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Programme

November, 4th, 2020

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The impact of wildfires on the Skadar Lake environment

10,15-10,25: Jelena Stanković (Serbia), Milica Stojković Piperac (Serbia), Boris Jovanović (USA), Dimitrija Savić-Zdravković (Serbia), Maja Raković (Serbia), Ana Petrović (Serbia), Djuradj Milošević (Serbia)
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10,45-10,55: Olivera Gavrilović, Snežana Radulović, Marina Šćiban, Maja Novković, Dušanka Cvijanović (Serbia)
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Effects of human pressure on diversity of phytoplankton and zooplankton communities in ponds

11,05-11,15: Mireya Ramírez-Ballesteros (Mexico), Carlos Alberto Durán-Ramírez (Mexico), Daniel Méndez-Sánchez (Czech Republic), Rosaura Mayén-Estrada (Mexico)
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11,15-11,25: Rosaura Mayén-Estrada (Mexico), Roberto Júnio Pedroso Dias (Brazil), Sthefane D'Ávila (Brazil)
Ciliates and molluscs: an overview of symbiotic relationship

11,25-11,35: Discussion

11,35-11,45: Nikola Đorđević, Vladimir Pešić, Slavica Petović (Montenegro)
Diversity and distribution of marine sponges in the Bokakotorska Bay

11,45-11,55: Tia Žeželj Vidoša, Ivana Pozojević, Iva Vidaković, Zlatko Mihaljević (Croatia)
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Phylogenetic analysis of water mites (Acariformes, Hydrachnidia) from the Lake Ohrid basin

12,05-12,15: Milica Jovanović (Montenegro), Vladimir Pešić (Montenegro), Helmut Satmann (Austria), Elisabeth Haring (Austria)
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12,25-12,35: Przemysław Śmietana, Marek Theus (Poland)
Effects of human limiting of interspecific competition between restocked noble crayfish and non-indigenous spiny-cheek crayfish in Sominko lake (NW Poland)

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12,45-12,55: Dejan Dmitrović (Bosnia and Herzegovina), Goran Šukalo (Bosnia and Herzegovina), Ana Savić (Serbia), Vladimir Pešić (Montenego)
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13,05-13,15: Stojković Piperac M, Galambos L, Milošević Dj, Novković M, Radulović S, Simić V, Cvijanović, D. (Serbia)
Effect of environment on the fish diversity in ponds and fluvial lakes along the Danube floodplain in Serbia

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14,15-14,25: Nikola Stanković (Serbia), Ivana Kostić (Serbia), Boris Jovanović (USA), Jovan Ćirić (Serbia), Dimitrija Savić-Zdravković (Serbia), Djuradj Milošević (Serbia)
Toxic effect of cianotoxin to the freshwater macroinvertebrates in a multistress environment: Acute tocivity of microcystin-LR to laboratory population of *Chironomus riparius (Diptera) larvae*

14,25-14,35: Marko Miliša, Renata Matoničkin Kepčija (Croatia)
Tree of heaven causing trouble on Earth

14,35-14,45: Discussion

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November, 5th, 2020

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Poster presentations (13:00-15:00)

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Panel discussion I
Rivers of Montenegro - science and challenges
(Presentation of the Book "The Rivers of Montenegro" / Springer Nature)
Vladimir Pešić (University of Montenegro)

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Panel discussion II
Microplastics under the microscope of researchers
Jelena Stanković (University of Niš)

Oral Presentations

The impact of wildfires on the Skadar Lake environment

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Abstract
Every year wildfires bring damages to the environment of Montenegro, and, in particular, to the Skadar Lake environment. Wildfires are caused by dry and hot weather which is established yearly from July to September, and is likely linked to the regional climate change. We used high resolution optical imagery (OLI Landsat-8 and MSI Sentinel-2A, -2B) to analyze Suspended Particulate Matter and Chlorophyll-a concentrations in the Skadar and Šas Lakes in order to understand the potential impact of wildfires on the ecosystems of the lakes as a direct impact of fires and smokes (ash), and indirect impact related to the flux of nutrients contained in ash and brought by rivers and streams to the lakes after heavy rains. The surface of burnt areas was also calculated for different regions around the Skadar and Šas Lakes.

Key words: wildwires, Skadar Lake, Šas Lake, Montenegro, environment.

Ciliates and molluscs: an overview of symbiotic relationship

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Abstract
More than 200 ciliate (Alveolata, Ciliophora) species, are known to live as symbionts of molluscs distributed worldwide. As symbionts, ciliates can act as parasites, ectocommensals or epibionts inhabiting several body regions (as shell, pallial cavity and visceral organs). The goal of the present contribution is to present some data of symbiotic ciliates of freshwater and marine bivalve (Mollusca, Bivalvia) species, including compiled data on their geographic distributions. We consulted available information, and checked the taxonomic status of ciliates and molluscan species. We obtained occurrence records for 142 species included in 90 genera of bivalves, and more than 130 ciliate species, in 26 countries. From these data, we elaborated distribution maps showing the world regions were this symbiotic relationship has been studied and evidencing the areas where research efforts are still necessary. The results are also discussed in terms of the different types of symbiosis, observed between ciliates and bivalves, and the impact of symbionts on their hosts. This is the first comprehensive study to review the biodiversity of ciliates associated to bivalve molluscs. Acknowledgments. To EBRAM meeting (UFJF) for a grant to RME for a short stay.

Key words: Ciliates, molluscs, parasites, epibionts, geographic distribution

Some free-living and symbiotic ciliates from National Park Lagunas de Montebello, Chiapas, Mexico

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Abstract

Ciliates are widely distributed and inhabits freshwater, brackish and marine habitats as free-living organisms, and also there are symbiotic species, i. e. epibionts of crustaceans. The aim of this study is to show the communities composition of the ciliates from three biotopes within Lagunas de Montebello, a National Park in Chiapas, Mexico: two lakes, phytotelmata of four species of bromeliads, and three species of decapods. We found the highest species richness in lakes, followed by ciliate species observed on decapods. Ciliate classes including most of the species were Heterotrichea, Spirotrichea, Colpodea, and Oligohymenophorea, being only in bromeliads where some exclusive ciliate species were found; no shared species between three biotopes were observed. Ciliates play an important role in each biotope. Acknowledgments. To Posgrado en Ciencias Biológicas, UNAM and to Consejo Nacional de Ciencia y Tecnología (CONACYT), for the scolarships to MRB, CADR and DMS. We thank to the Tziscao people for the permission for samples collection. Biól. M. Reyes-Santos and M. en C. I. Morales-Salas (Facultad de Ciencias, UNAM) are thanked for their technical support.

Key words: Ciliates, epibionts, diversity, communities, Mexico

Diversity and distribution of marine sponges in the Boka Kotorska Bay

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Abstract

Diversity of phylum Porifera in the Boka Kotorska Bay (Montenegro, Adriatic Sea) is presented with 2 clases, Calcrea and Demospongiae. Clacrea is represented with 5 species and Demospongia with 2 subclasses, 25 families and 42 species. Among them six species are Mediterranean endemics, ten are under protection by national and international legislation and one is alien species. This is a compilation of already published literature and recently collected data. The data was collected on 32 locations around the Boka Kotorska Bay. From literature point of view 41 species are distributed in the area while personal data confirm presence of six species new for the area.

Comparing distribution of the sponges around Boka Kotorska Bay we concluded the higher presence of the sponges in the inner part of the Bay (Kotor and Risan bay), while there are different species present at the entrance of the Bay, possibly because of the direct influence of the open sea. Within the inner part of the Bay we have identified three locations with high diversity and abundance of sponges and other benthic organisms. Locations Dražin Vrt and Sopot are situated near submerged freshwater springs (Vrulja) and third location is Verige strait, which connects inner bay with the Tivat Bay.

Fauna of Porifera in the Boka Kotorska Bay is still partially known although new data are constantly acquired and further studies are necessary for better understanding of sponge diversity in this area.

Key words: diversity, Porifera, sponges, Boka Kotorska Bay

Impact of Land Use on Trophic State of the Tisza River: Implications for Eutrophication Control

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Abstract

Understanding the relationship between land use and surface water quality is necessary for effective water management. This is a challenging task in predominantly agricultural areas such is the Middle Danube Basin.

The aim of this study was to explore the relationship between water quality and main land cover types along the River Tisza. Three river profiles were selected for the analysis: Martonoš -with natural land cover types; Novi Bečej -with dominant urban land use; and Titel -mostly with agricultural land use. Physico-chemical data were extracted from the annual reports (2012-2018) of the Environmental Protection Agency of Republic of Serbia and included monthly values for: dissolved oxygen, pH, oxygen saturation, electroconductivity, nitrate/ nitrite/ total/ organic nitrogen, biological and chemical oxygen demand, orthophosphates, total phosphorus, total organic carbon, chlorophyll a. Difference between profiles were tested for each environmental variable using T-test for Dependent Samples in Program STATISTICA.

The analysis showed that the trophic status of the River Tisza is more affected by agricultural land use compared to residential and urban areas, especially in terms of dissolved oxygen values and orthophosphates. Natural land cover types (shrubs and woodlands) were found to be effective buffer zones for the orthophosphates and nitrite nitrogen.

Key words: Land use, Corine, Eutrophication

Effects of human pressure on diversity of phytoplankton and zooplankton communities in ponds

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Abstract

Although plankton constitutes important part of the biodiversity in lentic ecosystems, the impacts of human activities on plankton diversity in ponds have been studied to a lesser extent. We tested the simultaneous effects of cumulative pressure of human activities which co-occur in the surrounding of the study ponds (i.e., gravel mining, crop production, road effects and waste input), nutrient pollution (i.e., orthophosphates and ammonia-nitrogen) and pond connectedness on phytoplankton and zooplankton richness and abundance. For this, we applied linear mixed effects models to the data sampled across the 18 study sites of six ponds. Cumulative human pressure in the study ponds showed negative effect on phytoplankton richness ($F = 7.47$; $p = 0.03$). Zooplankton richness was regulated by pond connectedness, indicating negative effect of pond isolation. Water pollution by ammonia-nitrogen showed negative effect on zooplankton abundance ($F = 8.28$; $p = 0.02$). Our results suggest that management strategies in the study ponds should reduce the intensification of anthropogenic activities and enhance connectedness among these systems.

Key words: anthropogenic activities, nutrient pollution, connectedness, plankton diversity, lentic ecosystems

How do anthropogenic stressors affect the longitudinal composition of lotic water mite (Acari: Hydrachnidia) assemblages?

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Abstract
Despite the growing research interest for water mite ecology, the environmental impacts along longitudinal river gradients on water mite assemblages are still poorly understood. Our goal was to determine how physico-chemical water properties and hydromorphological alternation affect water mite assemblage composition and distribution on a longitudinal river gradient. Macroinvertebrate samples were taken from 20 study sites distributed longitudinally along the whole 107 km course of a lowland river (Bednja River) in the Hungarian lowland ecoregion of Croatia. Physico-chemical water properties were measured and the degree of hydromorphological modification was assessed parallel to macroinvertebrate sampling at each site. Both species richness and water mite abundance were found to significantly increase with increased distance from the source. However, the assemblages from the upper river reaches and those from the lower river reaches shared very few species. Water mite species richness and diversity seemed to be positively associated with increased temperature, oxygen saturation, chemical oxygen demand and phosphorous levels. These environmental variables were also significantly higher with increased distance from the source, indicating that the cause of the significant association with water mite diversity may be only the result of covariance of the environmental variables. Nevertheless, water mite species richness and diversity were not reduced with increased levels of these variables, associated with organic enrichment and eutrophication pressures. Hydromorphological degradation also did not decrease neither water mite abundance, nor species richness and was positively correlated with both. Furthermore, a correspondence analysis on water mite microhabitat preferences even showed that 32% of all the species were positively associated with artificial microhabitats (Technolithal). These positive associations are most probably the result of decreased competition pressure from other larger invertebrates, rather than a genuine preference to hydromorphologicaly-disturbed habitats. Within this research, a total of 22 different species of water mites were found, 8 of which were documented for the first time in Croatia.

Key words: water mites; lotic ecosystem; hydromorphological modifications; anthropogenic stressors

Phylogenetic analysis of water mites (Acariformes, Hydrachnidia) from the Lake Ohrid basin

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Abstract

The subject of this research is a group Hydrachnidia that is present in all parts of the world, except Antarctica, and which has conquered all freshwater habitats. Water mites systematics is constantly subject to various modifications; it is of great importance to have the correct taxonomic identification of organisms. The fauna of these organisms has not been studied in the Lake Ohrid basin using molecular methods. A nondestructive method of DNA isolation was used, which allows further morphological analysis on water mites. A mitochondrial gene encoding cytochrome c oxidase I (COI) was used for species identification and phylogenetic analysis. For data analysis were selected 14 positive PCR products. The implementation of phylogenetic analyses enabled the first reliable assessment of the diversity of selected water mites taxa and improved knowledge about genetic diversity of the lake basin. The barcodes are deposited in the BOLD (Barcode of Life Data System) public database.

Keywords: Acari, Hydrachnidia, DNA-barcoding, COI, molecular phylogeny, taxonomy, Lake Ohrid.

Tree of heaven causing trouble on Earth

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Abstract
Invasive species seem to be one of the elements of habitat change globally. In this study we try to tackle the effect of habitat change caused by invasive tree species – the tree of heaven. The tree of heaven has been invading the area for decades and terrestrification took place. What was formerly aquatic habitat became a forest. Removal of the invasive trees enabled the reactivation of aquatic habitats and re-commencement and re-establishment of benthic assemblages. Rewetting was tested for 6 months in 4 channels. Simultaneously we monitored the changes in physico-chemical properties of water. Non biting midges and blackflies were the best recolonizers. Beetles were the slowest in re-acquiring new habitats. It is noteworthy that the invasive species must be controlled over longer period to allow a complete re-establishment of aquatic sites.

Key words: Rewetting, recolonization, macroinvertebrates, Krka, Croatia

State of zoobenthos taxa in undisturbed springs of Kozara National Park (NW Republic of Srpska, Bosnia and Herzegovina)

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Abstract
Kozara National Park is located on the Kozara Mountain in the northwestern part of the Republic of Srpska in Bosnia and Herzegovina. The zoobenthos community of springs in this area used to be completely unexplored. The aim of this study is to determine the state of zoobenthos taxa in undisturbed springs in the area of Kozara National Park. Semi-quantitative samples of zoobenthos were collected by hand net (250 µm mesh apertures) in 2019 from 15 undisturbed springs in this area. Representatives of 57 invertebrate taxa were recorded (mean ± SD: 18.53 ± 3.81). The highest number of collected individuals belongs to arthropods, as well as the highest number of recorded taxa. Most springs were characterized by highest abundance of Chironomidae. This taxon, including representatives of Oligochaeta and Dixidae, were found in all undisturbed springs included in this study. It is expected that a higher number of taxa would be determined with a continuation of this study, since the presented preliminary results are based on several different levels of taxonomic resolution in the identification of collected individuals.

Key words: zoobenthos, undisturbed springs, Kozara National Park

Effects of human limiting of interspecific competition between restocked noble crayfish and non-indigenous spiny-cheek crayfish in Sominko lake (NW Poland)

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Abstract
The situation of an indigenous noble crayfish (*Astacus astacus*) in Poland was evidenced as critical. The restocking seems to be only effective method to rescue the species from extinction in the Lakelands of the northern part of the country. The efficacy of restocking programmes depends on finding out solutions to many systemic problems. Especially problematic there seems to be difficulties with access to restocking material and expansion of invasive American crayfish species (*Faxonius limosus* Raf.).

We present the results of 4 year lasting restocking of noble crayfish in the Sominko lake against the background of overall active protection of the species in NW Poland.

The restocking process was realised parallely to systematic catch of the invasive crayfish species from Sominko lake. The effects of this way human limiting interspecific competition between restocked noble crayfish and non-indigenous spiny-cheek crayfish is analysed. The most distinct reactions within both population are related to habitat preferences.

Key words: Noble crayfish, Spiny-cheek crayfish, inter-specific competition, restocking,

Ladybug (Coccinellidae) fauna in the coastal area of Montenegro

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Abstract
The fauna of Coccinellidae of the coastal area in Montenegro was researched during 2019/20. Twenty-four (24) localities were covered, with different habitat types. During the research, 784 specimens were collected, and classified into 31 species. *Halyzia sedecimguttata* (Linnaeus, 1758) was found for the first time in Montenegro.

Key words: Coccinellidae, Montenegro, costal, first record.

Effect of environment on the fish diversity in ponds and fluvial lakes along the Danube floodplain in Serbia

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Abstract

Wetlands with natural hydrological regime along the Danube River in Serbia were recognised as sites of high conservation importance at national and European level. However, they are usually neglected from the routine monitoring programs and convinient method for their ecological status assessment has still not been proposed. The aim of the study was to present the current state of fish communities and to relate them to environmental parameters in fluvial lakes and ponds along the Danube river floodplain in Serbia (1400-1250 rkm) which is the first step for their inclusion in routine biomonitoring. The fish were sampled from a boat at 51 sampling stations, within 17 different water bodies. Simultaneously with biological data, several physico-chemical parameters were measured on each sampling station: pH, electroconductivity, temperature, dissolved oxygen, nitrate-nitrogen, chemical oxygen demand, biological oxygen demand, total organic carbon, orthophosphates and turbidity. Fish community was presented by Shannon-Wiener, Simpson and Margalef diversity indices. Principal component analysis (PCA) revealed that fish diversity increase with increasing dissolved oxygen content and decreasing chemical and biological oxygen demand, total organic carbon, and orthophosphates.

The results of this study present the main prerequisite for the development of fish-based bioassessment method .

Reptiles diversity of Mareza (Podgorica, Montenegro)

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Abstract

Within the project "Edukativna stanica Mareza" diversity of reptile fauna, as well as threat factors were investigated during April and May 2019 in a wide area of Mareza. Methodology included active searching and visual observation of species along defined transects, while for aquatic turtles adequate traps were used. Species identification is done according standard herpetological literature. In total, 20 reptile species are recorded (*Testudo hermanni*, *Emys orbicularis*, *Hemidactylus turcicus*, *Anguis fragilis*, *Pseudopus apodus*, *Dalmatolacerta oxycephala*, *Lacerta trilineata*, *Lacerta viridis*, *Podarcis muralis*, *Podarcis melisellensis*, *Dolichopis caspius*, *Elaphe quatuorlineata*, *Hierophis gemonensis*, *Malpolon insignitus*, *Natrix natrix*, *Natrix tessellata*, *Platyceps najadum*, *Telescopus fallax*, *Vipera ammodytes*, *Xerotyphlops vermicularis*), what comprises about 55% reptile species so far known for Montenegro. Three identified species (*Testudo hermanni*, *Emys orbicularis* and *Elaphe quatuorlineata*) are listed on Annex II of Habitat directive. No identified species are vulnerable, endangered or critically endangered according IUCN Red List. Almost all identified species, more precisely 16 species, are protected on national level. First finding of *Xerotyphlops vermicularis* in this area contribute to its distribution range in Montenegro, as species was so far known only for area of Lake Skadar. Main threat factors for reptile fauna in area of Mareza are: urbanization, habitat fragmentation and destruction, fires, illegal waste, direct killing by locals, road killing as well as lack of "canals" bellow roads which would provide unhindered species movement within their habitats. According to obtain results, area of Mareza can be considered as important reptile "biodiversity hotspot" in Montenegro.

Key words: biodiversity hotspot, reptiles, *Xerotyphlops vermicularis*, threat factors, Mareza

Factors affecting the life-time reproductive success of urban population of European blackbirds

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Abstract
Here, we present the results of a long-term study of European blackbirds which examined the effect of natal conditions on lifespan and lifetime reproductive success (expressed by the number of fledglings) of 152 nestlings (72 males and 80 females) ringed in the Stefan Żeromski Park in Szczecin (NW Poland). We have complete information regarding parental age, family brood (first-egg laying date, clutch size, and hatching sequence), bird size, lifetime reproductive success, pair density and weather conditions during the natal year. For males, total fledgling production was the smaller, the later the laying date of the family brood, but increased with mean daily precipitation and pair density in the natal year. In the case of females, we did not find any significant relationships between their lifetime reproductive success and the above parameters. Male lifespan increased with mean daily precipitation and bird density, but only pair density had a positive effect on female lifespan. We suggest that for females, genetic factors could be more important for their reproductive success than for males. In addition, a blackbird's lifespan depends strongly on environmental factors.

Key words: European blackbird, fitness, lifetime reproductive success, natal effects, Turdus merula.

Adsorption of copper and lead from water using waste grain of pomegranate

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Abstract

Lead (Pb) is the heavy metal, which is highly toxic for living organism even if it is present in low levels. Copper (Cu) is essential element, but in increased concentration it is very dangerous. According to The World Health Organization's recommendation copper limit in drinking water is 2 mg/L, and for the lead is 10 µg/L. Among the different removal technologies of these metals adsorption is very important. In the last period, a lot of work is being done to explore the possibility of using waste materials, especially agro-industrial waste to remove these metals from water.

The aim of this paper was to investigated the sorption potential of waste grain from pomegranate for the removal of lead and copper from aqueous solutions. The influence of contact time, sorbent dose, pH and initial Cu(II) or Pb(II) concentration on the removal of copper and lead from aqueous solution by batch sorption was investigated. The investigations were performed within the initial copper or lead concentration ranging from 5 to 60 mg/L. The mass of sorbent was varied in the range from 0.3 to 1 g, and pH was varied in the range 2.5 to 8.5. The results show that this sorbent can remove roughly 75 % lead and 38 % copper. Maximum sorption of lead (3.28mg/g) is achieved for initial lead concentration 50mg/L, time 60 minutes, sorbent mass 0.5 g and pH value 4. For copper sorption capacity of 2.7 mg/g is achieved for initial copper concentration 50mg/L, time 90 minutes, sorbent mass 0.7 g and pH value 4.

In this investigation was found that waste grain of pomegranate was more effective for the removal of lead than copper. Future research should consider using activated sorbent with the aim of increasing the degree of sorption.

Key words: copper, lead, adsorption, pomegranate, Montenegro.

Geometric morphometric approach to unravelling sublethal effects of CeO_2 nanoparticles

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Abstract
Present within the OECD priority list for safety testing of manufactured nanomaterials, cerium oxide nanoparticles (nano-CeO_2), present one of todays' major contaminants of the environment. The present study was carried out in order to explore the potential of geometric morphometric approach in unravelling sublethal implications of nano-CeO_2 exposure by exposing *Chironomus riparius* to 2.5, 25, 250, and 2500 mg of nano-CeO_2/kg of sediment (according to OECD test 218). Analysis revealed clear morphological changes in larval mouthparts (mentum and mandibles) and adult wings of specimens exposed to examined concentrations. The variability of morphological changes in *C. riparius* revealed by Geometric Morphometrics, prove this approach could be invaluable in ecotoxicity testing of manufactured nanomaterials, especially nano-CeO_2.

Key words: *C. riparius,* freshwater midge, morphological variability, nanotoxicology, OECD

Microcosm approach: In situ effects of microplastic mixture on community structure of freshwater benthic macroinvertebrates

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Abstract

Benthic communities represent one of the most threatened organisms in aquatic habitats due to accumulation of plastic particles in sediments. High abundance of MPs in aquatic habitats indicate higher probability of macroinvertebrates to ingest microplastic particles. Benthic community was exposed to high concentration of MPs, 80 g m^{-2} in sediment, and control, without addition of MPs. Mixture of MPs contained polyethylene (PE), polyvynil-chloride (PVC) and polyamide (PA) in a ratio of 50%: 25%: 25%, respectively. In situ experiment lasted for 100 days. Total number of taxa that colonized the trays were 22 (17 in control, 18 in HC treatment). Most dominant group within macroinvertebrate community was dipteran family Chironomidae, both in control and HC treatment. No significant differences in abundance and biomass at community level between control and HC treatment was recorded by PERMANOVA ((F=0.993; p=0.456 and F=0.344; p=0.797, respectively). Mixture of microplastics did not influence abundance and biomass of functional feeding groups within macroinvertebrate community (F=1.810; p=0.137 and F=0.377; p=0.736, respectively). Species richness (S), species abundance (N), biomass (B), Shannon's diversity index (H) and Simpson's index (D) showed no statistically significant differences between the control and treatment groups.

Keywords: Microplastics, Macroinvertebrates, Benthic community, Functional feeding groups, Microsocms

Innovative concept in Monitoring Water and Food Quality using Time series

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Abstract

Many phenomena in nature and society may be reliably modeled by time series. In the fields of environmental science, water and food safety, medicine, and many others, classical statistical tools have been used but often with no adequate answer to the issues arising from different conditions prevailing within or around the observed populations. Goal of this paper is to advertise some new time series models that could be appropriate in solving various issues in mentioned fields.

In cases where events of the past are influencing the values in the present or yet to come in future, the autoregressive models of time series are known as highly appropriate. These models enable predicting future values according to a phenomenon which is generally in recent past but sometimes also in distant history. Regarding the autoregressive models of time series, in most cases the assumed model has constant coefficients, and the prediction of future values is always based on the same pattern. Such models have been implemented widely, although in last few years there has been an expansion of time series models with random coefficients. This type of models assumes that the past does not dictate prediction always in the same way, instead depending on specific values in the past. Here our central topic will be an innovative concept in modeling population using time series models with random coefficients. More precisely, we will focus on time series based on so called thinning operators. The initial models based on binomial thinning were ideal for monitoring abundance of a population where an individual may either "survive" or "disappear". These models were unable to explain possible interactions between individuals that may produce new individuals. An advance in that context bring the models with so-called negative binomial thinning, which are ideal for describing populations where individuals interact with each other. For example, this model may be used for modeling populations of insects that may survive to the next sampling, may disappear or also might reproduce, or the same model may be applied to a colony of bacteria or any other harmful or beneficial microorganisms. These models may be particularly useful in observing the number of persons with a disease, as prediction improves by introducing a possibility that an infected individual may infect a certain number of healthy persons. Some models increase the scope of implementation to phenomena that may result in negative values. These models even allow using the measured results to determine some unknown, immeasurable components influencing the observed phenomenon. Exposing these "latent components" makes these models extremely valuable for purposes of, for example, supporting or refuting genetic disposition for an infectious disease.

Quality of drinking water is not just a matter of science but also an issue with economic, health, cultural, and even spiritual significance. This emphasizes the need for water quality monitoring. Lately, it is not enough to know present status of water quality, it is necessary to predict future status according to available data. Therefore, in addition to

monitoring, it is necessary to include in practice predictions of the future status of drinking water resources. This requires changes in legislative concerning water quality. Similar situation is in the field of food quality. There is a new challenge for processing and preserving food and in that process time series could be very useful tool.

Kkey words: time series models; water quality; food quality; legislatives

Poster Presentations

A first assessment of the microbiota of Taurida Cave

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Abstract

Caves are considered as ecosystems isolated from the surface in varying degrees. Hypogean habitats are mostly oligotrophic, with discretely distributed nutrients, where chemolithoautotrophic species can be found among the producers. In this case, life - support provides due to nutrients of endogenous genesis. Of particular interest are the cavities, which were completely isolated from the surface impact for a long time. As a consequence, unique landscapes and mineral environments were formed in such cavities. An example is given by the Taurida Cave, located on the Crimean Peninsula (Piedmont Crimea) and discovered during the construction of Taurida Highway. Samples of sediments were taken right after opening the cave in July 2018. For the cultivation of bacteria and microfungi, standard media, extracts from substrates were used. The number and biomass of microorganisms were determined by luminescence microscopy. Chemical composition of the main and trace elements of the cave deposits samples was determined by XRF WDS spectrometer. As a result, a difference in the number and biomass of microorganisms in different parts of the cave was revealed. The main contribution to the biomass of microorganisms is made by actinomycetes and microfungi. The bacteria were dominated by gram-positive bacteria of the genera *Bacillus*, *Arthrobacter, Micrococcus*. Among actinomycetes, species of the genus *Streptomyces* predominated. The species of microfungi *Penicillium chrysogenum*, *Trichoderma sp.*, *Aspergillus sp*. were identified, *Penicillium janczewskii* dominated. The high abundance and biomass of microorganisms in the substrates of cave may be related to the summer sampling period.

Keywords: karst caves, underground habitats, microfungi, cave sediments, speleothems, actinomycetes.

An comparative analysis of airborne and terrestrial fungi in show caves Novoafonskaya and Ali-Sadr

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Abstract

A study of cultivated species of micromycetes in two show caves Novoafonskaya (Caucasus) and Ali-Sadr (Iran) was carried out. The species composition of fungi has been analyzed in the air and cave sediments along the excursion route. Species identification was performed using standard approaches and cultivation methods. Jaccard index was applied to estimate similarity of communities of different biotopes. The species diversity of micromycetes was higher in the Novoafonskaya cave where 53 species of micromycetes were identified. Only 39 species were isolated from the Ali-Sadr cave. Representatives of Ascomycota predominated in fungal communities. The greatest species diversity was noted in the genera *Alternaria, Aspergillus, Fusarium, Penicillium*, and *Trichoderma*. Species *Alternaria alternata, Cladosporium cladosporioides, Cladosporium herbarum, Pseudogymnoascus pannorum, Oidiodendron tenuissimum* and *Penicillium chrysogenum* were identified in all biotopes of both caves. Comparison of two biotopes of the caves using the Jaccard index revealed a high similarity in the species composition in the soil and air of the Novoafonskaya cave (J = 0.56). On the contrary, the species composition of fungi was different in Ali-Sadr cave (J = 0.23), which may be explained by intensive propagules input from the surface due to the cave morphology features and the arrangement of excursion route.

Phytoplankton adaptation strategies under the influence of climatic changes and anthropogenic pressure on the Black Sea coastal ecosystems on the example Sevastopol Bay

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Abstract

Several paths of the Black Sea coastal waters phytoplankton community adaptation to changes in water temperature, nutrients concentration and anthropogenic pollution have been identified on the example of the Sevastopol Bay. Increase in water temperature and decrease in nutrients content in the studied waters in 2000 – 2014 caused a gradual decrease in the chlorophyll "a" concentration, total phytoplankton biomass and its re-composition, predominantly in the summer and autumn periods. The phytoplankton restructuring was reflected, first of all, by a decrease in relative diatoms contribution in the total phytoplankton biomass and increase in dinoflagellates contribution. Among the dominant diatoms species, the proportion of resistant to high temperatures, pollution, low nitrate content in the water and microzooplankton grazing species was increasing. An increase in nitrate concentration in the studied waters in 2020 led to increase in total phytoplankton biomass in compare to 2014 and predominance such diatoms species, that under the stated conditions did not led to the bloom emergence, which were regularly observed earlier in the Sevastopol region.

Key words: phytoplankton, Black Sea, climatic changes, anthropogenic pressure.

Variability of the ctenophore *Mnemiopsis leidyi* A.Agassiz (Ctenophora: Lobata) bioluminescence while regeneration

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Abstract

Measurement of intensity of bioluminescence generated by living organisms has become a standardized reliable biophysical method applied after the creation of the laboratory device *Svet* (Mashukova et al., 2017). The main parameters of the bioluminescence produced by some bioluminescent plankton have been studied.

The goal of the current studies is identification of the bioluminescence variability of the ctenophores *Mnemiopsis leidyi* A.Agassiz, 1865 in the process of regeneration. It has been stated that *M. leidyi* being seriously injured with preserved statocyst still actively move but the amplitude and duration of their bioluminescence lessen to their minimums that is 17.08 quantum $\cdot s^{-1} \cdot cm^{-2}$ and 1.37 s respectively under chemical stimulation and $14.85 \cdot 10^8$ quantum $\cdot s^{-1} \cdot cm^{-2}$ and 1.25 s respectively under the mechanical impact. Having completed regeneration and restored the body weight up to the initial value, the ctenophores increased their light emission up to the maximum levels corresponding to $332.33 \pm 16.61 \cdot 10^8$ quantum $\cdot s^{-1} \cdot cm^{-2}$ under the chemical stimulation and to $219.45 \pm 10.97 \cdot 10^8$ quantum $\cdot s^{-1} \cdot cm^{-2}$ under the mechanical impact. Several assumptions identifying the factors influencing the regeneration rate of *M. leidyi* and their bioluminescence variability range during their regeneration have been made. The possibility of applying bioluminescence for detecting ecological features associated with particular species is demonstrated.

Key words: ctenophores, the Black Sea, regeneration, nutrition, bioluminescence

Comparison of microplankton balance based on the content of ATP and chlorophyll a in the heterotrophic-photoautotrophic plankton in the northern area of the Black Sea during the autumn and spring seasons

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Abstract
Based on materials on the distribution of ATP and chlorophyll a microplankton in the euphotic zone of the Black Sea, collected on expeditionary flights R / V "Professor Vodyanitsky" in October 2016 and in March-April 2017, the heterotrophic photoautotrophic index (HPI) reflecting the ratio of heterotrophic biomass and photoautotrophic parts of the microplankton community was calculated. The interest in comparing precisely these seasons is due to the fact that they are similar in hydro physical conditions for the development of the community. Water trophicity was estimated by ATP concentrations as an indicator of the metabolically active microplankton biomass. It has been demonstrated that in the autumn season, the studied waters of the landfill can be estimated as mesotrophic, in the spring they are close to eutrophic. Judging by HPI, in the autumn season, heterotrophic forms of microplankton dominated in most of the water area, and in the spring, parity ratios of heterotrophic and photoautotrophic microplankton dominated.

Key words: The Black Sea, microplankton, ATP (adenosine triphosphate), chlorophyll-a, heterotrophic-photoautotrophic index, seasonal changes

The diatoms (Bacillariophyta) of the Yavorivsky National Park, broad-leaves forest zone of Ukraine, including *Caloneis albus-columba*, sp. nov.

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Abstract
First data on the diatoms in Yavorivsky National Park presents 89 species which were found in the hydrotopes of the park, among them *Cymbella simonsenii* Krammer, *Psammothidium vernadskyi* Bukhtiyarova et Stanislavskaya and *Stauroneis fluminopsis* van de Vijver et Lange-Bertalot were recorded for the first time in Ukraine. A new diatom species *Caloneis albus-columba* Bukhtiyarova, sp. nov. was described from the pond in stationary recreation area Kozulka. New species possesses strongly three-undulate valves with three rhombic segments that morphology is similar to *Caloneis lamella* Zakrzewski however differs from it by rhombic distal valve segments instead of oval ones as well as noticeably smaller width of central valve segment. Besides, the multi-seriate striae of the new species have the same width along their length and in *C. lamella* they are narrowed towards the apical valve axis. Taxonomy of other similar species is discussed, in particular, conspecificity of *Caloneis lewisii* R.M.Patrick with *C. lamella*. The illustrations with light and scanning electron microscopy are provided.

Tribus Persicarieae (Polygonaceae) in the flora of Serbia based on the revision of four herbarium collections

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Abstract
Tribus Persicarieae includes 5 genera and around 180 species with a cosmopolitan distribution. So far, members of this tribus have traditionally been included in the tribus Polygoneae. For example, this is the case in Flora Europea in which 22 species currently belonging to tribus Persicarieae, were included in *Polygonum* s.l. The aim of this paper was to determine the diversity of tribus Persicarieae in the Serbian flora, by examining and revising herbarium material. For this purpose, plant material from four collections was studied and on that occasion, a total of 614 herbarium sheets were analyzed. Of this number, 190 specimens were deposited in the herbarium collection of BUNS, 101 in PZZP, 163 in BEOU, and 160 specimens were deposited in the BEO collection. Identification and revision of the material were made according to Flora Europaea and other relevant regional floras. The nomenclature alignment was done using the latest literary and online sources. The presence of ten species and two subspecies was determined. In conclusion, considering that the present consensus is to segregate the members of the tribus Persicarieae from the tribus Polygoneae, we can distinguish three genera of Persicarieae in the Serbian flora – *Persicaria*, *Bistorta*, and *Aconogonon*.

Key words: *Aconogonon*, *Bistorta*, diversity, herbarium, *Persicaria*.

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Paeonia caucasica (Schipcz.) Schipcz. in Phytocenoses of the Republic of Adygea

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Abstract

Paeonia caucasica is an endemic Caucasian Near East species with a limited range. The species is listed in the Red Book of the Republic of Adygea (2012) with the category of rarity status 3 "Rare". It is included in the Red Book of the Russian Federation (2008) and the Red Book of endemic plants of the Caucasus (2013). The purpose of the research is to study the distribution and ecological features of *Paeonia caucasica* in Adygea. The material was collected in 2017-2020 during field surveys of the territory. An ecological and phytocenotic approach with stationary and semi-stationary research methods was used.

In ecological terms, *Paeonia caucasica* is mesotrophic and xeromesophyte, sciogeliophyte, winter – hardy and drought – resistant, in ecophytocenotic it is sylvan. On the territory of Adygea, the species is recorded at altitudes from 220 to 846 m above sea level in the lower and middle mountain belts in oak, oak-hornbeam, hornbeam-oak, oak-beech and beech forests.

In Adygea, *Paeonia caucasica* blooms in the first decade of April, the duration of flowering is up to 10 days. Entomophilous plant. Propagated by seeds, which are characterized by underground germination.

The number, density, and status of populations in different habitats differ significantly, as well as the degree of anthropogenic impact. Some populations are compactly dispersed, sometimes reaching high numbers. However, the species is reducing its range and should retain the category of rarity status in the new edition of the Red Book of the Republic of Adygea. The factors limiting the distribution of the species are: complex reproductive biology, low seed germination, weak competitiveness of seedlings and juveniles, lack of vegetative reproduction of populations, as well as logging, construction of roads and tourist facilities with the development of mass tourism and recreation.

Key words: distribution, ecological features, reproduction, populations, numbers, ontogenetic structure, limiting factors.

Ecological features, ontogenetic structure and status of populations of species of the genus *Cephalanthera* Rich. (Republic of Adygea)

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Abstract

Three species of the genus *Cephalanthera* are found in the Republic of Adygea: *Cephalanthera damasonium* (Mill.) Druce, *Cephalanthera longifolia* (L.) Fritsch, *Cephalanthera rubra* (L.) Rich. All of them are endangered and listed in the Red Book of the Republic of Adygea (2012). Objective of the study: identification of new localities, study of ecological-phytocenotic confinement and status of species populations using population-ontogenetic research methods.

The species are mesophytic and grow in beech, oak, hornbeam, oak-hornbeam and coniferous forests, more often in clearings and forest edges. Cephalanthera damasonium and Cephalanthera longifolia are helioscyophytes, Cephalanthera rubra is sciophyte.

Ontogenetic structure of populations of *Cephalanthera damasonium*: 3im: 21v: 3g (environs of Ust-Sakhray settlement, altitude above sea level is 581 m, oak-beech forest), 4v: 1g (environs of Krasnooktyabrsky settlement, altitude above sea level is 325 m, oak forest). Population of the species in the environs of Ust-Sakhray settlement is full-member, its condition is normal. Population of the species in the environs of Krasnooktyabrsky settlement is incomplete, its condition is regressive. The ontogenetic spectrum of both populations is right-sided with a predominance of virginal plants.

Ontogenetic structure of *Cephalanthera longifolia* populations: 10v: 2g (environs of Maykop, altitude above sea level is 230 m, oak-hornbeam forest), 2im: 12v: 1g (environs of Sadovy settlement, altitude above sea level is 312 m, oak forest). Population in the environs of Sadovy settlement is full-member, its condition is normal. Population in the environs of Maykop is incomplete, its condition is regressive. The ontogenetic spectrum of both populations is right-sided with a predominance of virginal plants.

Ontogenetic structure of *Cephalanthera rubra* populations: 1v: 8g (environs of Ust-Sakhray settlement, altitude above sea level is 581 m, oak-beech forest), 2g (environs of Krasnooktyabrsky settlement, altitude above sea level is 325 m, oak forest). Both populations are incomplete; ontogenetic spectra are right-sided with a predominance of generative plants. The status of the populations is regressive.

Limiting factors: low population size, weak competitive capacity, difficulty of pollination and reproduction, low resistance to anthropogenic influences, disturbance of growing locations, collection for ornamental purposes.

Key words: rare species, ecological-phytocenotic confinement, population structure, ontogenetic spectra, status of populations.

Freezing: how does water mites (Acari: Hydrachnidia) survive exposures at subzero temperatures?

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Abstract

Until now, nothing was known about the possibilities of water mites (Acari, Hydrachnidia) to survive in sub-zero temperature by imagines and deuthonymphs. In order to recognize the sensitivity of freezing by water mites experiments on the following issues has been conducted: 1. the impact of acclimatization on survival, 2. the impact of temperature, 3. the influence of the length of freezing time, 4. the survival rate of water mites from various types of water reservoirs, 5. the survival rate of water mites from different climatic zones. Particular species were grouped according to different surviving potential: well freeze survived (>50%) (*Limnochares aquatica, Piona nodata*, *Sperchon clupeifer*, *Hygrobates longipalpis*, *Lebertia porosa*), with mean values of survival (20% - 50%) (*Lebertia insignis*, *Piona pusilla*), with poor survival (<20%) (*Hydrodroma despiciens*, *Mideopsis crassipes*, *Unionicola crassipes*) and with complete lack of survival (*Torrenticola amplexa*, *Sperchonopsis verrucosa*). The research conclusions are: 1. water mites survive freezing point to –2°C, lower temperatures are lethal for them, 2. there are differences between short (24 - 48 hours) and long freezing time (168 hours), 3. it seems that freeze resistance is an evolutionary trait, assigned to particular species, not related to the living environment, 4. freeze survival is related to the European region and much smaller for southern Europe than central Europe.

Keywords: Water mite species, Survival strategies, Overwintering, Impact of acclimatization, Lethal temperature

Environmental factors shaping assemblages of ostracods (Crustacea: Ostracoda) in springs situated in the valley of the River Krąpiel

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Abstract
The study investigated the structure of assemblages of ostracods (Crustacea: Ostracoda) in springs situated in the valley of the small lowland River Krąpiel. The environmental factors shaping these assemblages and the potential of ostracods as indicators in this type of habitat were analysed. The factors taken into account in the environmental analyses included the type of spring, type of substrate, physicochemical parameters, and a hydrological assessment of the river valley. Thirty ostracod species were recorded. The numbers of individuals in the springs were very small, on average 100 per sample. Juvenile *Candona* sp., juvenile *Psychrodromus*, *Cypria ophtalmica*, and *Cypridopsis vidua* were dominant. The proportion of spring species was below 1%, except for juvenile *Psychrodromus* sp. with 21% and *Eucypris pigra* with 4%. The average number of taxa was very low – only 5. Spearman's rank correlation analyses revealed positive relationships between spring species: *Candonopsis scourfieldi* with *Psychrodromus fontinalis* (k = 0.49); *Eucypris pigra* with *Potamocypris zschokkei* (k = 0.44) and *Fabaeformiscandona brevicornis* (k = 0.52); and *P. zschokkei* with *Psychrodromus olivaceus* (k = 0.32). According to the CCA analyses, the ostracod assemblages were statistically significantly influenced by limnocrene springs, flooding of springs by river overflow, the presence of coarse leaf organic matter, the presence of fine organic matter, high content of NH_4, BOD_5, conductivity, pH, Fe, the river habitat modification index (RHM), the habitat modification score (HMS), and river habitat quality (RHQ). The abundance of ostracods in springs without leaf organic matter was twice as high as in those with this type of matter, and a similar tendency was noted for the number of species. In the springs flooded by river overflow, the average abundance of Ostracoda was three times as high as in those that were not flooded. Predominance of mineral substrate over fine particulate organic matter, higher pH, the presence of leaf organic matter, and the absence of flooding by the river ensured better habitat conditions for spring species. The quality of hydrological factors within the river valley showed no relationship with spring species. The species structure of the assemblages was not affected by the small range of variation in water flow velocity in the springs.

Key words: type of springs, ostracods, substrate, physicochemical parameters

Entomofauna of standing waters of Durmitor region (Montenegro)

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Abstract

Entomofauna standing water area of Durmitor was investigated during 2019 years. 78 species of Insects were collected, of which 28 species of Odonata, 27 species of aquatic Coleoptera and 23 species of aquatic Heteroptera. The species *Micronecta minutissima* (Linnaeus, 1758) is new to the fauna of Montenegro. The research was conducted on 21 water habitats of different types, 14 permanent and 5 temporal. The species *Anax imperator* (Leach, 1805) was found at an altitude of 1956 m, which is the highest find of its kind in Europe.

Dragonflies (Odonata) of Barlinek-Gorzów Landscape Park – faunistic and ecological study

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Abstract
The aim of the work was to analyse the occurrence of dragonflies (Odonata) in the area of the Barlinek-Gorzów Landscape Park (B-GPK) and its protection zone. Many environments occurring here have a similar natural character, and the whole area is poorly recognised in faunistic data. Qualitative and quantitative studies of imagines, larvae and exuviae were conducted in 1999-2000, 2002-2004 at 65 localities. Statistical analyses of the collected material were carried out (over 37 thousand specimens representing 48 species). They allowed to get to know the dominance structure of B-GPK odonatofauna, the occurrence and reproduction of dragonflies in seven types of waters, occurrence of larvae in various microenvironments and similarities between them. The collected data made it possible to check the phenological characteristics and carry out zoogeographical analysis. The obtained results were critically discussed against the background of literature data.

Key words: dragonflies, Odonata, microenvironments, similarity, phenology, zoogeography

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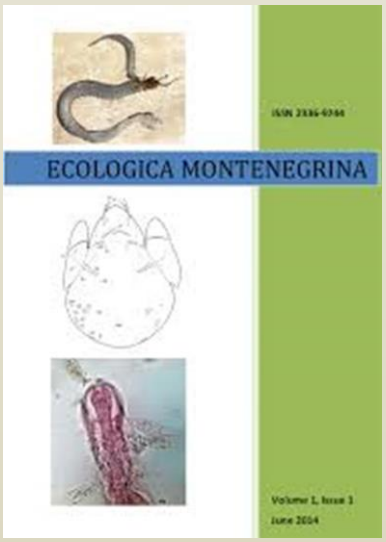

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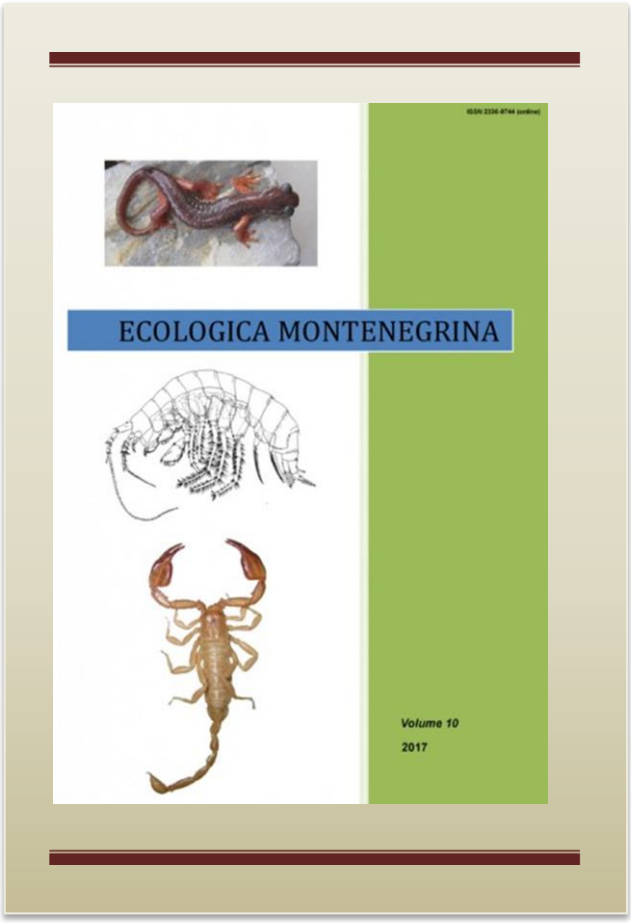

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