

Final Evaluation Report

Your Details						
Full Name	Margareta Lakušić					
Project Title	Establishing a long-term monitoring study of the endemic and highly endangered meadow viper (Vipera ursinii macrops) in Serbia					
Application ID	31558-1					
Date of this Report	13.07.2022					



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
Exploring the presence/absence and preferred microhabitats of meadow viper in Serbia				During our field effort, we thoroughly searched 17 grid cells, 1x1 km, with suitable habitats for meadow viper. As a result, the literature record was confirmed, and two new grid cells were added to the distribution of this species in Serbia. Furthermore, we collected morphological data, cloacal temperature, reproductive and feeding status, the behaviour of the animals at capture and the habitat parameters. In addition, GPS coordinates, exposition, time of the day, ground temperature and microhabitat type were collected. We marked individuals for capture- mark-recapture studies that are necessary for estimating population size and future monitoring, but due to the low number of captured individuals, we did not succeed in obtaining this information. In localities where we confirmed the meadow viper presence, we also confirmed that habitat quality is good, with places for basking, hiding and hibernation, along with a high abundance of prey. We also searched for all three viper species present in Serbia and documented all species of reptiles and amphibians in the studied area.
Identification of main threats and pressures for meadow viper's populations and their habitats				During the project activities, we have observed and evaluated the main threats and pressures on meadow viper populations and their habitats. Local conservation threats (following IUCN standard threats) include the potential development of tourism and recreation areas, which leads to increased visits and wandering around



		the meadow viper habitat that can
		population. Investment in renewable
		energy, more precisely the
		development of windmill farms, can
		destroy the habitat of this species.
		Logging and wood harvesting, with
		associated developments of road
		networks, is another anthropogenic
		activity with a potentially negative
		project we noticed an increase in an
		area subjected to logging. On the
		other hand, intentional and
		unintentional killing (road mortality) is
		almost absent.
		Additional threat factor is habitat
		shifting and alteration caused by
		abandoning traditional pastoral
		tarming. Finally, climate change, i.e.,
		increase in remperature, highly directs
		have low dispersal ability high level of
		habitat specialisation and are
		constrained to shift distribution to higher
		altitudes.
Increasing knowledge		We involved students from the
about the importance of		University of Belgrade and the University
snakes and mell habitals		of this in our field defivities and
		capture and manipulate venomous
		snakes, along with discussing the basic
		principles of monitoring snake
		populations and their habitats.
		During our field trips, we connected
		with the local populace and people
		trom the mountaineering society
		about the project and the importance
		of snakes and discussed the threats
		that meadow viper's habitat could
		face. The already present awareness in
		mountaineers offers an excellent base
		for the conservation of this species and
		its habitat. Unfortunately, due to the
		its habitat. Unfortunately, due to the COVID outbreak, our intention to interact in person with school children
		its habitat. Unfortunately, due to the COVID outbreak, our intention to interact in person with school children and the younger populace was



		media profiles (especially the Instagram profile) had high attendance, and we spread our message through this medium. These profiles will be used to increase the knowledge of snakes and their protection.
Improvement of species and habitat conservation measures		The result of our field activities is an increased number of localities where meadow viper occurs, information on the habitat status, and threat factors. This information is crucial for management planning that should focus on conserving endangered habitats and consequently protecting the species inhabiting them. We plan to send a report to the Ministry of Environmental Protection of the Republic of Serbia, in which we will point out threat factors and propose conservation measures. Even though we collected body mass and length to calculate the body condition index used to indicate the individual's health status, we could not access this information because of the low number of captured individuals. Therefore, we did not find suitable localities to establish long-term monitoring in Serbia but protecting the area where meadow viper is found will lead to the conservation of the species.

2. Describe the three most important outcomes of your project.

a). Distribution and habitat status

We surveyed 17 grid cells 1x1 km on Mokra Gora Mt. to determine the distribution of meadow viper (Vipera ursinii macrops) in Serbia. As a result, we confirmed this species in two new grid cells (suitable habitat spanning over five grid cells) and confirmed its presence in the grid cell from the literature (suitable habitat spanning over four grid cells). Furthermore, we identified habitat quality and threat factors and concluded that the best way to protect this species is to make a management plan to protect its habitat.

b). Education and awareness

Through interaction with the local populace and mountaineers, we contributed to the increased awareness of several nature conservation-related topics such as the importance of snakes in any ecosystem, illegal destruction of habitats, and ways to behave in case of encountering the snake in the wild.



We are grateful that we could offer five students the opportunity to participate in project activities. These students were taught how to plan fieldwork, catch and handle venomous snakes, record data in protocols and which biological material should be collected. As an outcome of this activity, they have basic knowledge of how to engage in different aspects of snake research and eventually start conservational projects of their own.

c). Modelling probability of finding Vipera ursinii macrops in Serbia

Identifying species' potential distribution is beneficial for conservation and management planning for rare and threatened species that are hardly found in the wild or for elusive species with scarcely known distribution. We used the Maxent machine learning method based on the presence-only data using climate and land-cover variables to estimate the potential geographic distribution of the meadow viper. Ecological models identified 28 1x1 km grid cells on Mokra Gora Mt. with suitable conditions for the occurrence of meadow viper. The most important environmental factors related to its distribution were the maximum temperate of the warmest month, precipitation of the driest and warmest quarters, annual potential evapotranspiration, and land-cover (moors and heathlands, natural grasslands). Also, this model revealed additional localities in Serbia where this species could be found, setting the base for future fieldwork.



Figure 1. Vipera ursinii macrops distribution map





Figure 2. Vipera ursinii macrops ecological niche suitability model for the Balkan Peninsula

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

Most of the difficulties were related to the weather. High mountain species highly depend on the duration of snow cover and vegetation emersion, and in the case of reptiles, this dedicates the timing to get out of hibernation. During some field trips, we had to shorten the stay due to the sudden drop in the temperature and decreased activity. One field trip we organised only at the lower altitudes, where the weather forecast was favourable. However, the activity of other reptile species was low, along with the low activity of Orthoptera, the main prey of meadow vipers, and we did not succeed in reporting meadow vipers' activity. Therefore, we rearranged the fieldwork dates in the locality where the forecast was most encouraging.

Other difficulties emerged from the restrictions caused by the COVID-19 outbreak. Even though our project started after the strictest bans were lifted, social gatherings were still at a minimal level, which affected our plan to organise educational activities in schools. To overcome this, we used social media, especially Instagram, with around 250 followers, to spread information about the project and general knowledge about the importance of snakes and their habitats.



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

During our field trips, we spoke with local inhabitants and mountaineers. The positive attitude toward protecting this region expressed by the member of the mountaineering society Beleg, as well as their already present awareness of the importance of nature protection, was just increased by sharing insights about our project. Their mountaineering house is in the European adder's habitat (*Vipera berus*), while there is the possibility of finding meadow viper nearby. We taught them how to behave in case of a close encounter with a snake and instructed them on how to decrease the chances of snakes choosing their house for the winter hibernaculum. During the talk with local people, we encountered both types: the ones with a fully negative attitude toward snakes and others who respect them. We explained to the first group of people the role reptiles have in the ecosystems and why they should not be considered a threat and systematically killed. We hope that the attitude is changed in at least some people.

5. Are there any plans to continue this work?

We will stay in contact with local people and mountaineers to keep in touch with what is happening in the localities where we found meadow viper. We are also interested in checking other localities in Serbia where meadow viper could be found and promoting their protection management. Along with localities in Serbia, our model showed many non-searched localities in neighbouring counties, such as North Macedonia, Montenegro and Bosnia. This is a prosperous starting point to continue the study of this endangered species and make a comprehensive conservation plan.

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

The results will be presented at the 21st European Congress of Herpetology in Belgrade (September 2022). Furthermore, we will keep using social media platforms and working with students to continue spreading the information about the project and its outcome. Students are also helping by sharing the content of our social media platforms.

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

The priority for Mokra Gora is to make a management plan and put the locality under the country's protection. A report on current threats and proposed conservation measures will be sent to the Ministry of Environmental Protection of the Republic of Serbia.

Additionally, in the light of meadow viper distribution, further field efforts should be orientated toward exploring suitable grid cells shown in the model, as well as continuing education of the general population on the importance of protecting reptiles and their habitats.



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?

Yes, the Rufford Foundation logo was used in presentations as well as in promotional materials such as T-shirts, sweatshirts, posters and notebooks.

Results of this project will be presented at the 21st SEH European Congress of Herpetology in Belgrade (September 2022), and the Foundation will be acknowledged. Furthermore, in the podcast 'Snakes of the Balkan Peninsula', available online, we expressed gratitude to the Foundation for supporting the implementation of this project. Also, in every future publication, poster or lecture in which the results will be used, The Rufford Foundation will be mentioned, thanked and promoted.

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

Vukašin Bjelica – was involved in organizing field trips, data collection, preparation of promotional material and lectures and a co-author of the article on meadow viper in Serbia for the Agricultural calendar published in 2022

Dr Marko Andjelković – was involved in many field activities, exploring and assessing the localities for the field trips, gathering the field data, making and sustaining connections with local communities

Dr Ljiljana Tomović - provided theoretical and practical knowledge, helped in decision-making process and gathering field data

Students from the Faculty of Biology, University of Belgrade and University of Niš, Serbia, helped us in the field with data collecting:

Uroš Ilić – BSc student Ana Petrović – BSc student David Mardžokić – BSc student Aleksandra Petrović – BSc student Stefan Avramović – MSc student



10. Any other comments?

We want to thank The Rufford Foundation for its financial support for this project. We are grateful for the opportunity to collect valuable data on this endangered species, as well as the chance to share our knowledge with locals and students. The collected data is essential for protecting the meadow viper and alpine meadows. During this project, we further improved our skills and trained a new generation of students who can continue conservation efforts in our country.

We are thankful to Maša Marković for designing our project logo and Mila Milošević for digitising it.

As the team leader, I want to thank team members and students for the interest, motivation and time invested in this project.

Special gratitude goes to Ervin Hadžić and mountaineers from the mountaineering society 'Beleg' for the logistical and personal support during the field trips.



A project team with colleagues from the Faculty of Biology, University of Belgrade and University of Banja Luka