Final Evaluation Report

Your Details	
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Project Title	Monitoring program establishment on endangered species affected by wildfires in Serbian protected natural areas
Application ID	36651-2
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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
Lycaena helle – Marking study				This project item had great success. We used the period from the second half of May to the end of June to conduct a marking study of the species *Lycaena helle* using the combined method of MRR and transect count to successfully determine the seasonal population size of the species. Bearing in mind the unpredictable weather conditions in the localities where the study was conducted (1400-1500 m.a.s.l), statistical processing of the data resulted in surprisingly good data that will be presented in detail in the published scientific paper. During this study, **175 adults** of the species *L. helle* were marked at locality named „Population under the locality - Ponor "i.e., Duboki Do stream, with an **additional 56 recaptures** (R) of individuals. **The estimate of the seasonal size of population is close to 1000 adults** during one season. As far as locality "Ponor" is concerned, the number of marked individuals was significantly lower i.e., only **30 individuals with 4 recaptures** (R). This is due to the fact that this population is much smaller and because of the slightly higher altitude where this population is located and the exposure of the terrain where the weather conditions were drastically worse. Nevertheless, all these data remain available to the scientific public for usage in the Biologer database and their value will be visible in future period and it's not negligible at all. In addition, we were able to determine one of the main questions, which is why the study was initiated, namely: "Are there mixing of individuals between these separate populations?". During the one-month period that the study lasted, we did not confirm the presence of a single individual from the neighboring population, which is very important information to know for the

				realization of the study. Also, we used this time to investigate a potential new inhabitant/find new localities of the species *Lycaena helle*. The results of this are also favorable for the species, bearing in mind that the team members noticed the dispersion of the species from the locality "Ponor" to the locality "Kopren", and at the same time, quality photos of other present species were additionally collected for the project item - Quiz improving.
Transect counts and access the fire on *Euphydryas maturna* species				For the realization of this item, during the flight period of the species: *Lycaena helle*, *Boloria eunomia* and *Erebia orientalis*, all known data of presence of the species were processed based on the Biologer database (the largest open-source database on biodiversity in the Balkan Peninsula) and the presence was recorded along the pre-planned routes of these species. During the project we conducted **25 line transects for the species *L. helle* and 12 line transects each for the species *B. eunomia* and *E. orientalis***, most of them overlapping for all 3 species. In the end, we came to the conclusion that the species ***B. eunomia* and *E. orientalis*** are still present with decent numbers of individuals (**over 100 noted individuals**). For the species ***L. helle* we have noted 304 findings** in total, but the species **is still missing in fire-damaged localities i.e Vražja glava and Tri čuke**. What makes us feel satisfied is the fact that during the research we noted **over 20 new findings** for the species L. helle in the stretch Ponor - Kopren, along the border with Bulgaria. Also, during the implementation of this item of the project, all known findings for the species *Euphydryas maturna* on the territory of NP "Đerdap" in Eastern Serbia were investigated. During 2021, a large number of wildfires occurred in that territory, which potentially affected the species. Out of 9 localities, where the species was previously recorded within the NP Đerdap, **we singled out 6 localities** that potentially coincide with the locations of several wildfires that occurred in 2021. So, we designated those localities as a priority for research. Although we didn't record any new findings of the species, which is not so strange bearing in mind the extremely small abundance of the species and

				the short period of time for research, we established that **none of the localities were affected by wildfires**, nor were there any wildfires near the localities, which was the main goal of this project item. Of course, it would be desirable in the future to monitor the state of the populations of this species on the territory of NP Đerdap, but in this case we achieved the expected results and gave priority to other key species of the project that actually suffered the damage. In the end, the most important information we came to during the field research of the *Lycaena helle* species is that the localities "Vražja glava" and "Tri čuke", which were studied in detail during the realization of the first Small Grant project "30495-1", are slowly recovering from the fires in 2019. **The species of *Lycaena helle* is still missing from these localities**, although the appearance of weaker vegetation is visible. In this regard, it is extremely important to continue the monitoring program in those localities and to include additional research of the vegetation, the wetlands where the species normally resides, trace the succession of sites etc., which we plan to do in the future period.
Workshops				The workshops were attended by more than 50 volunteers who worked on collecting data and photos about the species of Stara Planina Mt. Also, visiting experts and administrators of the Biologer database from the region participated in fieldwork, with whom we were looking for the rarities of this center of biodiversity in Serbia. Together, we collected a large amount of data on birds, butterflies and reptiles, and all data collected during the implementation of the project are available in the Biologer database. This was also an excellent opportunity to exchange experiences and professional practices with fellow experts from the field, and the continuation will follow next year in Croatia, where we will continue with this type of training through collective work with colleagues directly in the field.

Quiz improvement				The improvement of the quiz on this occasion represented the enrichment of the photo database used by the quiz and we are currently finishing the improvement of the user interface and the creation of additional options, such as to create a ranking of the best performance results, connecting the quiz results with the user account on the Biologer website that will make quiz easier to use for everyone. In this regard, approximately 200 quality photographs were added to the database afterwards, showing all the necessary characters for determining the species from the picture, as well as good amount photographs added directly on the field through Biologer Android app. Also, during the winter period, we have dedicated additional refinement of the quiz, continued sharing through social networks and the official website of the Biologer database, as well as coming up with new ideas that will help in the future to increase the availability of the quiz to a larger number of new users.
Publishing results				As a result of the research during the implementation of this Rufford project, the scientific paper will be created (work in progress) and published in the International scientific journal – Journal of Insect Conservation (2.2 five-year impact factor). After that we will work on promoting the work through social networks, the website of the Biological Society "Dr. Sava Petrović", the Biologer database, ResearchGate and at one of the upcoming Symposia of Serbian entomologists.

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

a) Lycaena helle – MRR and transect counts.

During this study, conducted in May and June 2022, using the marking method combined with the transect count method, we managed to determine the seasonal size of the population at the locality "Ponor" on Stara planina Mt. and to determine whether there is mixing of individuals between small, isolated populations. Of course, we informed the managers of the protected area of the Nature Park "Stara Planina" about details of marking study and the results we got. Furthermore, we agreed on a further monitoring program to prevent situation with wildfires, such as in 2019, and to respond in a timely manner, when necessary.

b) Science promotion and education

By including more than 50 volunteers in workshops, as well as in other activities during the project, they had the opportunity to get acquainted with the methodology of work in the field. Through the collection of georeferenced data on species in the field and the creation of quality photos of species with visible characters necessary for determination, they contributed to the realization of this project, and thus learned something new that they could implement in their own work in future. The inclusion of experts and administrators of the Biologer database from the region (most of them from Croatia) in group work with volunteers, contributed to the simplified transfer of field practices and knowledge about species to each volunteer. Also, the administrators themselves had the opportunity to exchange good practices and different methodologies that are more suitable for the implementation of certain studies, monitoring programs, etc., while working in the field with their expert colleagues. During the workshops approximately 2000 georeferenced biodiversity data points were collected, and for the entire project nearly 4000. Also, many quality photos were collected and implemented in the photo database used by the quiz for butterfly recognition (which we created during the implementation of the 1st Small Grant project). By improving the quiz, improving the user interface and enriching the photo database used by the quiz we plan to interest an even greater number of nature lovers, whether they are biologists or not. By promoting quizzes through social networks and the website of our organization and the Biologer organization, we intend to additionally interest experts, which contributes to the development of further cooperation of our community. And finally, by publishing a scientific paper, we directly point out to the very top scientists from our country and region about the importance of preserving rare and relict species that at any moment can disappear forever from our areas, mostly due to human negligence. At same time, we point out to the managers of the protected areas about the importance, methods of protection and measures necessary to comply with, so that situations like one in 2019 do not repeat.

c) Key species research

As target species for this project, we should mention three species that we investigated in detail during the realization of the first Rufford project i.e., *Lycaena helle*, *Boloria eunomia* and *Erebia orientalis*. By determining their abundance in all previously known localities through the predetermined routes, we continued monitoring program starting in 2020 and obtain a set of data for comparison with previous and upcoming years. This is important since the first species lost two, out of only a few populations, with which it is present on the Balkan Peninsula (only in Serbia and Bulgaria), during the wildfires in 2019 on Stara Planina Mt. Also, in recent years, the other two species have shown a reduced abundance in the locality "Babin zub", where they were previously the most numerous, and due to the construction of a hotel in 2010, they now appear in slightly higher numbers on the stretch Babin zub - Midžor. That is why such continuous monitoring studies are extremely important, because from year to year we can monitor the relative number of populations and, by comparing them with the actual situation on the field (potential construction of new buildings, fires, etc.), react in a timely manner in cooperation with the protected area managers.

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

The only unforeseen difficulty that could be mentioned might be the unstable weather conditions during the implementation of the *Lycaena helle* marking study. But we successfully overcame that obstacle, since we spent more days on field during the entire period when the population peak occurs, i.e the largest number of the population (which is extremely important for the validity of the methodology). With that, we managed to "capture" more than enough stable, sunny weather, because the species is then the most active, which is again important for the precise determination of certain parameters that were collected during the realization of the study.

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

Through continuous cooperation with the managers of protected areas where the largest number of rare and endangered species are found in our country, we can together work on the preservation of such species. Such areas receive a certain protection at the national level precisely based on monitoring studies that, through many years of research, indicate potential problems that the species face. In that regard, the exchange of information and research results with managers is of essential importance for them to create management plans and to work on developing awareness for further work on the promotion of each individual rarity of the area.

Volunteers involved in the implementation of research studies and workshops gain knowledge about species in general, especially rarities and species protected by domestic legislation. Through collective field work with experts, they acquire knowledge and practices for further independent work or group work by further involvement in the common goal - species conservation.

Cross-border cooperation with expert colleagues from the region is important for the exchange of good practices and adequate working methodologies in certain conditions, from which everyone benefits. With that, the community is strengthened, and the efficiency of the work is improved, which may be even more than necessary for preservation in cases of affection of some negative factors.

The quiz for butterfly recognition, which we created during the implementation of the 1st Rufford Small Grant project is the first and only quiz of its type in our country and is very important for the promotion of science. Its improvement and further promotion lead to an even larger group of nature lovers and young students of biology and ecology who can, in a very fun and instructive way, learn more about the living world that surrounds them.

On the other hand, the creation of a scientific paper with the SCI index on a relict and extremely endangered species, not only in our country but on the entire Balkan Peninsula, the experts are guided through a data set that has been processed satisfactorily and is field supported, into a more accurate state of the populations of one such species. The scientific basis, that is, the work according to the defined

methodology of this example, can also serve other colleagues for the application of similar or the same methodology in some other area and some other endangered species.

5. Are there any plans to continue this work?

Yes, for sure. Since we have confirmed that there is no mixing of individuals between isolated populations of *Lycaena helle*, and that the populations that were lost in the fires in 2019 have not been restored, we plan to devote the next period to even more detailed work on its preservation. The plan is to continue monitoring of this kind, to include even more aspects of methodological work in the study, trace the succession of sites to realize the reason the species still not occur in localities. We plan to continue cooperation with the managers of all protected areas, with whom we have already had successful cooperation. Bearing in mind the fact that in the last few years there has been an increasing number of uncontrolled wildfires, a good part of them in protected natural areas, we plan to continue with such initial research, which can tell us a lot about the state of populations after the occurrence of negative impacts. We plan to continue with the development of the quiz, since in this way we reached a good part of the volunteers who participated in the realization of this project, and we will most likely include them in some other activities, such as writing scientifically popular articles that will be published in one of the local magazines, as well as on our society website, all in order to further promote what we do. Of course, there are still a lot of things that we would like to implement in the upcoming period, and we will use that time to define and implement some of the most important ideas.

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

As always, we will publish the results of the research and all the news related to the project through social networks and websites of ourselves and organizations with which we actively cooperate, as well as through our own social networks. Also, the most important results will be published in the form of a scientific paper that will be available and visible to the general public through the above-mentioned types of media and through the ResearchGate, site better known to the scientific public. Also, our society participates in Symposia and annual gatherings of managers of protected areas in Serbia, so we will use that opportunity to promote even more our achievements.

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

Since we established that the population of *Lycaena helle* in the localities of Vražja glava and Tri čuke has not recovered from wildfires in 2019, it is necessary to continue the monitoring program started shortly after the wildfires have occurred. Most importantly, it is necessary to include more methodological aspects in the initial study of *Lycaena helle* in order to realize the reason why the species still does not occur in the localities (once with the most stable numbers) from which it was wiped out by fires in 2019 and to what extent there is a difference in biodiversity in localities damaged by wildfires and non-damaged, based on a more detailed study that we are planning for future period.

Also, it is important to continue research of key species to monitor the state of the populations of those species due to the pronounced fluctuation in abundance in certain localities (mainly caused by negative human impacts). It is necessary to continue, additionally strengthen and expand cooperation with the managers of protected areas, which we actively work on every year. Only in this way, by including adequate institutions, necessary for making actual steps, and with our professional help, we together achieve concrete results necessary for species conservation.

The inclusion of young nature lovers, biologists or not, in collective work at workshops is significant for several reasons. The volunteers themselves gain knowledge about the topics included in the workshops, work is being done to collect many valid data that can serve other colleagues when preparing any type of study, and this, not so popular type of science in our country, is being promoted. In this regard, we plan to involve even more volunteers, create more ideas (such as magazines, developing quizzes, publishing articles on fieldwork and other activities) on which they will work together to spread science among younger colleagues.

It is important to continue the activities started during the Rufford projects i.e., further development of the quiz to spread science among young nature lovers, more intensive promotion through the social media to increase the availability of content to a larger target group and publication of more methodologically supported works, important to the scientific public.

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 used t-shirts with the logo of The Rufford Foundation for promotion during the realization of all project activities. We distributed t-shirts to volunteers, colleagues, protected area managers and everyone interested in our work. Also, the promotion of the foundation was also done through social networks of our society and Biologer database networks, as well as in a scientific paper which will be published this year.

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

The entire research team, which includes Milan Ilić, Iva Stojanović, Marko Nikolić, Dimitrija Savić-Zdravković and Aca Đurđević, was involved in the realization of the main activities of the project i.e., marking study of *Lycaena helle* and the species research. **Dimitrija Savić-Zdravković** was in charge of promo material design and the promotion of project activities. **Milan Ilić** was in charge of scientific paper creation under the supervision of **Miloš Popović.** Quiz improvements were made by **Milan Ilić** and **Miloš Popović** and were agreed involving everyone's ideas. Also, over 50 volunteers, fellow experts and administrators of the Biologer base from the region also made a significant contribution to the implementation of the project through the collection of precisely georeferenced data on biodiversity, quality photos of species that we used to improve the photo database for the quiz, and through the exchange of experiences and professional practices that will contribute to our further work on species protection.

10. Any other comments?

I would like to take this opportunity to express my immense gratitude to The Rufford Foundation for providing support for our further work on monitoring relict, rare and endangered fauna species of Serbia. With the financial support of The Rufford Foundation, we were able to carry out a very demanding study of marking *Lycaena helle*, bearing in mind that such studies are lacking in our country and mostly refer to lowland, easily accessible species. But, in the end, all the effort paid off. Also, I would like to mention that cooperation with The Rufford Foundation helped us the most in creating connections and long-term cooperation with competent institutions, which was the initial idea. Now it is up to us to complete the previous results with an even more detailed study, a study of the biodiversity of this area. The direct contribution of this work we can most likely see during the revision of the Stara Planina Nature Park. I hope for our further cooperation, and the results will certainly not be lacking.

Picture 1. Fieldwork during MRR study. Photo by: Iva Stojanović

Picture 2. Marked individual of Lycaena hellespecies. Photo by: Milan Ilić

Picture 3. Bird ringing and data collection. Photo by: Danilo Penić

Picture 4. Entomological section during night fieldwork on locality Jabučko ravnište. Photo by: Danilo Penić

Photo 5. Project T-shirt with the logo of Organisations.