The Rufford Foundation
Final Report

Congratulations on the completion of your project that was supported by The Rufford Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. The Final Report must be sent in **word format** and not PDF format or any other format. We understand that projects often do not follow the predicted course but knowledge of your experiences is valuable to us and others who may be undertaking similar work. Please be as honest as you can in answering the questions – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please complete the form in English and be as clear and concise as you can. Please note that the information may be edited for clarity. We will ask for further information if required. If you have any other materials produced by the project, particularly a few relevant photographs, please send these to us separately.

Please submit your final report to jane@rufford.org.

Thank you for your help.

Josh Cole, Grants Director

Grant Recipient Details	
Your name	Jelena Stankovic
Project title	Effects of fish farming on water quality in mountain springs and community structure of aquatic biota
RSG reference	23343-1
Reporting period	November 2017 – November 2018
Amount of grant	£4999
Your email address	stankovic.b.jelena@gmail.com
Date of this report	5th December, 2018

1. Please indicate the level of achievement of the project's original objectives and include any relevant comments on factors affecting this.

Objective	Not achieved	Partially achieved	Fully achieved	Comments
Fieldwork				We successfully conducted fieldtrips in every season. Because of laboratory analysis we had to change dynamics and everything worked well. Field trips were conducted three times during a season and every time we were taking samples both sediment and for water chemistry at two localities from three microhabitats both from springs and effluent water from fish farms. *In situ*, we were measuring physico-chemical parameters of water each time. Also, we included Rapid Habitat Assessment (RHA), mostly because of future monitoring of the habitats we were working on. We have found eight more springs at investigated locations and took their coordinates.
Laboratory analysis				Laboratory analysis changed dynamics of field trips because water samples had to be analysed in the following 24 hours after sampling for representative results. Faculty of Science and Mathematics in Niš allowed us to use needed equipment and laboratory. Last field trip was conducted at the end of the project because the faculty had problem with spectrophotometer, which is used for testing concentration of nitrates and ammonia ions, for this project. We had to wait for spectrophotometer to be repaired so we could do analysis.
Estimate influence of the target point source pollution				Analysing samples, both sediment samples with macroinvetebrates and water samples for physico-chemical parameters, we got interesting results. Fish farms do not have to be

				obligatory pollutants, as we expected. It seems this depend on intensity of fish farming and type of ponds (or pools). Four of our localities (Vrelo 1, Vrelo 2, Pasjač and Grapa) had no significant difference in community change and water quality before and after fish farm, and two of them (Mazgoš and Krupac) had different influence. Based on water chemistry, there was difference in presence of ammonia ion, which was very high in discharged water at three localities. Also, nitrates were higher than expected at the same sites. Concentration of total phosphorus remained below the boundary of detection (< 0.02 mg L–1) at all of the investigated localities.
Create data base of springs				Talking to locals, we collected information about springs in villages we were visiting during our field campaign. We took the coordinates, made excel data base which will be sent to Institute for Nature Protection in Niš.
Interview local inhabitants about springs and point source pollution				We could not conduct regular interview due to villages we were visiting are inhabited with few old people per village so instead of classical interview we were speaking with locals about springs and writing down information they gave us. As for fish farm owners, at the time we were on field trips, we have not met them or they did not want to collaborate. As for the rest of interviews, we made an agreement to conduct anonymous interview in one school in Niš, which should be realised after winter holidays.
Raise human awareness (local inhabitants, fish farm owners and young people)				As it is previous said, fish farm owners did not cooperate, but we noticed younger population (students) is interested in this topic and they want to know more about nature and especially about springs.

Education lectures and field training				We conducted field training of sampling and collecting needed data every time we were on a field trip with new volunteers. As for lectures, we organised course of identification of freshwater macroinvertebrates at Vlasina for master students of Ecology at Faculty of Science and Mathematics from Niš. There were In cooperation with office for the young in Babušnica, near Pirot, we presented this topic to young people, students of elementary school and discuss about ecology and saving nature.
Design and printing t-shirts				Our designer, Miljan Ristić, has created the logo for the purpose of this project. Also, he designed all promotion materials. Illustration for front side of t-shirts was made by Dimitrija Savić-Zdravković. On the back side of t-shirts are printed: logo of The Rufford Foundation, logo of the project and logo of biological society 'dr Sava Petrović', which donated 200 t-shirts for printing for the project. We share these t-shirts with all participants on the project, volunteers, team members and students which attended our lectures.
Promotion material				Promotion material is presented as t-shirts, badges, stickers and notebooks. Badges are with logo of the project and logo of the Rufford Foundation. We made two types of stickers: first one with the logo of the Rufford Foundation and second one with the logo of the project. Also, two types of notebooks (both with the same design- logo of the project and logo of The Rufford Foundation)- small one as promotion material for volunteers and other participants and bigger ones for team members for writing data collected from the field trips, laboratory analysis etc.

Promotion activities				At the beginning of the project, we have first promotion at conference of students of biology and ecology 'Ekobiomorfa 2017' in Novi Sad. After this, we participated in radio show 'Prirodnim tempom' (SuperRadio), where we were talking about conservation of endangered water habitats, as springs are, and about aquaculture in Serbia and their potential influence on aquatic biota. We participated in summer camps: Temska and Crni Vrh, where we presented the project activities, goals and invited all participants to join us.
The Rufford Small Grants Conference				Very successful and inspiring conference. We presented our projects, share and heard good practices and problems during projects activities.

2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

During this project we had few problems. First of them was problem with water samples. It is said that field trips should be lasting 5 to 6 days per season. We thought we are going to do continuous field work, but the problem was about time limit of analysing water samples. After sampling, they should be analysed in 24 hours. In contrast to water samples, sediment samples with macroinvertebrates, well preserved, can be cleaned and analysed after a while. This is the reason why we changed our dynamics of field trips, and divide it into three field trips per season, collecting samples form two localities per day, then analyse them and do the rest of the work in the same manner. It worked well, because we had teams both for laboratory and field work.

Since the bought only chemicals for testing water parameters, we had collaboration with Faculty of Science and Mathematics in Niš and we were using laboratories and laboratory equipment. We had one period of delaying work because of spectrophotometer, which we needed for spectrophotometric analysis of nitrates and ammonia ion.

Regarding to interviews listed as project activity, we also changed approach. Classical interviews were replaced with talking to local people, and writing down information they gave us. Fish farm owners mostly were absent from the farms at the time we were on the field trips.

3. Briefly describe the three most important outcomes of your project.

1. Mapping springs – collecting coordinates of springs in mountain region, to see number of springs, their distribution and potential for further research and conservation of these habitats.
2. Education- sharing knowledge and experience during our work on springs and included fish farms, discussing about ecology and pollution, springs and aquaculture.
3. Estimate influence of fish farms on aquatic biota and influence of discharged water from fish farms on abiotic component – in content of finding balance between ecology and sustainable use of aquaculture. We concluded that intensity of fish farming dictated level of changes in aquatic biota, both in community structure and physico-chemical parameters. More intensive fish farming results in drastically higher concentration of ammonia ion and nitrates and less dissolved oxygen. As for benthic community structure, the presence of organic matter in water, which falls on the bottom and contribute to sediment structure, and the change in physico-chemical parameters coordinate condition of water habitats which organisms can inhabit. According to key organisms of group of macroinvertebrates in freshwater ecosystem, any change in abiotic parameters and organic pollution leads to absence of organisms from ordo Plecoptera, Ephemeroptera, Trichoptera genus Gammarus, Aselus, Tubificidae and Chironomus, respectively. Change in benthic community structure is noticed at sites which are influenced by intensive fish farming.

4. Briefly describe the involvement of local communities and how they have benefitted from the project (if relevant).

During the project our team has made variety promotional material that has been distributed within the local people, students, volunteers and participants on the project during field trips, organised lecture and education courses. Through this project, promotional material was made in local language, focusing on springs, as very important water habitats and aquaculture as anthropogenic influence on freshwater in mountain regions.

Students were interested with the project topics and during this project we had students Faculty of Science and Mathematics, Germany and Tunisia who joined our field trips and laboratory analysis.

Local people supported our research and share a lot of information about villages and sites where are settled our localities. Mostly, they supported us as young people working on conservation of aquatic habitats since in Serbia there are activities of the mass construction of mini hydro power plants on mountain streams and rivers.

5. Are there any plans to continue this work?

Within this project we realised there is a need for raising awareness of people, in general, about springs and protecting the nature. This is why there are several plans for continuing of this research:

- Starting educational tour and focus on collaboration with people (mostly fish farm owners) and NGOs which promote nature protection and ecology. Plan is to share results of our work at workshops, student conferences, but also organising more lectures and workshop to bring this topic closer to the young people who can get involved within this topic and contribute with their work and with new ideas.
- Continue working at the same localities but with more sampling sites for getting bigger and more precise picture about whole system (spring-fish farm-stream).
- To find and add new localities (trout fish farms) and compare them with investigated ones.

Also, physico-chemical parameters of aquatic biota are very important because they have great influence on defining conditions of aquatic habitats. Another plan is to analyse physico-chemical parameters of water more frequently, monthly, to track changes more relevantly and to try to define type and intensity of potential pollution.

Since master students of ecology started working on the same topic, we plan to continue with seasonally work at these localities.

6. How do you plan to share the results of your work with others?

First, two new members of our team, Ivana Veljković and Dragan Vulić started their master thesis based on this research and project, so they are going to continue this work during next year.

Database is going to be shared with Institute for Nature Protection in Niš.

We plan to continue our work on this topic, try to reach fish farm owners and make collaboration with them. Also, we plan expand our area of research, to compare it with our previous work, and to search for sites which can be added to this project.

Also, we are going to publish our work in journal of biological society 'Dr Sava Petrović', entitled as 'De Naturae' which is in progress.

Besides these two master thesis, we plan to write a paper with all data included and to publish it in journal of Faculty of Science and Mathematics, entitled as 'Biologica Nyssana'.

7. Timescale: Over what period was The Rufford Foundation grant used? How does this compare to the anticipated or actual length of the project?

The Rufford Foundation grant has been used for period November 2017 to November 2018. For this kind of research, based on field trips which are highly dependent on weather conditions and on laboratory work, which requires expensive equipment besides needed chemical for testing water samples, it is needed more time for collecting data from each season and for processing sediment samples. Since we have 36 samples per season, this requires a lot of time for cleaning the samples. Also, it is needed more time to identify all individuals to the level of species.

8. Budget: Please provide a breakdown of budgeted versus actual expenditure and the reasons for any differences. All figures should be in £ sterling, indicating the local exchange rate used.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Creation and maintenance of the website	178	178	0	
Designer	60	0	+60	
Accommodation + Food for 5 researchers for 5 field trips	877	1577	-700	
100 Bottles for samples	88	-		Amount added to 'Ammonia Low Range with Vario Tube Test Set'
Ethanol for preservation samples	221	-		Amount added to 'Ammonia Low Range with Vario Tube Test Set'
Nitrate Test Powder (15g); Lovibond	98	-		Amount added to 'Ammonia Low Range with Vario Tube Test Set'
Ammonia Low Range with Vario Tube Test Set;	305	544	+168	
Lovibond Phosphate Low Range No 1/No 2 Tablets	124	-		Amount added to 'Vario Total Nitrogen Low Range Set (0,5-25mg/l), 50'
Vario Total Nitrogen Low Range Set (0,5-25mg/l), 50	435	370	+185	
Vario Phosphate Total Set; Lovibond	348	170	+178	
Photo camera	300	345	-45	

3 neoprene suits	262	185	+77	Because we could not find small sizes of neoprene suits, we bought field boots (tree) for fieldtrips
Suber's net	29	52	-23	
3 GPS devices Garmin eTrex 10	353	0	+353	
Fuel costs for field trips	443	673	-230	
Fuel costs for promotion in Niš, Pirot and Dimitrovgrad	119	153	-34	
Printing 300 questionnaires and protocols	15	11	+4	
Printing 30 hats	79	33	+46	This item is replaced with notes and stickers
Making 100 badges	37	28	+9	
Printing 200 T-shirts	511	561	-50	
Printing 3000 brochures	117	115	+2	

Notes to budget:
** Calculated amount for items on applying date was 1GBP= 139.7 RSD*
**Value of actual amount for items was calculated based on median value during the project, as 1 GBP= 130 RSD*

9. Looking ahead, what do you feel are the important next steps?

There is need to people (fish farm owners, locals and young people) to get involved with this topic for so many reasons, by promotion of the topic and through interactive educational lectures. First of them is to protect our nature and our waters. Built fish farms are near springs. Although farms do not influence springs directly, they change quality of water they have received from springs. Since they are near, they actually affect upper flow of mountain rivers, which should be clean and unaffected and the same quality as springs they are supplied by.

Second important thing is to expand ecological point of view and try to gather aquaculture and ecology so both parts could be satisfied. Fish farms should exist because of human health, but with reduced influence which can be done using organic food for fish instead of industrial ones. This is also good for fish farmers in content of reducing expenses for commercial food, and for health of the fish they are breeding. In the end, there will be less anthropogenic pressure on water and food for people will be healthier.

Third step should be protecting springs in mountain regions because we are living in period of political interests with little or without any concern about water sources and since we still have them, we should pay more attention on them if we want to save them for next generations.

10. Did you use The Rufford Foundation logo in any materials produced in relation to this project? Did The Rufford Foundation receive any publicity during the course of your work?

We used The Rufford Foundation logo for designing promotion material for the purposes of the project. The logo is in brochure, notebooks, badges, stickers and in presentations made for promotion (lectures, promotion and conference).

During our lectures, before we started with the project topics, we presented The Rufford Foundation as foundation which enabled us this research to be conducted and all activities regarding the project. We have noticed older students were interested in The Rufford Foundation.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Jelena Stanković – Project leader. Have been participating in every field trip, taking samples and physico-chemical parameters *in situ*, as well as coordinates of springs and conducting RHA protocol. She has been processing all the data collected during the project. Also, she was the lecturer in Novi Sad, at camp Crni Vrh and participant in the radio show 'Prirodnim tempom' on SupeRadio in Niš.

Dimitrija Savić- Zdravković - PhD student at Faculty of Science and Mathematics – in charged for collaboration with Institute of Nature Protection in Niš and organising promotion activities. She was lecturer in Babušnica and at camp Temska.

Olivera Stamenković - PhD student at Faculty of Science and Mathematics in charge for laboratory analysis

Aca Đurđević- PhD student at Faculty of Science and Mathematics- in charge for identification of macroinvetrebrates

Miljan Ristić- master graphic designer- in charge for all design of promotion material and printing

Ivana Veljković – master student of Ecology at Faculty of Science and Mathematics – team member for field trips

Dragan Vulić – master student of Ecology at Faculty of Science and Mathematics – team member for laboratory analysis

We want to thanks students from exchange student programme, which were included in all parts of the project during their stay in Serbia. They have been volunteering on the project: **Lea Heberle** (Germany) has been on a field trips with us, helping us collecting samples and working in laboratory water chemistry. **Khouloud Sebteoui** has also been on few field trips, and working in laboratory on sediment samples.

We want to express gratitude to **Nevena Stojanović** and **Dejan Ristić**, students of Faculty of Arts, Department of Applied Arts, Niš, who helped with preparation of promotion material and printing.

Special thanks we owe to **Dr. Đurađ Milošević**, assistant professor at Department of Biology and Ecology University of Niš, as the expert in macrozoobenthos and ecology, who helped us organising field trips and enable us to do water chemistry in laboratory at Faculty.

12. Any other comments?

This has been great experience and I am very grateful to The Rufford Foundation for opportunity to conduct and realise my first project. The Rufford Foundation enabled me to organise field trips, conduct research based on topic I am very interested in and which I consider very important. This grant allowed me to conduct full research, to establish cooperation and work with different people. Also, this project inspire me and my team to investigate more and to continue working on springs, as unique aquatic habitats which need protection, hopefully with the Rufford Foundation financial support.