

Project Update: June 2018

INTRODUCTION

The area of the Vranica Mountain is characterised by an extremely high degree of diversity. Freshwater oligotrophic habitats, especially mountain springs, mountain creeks, mountain streams and peatlands give special value to this area. Prokoško Lake gives a certain level of recognition to this area. As stated in the project proposal, an extensive field survey was planned. During the field survey, structure and dynamics of the freshwater oligotrophic habitats will be studied. We will also collect samples of phyto-benthos and measure selected water parameters. The main objective of these different activities is to create a database of abiotic and biotic parameters which will serve as a base for the establishment of long-term monitoring of the biodiversity and state. Before realisation of detailed field survey, we have already successfully implemented following activities:

Activity 1. *Preliminary field survey;*

Activity 2. *Literature analysis;*

Activity 3. *Preparation of the general map of investigated area;*

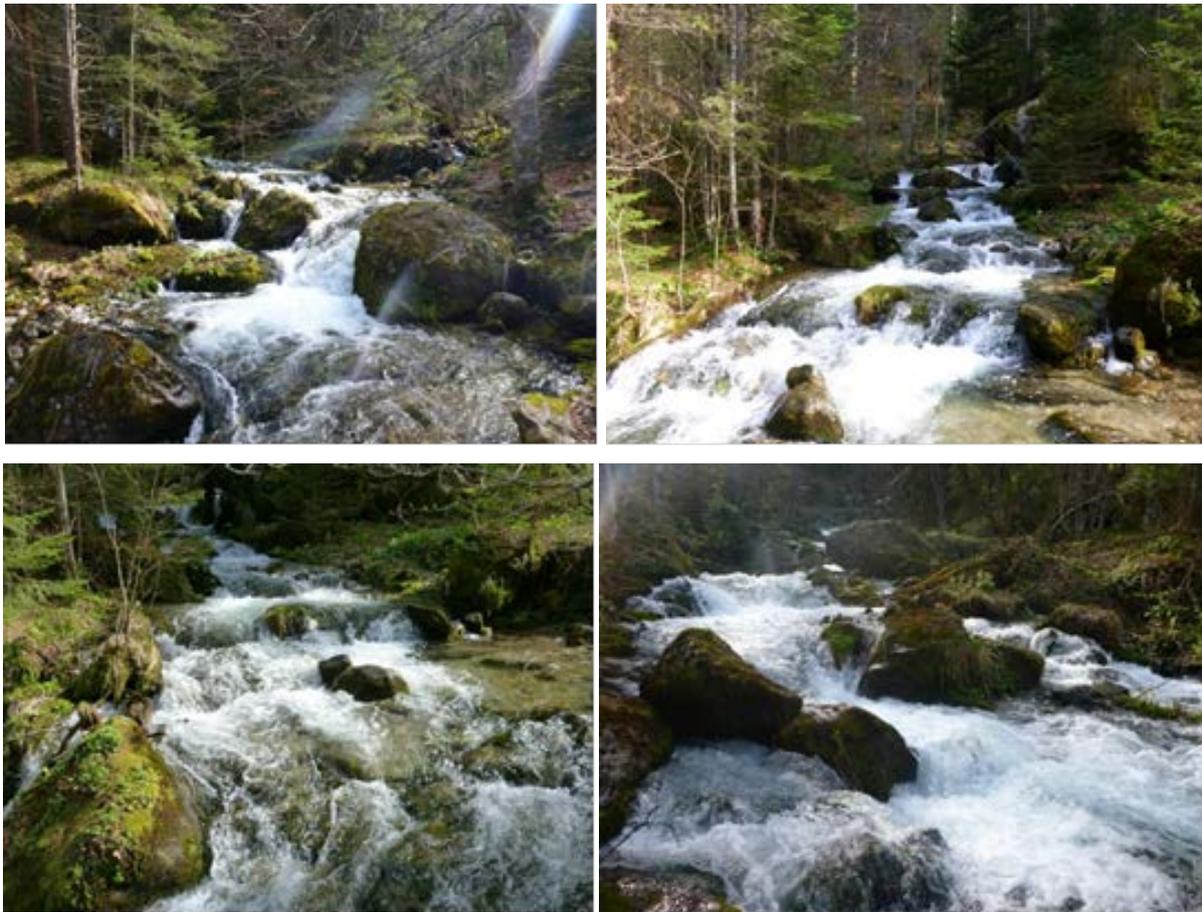
Activity 4. *Preparation of robust field protocol for long-term monitoring;*

Activity 5. *Submitting of abstract to the Rufford Small Grants Conference.*

Activity 1. *Preliminary field survey.*

In order to determine the experimental sites, during April 2018, a preliminary field survey was carried out. It should be noted that this preliminary field survey covered only a small part of Vranica Mountain. Detailed research will be continued in the future as indicated in the dynamic plan. Figures from 1 to 8 represent various aspects of freshwater oligotrophic habitats which are selected for future long-term monitoring.





Activity 2. *Literature analysis.*

In order to understand the structure and dynamics of selected habitat types, a large number of original scientific papers have been collected and analysed. These papers will serve as a basis for the establishment of a large database of reference, which will be expanded and analysed in the next period of realisation of our project. Mendeley reference software has been selected to manage the collected original scientific papers (<http://www.mendeley.com/download-desktop>).

Activity 3. *Preparation of the general map of investigated area.*

General map of the investigated area was prepared using GIS software ArcView 10.1 (Figure 9). In the further stages of our project, this map will serve as a basis for geocoding of freshwater oligotrophic habitat types and for the establishment of distribution of rare and endangered species of diatoms in the investigated area. In addition to the very rich river network which is already visible on the map, numerous mountain springs, creeks and also peatland ecosystems will be identified. Prokoško Lake occupies a central position on the Vranica Mountain, which is clearly visible on the map.

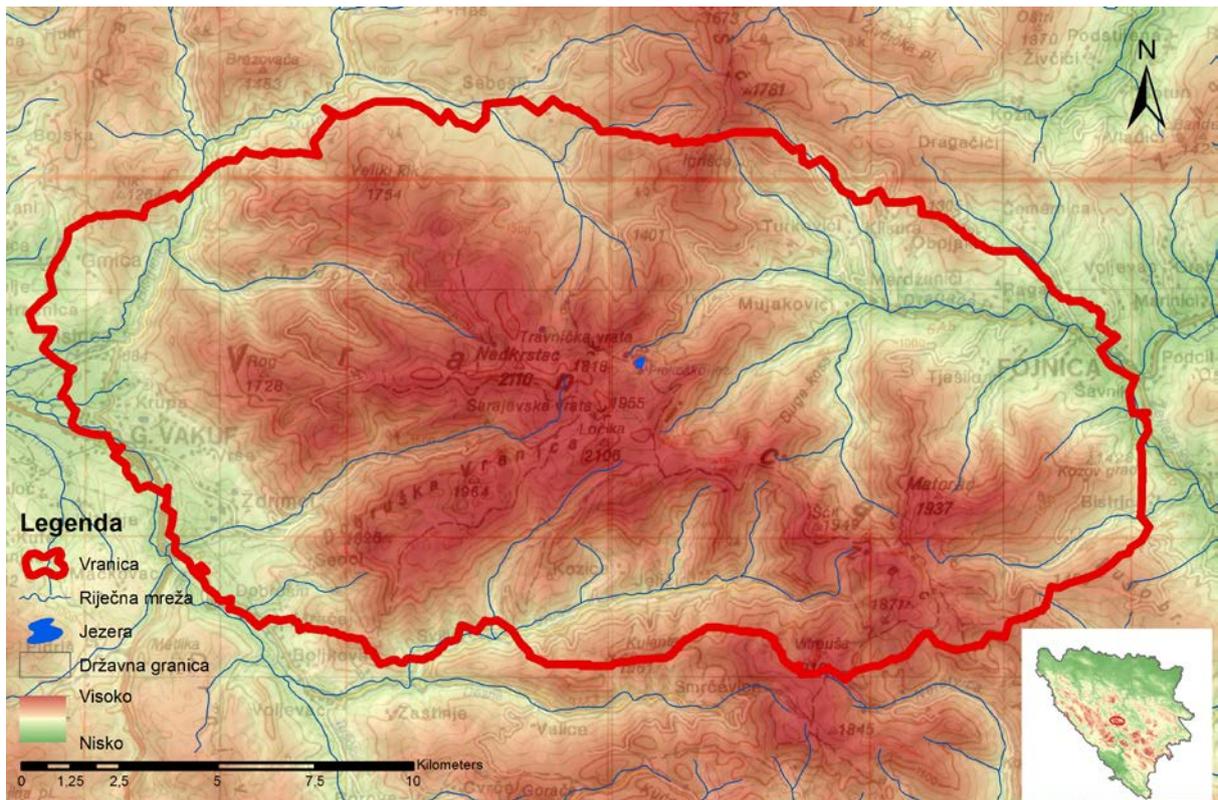


Figure 9. General map of investigated area.

Activity 4. Preparation of robust field protocol for long-term monitoring.

In order to establish a long-term monitoring, a detailed robust field protocol was prepared (Figure 10). This protocol was prepared for five freshwater oligotrophic habitats as follows: mountain springs, mountain creeks, mountain streams, mountain lakes and mountain peatlands. Our robust field survey protocol is divided into six parts as follows:

1. *Sample Header,*
2. *Related Sampling Activities,*
3. *Physical site conditions,*
4. *Water Measurements,*
5. *Sampling information I (QTHP Sample),*
6. *Sampling information II (QMH Sample).*

It should be noted that all our robust field protocol, as well as a sample of phytobenthos and permanent slides, will have unique QR Code, which will facilitate finding in the database (<https://qrcode.tec-it.com/de>).

MOUNTAIN SPRINGS [H]
Data field reviewed/digitizing: / / 2018
Data field entered into FOH_RG_2018: / / 2018

Rufford
Small Grants
www.rufford.org.uk

SAMPLE HEADER
Station ID: _____
Date: _____
Latitude (N): _____
Longitude (E): _____
Altitude: _____
Sample and Photographic note: _____

RELATED SAMPLING ACTIVITIES
Water chemistry Habitat survey Fish survey
Invertebrate survey Environmental DNA Bed sediment

PHYSICAL SITE CONDITIONS
Air temperature _____ °C Air humidity _____ % Light intensity _____ Lux
Clouds _____ % Wind (check) Calm Light Moderate Gusty
Precipitation (check) N/A Rain Sleet Snow
Precipitation intensity (check) N/A Light Moderate Heavy
Shading (check) N/A Shaded Partial Full Sun
Water color (check) Clear Brown Green Yellow

WATER MEASUREMENTS

Beginning water measurement		Ending water measurement	
Time		Time	
Water temperature (°C)	_____	Water temperature (°C)	_____
pH	_____	pH	_____
Dissolved oxygen (mg/l)	_____	Dissolved oxygen (mg/l)	_____
Specific Conductance (µS/cm)	_____	Specific Conductance (µS/cm)	_____
ORP (Oxidation Reduction Potential)	_____	ORP (Oxidation Reduction Potential)	_____
Turbidity (NTUs)	_____	Turbidity (NTUs)	_____

SAMPLING INFORMATION (GTHP Sample)
Primary sample: Repeated sampling replicate
Sample component: Microalgae Macroalgae Macrophytes
PHS¹: Epilithic Epilithic Epiphytic Epipsammic Epipellic
Instream habitat type sample: Main channel Channel margin Water depth _____ m

SAMPLING INFORMATION (GMH Sample)
Primary sample: Repeated sampling replicate
Sample component: Microalgae Macroalgae Macrophytes

Recognizable periphyton habitats (Note and sample)
Epilithic: _____ % Epilithic: _____ %
Epiphytic: _____ % Epipsammic: _____ %
Epipellic: _____ % Other: _____ %

Periphyton abundance (check) N/A Dense Moderate Sparse

Recognizable algal taxa (Note and sample) = [X]
Cyanophyceae Floridophyceae Chrysophyceae Xanthophyceae Chlorophyceae

Recognizable aquatic macrophytes (Note and sample)
N/A Dense Moderate Sparse

Dominant vegetation (Note)

Anthropogenic disturbance: Low Medium High

¹ PHS (Periphyton Habitat Sampled)

Figure 10. Outlook of robust field survey protocol for continuous and long-term monitoring of biodiversity.

Activity 5. Submitting of abstract to the Rufford Small Grants Conference.

Important part of our project is the presentation of obtained results at the International Rufford Small Grants Conference (Explore and protect the natural beauty of Balkans), which will be held from 27th to 28th September 2018, in Silver Lakes, Serbia. In that regard, the abstract was submitted entitled as: "CONSERVATION OF FRESHWATER OLIGOTROPHIC HABITATS ON VRANICA MOUNTAIN AND ESTABLISHMENT OF LONG-TERM MONITORING OF BIODIVERSITY (BOSNIA AND HERZEGOVINA)". (Please find at the end of the report).

FUTURE ACTIVITIES:

Detailed field research is planned during July and August 2018. As we have noted in the project proposal we plan to establish a long-term monitoring of freshwater oligotrophic habitats in the wider area of Vranica Mountain. During detailed field work, we plan to monitor basic physical and chemical parameters in order to establish a database for future monitoring. For this purpose, we plan to spend a large amount to purchase professional portable multimeter for field survey (Multi-parameter portable meter MultiLine® Multi 3620 IDS - Digital measurement with two universal measuring channels with the Multi 3620 IDS - pH, ORP, dissolved oxygen and/or turbidity simultaneously). In addition to monitoring of basic physical and chemical parameters of selected freshwater oligotrophic habitat types, we will also monitor anthropogenic influences and collect samples of phytobenthos. In order to take a precise coordinate of freshwater oligotrophic habitat types, we plan to spend a small amount for buying GPS Device. After completion of the extensive field survey, a detailed laboratory analysis will be performed. Results of detailed field survey and later laboratory analysis will be presented in our Addition and more detailed Second Project Update. In order to promote our work to the broad range of public, we will include our observations in iNaturalist¹ and on Youtube². More details will be presented in the following project updates.

¹ <https://www.inaturalist.org/projects/conservation-of-freshwater-oligotrophic-habitats-on-vranica-mountain?tab=about>

² https://www.youtube.com/channel/UCSZBVEUVQG04oETRFVYgIeA?view_as=subscriber

MOUNTAIN SPRINGS [1]

Data field reviewed/digitazing: / /2018/

Data field entered into FOH_RG_2018: / /2018/

SAMPLE HEADER	
Station ID: 1	
Date:	
Latitude (N):	
Longitude (E):	
Altitude:	
Sample and Photographic note:	
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RELATED SAMPLING ACTIVITIES

Water chemistry	<input type="checkbox"/>	Habitat survey	<input type="checkbox"/>	Fish survey	<input type="checkbox"/>
Invertebrate survey	<input type="checkbox"/>	Environmental DNA	<input type="checkbox"/>	Bed sediment	<input type="checkbox"/>

PHYSICAL SITE CONDITIONS

Air temperature°C Air humidity% Light intensityLux

Clouds% Wind (check) Calm Light Moderate Gusty

Precipitation (check) N/a Rain Sleet Snow

Precipitation intensity (check) N/a Light Moderate Heavy

Shading (check) N/a Shaded Partial Full Sun

Water color (check) Clear Brown Green Yellow

WATER MEASUREMENTS

Beginning water measurement		Ending water measurement	
Time	.....	Time	.....
Water temperature (°C)	.....	Water temperature (°C)	.....
pH	.....	pH	.....
Dissolved oxygen (mg ^l ⁻¹)	.....	Dissolved oxygen (mg ^l ⁻¹)	.....
Specific Conductance (µScm ⁻¹)	.....	Specific Conductance (µScm ⁻¹)	.....
ORP (Oxidation Reduction Potential)	.....	ORP (Oxidation Reduction Potential)	.....
Turbidity (NTUs)	.....	Turbidity ((NTUs)	.....

MOUNTAIN SPRINGS [1]

Data field reviewed/digitazing: / /2018/

Data field entered into FOH_RG_2018: / /2018/



SAMPLING INFORMATION (QTHP Sample)

Primary sample: Repeated sampling replicate

Sample component: Microalgae Macroalgae Macrophytes

PHS¹: Epilithic Epidendric Epiphytic Epipsamic Epipellic

Instream habitat type sample: Main channel Channel margin Water depth m

SAMPLING INFORMATION (QMH Sample)

Primary sample: Repeated sampling replicate

Sample component: Microalgae Macroalgae Macrophytes

Recognizable periphyton habitats (Note and sample)

Epilithic:% Epidendric:%

Epiphytic:% Epipsamic:%

Epipellic:% Other:%

Periphyton abundance (check) N/a Dense Moderate Sparse

Recognizable algal taxa (Note and sample) ✓ | ✕

Cyanophyceae Florideophyceae Chrysophyceae Xanthophyceae Chlorophyceae

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Recognizable aquatic macrophytes (Note and sample)

N/a Dense Moderate Sparse

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Dominant vegetation (Note)

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Anthropogenic disturbance: Low Medium High

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¹ PHS (*Periphyton Habitat Sampled*)

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

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Abstract

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

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

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