common Quail | N,Z,MP,ZP
Podicipedidae
Tachybaptus ruficollis | Little Grebe | ZP
Columbidae
Streptopelia turtur | European Turtle-Dove | !! | Z
Columba livia | Rock Pigeon | Z
Columba palumbus | Common Wood-Pigeon | N,Z,MP
Cuculidae
Cuculus canorus | Common Cuckoo | N,L,Z,MP
Caprimulgidae
Caprimulgus europaeus | Eurasian Nightjar | * | Z
Apodidae
Apus apus/pallidus | Common/Pallid Swift | Z
Rallidae
Crex crex | Corncrake | * | ZP
Rallus aquaticus | Water Rail | N
Scolopacidae
Actitis hypoleucos | Common Sandpiper | N
Laridae
Larus michahellis | Yellow-legged Gull | Z
Ardeidae
Ardea cinerea | Grey Heron | Z
Accipitridae
Aquila chrysaetos | Golden Eagle | * | N,L
Circaetus gallicus | Short-toed Snake-Eagle | * | MP
Circus aeruginosus | Western Marsh Harrier | * | MP
Circus pygargus | Montagu's Harrier | * | MP
Pernis apivorus | European Honey-buzzard | * | N,L,MP
Accipiter nisus | Eurasian Sparrowhawk | L,MP
Buteo buteo | Common Buzzard | N,L,Z,MP
Clanga/Aquila sp. | Clanga/Aquila sp. | MP
Strigidae
Bubo bubo | Eurasian Eagle Owl | * | MP
Otus scops | Eurasian Scops-Owl | N
Upupidae
Upupa epops | Eurasian Hoopoe | N,L,Z,MP,ZP
Meropidae
Merops apiaster | European Bee-eater | N,Z,MP
Picidae
Dendrocopos leucotos | White-backed Woodpecker | * | N,MP
Dendrocoptes medius | Middle Spotted Woodpecker | * | N
Dryocopus martius | Black Woodpecker | * | N,MP
Picus canus | Grey-headed Woodpecker | * | N
Dendrocopos major | Great Spotted Woodpecker | N
Dryobates minor | Lesser Spotted Woodpecker | Z
Jynx torquilla | Eurasian Wryneck | N,Z
Picus viridis | Eurasian Green Woodpecker | MP
Falconidae
Falco | Typical Falcons | ZP
Falco subbuteo | Eurasian Hobby | MP
Falco tinnunculus | Eurasian Kestrel | N,L,MP,ZP
Oriolidae
Oriolus oriolus | Eurasian Golden Oriole | N,Z,MP
Laniidae
Lanius collurio | Red-backed Shrike | * | N,Z,MP,ZP
Lanius minor | Lesser Grey Shrike | * | Z
Corvidae
Corvus corax | Common Raven | N,Z,MP
Corvus cornix | Hooded Crow | N,Z,MP,ZP
Corvus monedula | Eurasian Jackdaw | Z,MP,ZP
Garrulus glandarius | Eurasian Jay | N,L,Z,MP
Pica pica | Eurasian Magpie | N,Z
Pyrrhocorax graculus | Yellow-billed Chough | MP,ZP
Paridae
Cyanistes caeruleus | Eurasian Blue Tit | N,L,Z,MP
Parus major | Great Tit | N,L,MP
Poecile lugubris | Sombre Tit | N,Z
Poecile palustris | Marsh Tit | N,Z
Alaudidae
Lullula arborea | Woodlark | * | Z
Alauda arvensis | Eurasian Skylark | N,Z,MP,ZP
Acrocephalidae
Hippolais icterina | Icterine Warbler | N
Hirundinidae
Cecropis daurica | Red-rumped Swallow | N,Z
Delichon urbicum | Common House Martin | N,Z
Hirundo rustica | Barn Swallow | Z,MP
Ptyonoprogne rupestris | Eurasian Crag Martin | N,L,Z
Phylloscopidae
Phylloscopus collybita | Common Chiffchaff | N,L,Z,MP,ZP
Phylloscopus sibilatrix | Wood Warbler | N
Phylloscopus trochilus | Willow Warbler | N
Scotocercidae
Cettia cetti | Cetti's Warbler | Z
Aegithalidae
Aegithalos caudatus | Long-tailed Tit | N,Z
Sylviidae
Curruca communis | Common Whitethroat | Z,MP
Curruca curruca | Lesser Whitethroat | N,Z,MP
Sylvia atricapilla | Eurasian Blackcap | N,L,Z,MP
Sylvia borin | Garden Warbler | N
Sittidae
Sitta europaea | Eurasian Nuthatch | N,L,MP
Certhiidae
Certhia brachydactyla | Short-toed Treecreeper | N,L
Certhia familiaris | Eurasian Treecreeper | N,L

Troglodytidae
Troglodytes troglodytes | Eurasian Wren | N,MP
Cinclidae
Cinclus cinclus | White-throated dipper | L
Sturnidae
Sturnus vulgaris | Common Starling | Z
Turdidae
Turdus merula | Eurasian Blackbird | N,L,Z,MP,ZP
Turdus philomelos | Song Thrush | N,MP
Turdus pilaris | Fieldfare | N
Turdus viscivorus | Mistle Thrush | N,Z,MP
Muscicapidae
Ficedula albicollis | Collared Flycatcher | * | Z
Erithacus rubecula | European Robin | N,L,MP
Ficedula hypoleuca | European Pied Flycatcher | Z
Luscinia megarhynchos | Common Nightingale | N,L,Z,ZP
Monticola saxatilis | Rufous-tailed Rock-Thrush | MP,ZP
Muscicapa striata | Spotted Flycatcher | MP
Oenanthe oenanthe | Northern Wheatear | Z,MP,ZP
Phoenicurus ochruros | Black Redstart | N,Z,MP,ZP
Saxicola rubetra | Whinchat | N,Z,MP,ZP
Passeridae
Passer domesticus | House Sparrow | Z
Passer montanus | Eurasian Tree Sparrow | Z

Motacillidae
Anthus campestris | Tawny Pipit | * | MP,ZP
Anthus | Pipits | ZP
Anthus trivialis | Tree Pipit | N,MP
Motacilla alba | White Wagtail | N,Z,MP,ZP
Motacilla cinerea | Grey Wagtail | N,Z
Motacilla flava | Western Yellow Wagtail | Z
Motacilla flava feldegg | Black-headed Wagtail | Z
Fringillidae
Carduelis carduelis | European Goldfinch | N,L
Chloris chloris | European Greenfinch | Z
Coccothraustes coccothraustes | Hawfinch | N,Z,ZP
Fringilla coelebs | Common Chaffinch | N,L,Z,MP,ZP
Linaria cannabina | Eurasian Linnet | MP
Serinus serinus | European Serin | Z
Emberizidae
Emberiza hortulana | Ortolan Bunting | * | N,MP,ZP
Emberiza calandra | Corn Bunting | Z,MP,ZP
Emberiza cia | Rock Bunting | N,Z
Emberiza cirlus | Cirl Bunting | N,Z
Emberiza citrinella | Yellowhammer | N,Z,MP
Emberiza melanocephala | Black-headed Bunting | Z

Eurasian Turtle-dove and a Common Wood-pigeon, Zalomka Valley. Photo: Piotr Bednarek

Rock Partridge, Morine Plateau. Photo: Szymon Czyżewski

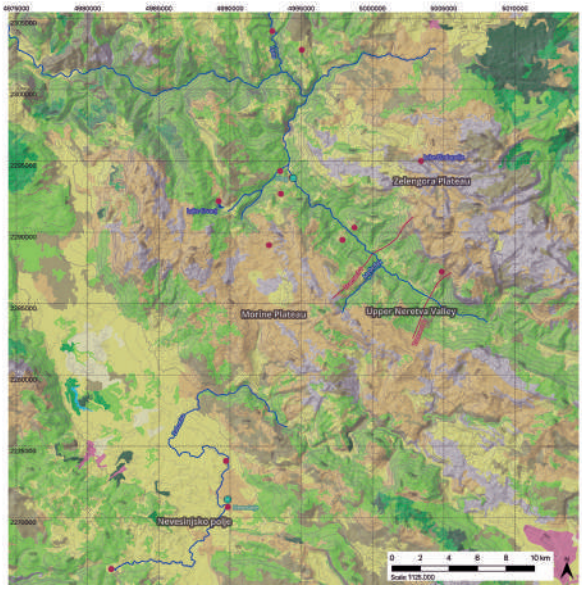
AMPHIBIANS AND REPTILES OF UPPER NERETVA AND NEVESINJSKO POLJE

Saudin Merdan, Aleksandra Babić, Mia Dejanović, Rejna Kolašinac

Center Dr. Stjepan Bolkay, Olovo, Bosnia and Herzegovina

"The Upper Neretva River represents one of the most valuable natural pearls of our country. Its rich biodiversity of flora and fauna can be recognized in every metre of this stream. Our two-year research of amphibians and reptiles, conducted on Neretva Science Weeks 2022/23, has given us amazing results! We strongly believe that the data collected will be a valuable part of the fight for the preservation of this natural gem, for our presence and the future."

Aleksandra Babić



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

To achieve more spatial coverage of various habitats we enlarged the research area, thus including amphibian and reptile habitats potentially threatened by various factors. On 14 different sites, we used various methods and collecting tools for examining herpetofauna: individuals were visually registered or sonically recognized, for more detailed analysis were caught by hand, trapped with funnel traps, or caught by the loop method. All individuals were returned to the same place they were collected. The research was conducted both during the day and night.

Preliminary results

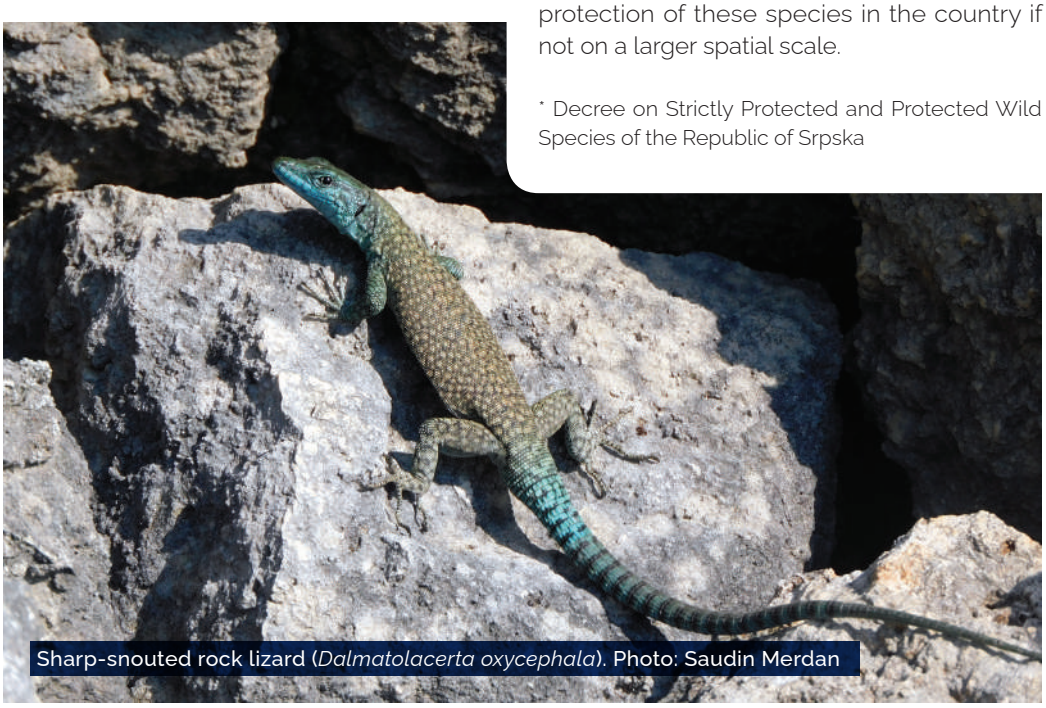
The rich biodiversity of the upper Neretva River and Nevesinjsko Polje are confirmed by our findings of the herpetofauna in these areas. We found 8 species of amphibians and 13 species of reptiles. These unusually high figures indicate low anthropogenic pressure. The loss of these species would likely have major consequences on the balance of the entire ecosystem.

Highlights

When it comes to reptiles, two very significant species have been recorded, *Dinarolacerta mosorensis* and *Dalmatolacerta oxycephala*. *D. mosorensis* is listed as vulnerable in the IUCN list and a protected wild species according to the DRS*. It is listed in Annex II of the Habitats Directive (and thus a target species for the creation of Natura 2000 sites) and Annex III of the Bern Convention. *D. oxycephala* is a protected wild species according to the DRS*, and it is listed in Annex IV of the Habitats Directive and Annex III of the Bern Convention.

On the batrachology part, the most important species were *Bombina variegata* and *Rana graeca*, both are strictly protected wild species by the DRS*. *B. variegata* is listed in Annex II and *R. graeca* is in Annex IV of the Habitats Directive. One of this year's discoveries is *Ichtyosaura alpestris*, a protected wild species according to the DRS* and listed in Annex III of the Bern Convention. Each population of the mentioned species was found with numerous and healthy individuals in their habitats, suggesting the researched areas to be important for the protection of these species in the country if not on a larger spatial scale.

* Decree on Strictly Protected and Protected Wild Species of the Republic of Srpska



Sharp-snouted rock lizard (*Dalmatolacerta oxycephala*). Photo: Saudin Merdan

Mosor rock lizard (*Dinarolacerta mosorensis*). Photo: Saudin Merdan

Alpine newt (*Ichthyosaura alpestris*). Photo: Saudin Merdan

Horned viper (*Vipera ammodytes*). Photo: Saudin Merdan

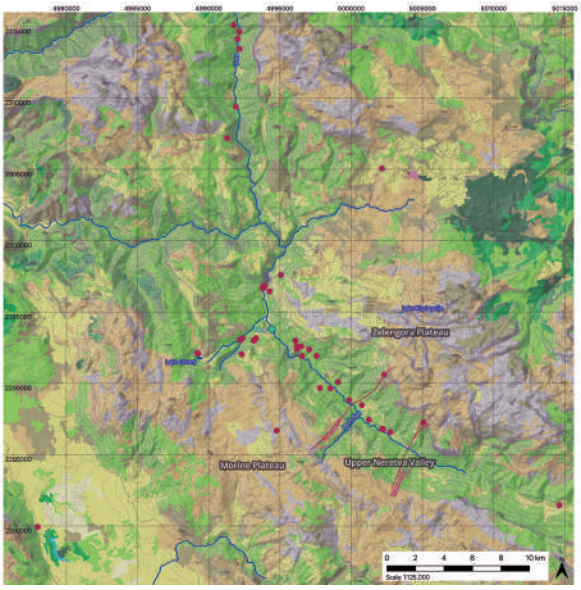
TRACING THE TRAILS OF LARGE CARNIVORES

Manuela Habe[1], Emir Delić[2], Robert Oroz[3]

[1]Independent Scientist, Austria; [2]Environmental Specialist, Bosnia and Herzegovina;
[3]Environmental Activist, Bosnia Herzegovina

"The ubiquitous presence of large carnivores in the Neretva Valley enables a tighter coupling of predator-prey dynamics than elsewhere in Europe and speaks for the impressive and functionally intact biodiversity of the Upper Neretva Valley. Given the abundance of observed tracks, wolf and bear are obviously an integral part of the Upper Neretva Valley´s old-growth forests, co-shaping the ecology of this landscape. Such otherwhere rather unimaginable wilderness allows us to understand and appreciate ecological equilibria. In fact, the large carnivores are crucial for the preservation of this pristine river valley in a functionally intact state, and the protection of the valley is likely crucial for the continued survival of large carnivores in this region."

Manuela Habe



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

We invited all participants of the Neretva Science Week to contribute findings of large carnivore field signs during their field work. This went under the prerequisite of a short field guide, which included graphs of typical large carnivore tracks and explained how to collect valid data of field signs like scats and tracks. Building on knowledge gained in 2022, we also set out 4 camera traps (CTs) covering a predesigned focus area and tracking according transects. One CT was set up from 5.5. to 31.5. (19), two CTs from 29.5. to 6.6. (10,4) and two respectively from 1.6. (CTRO2 0 records 0 species) to 6.6. All large carnivore and wild cat records were classified into C1 - verifiable records (genetic samples, pictures of animals with coordinates, measured tracks, faeces), C2 - records with additional information and C3 - not verifiable (e.g. personal observation). Additionally we joined day-expeditions to the Ljuta and Zalomka rivers and road-tracked the plains to get a clearer picture of possible connections and migration routes among habitats.

Preliminary results

With 15 contributors we recorded 79 field signs (C0: 29, C1: 32, C2: 8, C3: 10). We collected 50 records of large carnivores (incl. wild cat) and 29 records from 8 further mammal species (*Lepus europaeus*, *Lutra lutra*, *Martes*, *Capreolus capreolus*, *Meles meles*, *Sciurus vulgaris*, *Sus scrofa*, *Vulpes vulpes*). Among the 32 validated large carnivore records (Tab.1) are eight genetic samples (5 wolf, 3 bear) from 4 contributors that were sent to Banja Luka for further analysis.

Species	All	C1	C2	C3
Brown bear (*Ursus arctos*)	14	7	1	6
Eurasian lynx (*Lynx lynx*)	1	-	-	1
Grey wolf (*Canis lupus*)	32	25	4	3
Wild cat (*Felis silvestris*)	3	-	2	1

Tab.1. Large carnivore records; after species and record category (C1 - verifiable, C2 - record with additional information, C3 – not verifiable).

With 4 camera traps we collected 33 records, 19 of them with the camera that was set up the longest. We thereby documented 8 mammal species including grey wolf (*Canis lupus*) and wild cat (*Felis silvestris*), the wild cat at two locations.

While we did not find any large carnivore evidence on the expedition day to Zalomka, the wolf and bear records from the Ljuta and the bear record close to Nevesinje point to a remaining connection of the valleys for the migration of these species.

Highlights

The high number of collected large carnivore field signs (2022 = 8, 2023 = 50), enabled by the season and the high willingness of colleagues to contribute observations, underpinned the feeling of being surrounded by apex predators. As for the wild cat, that is generally accepted to be present, qualitative data is rare and we were lucky to catch even two individuals, likely one wild cat and a hybrid, on camera.

Wolf footage on camera trap. Photo: Robert Oroz

Wild cat footage on camera trap. Photo: Manuela Habe

Wolf scat attracts butterflies. It provides them with minerals. Photo: Manuela Habe

Bear Footprint. Photo: Manuela Habe

Upper Neretva Valley, with its dense forest, is home to all large carnivore species. However, intensive logging has started in the region. This poses a big threat not only to the forest, but to the whole ecosystem of the Neretva valley. Photo: Joshua D. Lim

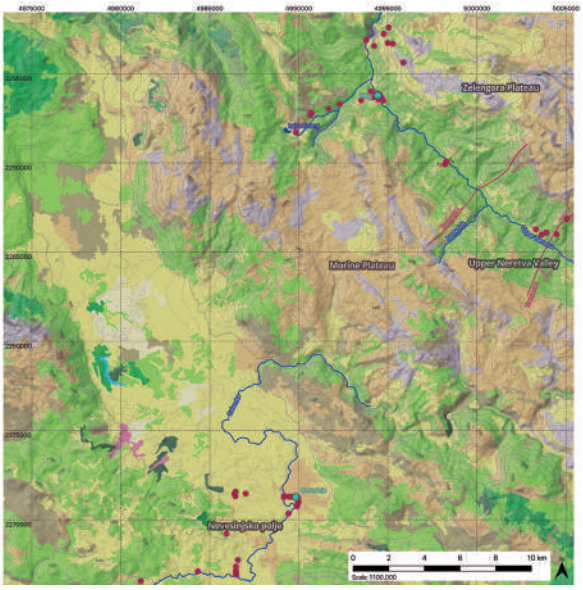
BATS OF UPPER NERETVA AND NEVESINJSKO POLJE

Maja Zagmajster[1], Ester Premate[1], Tinkara Kepic[1], Liza Trebše[1], Annasibila Požrl[1], Anton Vorauer[2], Vojo Milanović[3]

[1]University of Ljubljana; [2]Ecotone Austria; [3]Centre for Karst and Speleology

"Although the weather conditions and timing of this year's NSW were far from optimal for bat surveys, we managed to collect exciting new data. We recorded three new bat species for the area, two of which are listed as species of highest conservation concern in Europe, and found many new bat sites. The Neretva River Valley is home to a rich community of bats, which makes this area even more valuable and in need of adequate long-term protection."

Maja Zagmajster



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Encouraged by bat discoveries in 2022, we used a variety of methods to gather as much information about bats as possible. During the day, we searched for potential roost sites. We examined many abandoned buildings in the Upper Neretva Valley, and obtained information about some bat roosts from the Zalomka River in Nevesinjsko Polje. We investigated three caves: Čašica and Golubnjača in the Neretva area and Vranjača near the Zalomka river basin. We also set mistnets at three sites, where we anticipated bat flight paths. Automatic bat detectors were placed at different locations in the Neretva River Valley and for one night next to the Zalomka River. They were also placed at three different altitudes on a predefined transect above the Upper Neretva Valley. Manual bat detectors were used at some sites. All bat call recordings are still under investigation.

Preliminary Results

We searched more than 20 potential roost places, which were mainly abandoned buildings, three caves and some tree hollows. Mist netting was successful only at the cave entrance, where we caught 14 individuals of five different bat species. In total, we detected at least 11 bat species. Three species were confirmed for the first time: Mediterranean horseshoe bat (*Rhinolophus euryale*), Geoffroy's bat (*Myotis emarginatus*) at the cave above Neretva River Valley and European free-tailed bat (*Tadarida teniotis*) in Nevesinjsko polje. We recorded Lesser horseshoe bats (*Rhinolophus hipposideros*) at many buildings, some of which were most likely maternity roosts.

Highlight

Despite far from optimal weather conditions and many rainy evenings, we were successful in recording bats. We have discovered at least three bat species which were not registered in last year's bat research, and discovered many new bat roosts of *R. hipposideros*. Two of the newly discovered species, *R. euryale* and *M. emarginatus*, are among bat species of highest conservation concern in Europe. This has increased the number of such species in Neretva River Valley to five in total. We also made the first inventory of bats in the Zalomka river basin, where only a few species were known from previous research.

Buildings present potential roosts for bats, so we checked all which we could access. In the stable on the right side of the photo we discovered a group of Lesser horseshoe bats (*Rhinolophus hipposideros*), probably a maternity colony. Photo: Maja Zagmajster

Mediterranean horseshoe bat (*Rhinolophus euryale*) is one of the most endangered horseshoe bat species in Europe. We confirmed its presence in the Upper Neretva Valley. Photo: Maja Zagmajster

Geoffroy's bat (*Myotis emarginatus*) was caught in a mistnet when leaving a cave, showing it was staying in the cave during the day. Photo: Maja Zagmajster

The Natterer's bat (*Myotis nattereri*) was recorded already in 2022, its presence was confirmed also this year but at a different site. Photo: Maja Zagmajster

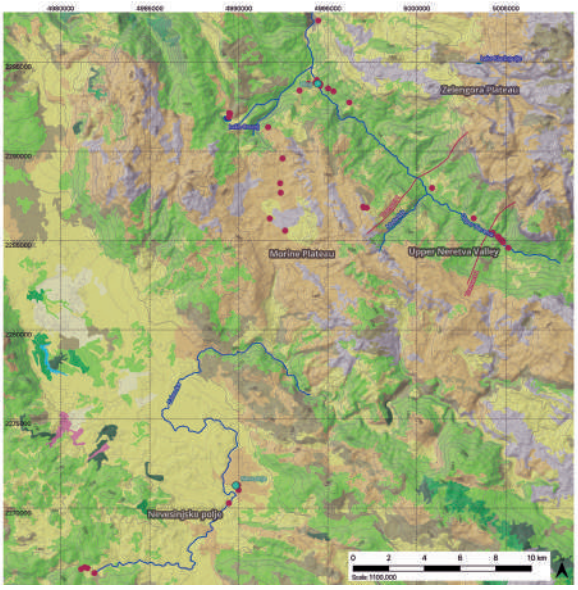
GRASSHOPPERS AND CRICKETS IN THE UPPER NERETVA, MORINE PLATEAU AND NEVESINJSKO POLJE

Slobodan Ivković[1], Laslo Horvat[2]

[1]Staatliches Museum für Naturkunde Karlsruhe, Germany
[2]Austria

"Diverse habitats along the Upper Neretva River are home to the unique Orthoptera fauna, of which many are endemic. Field research conducted on two occasions in 2023 resulted in a high number of species, proving that the region of the Upper Neretva River represents a very important area for Orthoptera."

Slobodan Ivković



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

In order to collect data on Orthoptera we have visited seven main localities, mostly meadows along the Neretva River, Ulog, Lake Crvanj, Morine and Zalomka River. We also collected data while moving between main localities. We first recorded Orthoptera during the Neretva Science Week 2023, in the period 28.05-05.06.2023. At this time, the majority of found specimens were still nymphs due to a cold spring and thus not possible to identify. In order to avoid missing to detect important species occurring in the study area, we revisited the same localities in the period 12.08-16.08.2023. For Orthoptera sampling/detection, we used various methods: During the day we sampled by common entomological methods including visual and acoustic searching, sweep netting, beating from trees and shrubs. During the night we collected specimens using a headlamp. Material was usually identified in the field. For more detailed analysis in the genera *Poecilimon*, *Isophya*, *Modestana* and *Montana* we collected male individuals and recorded male calling songs. Collected specimens were preserved in 96% ethanol and deposited in the author's private collection.

Results

Most of the species found during the NSW 2023 are species which occur in late spring, such as Gryllidae, *Tetrix* spp., *Omocestus rufipes* and *Aiolopus strepens*. Our second field work phase in August resulted in a higher number of species, of which as the most interesting we can emphasise these Balkan and Dinaric endemics: *Dinarippiger discoidalis*, *Isophya speciosa*, *Modestana modesta*, *Ovaliptila willemsei*, *Pholidoptera dalmatica*, *Prionotropis hystrix* and *Psorodonotus illyricus*. Several found species are listed on IUCN Red List of Orthoptera: *Arcyptera brevipennis* and *Prionotropis hystrix* as Vulnerable (VU) and *Psorodonotus illyricus* as Near Threatened (NT). Also, one *Poecilimon* species, found on Morine, belongs to a yet undescribed species close to *P. albolineatus*. In total, during our field work we recorded 60 Orthoptera species. Given that some common species were not found or were overlooked, we estimate the real number of the species in the investigated area to be around 70.

Ovaliptila willemsei, male, Balkan endemic. Photo: Laslo Horvat

Species list

Symbol ! denotes Near Threatened species and !! Vulnerable species according to IUCN. Areas where species were observed are coded as follows: Neretva Valley (N), Ljuta Valley (L), Zalomka Valley (Z), Morine Plateau (MP), Zelengora Plateau (ZP). Bolded are Balkan endemics, bolded and underlined are endemic species of the Dinaric Mountains.

Acheta domesticus (Linnaeus, 1758) | ? | N
Aiolopus strepens (Latreille, 1804) | N,Z
Anacridium aegyptium (Linnaeus, 1764) | N
Arcyptera brevipennis (Brunner von Wattenwyl, 1861) | ! | MP
Arcyptera fusca (Pallas, 1773) | MP
Barbitistes yersini Brunner von Wattenwyl, 1878 | N,MP
Bicolorana bicolor (Philippi, 1830) | N,MP
Calliptamus italicus (Linnaeus, 1758) | N
Chorthippus dorsatus (Zetterstedt, 1821) | N,MP
Chorthippus maritimus Mistshenko, 1951 | Z
Chorthippus mollis (Charpentier, 1825) | N,MP
Conocephalus fuscus (Fabricius, 1793) | N
Decticus albifrons (Fabricius, 1775) | N
Decticus verrucivorus (Linnaeus, 1758) | N,MP
***Dinarippiger discoidalis* (Fieber, 1853) | Z,MP**
Euchorthippus declivus (Brisout de Barneville, 1848) | N,MP
Eupholidoptera schmidti (Fieber, 1861) | N
Euthystira brachyptera (Ocskay, 1826) | N,MP
Gomphocerippus rufus (Linnaeus, 1758) | N
Gryllus campestris Linnaeus, 1758 | N,Z,MP
Isophya modestior Brunner von Wattenwyl, 1882 | N
***Isophya speciosa* (Frivaldszky, 1868) | N**
Meconema thalassinum (De Geer, 1773) | MP
Melanogryllus desertus (Pallas, 1771) | N
***Modestana modesta* (Fieber, 1853) | Z,MP**
Montana stricta (Zeller, 1849) | N,Z,MP
Oecanthus pellucens (Scopoli, 1763) | N,MP
Oedipoda caerulescens (Linnaeus, 1758) | N,MP
Oedipoda germanica (Latreille, 1804) | N,MP
Omocestus haemorrhoidalis (Charpentier, 1825) | MP
Omocestus rufipes(Zetterstedt, 1821) | N,MP
***Ovaliptila willemsei* (Karaman, 1975) | N**
Pachytrachis gracilis (Brunner von Wattenwyl, 1861) | N,MP
Pezotettix giornae (Rossi, 1794) | N,MP
Phaneroptera falcata (Poda, 1761) | N,MP
Phaneroptera nana Fieber, 1853 | N
***Pholidoptera dalmatica* (Krauss, 1879) | N,MP**
Pholidoptera frivaldszkyi (Herman, 1871) | MP
Pholidoptera griseoaptera (De Geer, 1773) | N
Platycleis affinis Fieber, 1853 | N
Platycleis grisea (Fabricius, 1781) | N,MP
Poecilimon thoracicus (Fieber, 1853) | MP
Polysarcus denticauda (Charpentier, 1825) | N
***Prionotropis hystrix* (Germar, 1817) | ! | Z**
Pseudochorthippus parallelus (Zetterstedt, 1821) | N,MP
***Psorodonotus illyricus* Ebner, 1923 | ! | N,MP**
Rhacocleis germanica (Herrich-Schäffer, 1840) | N
Roeseliana roeselii (Hagenbach, 1822) | N
Stauroderus scalaris (Fischer von Waldheim, 1846) | MP
Stenobothrus lineatus (Panzer, 1796) | N,MP
Stenobothrus nigromaculatus (Herrich-Schäffer, 1840) | MP
Stenobothrus stigmaticus (Rambur, 1838) | MP
Tessellana tessellata (Charpentier, 1825) | N
Tetrix subulata (Linnaeus, 1758) | Z
Tetrix tenuicornis (Sahlberg, 1891) | N,Z
Tettigonia caudata (Charpentier, 1845) | MP
Tettigonia viridissima (Linnaeus, 1758) | N,Z,MP

Poecilimon sp., male, possibly a new species, Balkan endemic. Photo: Laslo Horvat

Prionotropis hystrix, male, Balkan endemic, vulnerable. Photo: Laslo Horvat

Ephippiger discoidalis, male, Balkan endemic. Photo: Laslo Horvat

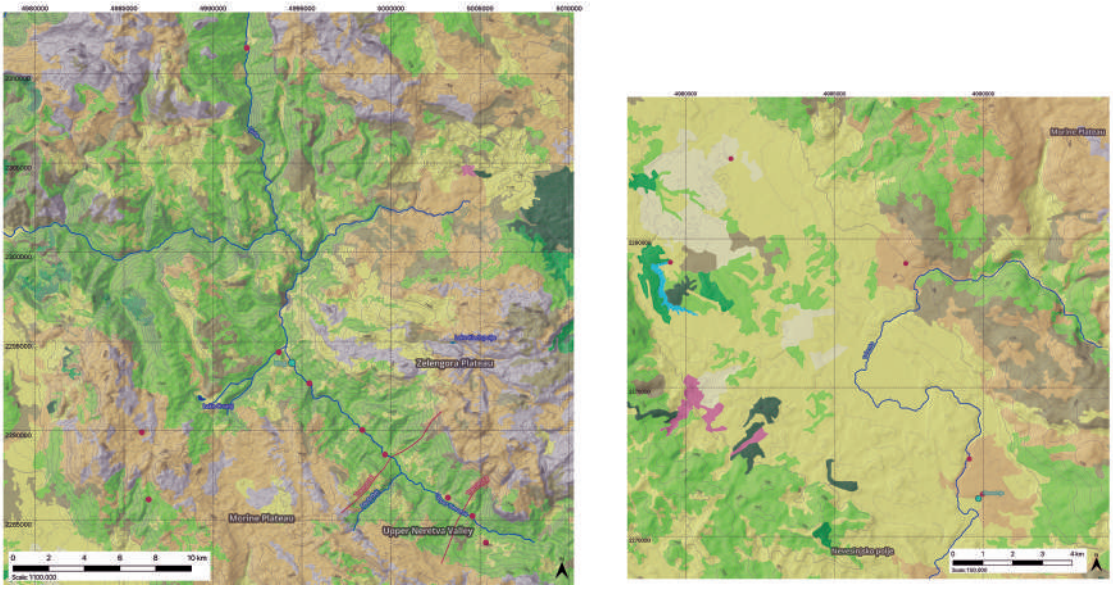
BUTTERFLIES AND MOTHS: INDICATORS OF EXCEPTIONAL NATURAL HERITAGE

Branislava Dukić[1], Dejan Kulijer[2], Thomas Zechmeister[3]

[1]Arbor Magna- Natural Heritage Protection Society, Bosnia and Herzegovina; [2]National Museum of Bosnia and Herzegovina; [3]Biological Station Lake Neusiedl, Illmitz, Austria

"During our visit last year, the local fishkeeper Boban told me: ''Once you come to Ulog and feel the spirit of the Neretva, you will want to come back again and again''. Now, two years later, I understand that he was right. I believe that our path will again be intertwined with the upper course of the Neretva."

Branislava Dukić



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Last year´s focus was on the habitats next to the Upper Neretva River itself, this year we expanded our research to the mountain range, and also visited Nevesinjsko Polje and Zalomka River. Various survey methods were applied to study both diurnal and nocturnal species. Moths were attracted with light traps (portable heath moth traps, collecting tents) and diurnal species were sampled with an entomological net or photographed in the wild. We visited 15 localities despite extremely bad weather with temperatures mostly below 20 °C and frequent rain showers. We note that such conditions are suboptimal for the observation of this group of insects.

Preliminary results

In addition to the 55 species of butterflies found in 2022, we confirmed the presence of 16 additional species, leading to a final number of registered species of butterflies in the investigated area of 71. As for moths, this year we confirmed 21 species in addition to the 196 identified in 2022 already, resulting in 217 species of moths in total. Processing of collected material is not yet complete, as some species require more time and expertise for identification, so the reported numbers are not final.

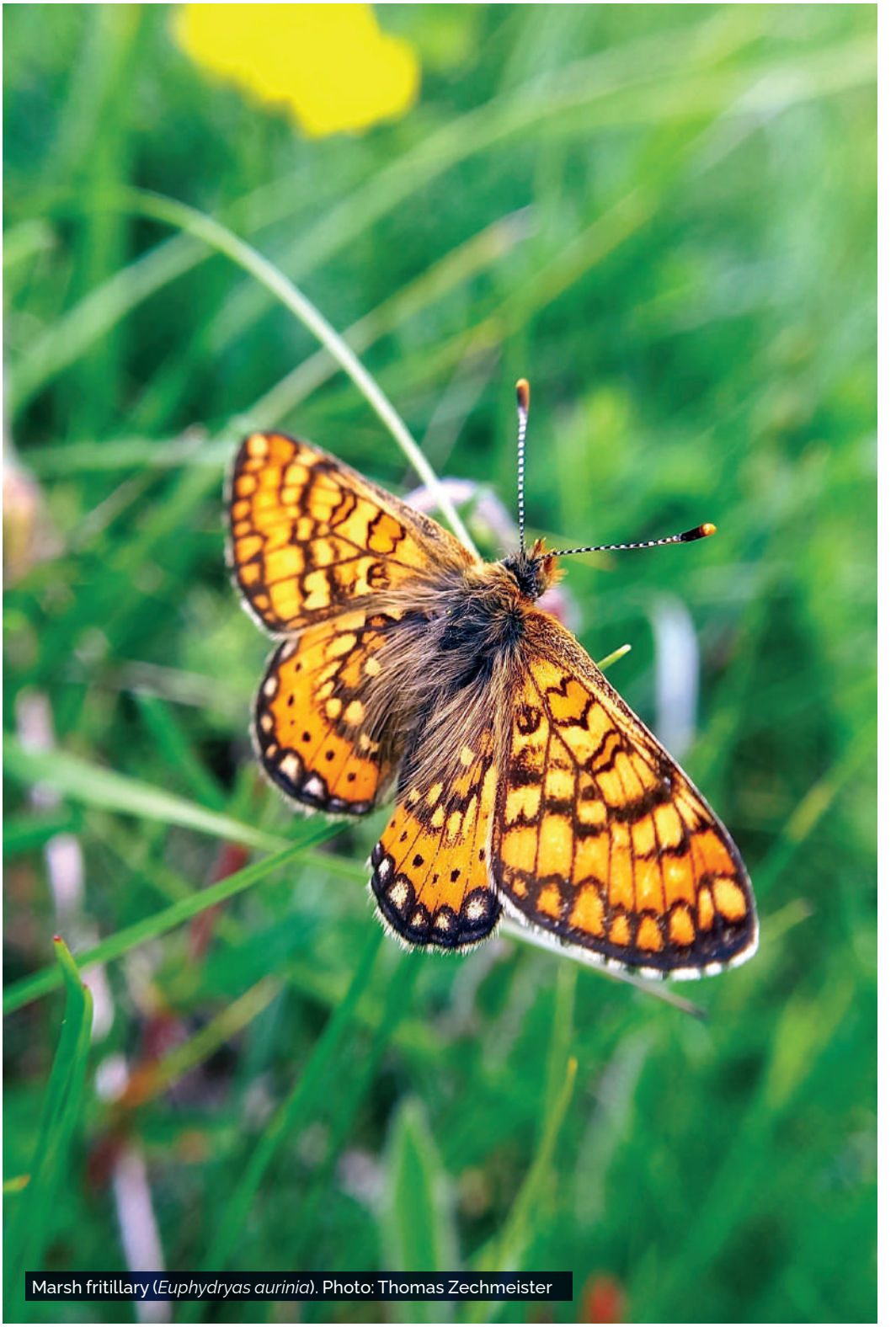
Besides this impressive species richness, we noted the high abundance of most species of butterflies and moths, which also resulted in high capture success in the light traps. Therefore, we believe that especially moths may play a major stabilising role in the regional food web, e.g. as a resource for birds and bats. Such observations have become impossible in areas of Central Europe with industrial agriculture since decades!

Highlights

Despite the short duration of the survey and unfavourable weather conditions, our results confirm the high diversity of Lepidoptera fauna in the research area. New records of four species demonstrate the importance of this area for the preservation of species of European Conservation concern in Bosnia and Herzegovina.

Eriogaster catax is a registered Natura 2000 species listed in Annexes II and IV of the EU Habitats Directive and Annex II of the Bern Convention. Its widespread presence in the study area is confirmed here after more than 100 years. It is a data deficient species on a global scale, known in Bosnia and Herzegovina from only a few historical records. We found many new locations along the Neretva and Ljuta

Larvae of *Eriogaster catax.* Photo: Branislava Dukić



Marsh fritillary (*Euphydryas aurinia*). Photo: Thomas Zechmeister

Common blue butterfly (*Polyommatus icarus*) copula. Photo: Thomas Zechmeister

Euphydryas aurinia is another species on the Natura 2000 list and found in Annex II of the EU Habitats Directive and Annex II of the Bern Convention. The presence of this species indicates intact meadow structures with grazing activity lacking large scale mowing.

Parnassius mnemosyne and *Zerynthia polyxena* are both listed in Annex IV of the EU Habitats Directive and Annex II of the Bern Convention. The presence of this species depends on its food plants belonging to the genus *Aristolochia*, which tends to occur in near-natural and "wild" areas with various natural vegetation types.

Clouded Apollo (*Parnassius mnemosyne*). Photo: Thomas Zechmeister

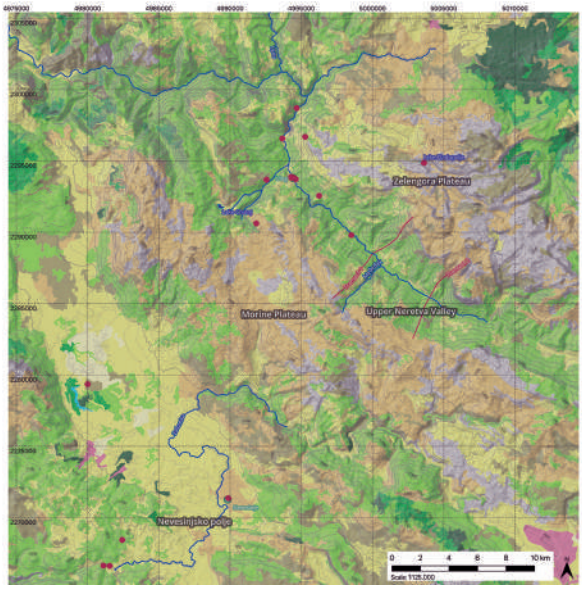
SPIDERS: FIRST INVESTIGATION IN UPPER NERETVA AND NEVESINJSKO POLJE

Žan Kuralt, Neža Pajek Arambašič

University of Ljubljana

"We were genuinely impressed by the abundance and diversity of spiders along the Neretva River. There were spiders under every stone, and believe us, we left no stone unturned ;-). Collecting 84 spider species in such a short period proves the pristine nature and supports the conservation efforts in the area."

Žan Kuralt



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

With a few exceptions, spiders don't live or prey in rivers, but they are abundant and important predatory invertebrates along the shorelines and in riparian vegetation. Their mesopredator role in the food web turns them into suitable bioindicators responding quickly to environmental disturbances, also those originating in the river.

The spider fauna of the region has hardly been explored, hence we tried to collect material in a variety of (micro)habitats that spiders occupy. We focused on the Upper Neretva Valley and Nevesinjsko Polje, where we also collected material in the Vranjača cave. Sampling locations varied in occurring habitat types, although we predominantly focused on the riparian zone and wetlands. We employed various sampling methods (using forceps and aspirator, round sweep net, leaf litter sifting and pitfall trapping) to efficiently gather as much data as possible in the limited sampling time. Collected material was inspected in an improvised field laboratory and preserved in 70% ethanol.

Preliminary Results

BiH´s spider fauna is poorly known; the national spiders checklist comprises only 181 species. Based on the diverse climate, terrain and habitat types, one would expect this number to be up to 10 times higher. Checklists of neighbouring countries are far from complete, but comprise around 700 species. Altogether we identified 84 species from 80 genera and 22 families within just a week. Of these, 57 were collected in the Upper Neretva, and 36 in the Nevesinjsko polje and Vranjača cave. 53 (63 %) of the identified spider species are new for BiH, which confirms the faunistic knowledge gap of spiders in the country.

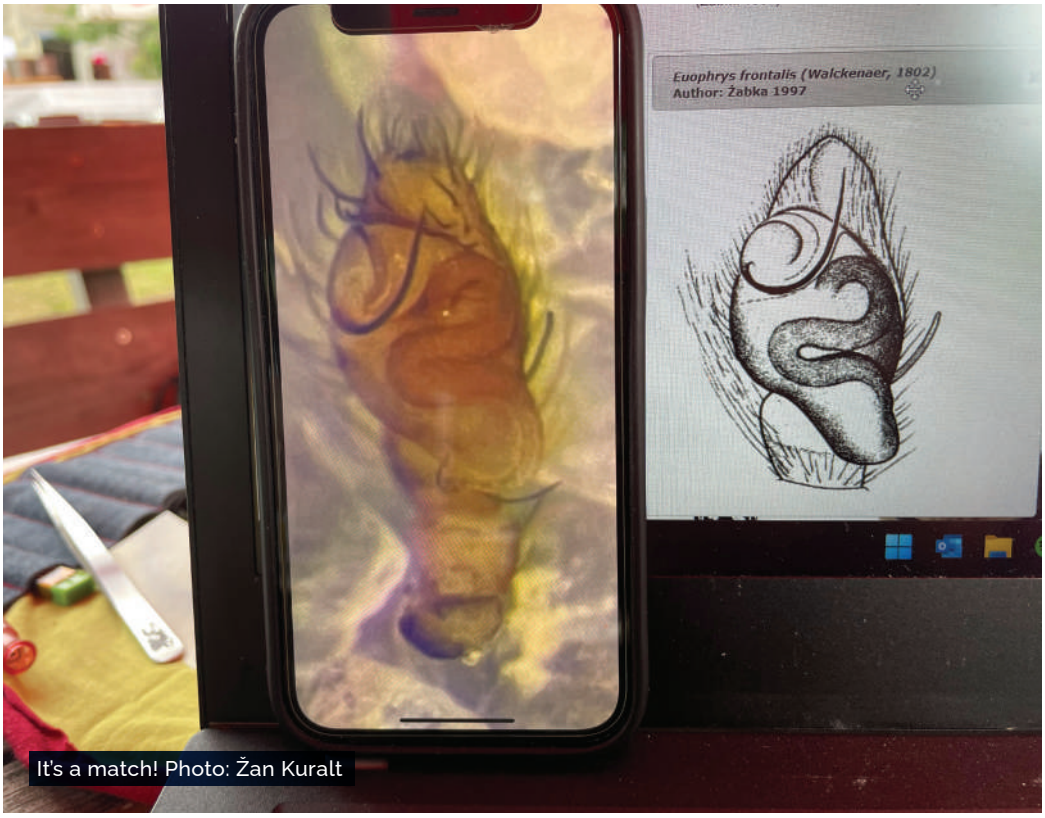
These results are truly astonishing, especially considering the short survey duration and unfavourable weather. Spiders also differ in their annual life cycles, meaning we likely missed spider species that reach adulthood in either early spring or late summer/early autumn. A long-term sampling throughout the year would surely yield even higher species diversity, and uncover more rare (and possibly endangered) species.

Highlight

Piratula knorri was probably the most abundant species along the Neretva River. This wandering spider from the Lycosidae (wolf spiders) family tends to live near water, where it is able to exploit surface tension to run across the water and even dive to catch its prey. During the visit to Vranjača cave, we collected two rarely found Linyphiid species (*Trichopterna cito* and *Leptyphantes leprosus*) and *Parastalita stygia*, an eyeless Dysderid spider endemic to the Dinaric region.

Red-bellied jumping spider (*Philaeus chrysops)* (Salticidae), male. Photo: Neža Pajek Arambašič

Araneologist looking for spiders with an aspirator. Photo: Neža Pajek Arambašič



It's a match! Photo: Žan Kuralt

Red-bellied jumping spider (*Phialeus chrysops*), female. Photo: Neža Pajek Arambašič

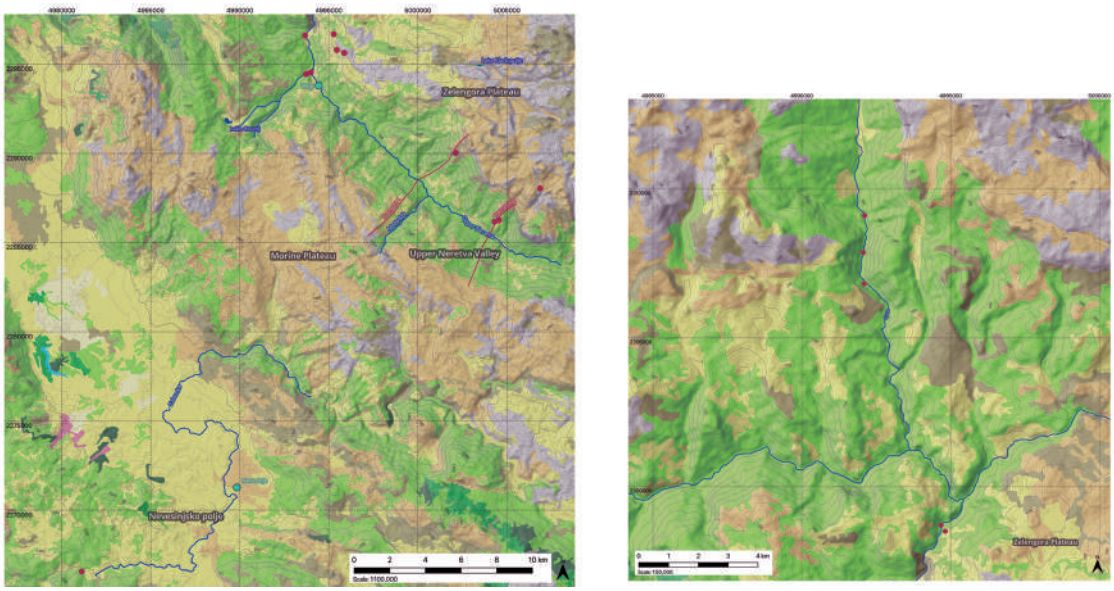
SUBTERRANEAN FAUNA: BIODIVERSITY IN THE DARKNESS

Maja Zagmajster[1], Ester Premate[1], Tinkara Kepic[1], Liza Trebše[1], Annasibila Požrl[1], Vojo Milanović[2], Vid Naglič[3]

[1]University of Ljubljana; [2]Centre for Karst and Speleology; [3]Agricultural Institute of Slovenia

"The river interstitial in gravel bars is a special, often obscure subterranean habitat. Here, on the Neretva, it was hiding several subterranean species new to science. We again collected the same still undescribed amphipod species as last year, at multiple new localities in the vicinity of Ulog. Our samples will allow the species' formal scientific descriptions, hopefully not to just lose it to a man-made reservoir in the near future."

Ester Premate



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Our aim was to improve the knowledge of the distribution and diversity of obligate subterranean species (troglobionts) of the Upper Neretva River Valley. We searched for subterranean animals in interstitial habitats, springs, and caves. At gravel banks we used the Bou-Rouch method, while at springs, we sampled the animals using the water net and by hand. We sampled Čašica and Golubnjača caves in the karst hills around the Neretva River and Vranjača cave in Nevesinjsko Polje. In the caves, we searched for animals visually; in Čašica cave we also set baited pitfall traps without preservatives, and later collected live animals. We stored all collected specimens in ethanol for examination in the laboratory, and identification based on morphological and molecular characteristics.

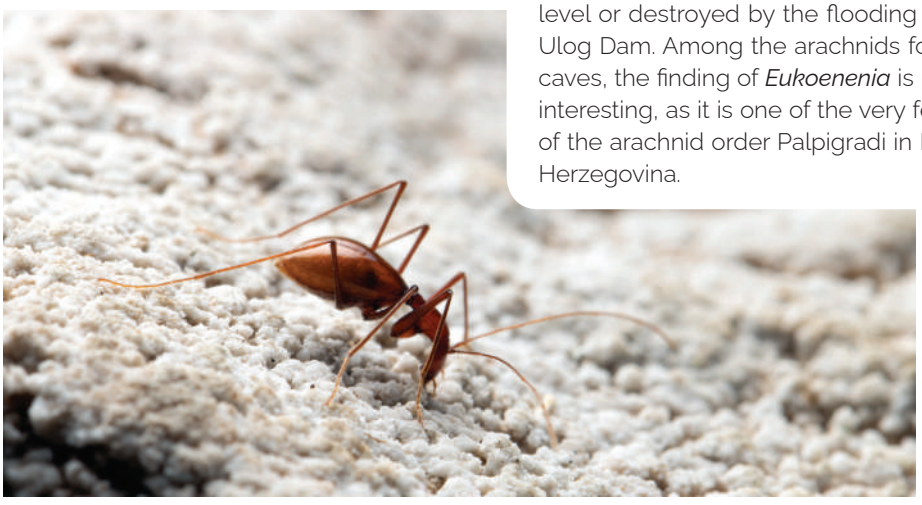
Preliminary results

We collected samples of aquatic invertebrates from three gravel bars at the Neretva River, one gravel bar of its tributary Jezernica River, and from nine springs. Among the animals we collected from river interstitial and springs, we recognised at least three troglobiotic species belonging to the genera *Niphargus* sp. (Amphipoda) and *Proasellus* sp. (Isopoda).

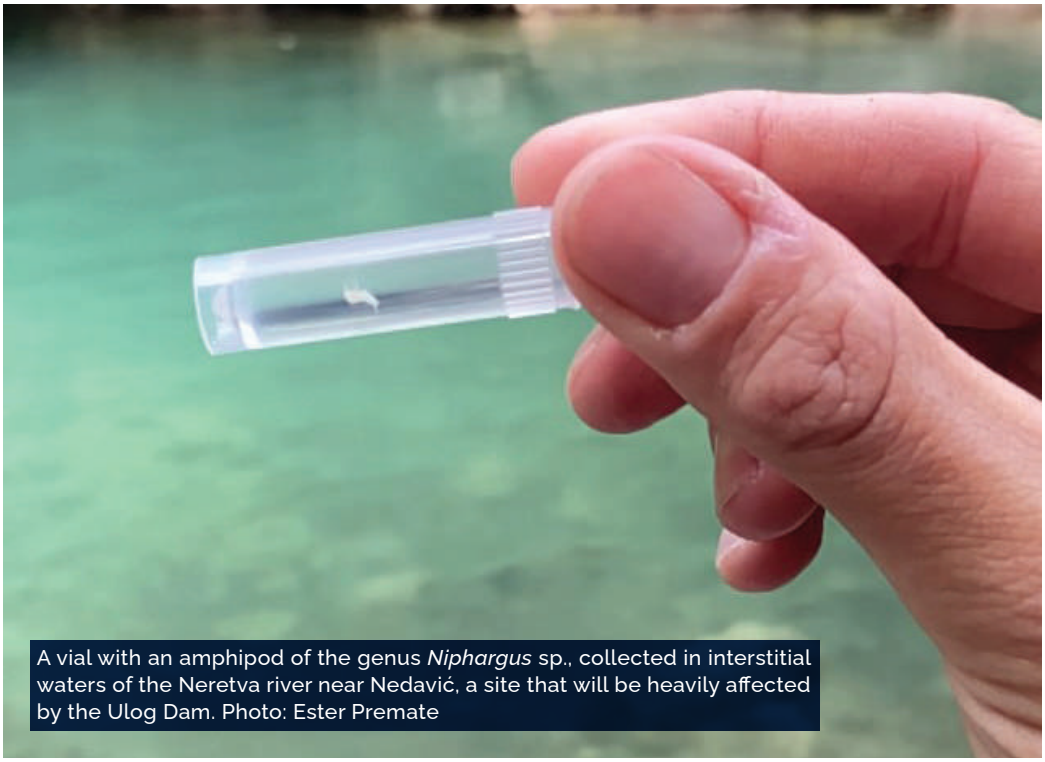
One of the *Niphargus* species was already found in 2022 and identified as new to science; it is now known from more sites. In the three caves we found at least six terrestrial troglobiotic species, some of which were previously unrecorded in the area. These include two beetle species, one terrestrial isopod, one species of Collembola and two arachnids (one spider and one palpigrade). In Vranjača cave in Nevesinjsko polje, we also found a yet underscribed *Niphargus* species. In total, we collected at least nine obligate subterranean species, but this number will increase when samples are examined in detail by taxonomic experts and/or additionally analysed by molecular methods. We expect to find additional troglobiotic species mainly among the microcrustaceans, namely copepods and ostracods, collected from gravel bars,but also among other groups, e.g., water mites.

Highlights

Sampling at new localities allowed us to expand the known range of many taxa collected in the previous year, including the new species of *Niphargus*. We found these exciting species in much greater numbers, yet their localities (gravel banks near Nedavić and Likač) shall be severely affected by the lowering of the groundwater level or destroyed by the flooding due to the Ulog Dam. Among the arachnids found in the caves, the finding of *Eukoenenia* is particularly interesting, as it is one of the very few records of the arachnid order Palpigradi in Bosnia and Herzegovina.



Cave beetle *Anthroherpon* sp., found in both Čašica and Golubnjača caves. **Photo:** Teo Delić



A vial with an amphipod of the genus *Niphargus* sp., collected in interstitial waters of the Neretva river near Nedavić, a site that will be heavily affected by the Ulog Dam. Photo: Ester Premate

Sampling of the river interstitial at the Neretva gravel bar close to Nedavić. Photo: Ester Premate

Climbing out of the cave Golubnjača. Its entrance is a 15 m deep pit. Photo: Ester Premate

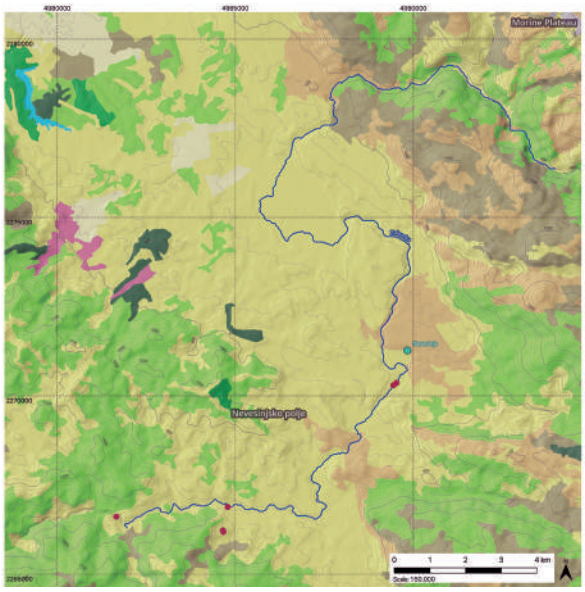
SOIL FAUNA IN AGRICULTURAL LANDS OF NEVESINJSKO POLJE

Vid Naglič

Agricultural Institute of Slovenia, Slovenia

"We were amazed by the diverse soil mesofauna in the Nevesinje field. This confirms that the field's agricultural land is home to vital, often overlooked organisms crucial for soil biological quality."

Vid Naglič



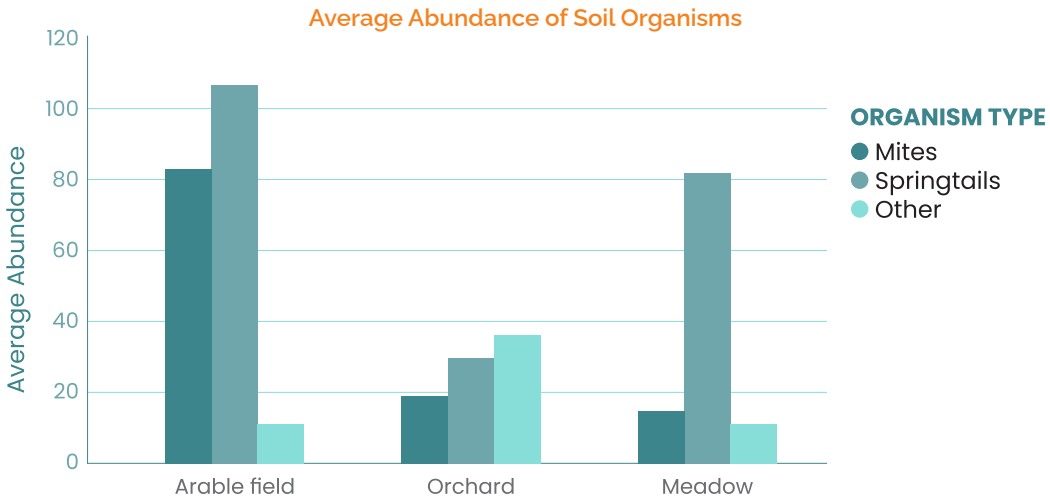
Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

We investigated the biodiversity of soil mesofauna of the agricultural landscape in the Nevesinjsko Polje, which will presumably be lost (flooded) by the proposed dam construction. On two consecutive days, we collected samples with a soil corer for the top 10 cm layer of the soil in the southwest of Nevesinje field, where the (proposed) dam Poscenje will be built, and in the west near village Budisavlje, just below the upper limit of the future reservoir. In Poscenje we sampled a meadow, an orchard, and an arable field. In Budisavlje, we sampled a flooded meadow and an arable field. The 6 samples were used for eDNA-based metabarcoding, which is still in progress. Here we report the results of a soil quality assessment using the Soil Biological Quality Index based on soil arthropods (QBS-ar) to provide a first insight into the diversity of soil fauna in Nevesinjsko Polje. The index is based on the concept that the presence of microarthropod groups morphologically well adapted to soil is higher in high quality soils. We sorted and scored the present microarthropods based on their eco-morphological forms (EMI) related to the degree of adaptation to the edaphic life, and then calculated QBS-ar as a sum of EMI values obtained in the extracted sample. We expect that Nevesinje's varied and traditionally cultivated agricultural habitats host highly diverse soil mesofauna.

Preliminary results

The arable field hosted the highest abundance of soil mesofauna, notably mites and springtails. Conversely, the orchard had the lowest abundance, dominated by other groups like ants (*Hymenoptera*). The QBS-ar scores were highest in the arable field, followed by meadow and orchard. The Shannon-Weaver index, sensitive to rarer species, was highest in orchard and pasture, while the Simpson dominance index, emphasised the arable field. High abundances of organisms found in agricultural land of the Nevesinje field shows high quality of soil and can be attributed to extensive agricultural practices. These promote sustainable resource use and support biodiversity, leading to healthier soils and reduced dependency on agrochemicals. As a result, the food produced is of higher quality and free from harmful residues, ensuring both environmental health and safer consumption for individuals. Our further genetic analysis is expected to unveil a hidden biodiversity that has remained unexplored with macroscopic techniques so far.



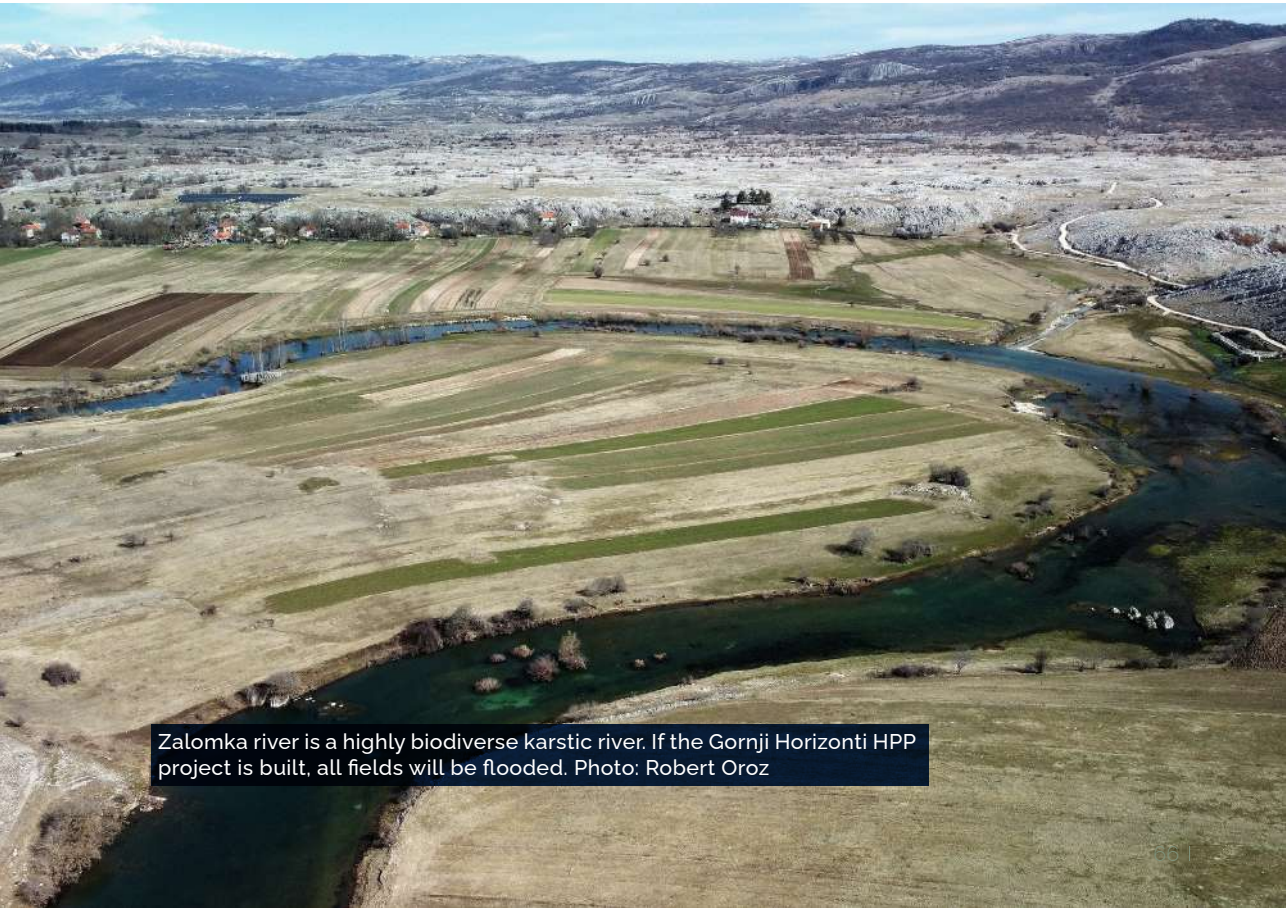
Sampling site	QBS-ar score of eco-morphological forms
Arable field	142
Orchard	114
Meadow	135

Location	Richness index	Shannon-Weaver index	Simpson index
Arable field	14	1.70	0.25
Orchard	11	1.96	0.18
Meadow	12	1.99	0.16

Beetle (*Curculionoidea*). Photo: Vid Naglič

In one soil sample of 1.5 kg, up to 200 individuals of various eco-morphological groups of invertebrates were found. This is a sign of high quality soil. Photo: Una Rebić

Sampling on a meadow. Photo: Una Rebić



Zalomka river is a highly biodiverse karstic river. If the Gornji Horizonti HPP project is built, all fields will be flooded. Photo: Robert Oroz

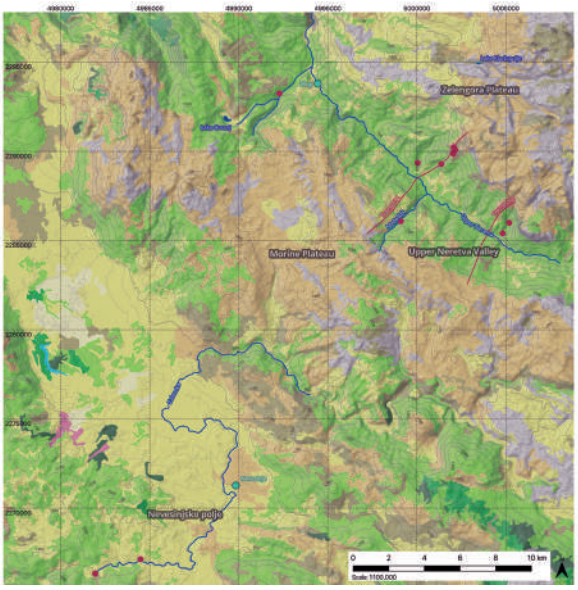
AQUATIC BEETLES OF THE UPPER NERETVA AND NEVESINJSKO POLJE

Michaela Brojer

Natural History Museum of Vienna, Austria

"The great variety of tributaries, every single one with its peculiarities, all those smaller water bodies within the river's catchment, such a wide range of habitats... and different groups of water beetles everywhere ;-)."

Michaela Brojer



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Whereas, during Science Week 2022 the main goal was creating a most possible complete list of the assemblage of water beetle species that are to be found within the upper course of Neretva River, in 2023 three days of fieldwork were mostly used for further investigations of tributaries, springs and special habitats. Additionally two sites along the Zalomka River were sampled.

Preliminary results

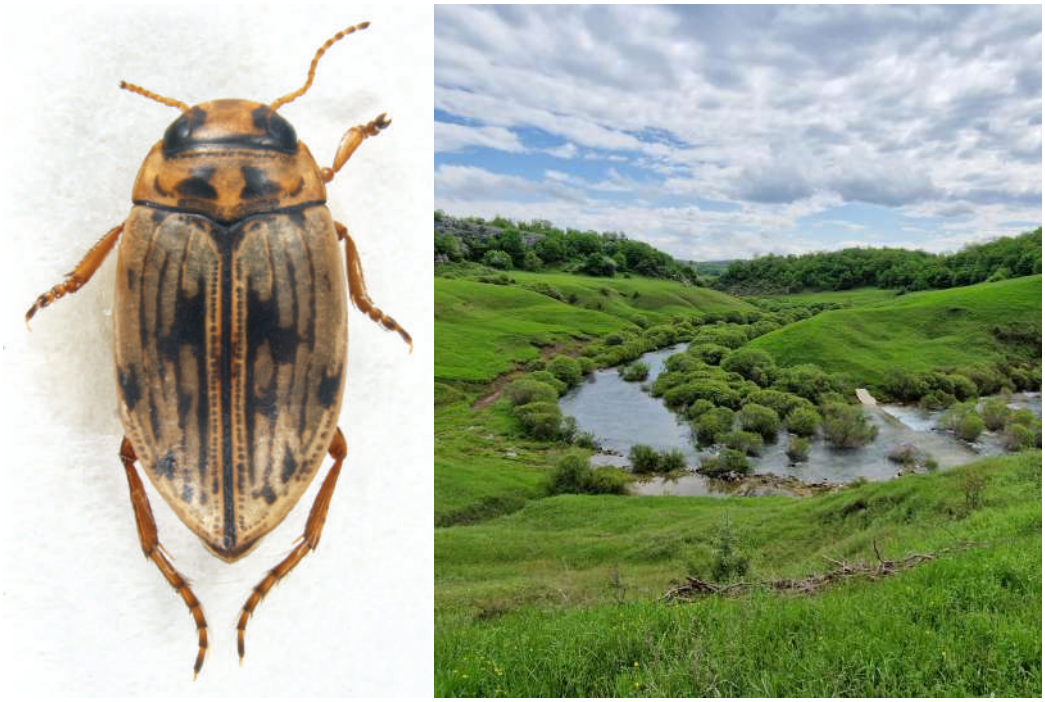
With the larvae of *Eubria palustris,* the examination of some springs led to the finding of an additional water beetle family, Psephenidae, not previously registered during Science Week 2022 (Brojer, in press). Another noteworthy finding is the rather rarely collected species *Prionocyphon* cf. *serricornis* (Scirtidae) with their larvae requiring very specialised phytotelmatic habitats like water-filled cavities in hollow deciduous trees and stumps.

From sampling tributaries of Neretva River (Krupac, Međeđak, Tuniski Potok and Jezernica) the identity of *Hydraena bosnica*, an endemic species to Neretva River basin, can be confirmed through male specimens found in at least two tributaries.

After preliminary examining the samples of aquatic Coleoptera of Zalomka River the most striking result is the dominance of water beetle families associated to more lentic habitats like Dytiscidae (e.g. *Scarodytes* sp.), Hydrophilidae and Helophoridae, while the water beetle families preferring lotic habitats (e.g. Hydraenidae, Elmidae) were absent. This reflects the intermittent character of this river, resulting in a very different species assemblage in contrast to the Upper Neretva River.

Hydraena bosnica. Right: Aedeagus of *Hydraena bosnica.* Photo: Michaela Brojer. Bottom: Međeđak stream. Photo: Gabriel Singer

Top right: Larva of *Prionocyphon* sp. Bottom right: Larva of *Eubria palustris*. Bottom left: Spring. Photo: Michaela Brojer



Scarodytes sp. and Zalomka River. Photo: Michaela Brojer

The Upper Neretva River is home to many endemic species, that live only here and nowhere else in the World. Photo: Ester Premate

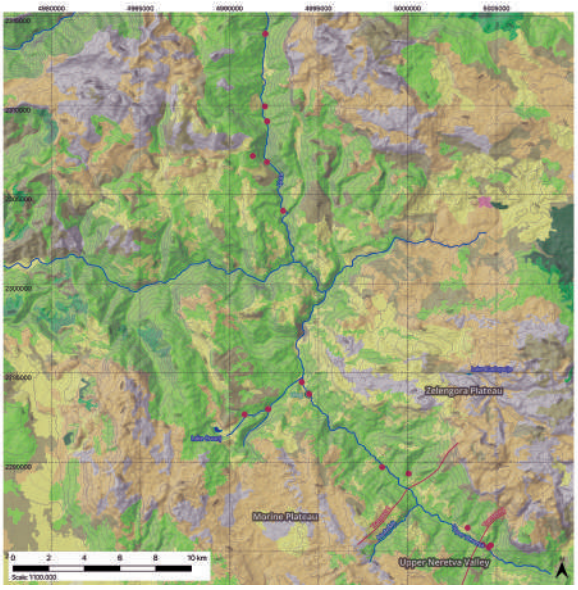
STONEFLIES AND CADDISFLIES OF THE UPPER NERETVA RIVER

Graf Wolfram, Novotny Christoph, Teufl Pia

University of Natural Resources and Life Sciences, Institute of Hydrobiology and Aquatic Ecosystem Management

"It was impressive to watch the air above the Neretva whirring with huge stoneflies, swarming up- and downstream to deposit their eggs. These sizable insects, representatives of the genera Perla and Dinocras, serve as clear indicators of ecologically intact, rapidly flowing, and well-oxygenated streams. The artificial conversion of such habitats into stagnant water bodies by damming would certainly lead to the disappearance of these captivating organisms."

Pia Teufl



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

We investigated Plecoptera and Trichoptera fauna in the Upper Neretva River through a thorough assessment of various habitats in the Neretva River, its tributaries Krupac, Ljuta, and Jezernica, as well as some smaller, unnamed brooks within the catchment. During daytime, a sweeping net was used to capture adult organisms in the riparian zone, while larval stages were collected from the streams using a sieve. Additionally, light traps were set up during the night at Neretva and Krupac. The collected data complement the results of last year's science week, as through seasonal variation insects with different flight periods could be observed.

Preliminary results

All in all, 15 Plecoptera species and 20 Trichoptera species were found. Among Plecoptera, 9 genera belonging to 5 families were detected. 16 Trichoptera genera out of 10 families were documented.

Species newly recorded for the area are *Brachycentrus montanus*, *Leuctra hippopoides* and *Nemoura minima*. Some taxa still require deeper taxonomic analyses, for example specimens of the *Isoperla tripartita* group and the *Leuctra inermis* group. Moreover, larvae of *Drusus schmidi* and *Beraeamyia schmidi* were collected, for which no up to date descriptions exist.

Our aim is to provide data on biodiversity in the region and understand the significance of diverse habitats in supporting the thriving insect population. These aspects become crucial considering the ongoing construction of dams, which are known to profoundly alter river systems, disrupting the natural flow and adversely affecting aquatic habitats. For the area around Ulog, we expect detrimental effects of the hydropower project on the insect populations, which rely on diverse habitats for their survival and reproductive success.

Species list

Plecoptera

Amphinemura sulcicollis Stephens, 1836
Brachyptera seticornis Klapálek, 1902
Brachyptera tristis Klapálek, 1901
Dinocras megacephala Klapálek, 1907
Isoperla bosnica Aubert, 1964
Isoperla tripartita-group
Chloroperla tripunctata Scopoli, 1763
Leuctra hippopoides Kempny, 1899
Leuctra inermis-group
Leuctra quadrimaculata Kis, 1963
Nemoura cinerea Retzius, 1783
Nemoura minima Aubert, 1946
Nemurella pictetii Klapálek, 1900
Perla marginata Panzer, 1799
Protonemura auberti Illies, 1954
Protonemura intricata Ris, 1902

Trichoptera

Beraea pullata Curtis, 1834
Beraeamyia schmidi Botosaneanu, 1960
Brachycentrus montanus Klapálek, 1892
Metalype fragilis Pictet, 1834
Diplectrona atra MacLachlan, 1878
Drusus schmidi Botosaneanu, 1960
Drusus radovanovici Marinkovic-Gospodnetic, 1971
Ecclisopteryx keroveci Previsic, Graf & Vitecek, 2014
Hydropsyche dinarica Marinkovic-Gospodnetic, 1979
Odontocerum albicorne Scopoli, 1763
Philopotamus montanus Donovan, 1813
Potamophylax luctuosus Piller & Mitterbacher, 1783
Rhyacophila loxias Schmid, 1970
Rhyacophila nubila Hagen, 1859
Rhyacophila polonica MacLachlan, 1879
Rhyacophila tristis Hagen, 1859
Silo piceus Brauer, 1857
Stenophylax mitis MacLachlan, 1875
Synagapetus iridipennis MacLachlan, 1879
Wormaldia bosniaca Botosaneanu, 1960

Highlights

In stark contrast to the extremely high abundances of insects in the light traps during the visit in 2022, the low temperatures during the sampling in 2023 led to conspicuously low Trichoptera densities in the light traps. Despite these unfortunate conditions, a high species diversity was recorded already at such low sampling success. Species diversity would supposedly be even higher if flight activities of caddisflies were encouraged by warmer nights.

The world at night. Thousands of insects can be identified via light traps. Photo: Ivana Milaković

Dinocras megacephala is an indicator of pristine, undammed, fast-flowing stream. Photo: Pia Teufl

Krupac is one of the bigger tributaries in the most upstream part of Neretva. Photo: Vladimir Tadić

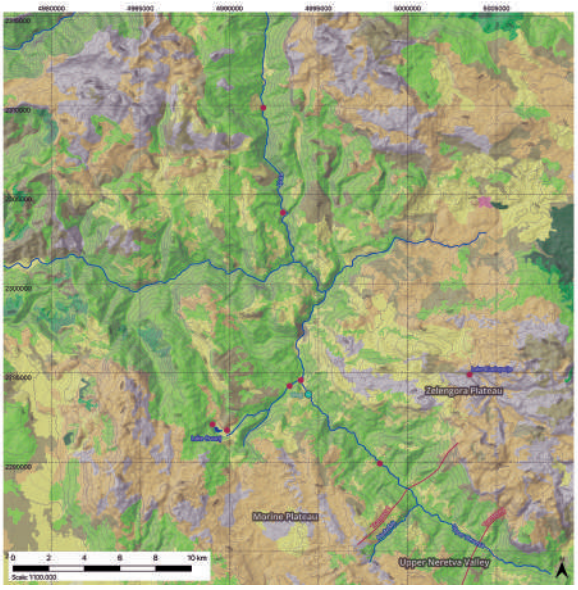
AQUATIC MACROINVERTEBRATES AS WATER QUALITY INDICATORS

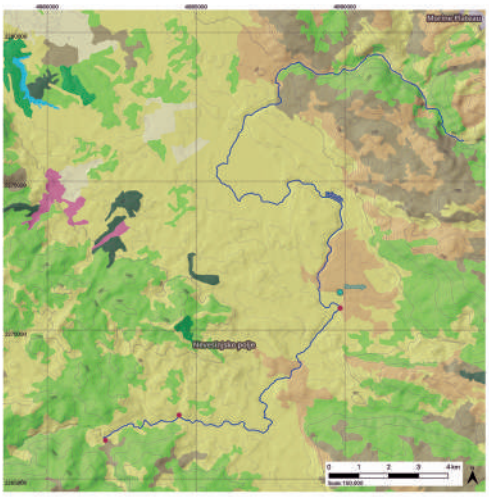
Stefan Anđus, Katarina Zorić, Nikola Marinković, Jelena Tomović, and Bojana Tubić

University of Belgrade, Institute for Biological Research "Siniša Stanković" - National Institute of the Republic of Serbia, Department for Hydroecology and Water Protection

"I had many interesting encounters walking through the waters of the Neretva catchment, but one occasion I particularly cherish - the stumbling upon freshwater sponges! This might not seem much, but for me it was a euphoric experience. I will never forget the hardships of the desperate search for these creatures at the start of my PhD. All that stone turning, waders tearing and nerve wracking to finally obtain a sample, and now here they were, inconspicuously dwelling in a mountain lake, where I would least expect them. This place is full of such surprises."

Stefan Anđus





Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Benthic invertebrates are important bioindicators frequently used for the integrated assessment of rivers regarding the requirements of the Water Framework Directive. I here provide a bioassessment using the aquatic macroinvertebrate community based on the Rapid Bioassessment Protocols, the procedures of the Environment Agency of UK, the Austrian Guidelines "Saprobiology", and standards EN ISO 10870, EN 16150 and prEN 17136. For this, I employed standard Multi-Habitat-Sampling (MHS): benthic macroinvertebrates are collected with a hand-net from 20 sampling units distributed across all major microhabitats with coverage more than 5%. Specifically important microhabitats (e. g. Xylal) with low coverage are sampled with slightly over-proportional effort. All biological material was preserved with 90% ethanol. Identification of specimens was done based on morphological characteristics. The benthic macroinvertebrate community was analysed to yield a number of integrative ecological characteristics: abundance, total number of taxa and saprobity index. The latter was assessed using bioindicator lists by Moog (1999).

Preliminary Results

Across the 11 study sites, we identified 89 taxa from 18 taxonomic groups (see list of taxa). The highest number of taxa (Fig. 1a), a strong indicator of biodiversity and ecosystem health, was detected in the Neretva on the "Beach" site (41 taxa), followed by two downstream sites on the Neretva, Cerova and Ljuta, both with 35 taxa. In contrast, Zalomka–sinkhole only had 5 taxa. The highest abundance (Fig. 1b) of organisms was detected in the creek downstream of Lake Crvanj (720 specimens/m^2, mostly Chironomidae and Hirudinea (leeches). In contrast, in the Zalomka-sinkhole sample there were only 36 specimens, likely due to the vicinity of the sinkhole and fast water current, considering the presence of a notably higher abundance (266 specimens/m^2) upstream near the planned dam site.

The saprobic index (Fig. 1c) is invaluable for assessing water quality. Using known pollution tolerances of the present organisms, the index reliably indicates organic pollution and the overall health of an aquatic ecosystem, thus supporting the monitoring and management of water resources. Most investigated sites showed low scores of the saprobic index. The highest four scores belong to sites with low to no water flow (Lake Kladopolje) which is correlated with higher organic deposition and is not necessarily a consequence of anthropogenic pressure.

Besides underlining the good ecological status of the investigated sites, work on aquatic macroinvertebrates resulted in two notable findings: First, the presence of the rare lacewing *Nevrorthus apatelios* was confirmed at the site Cerova on the Neretva River and on a new site on the Ljuta River as well. Second, another species considered rare in the Western Balkan region, *Epeorus yugoslavicus*, was detected at the Beach site on the Neretva River and in the Ljuta River.

Sampling aquatic invertebrates.
Photo: Sandra Josović

Rare finding of a sponge (Spongillida) from Lake Kladopolje. Photo: Stefan Andus

Stoneflies (*Perla* sp.) from the Ljuta river, indicators of good water quality and a healthy ecosystem. Photo: Brais Palmas

List of taxa

Areas where species were observed are coded as follows: Zalomka - sinkhole (Z1), Zalomka - dam site (Z2), Zalomka - spring near the mill (Z3), Neretva - The Beach (N1), Neretva - Cerova (N2), Ljuta downstream (L1), Ljuta upstream (L2), Jezernica donja (J), Lake Kladopolje (K), Creek under Lake Crvanj (C1), Spring above Lake Crvanj (C2).

Gastropoda
Galba truncatula (O. F. Müller, 1774) | Z1,Z2,Z3,C1
Peregriana labiata (Rossmässler, 1835) | K
Valvata sp. | K
Succineidae Gen. sp. | C1
Bivalvia
Sphaerium corneum (Linnaeus, 1758) | K
Pisidium sp. | K
Crustacea
Asellus aquaticus (Linnaeus, 1758) | Z3,C2
Gammarus sp. | N1,J,C2
Austropotamobius pallipes (Lereboullet, 1858) N2
Hirudinea
Dina dinarica (Sket, 1968) | Z1,Z2,Z3,L1,C1,C2
Erpobdellidae juv. | L1,C1
Erpobdella octoculata (Linnaeus, 1758) | K
Glossiphonia nebulosa Kalbe, 1964 | K
Diptera
Liponeura sp. | N1,L1,L2
Ibisia marginata (Fabricius, 1781) | Z2,Z3,N2,L2,J
Oxycera pardalina Meigen, 1822. | N1,N2
Eleophila sp. | L1,J
Atherix ibis (Fabricius, 1798) | N1,N2,L1
Dicranota sp. | L1
Eleophila sp. | N1,N2,L1,L2
Hexatoma sp. | N2,L1,L2,J,C2
Tabanus sp. | Z1,Z2,N1,L1,L2
Pelina sp. | Z3
Hemerodromia sp. | N1
Clinocera sp. | Z3
Dolichopodidae Gen. Sp. | L1
Chironomidae Gen. sp. | Z2,Z3,N2,L1,J,K,C1,C2
Ceratopogonidae Gen. sp. | Z3,N1,N2,L1,C2
Simuliidae Gen. sp. | Z2,Z3,N1,N2,J,C1
Plecoptera
Protonemura montana Kimmins, 1941 | N1,L1,L2,J
Leuctra hippopus-Gr. | Z2,N1,N2,L1,L2,C2
Perla pallida Guérin-Méneville, 1838 | N1,N2,L1
Amphinemura sulcicollis (Stephens, 1836) | N2,L1
Rhabdiopteryx acuminata Klapálek, 1905. | Z3
Isoperla grammatica (Poda, 1761) | N1,N2,L1
Nemoura cinerea (Retzius, 1783) | C1,C2
Odonata
Anax imperator Leach, 1815 | K
Libellula depressa Linnaeus, 1758 | K
Pyrrhosoma nymphula (Sulzer, 1776) | Z2,K
Trichoptera
Micrasema minimum McLachlan, 1876 | N1,N2,L1,L2

Philopotamus montanus (Donovan, 1813) | N1
Chaetopteryx villosa (Fabricius, 1798) | L2
Sericostoma personatum (Kirby & Spence, 1826) | N1,N2,L1
Rhyacophila tristis Pictet, 1834 | N1,L1
Rhyacophila torrentium Pictet, 1834 | L2
Rhyacophila aurata Brauer, 1857 | N1,N2,L1
Glossosoma boltoni Curtis, 1834 | N1,N2,L1,L2,J
Rhyacophila munda McLachlan, 1862 | N2
Rhyacophila sp. | N1,N2
Hydropsyche pellucidula (Curtis, 1834) | N2
Hydropsyche instabilis (Curtis, 1834) | N1
Hydropsyche incognita Pitsch, 1993 | L1,J
Hydropsyche fulvipes (Curtis, 1834) | N1,L1,L2
Halesus digitatus (Schrank, 1781) | N1,N2
Plectrocnemia conspersa (Curtis, 1834) | N2,L1,J,C1
Potamophilax cingulatus | N2,J,C1,C2
Phryganea bipunctata Retzius, 1783 | K

Coleoptera

Elmis sp. Lv. | N1,N2,L1
Stenelmis conaliculata | N1
Stenelmis conaliculata Ad. | C2
Elodes sp. Lv. | N1,N2,J
Esolus angustatus (Müller, 1821) Ad. | N1,N2,L1,J
Esolus angustatus (Müller, 1821) Lv. | Z2,N1,N2,J
Limnius volckmari (Panzer, 1793) Ad. | L1
Platambus maculatus (Linnaeus, 1758) Lv. | C1,C2
Platambus maculatus (Linnaeus, 1758) Ad. | C2
Limnius volckmari (Panzer, 1793) Lv. | N1,L2
Hydrobius sp. Lv. | Z3,C1
Hydraena sp. Lv. | Z3
Suphrodytes dorsalis (Fabricius, 1787) | Z2,Z3
Dytiscus sp. Lv. | K
Dytiscus sp. Ad. | L1

Megaloptera

Sialis sordida (Klingstedt, 1932) | K

Neuroptera

Nevrorthus apatelios Aspock, Aspock & Holzel, 1977 | N2,L1

Ephemeroptera

Epeorus yougoslavicus (Samal, 1935) | N1,L1,L2
Epeorus sylvicola (Pictet, 1865) | N1
Ephemera danica Müller, 1764 | N1
Paraleptophlebia submarginata (Stephens, 1835) | N1,J
Rhitrogena semicolorata-Gr. | Z1,N1,N2,L1,L2,J
Serratella ignita (Poda, 1761) | Z2,N1,N2,L1,L2,J
Cloeon dipterum (Linnaeus, 1761) | N2,K
Ecdyonurus venosus Fabricius, 1775 | L1
Baetis fuscatus (Linnaeus, 1761) | N1,N2
Baetis alpinus Pictet, 1843 | Z2,N1,N2,L1,L2,J
Baetis rhodani (Pictet, 1843) | N1,N2,L1,L2,J,C1
Ecdyonurus alpinus Hefti,Tomka & Zurwerra, 1987 | N1,N2,L2
Siphlonurus alternatus (Say 1824) | Z1,Z2,Z3
Baetis muticus (Linnaeus, 1758) | N1,N2,L1,J
Habrophlebia fusca (Curtis, 1834) | N2
Caenis robusta Eaton, 1884 | K
Caenis luctuosa (Burmeister, 1839) | K
Spongillidae Gen Sp. | K
Hydrachnidia Gen. Sp. | N1,K,C2
Colembola Gen. sp. | K

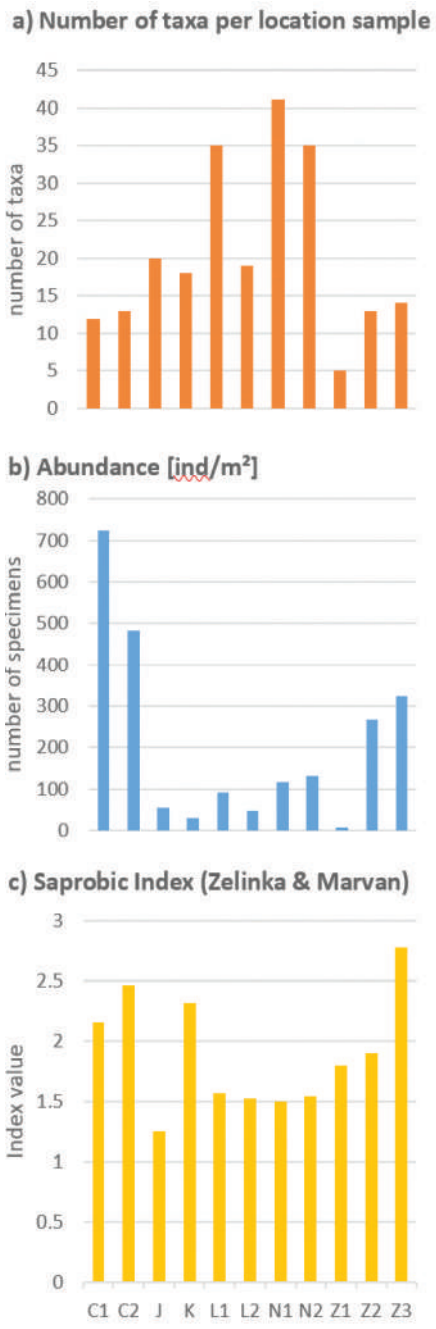


Figure 1. Patterns of major bioindicator variables across sampled sites: (a) abundance, (b) total number of taxa, (c) saprobic index. Sites coded as follows: Creek under Lake Crvanj (C1), Spring above Lake Crvanj (C2), Jezernica donja (J), Lake Kladopolje (K), Ljuta downstream (L1), Ljuta upstream (L2), Neretva - The Beach (N1), Neretva - Cerova (N2), Zalomka - sinkhole (Z1), Zalomka - dam site (Z2), Zalomka - spring near the mill (Z3).

HIDDEN BIODIVERSITY IN REMOTE CANYONS AND SPRINGS

Jan Martini[1,2]; Thea Schwingshackl[1,2]; Anna Katharina Lau[1]; Mirza Čelebičić[3]; Gabriel Singer[1]; Simon Vitecek[4,5]

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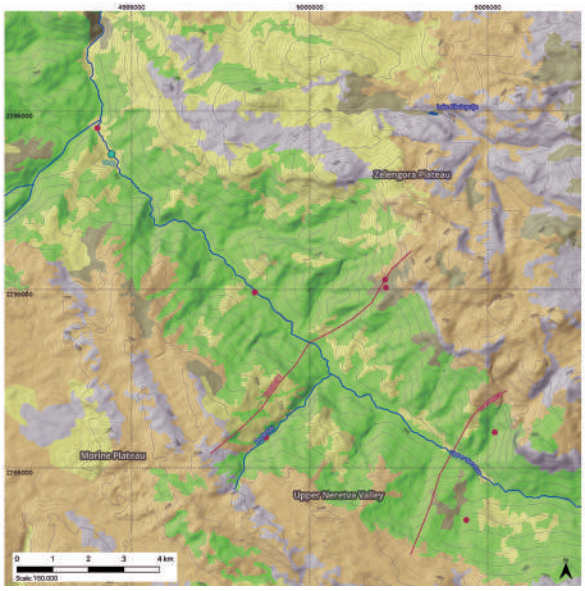
"Blond beauty sublime
betrays biodiversity
O precious canyon"

a Haiku, Simon Vitecek



Map of the study area with marked sampling sites (red dots). For legend, see page 4.

Approach

Many of the Upper Neretva's tributaries are inaccessible and unexplored, yet we expect them to significantly contribute to regional biodiversity. For instance, as cradles of endemic species that are found in just a few streams. We sampled several springs in abandoned subalpine meadows at high elevations on the right slopes of the valley of the Upper Neretva and explored Međeđak River, which cleaves a steep and forbidding canyon into the left-sided valley slope. The latter was explored through a demanding canyoning expedition, perhaps the first ever along this river, and later accessed via a forgotten path to an ancient mill. Besides a battery-powered drill, bolts, rope, harness to access sampling sites, hand nets and light traps were the only equipment we could portage to document the biodiversity of these out-of-reach habitats.

Preliminary results

A greater diversity of sampling methods and a slightly earlier timing compared to last years' Science Week recovered new records of species in the Upper Neretva and its tributaries and springs: We found *Stenophylax vibex* (Curtis 1834), a widespread species but so far not recorded from Bosnia. Another first record is that of *Stenophylax meridiorientalis* Malicky, 1982, a species distributed from the southern Balkans to Asia Minor. We found many larvae of the southern Balkan endemic *Thremma annomalum* McLachlan, 1876 in one spring in the subalpine meadows. Also, we recorded the endemic *Crunoecia bosniaca* Marinković-Gospodnetić, 1970. And in the deep ravines of the Međeđak river and the Krupac tributary we discovered *Drusus radovanovic*i Marinković-Gospodnetić, 1971, a micro-endemic species which has so far only been found in the rather secluded spring streams of the Neretva River. In fact, the range of this species covers a bare 75 km^2 (Neu et al. 2015). In the Neretva catchment, it is quite restricted to a small area of the remote upper section of the river.

Our exciting findings from very limited sampling effort highlight that this region is highly understudied and many more species must be expected there. Moreover, the occurrence and high abundances of species like *D. radovanovici* clearly demonstrate that such remote, minimally impaired habitats are crucial for many species. And that even slight deterioration of the integrity of this ecosystem could have dramatic consequences for its fauna.

Highlights

Bolts, drill, rope, neoprene suit, headlights, wading boot, small vials, butterfly net and fine tweezers are on your equipment list if you want to find *Drusus radovanovici* in the Međeđak River. The species distribution range is restricted to such extremely remote and vulnerable habitats. Trying to find the species gives you a first-hand immersive experience of its natural habitat.

Upper part of Međeđak stream.
Photo: Gabriel Singer

Inside the Mededak canyon. Photo: Gabriel Singer

An aberrant fully grown adult specimen of *Drusus radovanovici* in its preferred habitat. Photo: Gabriel Singer

Adult specimen of caddisfly species *Drusus radovanovici*. Photo: Ana Previšić

Wild beast: Larvae of *Drusus radovanovici*. Photo: Ana Previšić

SOCIOLOGY: LOCAL-RIVER CONNECTIONS IN THE UPPER NERETVA VALLEY

Anna Scaini[1], Constance Brouillet[2], Josh Egginton, Mara Senatore, Ana Stritih[3], Martine Wijnstra

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"I don't want to be in London, or in the Seine in Paris, because my roots are here. All my bones are here, behind me. It's simple, that's it. Just like, compare it to salmon who goes to the sea and then goes back in the river to die where he was born"

"She thinks that this is one of the most beautiful rivers. She very much does remind her of him. She knows every place where he used to hunt and fish. She knows every corner of the river where he fished. The river very much reminds her of her husband."

"Everyone is gone. There are no conditions, no shops, no doctors, no, everything is closed. This used to be a municipality. There were two buses from Sarajevo every day. Now there is nothing. If there is no car, I have to go 21 or 22 kilometres to buy milk and eat, but I don't have anything. That's why I'm a little bit sad. But it's nice, it's nice".

[transcript from an interview] (translated in English from Bosnian)

Locals from the village. Photo: Metod Blejec

Approach

Our work aimed at interviewing locals to explore (i) what values community members attribute to the landscape of the Upper Neretva River and which relations and connections they may have with it, and (ii) what impacts on the river they perceive now and will in the future, including their feelings they experience, specifically in relation to hydropower development. Over the course of a month, Martine and Josh have conducted 24 interviews with members of the local community.

Preliminary results

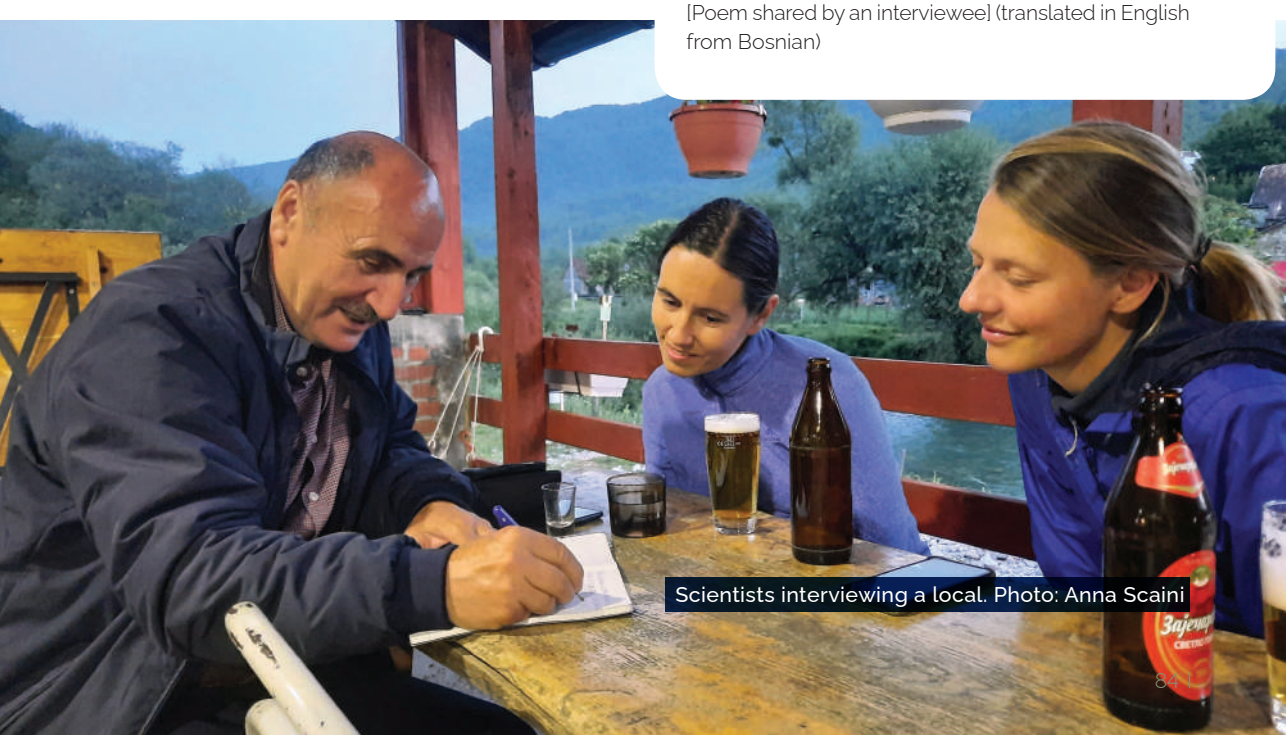
Our intention has been to understand more deeply how people's lives weave with that of the river. The local (eco-)political situation is complex, but at its heart are people that feel unheard and forgotten. Largely, the desires of those that live in the area of the upper Neretva River are ignored by local to national decision-makers and many struggle with a sense that nothing can change. They have watched the decline of a once vibrant community. Not long in its past, Ulog had a post office, markets, and a school.

This all sits in the memory of the people that still live here alongside tales of swimming at the local beach, being taught to fish by their parents and enjoying parties at the local lake. The interviewees have obvious pride in their waters, even now speaking of how you can drink the water of Neretva as you swim in it. Their perspective on the dam often reflects a wider understanding that their land is being extracted for power and wood, the benefits of which they will not see. Resources are taken even as the built infrastructure declines. This is shown in a road, which has been left to deteriorate year on year, stopping many from returning, whilst construction machinery and logging trucks tear up what is left of it. And yet despite all this, the embers of a truly remarkable community of care, built on giving whatever can be given whenever the situation arises, remain here.

Highlights

For the source of the beautiful Neretva
Where even fairies have not muddied the source
Where the river divides the mountains
Where the soul separates from the heart

[Poem shared by an interviewee] (translated in English from Bosnian)



Scientists interviewing a local. Photo: Anna Scaini

WHAT BROUGHT US HERE? PERCEIVED IMPACT OF THE NERETVA SCIENCE WEEK

Anna Scaini[1], Constance Brouillet[2], Josh Egginton, Mara Senatore, Ana Stritih[3], Martine Wijnstra

[1]Department of Physical Geography, Stockholm University, and Bolin Centre for Climate Research, Sweden; [2]ETH Zürich, Switzerland; [3]TU Munich, Germany

"I have a feeling NSW boosted scientists' enthusiasm and empowered them, wherever their stance on the scientists role in the world is. I believe events like these upgrade them at least a notch".

[One of the inspiring free-text responses on the questionnaire]

Ulog from above. The village once was a vibrant town with 700 school kids. Today the total population is below 15. Photo: Vladimír Ruček

Approach

Researchers have different attitudes towards "mission-driven research", yet such initiatives abound given challenges like climate change or biodiversity loss. Typically, objectives of such research involve reaching a more-than-science goal; mostly this is to produce knowledge that has an impact in the sense of contributing to achieving sustainability goals. But how straightforward is it to translate research into real-world impacts? What drives researchers to take part and facilitate the transition from research to impact?

Our work aimed to collect experiences from the Neretva Science Week participants to learn about the personal and scientific challenges of translating research into real-world impact. We hypothesised that during the week, participants of the NSW would feel they could play a strong role in advocacy and impact, and that shortly after the week, they would feel more empowered to achieve impact. However, those positive feelings might decrease over time.

We asked participants of the NSW to fill in questionnaires at the beginning and at the end of the NSW and three months later, the last round also included participants of the NSW 2022. Questions were both closed and open-ended. In particular, they were asked about their sensitivity to protecting the Neretva, the perceived impact of their work and, in general, the perceived impact of science and its role in ecosystem management. Responses will allow us to identify the guiding factors that bring them to the Neretva Science Week in relation to their profiles (e.g. gender, career stage, country of residence, employer, etc).

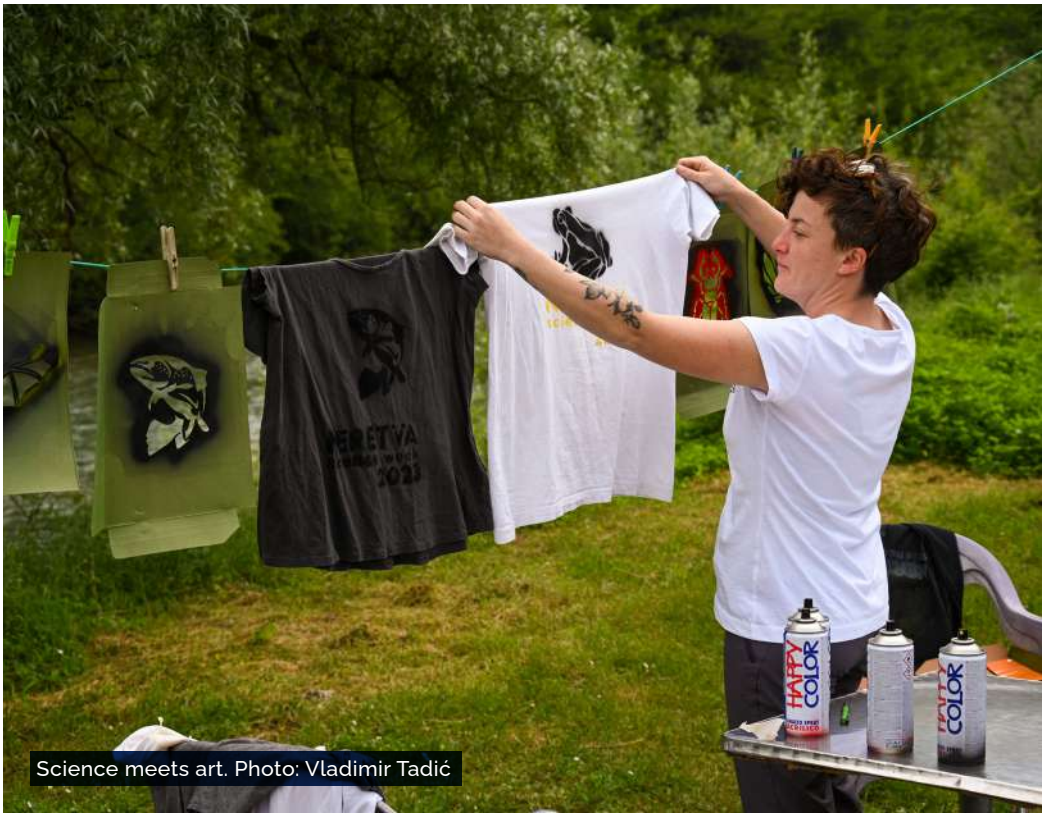
Preliminary results

A total of 56 participants filled in the first questionnaire upon starting their experience at the NSW, while 44 participants filled in the second questionnaire following the NSW. Both questionnaires highlight a sense of community among the participants. Nearly half of the respondents to the first questionnaire indicated that this was the first time on the Neretva. For most researchers, the NSW was an unfunded side project, sometimes far from their usual research. Many respondents to the second questionnaire shared inspiring views on what surprised them, often highlighting habitat diversity and complexity of the study area. No analysis was undertaken on the responses as the third questionnaire is yet to be distributed among NSW participants. We aim to prepare a collaborative research article showcasing the opinion of the participants and sharing their views to foster change. This research article is currently in a preliminary form and reflects on the added value of initiatives that involve scientists (and other professionals) in more-than-science outcomes.

Highlights

"Joint efforts and research results will be a powerful tool in deciding the fate of this amazing area". [One of the inspiring take-home messages from the NSW about the role of scientists]

Photo: Vladimir Tadić



Science meets art. Photo: Vladimir Tadić

Besides collecting data, raising awareness and increasing public attention is a crucial part of the science week. More than 15 journalists joined the event, from Bosnia-Herzegovina and from around the world. Photo: Vladimir Tadić