

Conservation of Freshwater Oligotrophic Habitats on Vranica Mountain and Establishment of Long-Term Monitoring of Biodiversity



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CONSERVATION OF FRESHWATER OLIGOTROPHIC HABITATS ON VRANICA MOUNTAIN AND ESTABLISHMENT OF LONG-TERM MONITORING OF BIODIVERSITY (BOSNIA AND HERZEGOVINA)

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INTRODUCTION

Vranica Mountain (**Fig. 1**) is characterized by an extremely high degree of oligotrophic freshwater habitats. Due to global climate change and intense anthropogenic activities, reduction and threatening of these types of habitats in the area of Vranica are increasing each day. In order to protect these habitat types and high diversity of species, it is necessary to assess their condition. In many cases, oligotrophic habitats are used as reference sites due to their high ecological status. A diversity of diatoms were taken as a tool for assessment of the state of oligotrophic freshwater habitats. The main aim of this study is to establish a database of abiotic and biotic parameters which will enable further action, especially towards their restoration, conservation and long-term monitoring of biodiversity. These project might help in establishing reference conditions not only for Bosnia and Herzegovina, but also for neighboring countries (**Fig. 2, 3, 4**).

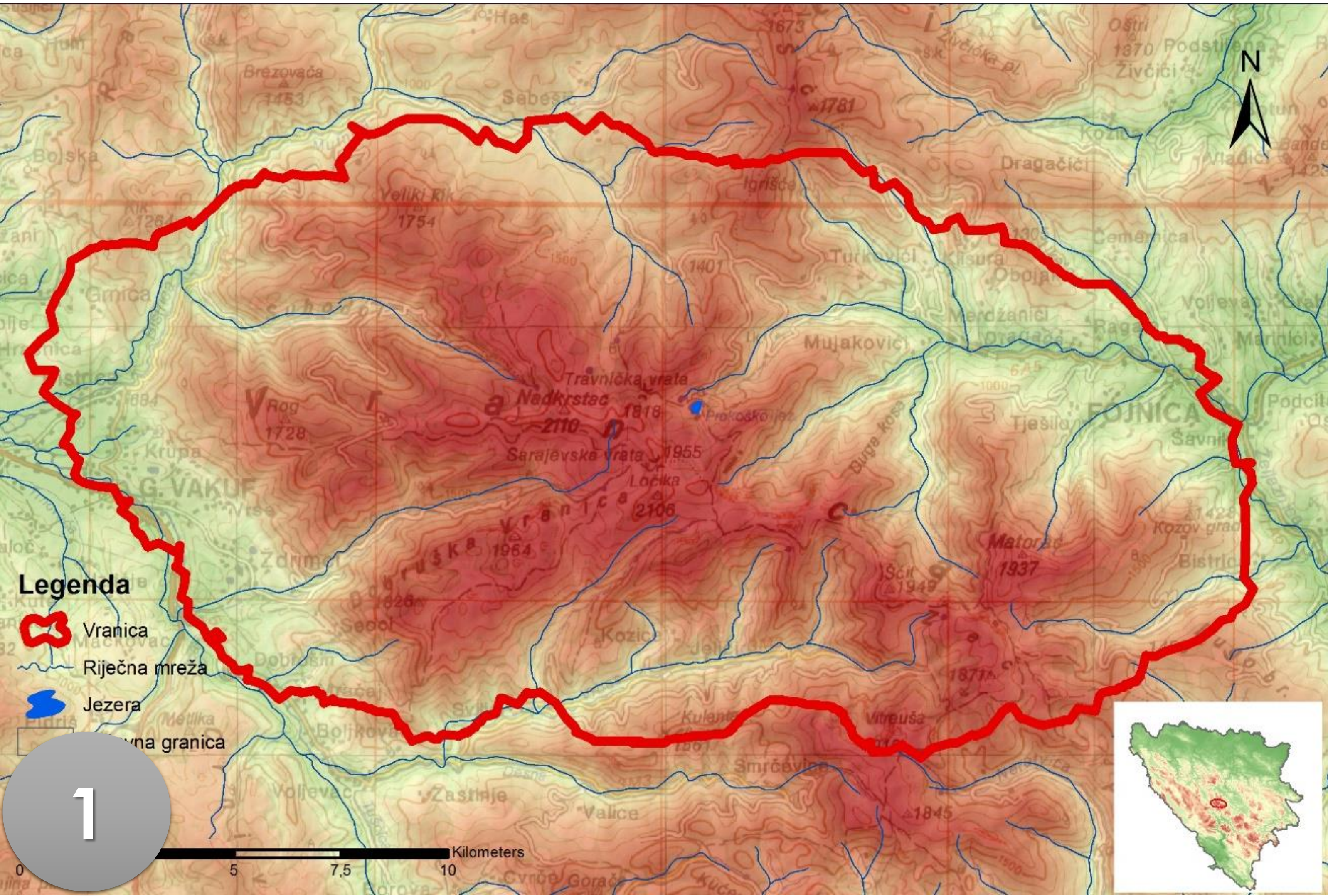
MATERIAL AND METHODS

Phytobenthos samples will be collected during all phases of fieldwork. Diatoms identification and nomenclature will be mainly based on specific diatom literature and identification key. Light microscope observation and micrographs will be performed using a Best Scope 2020 microscope, equipped with a digital camera (MD-130 BestScope). Species composition and the quantitative relationship will be estimated from the permanent slides under 1000x magnification. Remarks on the autecology and general distribution will follow Van Dam *et al.* (1994) and general information about ecological guilds of diatoms will follow Rimet & Bouchez (2012) classifications. General distribution, description and note on ecology based on the relevant literature will be provided for every taxon found in different oligotrophic freshwater habitat types in the wider area of Vranica mountain. Highlighting the presence of rare and vulnerable species of diatoms will be gained from the Red List published by Lange-Bertalot & Steindorf (1996). During laboratory research, data matrix will be prepared, which will serve as a basis for carrying out a series of univariate and multivariate analyses.

Description of study area. Vranica mountain is located in the central part of Bosnia and Herzegovina. Boundaries of the mountain range Vranica are determined by coordinate 43° 30' and 44° 00' N; 17° 30' and 18° 00', E and cover app. 288 km. Vranica has a very heterogeneous geology and petrography. Various eruptive rocks and crystal shales, feldspars, muscovite and biotite play the dominant role here. The whole system is rich in numerous springs, brooks, and small rivers, which are active throughout the year, and they determine the specific hydrological regime of this area. The Prokoško lake (46.039 m²) at the 1.635 m of altitude gives the subalpine belt a particular ecological value. The vegetation is characterized by the following vegetation belts of climatogenous forests: *Quercion roboris*, *Quercion petraeae*, *Aremonio-Fagion*, *Luzulo-Fagion*, *Piceion excelsae*. Upper timberline makes the presence of *Pinion mugi* and *Alnion viridis*. This area is a habitat for numerous steno-endemic plant species.

RESULTS AND DISCUSSION

Living world of oligotrophic freshwater habitats, despite their surface, is extremely distinctive and diverse in the wider area of Vranica. In addition to numerous springs and mountain creeks, also this area is characterized by the presence of peatland ecosystems. These habitat types are an extremely valuable elements of biological and ecological diversity. The most prominent plant species with high conservation value are: *Alchemilla xanthochlora*, *Eleocharis palustris*, *Eriophorum gracile*, *Parnassia palustris*, *Philonotis fontana*, *Pinguicula leptoceras* and *Saxifraga stellaris*. Bryophyte species which inhabit oligotrophic freshwater habitats is very rare, and they also have high conservation value and the most prominent are listed as follows: *Bryum schleicheri*, *Calliergon stramineum*, *Climacium dendroides*, *Ctenidium molluscum*, *Plagiomnium affine*, *Sphagnum russowii* and *Sphagnum subsecundum*. Preliminary research on diversity of diatoms in the peatland ecosystems are reveals a large number, which according to Lange-Bertalot & Steindorf (1996) have a certain degree of vulnerability, as follows: *Adlafia bryophila*, *Caloneis tenuis*, *Cymboppleura amphicephala*, *Cymbella aspera*, *Diploneis krammeri*, *Diploneis petersenii*, *Encyonema neogracile*, *Eunotia arcubus*, *Eunotia arcus*, *Eunotia glacialis*, *Eunotia tetraodon*, *Frustulia crassinerivia*, *Gomphonema parvulus*, *Neidium affine*, *Neidium bisculatum*, *Pinnularia subrupestris*, *Pinnularia microstauron*, *Placoneis ignorata* and *Stauroneis phoenicenteron*. In mountain springs and small creeks, during field work, one crenic species of macroalgae was discovered (*Hydrurus foetidus* (Villars) Trevisan) (**Fig. 5**). This species is indicator of good ecological state of freshwater oligotrophic habitats, especially mountain springs and creeks. It is indicative that oligotrophic freshwater habitat types on Vranica Mountain are a “hot spot” of biodiversity. However, due to global climate change and variation in hydrological regime and strong anthropogenic influences, these habitat types and the species contained therein are extremely vulnerable. In order to protect these habitat types, in the future it is necessary to establish a long-term monitoring of biodiversity, as well as their condition. The aim of this monitoring is to create a plan for the future restoration and conservation activities of these very unique and sensitive habitat types and to protect high degree of species diversity.



Description of figure: **Fig. 1.** General map of investigated area, **Fig. 2.** Mountain creek, **Fig. 3.** Mountain stream (Jezernica), **Fig. 4.** Part of mountain creek in the near of spring and **Fig. 5.** Crenic macroalgae, *Hydrurus foetidus* (Villars) Trevisan.

CONSERVATION OUTPUTS

After the completion of all phases of our project, five main practical conservation outputs will be derived: **1.** Identification and mapping of oligotrophic freshwater habitats in the wider area of Vranica Mountain; **2.** Developing robust field survey protocols for continuous and long-term monitoring of the biodiversity; **3.** Transfer of knowledge and training of young researchers in the field of restoration and conservation ecology; **4.** Dissemination of knowledge and raising of ecological awareness about the values and importance of oligotrophic freshwater habitats, and **5.** Creating plans for the future restoration and conservation activities of oligotrophic freshwater habitats in Bosnia and Herzegovina.

