Final Evaluation Report

Your Details	
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Project Title	Environmental value, Landscape and Biological Diversity of the Lori Plateau Lakes and Watershed (Lori region, Republic of Armenia)
Application ID	31363-1
Grant Amount	£6000
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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
Lacustrine and nearshore fauna inventory	ornithological				10 bird species listed in the Red Book of Armenia and three bird species listed in the IUCN Red list with a status VU or NT were discovered during the work. Bird inventory was conducted carefully and comprehensively, still not all lakes were embraced and not all sectors of the plateau covered with the research due to the COVID-19 2nd and 3rd waves restrictions.
	herpetological				Three species of amphibians and six species of reptiles in total were recorded in total during the Project. *Darevskia dahli* (listed in the IUCN Red List and the Red Book of Armenia) was recorded via the project. Amphibian species diversity was studied at nine Lori plateau lakes. Morphometry measurements were performed for 145 frogs and integrated into a wider scientific network. *Hyla orientalis* found at four lakes. Despite the efforts made in the field, no specimen of newts were recorded, which potentially remains an important scientific and conservation objective.
	ichthyological				Fish fauna was

					comprehensively inventoried at nine Lori lakes. *Pseudorasbora parva*, *Alburnus hohenackeri*, *Carassius gibelio* were demonstrated to be major inhabitants of the lakes. Invasion of *P. parva* and *A, hohenackeri* may damage other (native) species. In many lakes fish populations were shown to require careful remediation.
Hydrobiological research					Phytoplankton species diversity, abundance and biomass were assessed in water of three lakes as proxies of the aquatic systems ecological status. The lakes can be characterised as mesotrophic. Chlorophyta algae is the dominant group in all studied lakes (up to 70 % of total population and biomass). The only significant drawback of the hydrobiological research is that only three lakes were studied via the project.
Lakeshore and water flora inventory					Five species of plants listed in the National Red Book, two species having IUCN status higher than LC, and one endemic of the Caucasus were recorded at the studied Lori lakes.
Hydrological survey on the lacustrine basins					Comprehensive bathymetry and level fluctuations measurements were carried out on six lakes of the plateau. Basin morphometry and hydrology network was described and recorded via drone footage. Still many more lakes are yet to be investigated.
Landscape-level data systematization					At least seven habitat types (EUNIS classification) listed in the Resolution 4 of the Bern

				Convention were recorded via the project. Detailed spatial landscape data were obtained and processed for four lakes, others were studied briefly. Lakes were grouped into four clusters according to their geographical setting, human impact and conservation priorities. More attention needs to be addressed to the numerous dried basins and their role in ecosystem balance of the plateau.
Assessment of the human impact degree and contamination level				A number of past and present human activities and their consequences were outlined, hierarchised and measured, so that a strategy for the lake's restoration could be elaborated in the future. System of drainage, peat extraction, agriculture and invasive species introduction are considered major activities to damage the lacustrine ecosystems of Lori. Contamination level of water, soil and sediments was not measured properly during the project due to unstable epidemic and national situation in Armenia.
Suggestion of the protection measures to the local and/or Republic authorities				Because of the unforeseen difficulties outlined below (paragraph 2), no direct dialogue was arranged with the authorities. Still, certain agreement from the Ministry of Environment was received for the project before the works, and conservation suggestions have been addressed to the Ministry and Lori region authorities just after the report was compiled.

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

During the whole term of the project in 2020-2021 the work was obstructed by insurmountable circumstances and emergencies. As the COVID-19 pandemic was announced in early 2020, a number of activities and trips were restricted, also for some of the participants of the project from the Russian side who initially had been supposed to be involved in the work. The work was conducted only in September 2020 due to temporary international transport restrictions in summer 2020.

A military conflict broke out between Armenia and Azerbaijan in late September 2020 (so-called 2020 Nagorno-Karabakh war), just few days after the autumn expedition. National crisis after the war lasted almost until early spring 2021 and limited execution of the project significantly, coupled by the COVID-19 "third wave".

These difficulties influenced mostly the term of the field work which initially had been planned to be held several times during summer 2020. Air connection between Russia and Armenia was suspended during spring and summer 2020, and prices rose significantly. As the situation between Armenia and Azerbaijan got unstable by the end of September 2020, the material collected during the autumn field work was primarily used in the project. It was unclear whether another field session could be held in these conditions, still, luckily, a brief visit in May 2021 provided an important supplement to the initial results.

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

1. Spatial distribution of 16 nationally protected and eight IUCN-listed flora and fauna species at the Lori lakes site was updated and finalised. More importantly, the inventory was conducted simultaneously in different parts of the plateau, with relation to the bio topic attribution of the species.

2. For the first time habitat diversity of the Lori lakes Emerald site was investigated for certain lacustrine basins, which enabled to study ecological conditions separately in different parts of the plateau with respect to rare species distribution. EUNIS classification was used during the project, so the results are easily comparable with the previous similar studies (Fayvush et al., 2016) and are in agreement with the Bern Convention objects monitoring approach.

3. Major threats and ways of human impact are indicated, and their consequences (present or potential) for the ecosystems are discussed. Emphasis has been made on the violations of hydrological regime of the whole Lori lakes network, which is a predominant factor to damage the lacustrine systems biodiversity.

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

Local communities were not involved in the work during the project term. Suggestions of the Lori lakes site ecosystems restoration and conservation measures

elaboration were addressed to the local authorities and to the Ministry of Environment of the Republic of Armenia.

5. Are there any plans to continue this work?

The Project No. 31363-1 was the first step of our research group in establishing guidelines for the anticipated nationally protected area on the Lori plateau. The obtained landscape and biological diversity data have helped to build a background for further actions in this direction. The most important purpose for the next step is to multiply the number of the researchers engaged in the project and to upscale the whole framework of the future research. Concerning this, several approaches are considered to gain and ensure protected regime over the key sites of the Lori plateau.

1) New research is planned to be conducted in 2023 specifically on the lakes dedicated for highest conservation priority, namely the Clear Liman, the Horse Liman and the Urasar (see Final Report, Appendix 14).

2) Botanical, herpetological and habitat survey of the neighbouring dried basins is planned to be held simultaneously in order to expand the project 2020-2021 data and to assess these transformed ecosystems' restoration capability.

3) For longer perspective the surrounding terrain around the plateau is planned to be involved into the conservation plan, in particular pieces of forest on the Bazum ridge slopes some 10 km to the south from the "hillside lakes" of the Lori plateau.

4) Apart from scientific and conservation research, we intend to maintain a dialogue with local authorities and agricultural entrepreneurs, in order to facilitate a form of self-sustaining social control over the Lori lakes environment.

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

Results on the fish populations threats were presented on the Sixth International Symposium "Invasion of Alien Species in the Holarctic. Borok-VI" (October 11-15, 2021, Uglich, Russia) (report «Invasive Populations of *Pseudorasbora parva* in Lakes of Northern Armenia».

First results of the botanical research were sent to the journal «Takhtajania» of Armenian Botanical Society & Institute of Botany NAS RA (Yerevan) under the title «The new finding of *Acorus calamus* (Acoraceae) in Northern Armenia» and are currently being reviewed.

Herpetological and landscape results are currently being adapted and complemented with the previous regional research data and soon will be sent for publishing in Russian or international journals indexed in Scopus.

Main results of the project and suggestions on new conservation initiatives are prepared to be sent to the local authorities of the Lori region and Ministry of Environment of the Republic of Armenia.

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

The Project duration was in total 1 year.
The field stage of the Project was delayed by 3 months due to unstable epidemic situation and cancelled air connection. Nevertheless, first visual data were collected by the Armenian team members solely in summer 2020. Joint Russian-Armenian expedition was held in September 2020. Water and sediments samples processing was conducted in October-November 2020. Preliminary summary and elaboration of the spring work plan were made in December 2020 – February 2021. Final field session was performed by the Armenian Project team in May 2021.
As the war over Nagorno-Karabakh put Armenia into socio-economic crisis of the national scale from October 2020 to February 2021, spring expedition was undefined during this long term.

8. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item		Budgeted Amount	Actual Amount	Difference	Comments
Expenses of "Nature Heritage" NGO (organization, accountancy, procurements)		2160	400	-1760	Organizational expenses were finally calculated as accountancy work for 50 £/month (June-October 2020; March – May 2021). Difference in 50 £ appeared from the necessity to postpone the fieldwork to September 2020 instead of August 2020
Travel expenses	Airfare + train / bus	900	1621	+721	Combined route of airway and railroad / bus was the only possible way to reach Armenia from Russia during the COVID-19 restrictions. Prices on airfare rose more than two-fold due to complicated epidemic situation and reduced air connection. Despite less

					amount was spent on airfare than it had been planned initially, May 2021 expedition was conducted without participation of the Russian team members due to the high flight prices. These leftovers were partially redistributed for other purposes, e.g., camera Canon EOS 2000D.
	Fuel and local travel expenses	442	254	-188	Car rent used by the Russian team amounts to 200 £ during the autumn 2020 expedition. Accordingly, more than 200 £ were spared because spring fieldwork was conducted solely by Armenian team members.
Subsistence		810	803	-7	
Quadcopter		1035	633	-402	Less expensive, yet perfectly suitable and functional DJI Mavic Mini was purchased for the Project instead DJI Mavic PRO, which production had been stopped in the early 2020. The leftovers were partially used for the lens and camera purchase. See link to the image's gallery by Dmitrii Sadokov and Andrei Ostashov in the end of this report
Inflatable boat		383	149	-234	A smaller boat was chosen for the Project because no need for the Echo sounder fitting onboard had been drawn (see below).
Expendables and laboratory expenses	Laboratory expenses (Phytoplankton studies)	270	261	+785	Phytoplankton research was conducted in three lakes for necessary characterization of the lakes' trophic status.

	Laboratory expenses (Water and sediments chemistry analyses)		268		Trace and major elements content in water and sediments samples was measured using ICP-MS technology in "Hydrometeorology and monitoring center", Yerevan, Armenia. The leftovers saved from the pH-meter purchase were used for these expenses.
	Field expendables (fishing nets, rubber boots, sweep-net, flashlights, ropes and other)		526		Different accessories for the fieldwork (ichthyologal, herpetological, botanical) were purchased in local shops in Armenia. Most of them were fish traps, rubber boots, flashlights. All purchases are confirmed by invoices.
Sub-total		**6000**	**4915**	**-1085**	
Equipment for photography	Lens Tamron 18-400 mm f/3.5-6.3		505	+977	Lens was purchased for the camera Canon EOS 1200D, owned by Valentina Digalova. New lens enabled to obtain high-quality images of living objects (distanced and small) and panoramic views (see link to the gallery by Dmitrii Sadokov and Valentina Digalova in the end of this report). The leftovers saved from other lines were used for this purchase.
	Camera Canon EOS 2000D BK 18-55 with a bag		462		New digital Canon was purchased for shooting plants with shorter focus distance and well-balanced zooming (see link to the images gallery by Ivan Gabrielyan in the end of this report).
Portable radio set			50	+50	The portable walkie-talkie set was purchased for more comfortable communication during the

				fieldwork. The saved leftovers from other lines were used for this purchase.
Snake tongs (100 cm)		68	+68	Snake tongs were purchased in order to identify snake species more correctly and to make good images without harm for a snake.
Total	**6000**	**6000**		

The rate of £ (GBP) / Armenian dram (AMD) was accepted as 617 AMD/GBP. Difference between the budgeted and actual expenses appeared largely due to increased prices for the international travel and as a consequence of the forced changes in the members of the Russian team participation in the fieldwork. The leftovers saved from travel, subsistence and equipment expenses were used to purchase new units of accessories and equipment (Camera, Lens, Snake tongs, Portable radio) and to comprehensively perform phytoplankton research in water of the three lakes.

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

The Project No. 31363-1 results present a foundation for many possible interdisciplinary research and activities. Below are some of the most important steps to be carried out in the area as part of its sustainable development.

1) More lakes to study. Key lakes of the Lori plateau have been embraced within the project, still there are more than 20 minor lacustrine basins, most of which are dried partially or completely. More of specific ecological features are expected to be distinguished on these sites, as vegetation cover creates peculiar patterns, which vary from the studied aquatic systems greatly. Comprehensive review of the lake's bio- and geodiversity is recommended to be performed the same way as presented in the Project report.

2) Emphasis on the key preservation sites. At least three lakes were outlined as sites of the highest conservation priority, where establishment of strictly protected sanctuaries is planned to be suggested to the authorities, and several more basins were highlighted for discussion. To pursue the conservation objectives, a special research expertise needs to be performed on these "key sites" (lakes Clear Liman, Horse Liman, Urasar, possibly Stepanavan lakes and several semi-dried basins of the Central Lori Plateau), including nationally approved scaled assessment of the ecosystem's vulnerability. These activities would work out most effectively if driven by the oriented national policy (strategy, plan, program) and in accordance with the best international wildlife preservation guidelines.

3) Involvement of local communities. Residents of Stepanavan, Tashir, Saratovka and Novoseltsevo are considered main consumers of the Lori lakes ecosystems services. It is a matter of fact that many lacustrine sites endured severe damage in the past due to uncontrolled peat extraction and water discharge regulation. To

counterbalance the cumulative damage, certain demand on the clear environment should be expressed by the local citizens, mainly by means of joint restoration activities. Necessary level of consolidation can be effectively approached through series of regular educational practices or sessions directed at raising the ecological awareness, e.g., concerning prevention of invasive fish species introduction. Special efforts should be made to establish mutual agreement with local farmers and livestock holders, in a way of decreasing the impact of agriculture on the most vulnerable sites.

4) Integration into regional conservation network. Numerous environmental and wildlife conservation projects have been currently ongoing in the North Caucasus region. It is important for the Lori lakes biodiversity data to be compliant to conservation programmes implemented at the nearest localities. The Lori lakes site is ranked as a Freshwater Key Biodiversity Area, an Important Bird Area and listed in the "Emerald" Network as an Area of Special Conservation Interest. According to the mentioned statuses, any new topical project on the Lori lakes site should follow the work principles employed by the relevant international committees for the new data to be consistent with the existing databases. Finally, since many other key biodiversity areas, hotspots and nature reserves operate in the Lori plateau vicinity (Lake Arpi, Mount Achkasar, Relict Steppe of Jajur Pass), it is a matter of common interest to implement new conservation practices in Lori in accordance with the existing network, so that they would be mutually complementing (e.g., as eco-corridors).

10. 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?

The logo was not used in any printed materials or signs. Links on The Rufford Foundation were provided in all news reports, discussions with the authorities, internet reviews and in publications (see below).

https://vk.com/@musician-odnazhdy-v-armenii

https://www.facebook.com/permalink.php?story_fbid=1369732290124934&id=100012645283074

https://www.facebook.com/permalink.php?story_fbid=1142376422860523&id=100012645283074

https://www.facebook.com/permalink.php?story_fbid=1070989279999238&id=100012645283074

https://www.facebook.com/permalink.php?story_fbid=1068317100266456&id=100012645283074

https://www.facebook.com/permalink.php?story_fbid=1058318827932950&id=100012645283074

Oral report «Invasive Populations of Stone Moroko *Pseudorasbora Parva* in Lori Lakes (Northern Armenia) » was presented at the Sixth International Symposium «Invasion of Alien Species in Holarctic. Borok-VI» (11 Oct. – 15 Oct. 2021, Borok – Uglich, Russia). The materials were published in the Book of abstracts.

The link on the project and The Rufford Foundation was included into the article sent for publication to the journal «Takhtajania» of Armenian Botanical Society & Institute of Botany NAS RA (Yerevan) under the title «The new finding of *Acorus calamus* (Acoraceae) in Northern Armenia».

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

Name	**Affiliation**	**Role in the project**	**Activities**
Dmitrii Sadokov	«Nature Heritage», environmental NGO (Armenia), Darwin Nature Biosphere reserve (Russia), St. Petersburg State University (Russia)	Principal investigator, expert on landscape and environmental studies	Landscape mapping, geobotanical survey, hydrological survey, analysis of human impact risks and conservation priorities, water and sediments data interpretation
Ivan Gabrielyan, Prof.	Institute of Botany after A.L. Takhtajyan NAS RA (Armenia)	Project botanist	Flora inventory, identification of flora species
Samvel Pipoyan, Prof.	Armenian Pedagogical University after Kh. Abovyan (Armenia)	Project ichthyologist	Fish populations inventory. Risk assessment for the fish fauna of the lakes due to uncontrolled introduction of invasive species.
Vasil Ananian	Freelance expert (Armenia)	Project ornithologist	Bird inventory, identification of bird species
Ilona Stepanyan, Dr.	Scientific Center for Zoology and Hydroecology NAS RA (Armenia)	Project herpetologist	Herpetological survey, measurements of frog's morphometry, newt inventory, ichthyological survey
Andrei Ostashov	Permafrost Institute after P.I. Melnikov, Siberian Branch, Russian Academy of Science (Russia)	Project hydrologist	Landscape air footage, hydrological network characterization, bathymetry measurements, water level measurements
Valentina	St. Petersburg State	Project	Herpetological survey,

Digalova	University (Russia)	herpetologist	measurements of frog's morphometry
Lusine Hambaryan, Dr.	Yerevan State University (Armenia), Scientific Center for Zoology and Hydroecology NAS RA (Armenia)	Project hydrobiologist	Hydrobiological study of water samples and interpretation
Anush Arakelyan, Knarik Hambardzumyan		Volunteers	Ichthyological, herpetological inventory

12. Any other comments?

The team is grateful to The Rufford Foundation for supporting our project.

We look forward to continuing the work in terms of the 2nd stage grant, for many problematic issues still remain to be addressed in this field.

We thank referees Prof. Vladimir Boynagryan, Prof. Dmitriy Sevastyanov, Dr. Grigory Fedorov and Dr. Olga Galanina for their confidence in the success of the Project.

We thank «Nature Heritage» Environmental Agricultural NGO and its head Anush Nersesyan for the project maintenance and administration. We are also grateful to Karen Manvelyan and Arus Tumanyan for providing expert view on the matter of nature conservation on the Lori plateau.

The photos shot during the work (including the drone footage) were uploaded and are suggested to be attached to the Project Report. Please follow the link to find the folders with the images: https://mega.nz/folder/F1BSVZAQ#IXS9GPnFadTe_rVC5l_PIw