

Final Evaluation Report

Your Details	
Full Name	Milenka Božanić
Project Title	Towards in situ and ex situ conservation of the European mudminnow (<i>Umbra krameri</i>) in Serbia
Application ID	33514-1
Date of this Report	11 April 2022

1. 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
Assessing the most recent distribution of the species in Serbia; checking its known populations; investigating suitable areas for its eventual presence/findings.				We have partially fulfilled this objective. Already known habitats of this species in Serbia have been additionally investigated and it has been confirmed that stable populations have been recorded. Several months of research of potential new sites did not give results because we did not find any new populations.
Collecting comprehensive data regarding biology and ecology of found populations, in case of new findings, collecting material for genetic analyses.				As we did not find new subpopulations in Serbia, this objective was not fulfilled. For this reason, we were unable to collect genetic material for analysis.
Preparing suitable reservoirs as surrogate habitats for laboratory-reared offspring; captive breeding of selected populations in the laboratory.				We have achieved this objective. We have been successfully cultivating and spawned individuals taken from the nature first in the laboratory, and then formed receiving earth basins to continue cultivating hatched individuals until they return to natural habitats at the same place where the individuals were taken.
Translocating laboratory-reared fish in selected suitable habitats in the nature.				We have successfully hatched and returned the cultivated individuals to their natural habitats; thus, we have achieved this objective.
Education of the population.				We believe that we have successfully achieved this objective. Several times during the project, we had workshops where a large number of students, locals, members of the biological scientific communities of Serbia had the opportunity to learn why it is

				important to preserve the habitats of this vulnerable species. In this way, through this project, people's awareness of the importance of additional protection of fragile ecosystems (canals and ponds) inhabited by this species was raised, and the need to reduce harmful anthropogenic impact was pointed out, drainage, regulation of watercourses, landfills.
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2. Describe the three most important outcomes of your project.

a). Assessment of the distribution of the species in Serbia (as bio-ecological outcome)- Already known populations of this species were checked in the field and the presence of *U. krameri* was confirmed. Field research mostly referred to possible potentially suitable habitats where the species could be found. Habitat research has also been carried out which, according to their physical, chemical and biological characteristics, can be places where reintroduction of the species would take place after ex situ cultivation. Even if there were literature data from the 1970s and 1980s on individual findings outside the area of Vojvodina (northern Serbia), this research did not confirm, nor did they find new habitats.

b). Breeding outcome- *Umbra krameri* has been successfully spawned and cultivated in laboratory conditions. The parent flock (males and females), as well as the hatched young individuals were returned to their natural habitats. During laboratory cultivation, we collected certain data on their behaviour and diet during the spawning period and several months after hatching larvae, which provided the basis for later cultivation in the laboratory in order to preserve this vulnerable species from extinction.

c). Educational outcome- Project activities were presented (through lectures, presentations, TV shows on national television) to the general public, local population, students of Biology and Ecology at the Faculty of Biology in Belgrade and Novi Sad, Faculty of Agriculture and Forestry, primary and secondary school pupils and members of the biological scientific communities of Serbia. We believe that we have raised people's awareness and given a clear message about how necessary it is to protect the natural habitat and protect the vulnerable species *Umbra krameri* in Serbia.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

Considering some difficulties which occurred during the project, those were mainly caused by natural factors. Namely, during the breeding and spawning of *Umbra krameri* in 2021. a certain number of hatched individuals died, which affected the outcome and success of spawning. Also, during spawning at the beginning of 2022. one female and one male died due to an infection caused by the fungus

Saprolegnia in laboratory conditions. The infection was successfully resolved by using appropriate preparations for that purpose.

4. Describe the involvement of local communities and how they have benefited from the project.

We came out of the project with a very positive experience, given the desire of local community members to get actively involved and help our work, as well as to contribute as much as they can. A lot of people from the local community followed and were interested in our research and pointed out the possibility that *Umbra krameri* may be found in some new sites that were outside of the ones we have already researched.

5. Are there any plans to continue this work?

Upon completion of the project, we plan to continue research in terms of continuing the cultivation of this species in the laboratory and after obtaining stable populations to reintroduce to new suitable habitats identified during this project. We also plan to further educate the population about the importance of preserving the habitat where *Umbra krameri* is located and preventing intensive human activities that may endanger it.

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

The fact that we have already been contacted about our project by students and other colleagues who were interested in our research and who had a desire to get involved in the project, partially provides an answer to this question. However, in addition to that, we plan to publish our results in scientific journals, and in the next period, a master's thesis will be defended at the Faculty of Agriculture, which will be based on data obtained during this project. A good way to share our knowledge is to present our results at upcoming national and international scientific conferences.

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

Important next steps are to publish the data collected so far in a scientific journal, as well as to present them through national and international conferences. Then the next step could be a detailed assessment of potential threats and problems in the conservation of this species, proposing additional measures and improving existing measures to protect the habitats of small and isolated populations of this species. We also plan to contribute to the action plan for the recovery of this species in Serbia. Based on the management plans of the areas where the species are present, we propose continuous monitoring population trends and the degree of conservation of *Umbra krameri* habitat.

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

We took every opportunity to present The Rufford Foundation and its support for nature conservation. We used the Rufford Foundation logo in every appropriate situation (oral and poster presentations, promotional material, etc.). The Rufford Foundation will also be mentioned in future scientific publications based on data collected during this project.

9. Provide a full list of all the members of your team and their role in the project.

Dr Milenka Božanić: research associate: project promotion, hunting specimens for spawning in the laboratory, preparation of the aquarium, taking care of the individuals we raised, returning the specimens to their natural habitat, providing natural and artificial food for *Umbra krameri*.

Prof. Dr Ivana Živić: organization and promotion of the project, budget management, organization of field research, returning individuals to their natural habitat.

Prof. Dr Zoran Marković: he helped us with useful advice regarding various project activities and shared his experiences in the realization of spawning in the laboratory. He also helped us solve problems related to the nutrition of fish in laboratory conditions.

Dr Saša Marić: associate professor: hunting individuals for spawning in the laboratory, field research, returning individuals to their natural habitat, useful advice during the realization of spawning, taking care and feeding individuals in the laboratory.

Dr Marko Stanković: assistant professor: field research, laboratory assistance, formation of aquariums for cultivation.

Dalibor Vukojević: doctoral student: taking care of individuals in the laboratory, nutrition.

Stefan Marjanović: doctoral student: nutrition of the young individuals.

Andjelina Tatović: doctoral student: field research.

Dorđe Gajić: student: field research.

Tamara Ćurović: student: field research.

We would also like to thank the entire team of the Special Nature Reserve "Kraljevac" for their help in hunting individuals, as well as our colleague Dr Vanja Markovic for their help during field research.

10. Any other comments?

Finally, we would like to express our deep gratitude for the opportunity and support provided by The Rufford Foundation, as well as for everything they have done around the world to support and help young scientists to become more involved in nature conservation and protection. In every way, this project was a very important experience for us.