

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

Your name	Dr. Gabriel Laufer
Project title	Water reservoirs as habitat for amphibians: promoting conservation by controlling bullfrog invasion in Aceguá, Cerro Largo, Uruguay
RSG reference	20513-1
Reporting period	November 2016 - November 2017
Amount of grant	£5000
Your email address	gabriel.laufer@gmail.com
Date of this report	3th March, 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
<p>Raise awareness of the local community regarding the conservation and the problem the bullfrog leads to.</p>				<p>We worked with different types of social actors:</p> <ul style="list-style-type: none"> - local educational centres, achieving a strong interest and commitment. - community radio broadcasting, by carrying out auditions and knowledge contests about native species and the bullfrog threat. -organised activities for adults in which they were informed and taught biodiversity values and possible actions for helping conservation. -land owners and local authorities (see participatory monitoring).
<p>Establish participatory monitoring with local people.</p>				<ul style="list-style-type: none"> -We worked with the local inhabitants both from the village and the countryside, through unstructured interviews, showing them bullfrog calls, as a tool to help them identify these. -the data obtained from the local inhabitants was mapped and shared with them during the subsequent meetings. -Aceguá's inhabitants are currently gathering data of the invasion which is being sent to us (by e-mail, Facebook and/or personal communications).

<p>Promote a contributive behavior from the local community concerning the solution of the conservation problem.</p>			<ul style="list-style-type: none"> -Activities in which we fished and cooked bullfrogs were carried out with local people. -This work led to several residents of Aceguá to take their own initiative to fish bullfrogs. We could see evidence of this when we were shown photos and even their refrigerators and also told stories. -With the support of the culture commission (Asciación de Cultura y Deportes de Aceguá: Carolina Gomez and Stella Sanchez), it was possible to mobilize local forces so they could be prepared to interact with the national environmental authorities.
<p>Involvement of national authorities in the problem of the bullfrog invasion.</p>			<ul style="list-style-type: none"> -Our results were presented to the head of invasive species department (Ana Laura Mello) and the head of Protected Areas (Lucia Bartesaghi), which are part of National Ministry of the Environment (in a personal meeting). -Our results were shared with the National Committee of Invasive Alien Species, chaired by Marcelo Iturburu. -After this, we had several working meetings with M. Iturburu and the regional authorities of Aceguá and San Carlos (the other invaded site). We understand that the authorities became aware of the environmental problem and the possible ways in which they can take action to control it. -In the month of October a workshop was held in Aceguá with the local actors and the participation of M. Iturburu in behalf of the National Ministry of

				<p>the Environment. This meeting had ample concurrency and a strong diffusion by the national and local media.</p> <p>We also focused on the fact that the bullfrog is located near the drinkable water reserve lagoon, and the danger of deterioration of this ecosystem supply service. That's why we involved the referent actor:</p> <p>-Ing. Luis Nicola (Regional Director of public company for the supply of drinking water, OSE): support for management, especially in water bombs.</p>
Preparation of field information for conservation management.				<p>-Mapping of invaded sites and characterisation of ecosystem attributes within a radius of 5 km around the initial focus of invasion.</p> <p>-Database of local actors and their functions. Presented at the meetings and later published.</p> <p>-A new participant who specialises in spatial information, joined our team (Ignacio Lado, see below).</p>
Identification of local Biodiversity determinants (at pond level).				<p>A series of determinants of biodiversity were identified, emphasising vertebrates. These determinants would be: the presence of peripheral, emergent and floating vegetation, the maintenance of a flooding zone, and the fish presence (see published and "in preparation" papers).</p>

<p>Exploration of impacts and mechanisms related to bullfrog invasion.</p>			<p>Our observations are contributing to a greater understanding of the system, the richness of native species and the natural history and effects of bullfrog (see published articles). We were able to identify that the most affected native anurans were those that are most related to the permanent lentic systems. We observed that the bullfrog presence leads to negative effects (in richness and abundance) on native amphibians and has a positive effect in size and abundance of some native fish (article under evaluation). With the usage of stable isotopes technique, we concluded that the fish could be directly preying on adults and bullfrog larvae, as well as benefiting from the alteration of the energetic pathways of the trophic network. In this last mechanism, bullfrog tadpoles would have a preponderant role (article in preparation).</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

Although we knew that the inhabitants of Uruguay have little knowledge of native biodiversity, this surprised us especially in Aceguá. We found that local people were not aware of the high and rich local diversity. Therefore, we had to adapt our activities and place greater emphasis on this aspect. We decided not to initially talk about bullfrog as a problem, before working with the value of biodiversity and local ecosystem functions. This was a learning experience for our team and served to reinforce our message of conservation. Today, we are surprised by the thrust that this generated and how the children and adults of Aceguá know about different native amphibian species, such as the charismatic monkey frog (*Phyllomedusa iheringhi*), or the hylids (*Ololygon aramotheyella* and *Dendropsophus minutus*).

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

The three major outcomes of our project were: 1) the generation of a favorable

local context for conservation, 2) the generation of knowledge in the form of participatory research, which supports our conservation objectives, and 3) the involvement of national authorities in an action plan.

1) The context of support for conservation was generated with the aim of the different activities that we carried out in Aceguá. Although we have been working at this area for many years, this project allowed us to achieve a socio-ecological approach that we had not previously had. Undoubtedly, our previous years helped us to gain the trust and support of the local people and achieve good results. It was very noticeable how the different local actors began to identify the natural values of the area and the threat of bullfrog invasion. This was evident in the results of our non-formal education activities in the school and the high school, and in the different workshops. We achieved a very strong participation, both with children and adults, through the identification of the value of native biodiversity and its conservation. The great level of knowledge reached by many local people is something very rare in our country. In addition, the villagers generated independent initiatives, such as a science club in the high school, fishing and cooking bullfrog events, and contact with regional authorities in Brazil (Aceguá is located at the borderline). This shows us that the local population is committed to the conservation objectives proposed by our project. In fact they are asking for the support of the national authorities for bullfrog eradication.

2) Our research work is generating very interesting results for the knowledge of the native ecosystems, and the bullfrog invasion problem. In this sense, we performed five large field campaigns, we processed the information in the laboratory of the National Museum of Natural History in Montevideo, we analysed stable isotopes of carbon and nitrogen, and then we assembled several databases which we are using for our research (including data collected in this project and historical data). These results are useful as scientific evidence of the problem, for the academic training of our members (see team members below) and as a contribution to the theoretical framework of invasion ecology, which addresses the problem of the bullfrog as a global challenge. Below are listed the articles published and being prepared in the context of this project (section 6).

3) Finally, it is remarkable the involvement of the national environmental authorities. In this sense, it should be noted that this is the first exotic species for which the Ministry of the Environment is considering a control and eradication project. This result of our project, although it is at the beginning, is a milestone for conservation in Uruguay, a country where actions on the ground have not been commonplace, nor established at the level of national management institutions. There is a lot of progress to be made in this aspect and we have every interest to support it, but the step that was taken and the commitment assumed by the Stakeholders was significant.

In fact, these days, we were informed that the Ministry of Environment (with the support of the regional Army) appointed a work team and is preparing the

logistics and materials to start a pilot plan for the eradication of bullfrogs and restoration of some invaded systems in Aceguá. Although it will require a major effort, this news comforts us and encourages us to continue with our conservation work.

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

We can say firmly today that the issue of conservation is installed in the local Aceguá agenda. It is so installed, that people have continued with different activities related to the theme and a strong connection has been created with our team. This far exceeded our expectations and we believe that it will be a fundamental basis for the success of the management plans that the Ministry of the Environment intends to initiate this year.

In the educational centers the topic of conservation was maintained as part of the study throughout the year, with activities during our visits and a fluid contact and work in class of the teachers during the rest of the year. A dynamic of interaction was generated in which the teachers sent us pictures of the animals they saw and questions to which we responded. We also prepare teaching materials, such as an amphibian guide to the Eastern Hilly Region (the ecoregion where Aceguá is located). With some groups, field activities were carried out, both with us and with their teachers. Recently Lucy, the director of School 74, thanked us for the great motivation and love of nature that was generated in the children this year. What's more, a group of high school student won a trophy (second position) at the regional conference of high school science clubs (pictures of this event are in their Facebook: @impactodelaranatoro).

While we understand that the education and participation of children is fundamental, considering the urgency of conservation actions, we also gave special emphasis to activities with adults. The activities and workshops with adults also had a great support and participation. This generated a motivation in several local inhabitants to fish and consume bullfrogs, combining conservation with recreation and feeding. In summary, we understand that our project managed to establish in the town the theme of the environment and a vision that everyday personal actions can contribute to conservation. This situation is so rare in Uruguay that it attracted attention and motivated the realization of more than 12 national press releases in recent months (television, newspaper and radio).

5. Are there any plans to continue this work?

The plans of continuity of our project do not come only from our interest, but also respond to the demand of different actors involved. Our main motivation to continue with our work is that the country is in the process of executing one of the first nature management and restoration initiatives. We believe that our work, both

socially and environmentally, is a necessary support to boost this first movement initiative of the different national institutions. In addition, we want to extend this work to the other sites invaded in Uruguay, generating similar actions for the other existing population in San Carlos (department of Maldonado), as well as a warning and early detection network of some possible new foci at the sites where the old bullfrog farms worked. This problem, which has attracted public attention, would also be a good way to take the conservation of amphibians and their ecosystems to different parts of the country.

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

During the course of the project four scientific articles were published in refereed journals and two book chapters, where some of the results obtained with our work in Aceguá were exposed (see the list at the end of this section). In addition, during this year our work will continue on writing and submitting new articles, on environment selection, effects on biodiversity and changes in trophic networks after the bullfrog invasion.

Through the active participation of a member of the team (GL) in the National Committee of Invasive Alien Species, the partial and final results of the project were shared with the main authorities and researchers working on invasive alien species in Uruguay. Currently, the issue of the bullfrog is a priority in this committee, which received information on the early state of the invasion as an opportunity to act.

In addition, during the course of 2017 several interviews were carried out with members of the team by different press media (radio, television and newspapers). In these interviews both, our activities and results were exposed. In fact, several of the activities carried out in Aceguá were promoted by local radio 90.3 and by a national newspaper "La Diaria". Likewise, on November 23 we held a conference open to the public at the National Museum of Natural History about the work and results of this project.

Scientific publications made during this project:

Laufer G., Gobel N., Borteiro C., Soutullo A., Martínez-Debat C. & de Sá R. *In press*. Current status of American bullfrog, *Lithobates catesbeianus*, invasion in Uruguay and exploration of chytrid infection. *Biological Invasion* DOI 10.1007/s10530-017-1540-z

Laufer G., Gobel N., Soutullo A., Martínez-Debat C. & de Sá R. 2017. Assessment of the calling detection probability throughout the day of two invasive populations of bullfrog (*Lithobates catesbeianus*) in Uruguay. *Cuadernos de Herpetología* 31(1):29-32.

Laufer G. & Gobel N. 2017. Habitat degradation and biological invasions as a cause of amphibian diversity loss: a case report in Aceguá, Cerro Largo, Uruguay.

Phyllomedusa 16(2):289-293.

Gobel N., Laufer G. & Serra W. 2018. Natural history and ecology of four fish species in artificial water reservoirs in north-eastern Uruguay. North-western Journal of Zoology: e171401

Laufer G., Gobel N. & Soutullo A. *In press*. Estado de la invasión de la rana toro en Uruguay: Avances y Perspectivas. In: Brugnoli, E. & G. Laufer (Eds). Ecología, Manejo y Control de Especies Exóticas Invasoras en Uruguay, del Diagnóstico a la Acción. IV Congreso Uruguayo de Zoología. Dirección Nacional de Medio Ambiente, MVOTMA. Montevideo, Uruguay. 7 pp.

Laufer G. *In press*. El dilema del control y erradicación de las especies exóticas invasoras ante los requerimientos de la opinión pública. In: Teixeira de Mello, F. Experimentación con animales no tradicionales, CHEA, Uruguay. 11 pp.

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 project was extended 3 months longer than scheduled, because new interactions and activities with the national authorities were generated. We understand that this deviation is not significant for the objectives of the project.

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. 1 £ = UY\$ 39, 5 (30/11 www.portal.brou.com.uy)

Item	Budgeted Amount	Actual Amount	Difference	Comments
Transport to Aceguá (gasoline, bus ticket)	1500	1300	-200	we managed to save a little in this area
Logistic and maintenance during fieldwork	1350	1350	0	
Graphic design and printing of booklets	380	480	100	we prepare more material of the thought
Materials for field (boots, clothes, batteries)	220	260	40	price increases
Material for sampling (trawls, hand net, audio recorder)	500	560	60	price increases

Material for stable isotopes (instrumental, capsules, filters)	40	40	0	
Stable isotope analysis (Davis Laboratory)	750	750	0	
Materials for bullfrog fishing day (fishing and cooking instruments)	80	80	0	
Graphic material for school activities	100	100	0	
Reports printing	40	40	0	
Input for workshop with	40	40	0	
Total	500	500	0	

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

Our fieldwork was very useful in determining the negative effects of the bullfrog on the local amphibian community. We also managed to set up participatory monitoring, in which the different local social actors of Aceguá generate data and receive information on the situation of this invasion. We also managed to establish local support, with our work in schools, with adults, with fishermen, etc. In summary, we have generated favorable local conditions for the establishment of a control plan for the bullfrog problem. However, this is not enough. We understand that a national action plan with field work is needed to solve the problem.

In the framework of our project, we managed to involve the relevant national and regional authorities and actors. They now have all the intention to act, supporting the community of Aceguá for the eradication of the bullfrog, and the restoration of their natural systems. This is our line of work in the future, for which we will request a new project from The Rufford Foundation. Our intention is to develop management and restoration measures in a participatory manner.

Our next objective is to accompany and motivate the experimentation of management measures in the field. We also want to maintain our work in education and maintain a monitoring of management measures (both biological and social). We also want to work on the restoration of ecosystems and the valuation of their services. Finally we understand that all the experience we are doing must be documented and communicated, in order to be repeated in other invasions and other conservation problems.

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?

The Rufford Foundation logo was used in all education, outreach and communication activities carried out. In all cases, we communicated the

support received from the Foundation, which made our work possible, as well as the support it is giving in various conservation projects around the world. In addition, the logo was used for our Facebook group (“Rana toro en Aceguá”) and in the different materials delivered in the trainings. The announcements disseminated to all activities also included the Rufford Foundation logo.

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

Gabriel Laufer is the coordinator of our project. He coordinated the field campaigns, and participated in the planning and execution of the workshops held with the local residents of Aceguá. In addition, he participated in the monthly meetings of the National Committee of Invasive Alien Species and held meetings with the authorities of the regional and national Ministry of the Environment. Gabriel is the visible face of our project, facing the new plan of control of the invasion that the authorities are organizing.

Noelia Gobel participated in all the field samplings, and prepared and conditioned the samples for stable isotope analysis. She also participated in the planning and execution of workshops with children and adolescents through the integration of educational practices through the game. Noelia is finishing her Masters in Ecology, whose thesis deals with the ecology of the Bullfrog invasion.

Nadia Kacevas participated in the field samplings and in all the workshops held in the Aceguá educational centers. Nadia recently obtained her biologist's degree, with a final work about bullfrogs.

Sofia Cortizas participated in the planning and organization of the activities. She is currently studying a Master's Degree in Biodiversity in Spain.

Ignacio Lado began working on our project in April 2017 within the framework of his master's thesis. Ignacio participated in several field surveys and collected spatial information to map the distribution of bullfrogs, presence-absence of native amphibian species and the different environments present in Aceguá. In this way we are beginning to spatially model the expansion of bullfrog, the selectivity of environments it presents and the effects on native amphibians.

Alvaro Soutullo is a reference in conservation in Uruguay. His work focuses on wildlife management and interaction with decision makers. His role in our team was to stimulate communication and interaction with national authorities. He was also a constant support in the preparation of our team for these interactions.

12. Any other comments?

Some press references (there are more than 30 press releases about our work):

2018. Uruguay invasive experts draw bead on bullfrogs
<http://www.ecoamericas.com/en/> (February 2018)

2018. El Ejército sale a la caza de miles de "ranas toro" en Cerro Largo
<https://www.elpais.com.uy/informacion/ejercito-sale-caza-miles-ranas-toro-cerro.html>

2018. Ranas peligrosas, en la mira de militares uruguayos
<https://tn.com.ar/internacional/militares-uruguayos-combatiran-ranas-peligrosas-854293>

2017. Preocupa posible invasión de "ranas toro" en Uruguay.
<http://www.montevideo.com.uy/Ciencia-y-Tecnologia/Preocupa-posible-invasion-de-ranas-toro-en-Uruguay-uc664288>

2017. Una jornada de pesca de rana toro intentará concientizar sobre este problema en Uruguay.
<http://www.montevideo.com.uy/Ciencia-y-Tecnologia/Una-jornada-de-pesca-de-rana-toro-intentara-concientizar-sobre-este-problema-en-Uruguay-uc666781>

2017. Científicos publicaron un artículo sobre la invasión de la rana toro en Uruguay
<https://findesemana.ladiaria.com.uy/articulo/2017/9/cientificos-publicaron-un-articulo-sobre-la-invasion-de-la-rana-toro-en-uruguay/>