Final Evaluation Report

Your Details	
Full Name	Miguel David Barrios Amaya
Project Title	Ecological and conservation genetics approach for the conservation of the turtle grass (*Thalassia testudinum*), an entire ecosystem
Application ID	25077-1
Grant Amount	5000
Email Address	mdbarriosa@unal.edu.co
Date of this Report	31/12/2019

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
Understand the genetic processes that have taken place in these meadows, assessing the genetic diversity, population structure, clonality and connectedness among populations.				This objective was successfully achieved, and we could even include three more sampling locations outside the Seaflower Biosphere Reserve (Isla Tortuguilla, Isla Palma and Barú) to compare between *T. testudinum* populations from oceanic islands and near shore islands. Nevertheless, samples from Serranilla were not taken due to the distance and difficult access.
Describe the role of the sexual and clonal reproduction in the dynamic of these populations, as strategies to survive in changing conditions				Clonality proportion was calculated based on the number of clones sequenced over the total number of samples sequenced. It is needed a deeper analysis to say statistically that there is any correlation between the human impacts and the clonality index.
Determine whether any of the populations shows negative identifiers such as low genetic diversity, isolation, bottlenecks or inbreeding. And identify which of them need priority in management and conservation programs.				Beyond having negative indicators of the genetic variables, we found that small and isolated islands show more structured and less connected populations, which was previously expected, but showing the steppingstone pattern. Additionally, we found that not all the sampling locations or islands represent an individual population (in near shore islands, Isla Fuerte and Isla Tortuguilla are one population)
Find out if human activities influence the genetic characteristics of the meadows by comparing the genetic diversity within populations of those which are exposed to anthropogenic stress and the ones located in areas with very few				It is evident that human activities influence the physical characteristics of the meadows, such as coverage, density, primary production and distribution. Despite, it's difficult to find a correlation between human activities and genetic characteristics of the populations of any species, due to the fact that they show information at a different timescale, we found that there is a

human disturbances.				slight indirect correlation between sexual reproduction and waste deposition and industry.
Share information of seagrass conservation and importance of this kind of studies with the community from San Andrés and Isla Fuerte, by means of talks and workshops				We developed socialisation activities with people from Isla Fuerte, Providencia and San Andrés. Additionally, as part of my actual job, during the XIII Session of the Seaflower National Worktable I had the opportunity to share the preliminary results of the project with an approach of decision making and policies. Local and national authorities, universities, NGOs and other institutions were part of this meeting, coordinated by the Colombian Ocean Commission.

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

The main difficulties to carry out the project were the costs of the lab supplies and the time they take to arrive to the country. Some lab kits for DNA extraction and PCR, primers and other supplies were quoted from the companies' websites, to consolidate the initial budget. Nevertheless, these companies don't have direct representation in Colombia and it is necessary to make the purchase through an authorised distributor, which increases the price by 100% or 150% (e.g. today's price of DNeasy Plant Mini Kit 250 in the Qiagen website is GBP 773 and with the Colombian distributor is £1710, so the cost in Colombia is 221% the cost in the UK). Additionally, it takes between 45 and 60 days for the order to be delivered, and it can even take 90 days.

Lina Barrios-Gardelis, part of the team of the project and postdoctoral researcher at The Ecological Genetics and Conservation Group of Manchester Metropolitan University, sent me the Qiagen DNeasy Plant Mini Kit (250) from the UK, due to the fact that it can be stored at room temperature (15-25°C), and the research group of MMU covered the expenses of the delivery Manchester-Bogota. Thus, the price we paid for this kit at that moment was £821, less than half of the price here in Colombia.

Despite this, the PCR kits and consumables (Eppendorf tubes, racks, tips and others) were ordered through the local distributor because these kits need to be stored at -4°C and were not able to be sent from UK. In resume, we could manage to buy the most expensive kit at a reasonable price, but it is still challenging to perform research here, compared with countries in Europe and North America.

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

- Produce first-hand information about the conservation status of seagrass meadows in the Colombian Caribbean, comparing the characteristics of

oceanic and near shore island populations and the impact of the main human activities on the preservation and management of them. This evidenced in technical reports and socialisations to the decision makers and stakeholders and a scientific paper that will be published this year (still in progress). The management proposal mentioned in the application form is been created with the collaboration of CORALINA (local environmental authority of the Seaflower BR), Seaflower Research and Conservation Foundation and the Secretariat of Environment of the local government.

- Involving the local communities through talks, fieldwork, socialisations and workshops.
- An MSc marine biology thesis, product of this research.

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

Local communities got involved with the project from different points, but mainly through the fieldwork activities that we carried out, in which they helped us a lot, small talks, socialisations and workshops.

They have benefitted from the project with economic incomes (fieldwork activities, hosting, boat rent, restaurants and other expenditures), transference of knowledge and, at a medium term, the improvement of ecosystem management strategies and policies.

Fieldwork

Generally the locals helped us identifying where the meadows are, showing and telling us about the main economic activities carried out at each place, telling us stories about how the ecosystems were years and decades ago and, from their point of view, what is affecting the most the wildlife in general. There were many situations we faced up during the daily work at the different places, from the kid who knows exactly what seagrasses are and how important they are, to the local old man not related with fishing or tourists who though seagrasses were algae, something that happens all around the world.

5. Are there any plans to continue this work?

- With the information gathered, the idea is to apply for funding with a second step of the project, focused on participatory seagrass meadows restoration and monitoring with the local communities.

- Ask the authors of other population's genetics studies of *T. testudinum* along the Caribbean (Mexico, Florida, Virgin Islands and Panama) for their data to make a regional analysis of the historical colonisation and distribution of the species. This, with the aim of publishes another scientific paper about biogeography.

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

Apart from the talks and workshops with community and stakeholders, I'm planning to socialise the research results in an academic event during 2020, such as a national or international congress or seminary. The event will be defined during January 2020.

Publish another press note or article about the importance and general outcomes of the project, in the university newspaper.

Submit a scientific paper in an indexed journal.

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

The grant was supposed to be used between April 2018 and April 2019, but the real period of time was between August 2018 and November 2019. Due to the fact that I had personal and familiar issues, I requested an extension on the time of the grant until December 2019.

The project started on June 2018 and will end with the presentation and acceptance of the thesis document to the university. This process will be completed during the first semester of 2020.

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
Supplies: Fieldwork (Ziploc bags, waterproof bags, silica gel, alcohol) and DNA extractions (i.e. Primers, Taq mastermix, other PCR reagents, micropipette tips)	920	1385	+465	This is the main difference in the budget, and it is due to the difficulties mentioned in the point 2.
Workshop to carry out in San Andrés with the community	384	402	+18	
Equipment: Fieldwork	290	120	-170	Some of the equipment mentioned was not necessary to purchase. Personal equipment was used.

Other subsistence: Personal items, basic medicines if needed	50	34	-16	
Food: for 2 researchers during fieldwork, including refreshments for specific days of field for 3 people	732	492	-240	Travel expenses were less than expected.
Lodging: Accommodation during fieldwork for 2 researchers	1120	855	-265	Travel expenses were less than expected.
Transportation: vessels from San Andrés to Bolivar Cay Island and Albuquerque Cay Island, and from Cartagena to Isla Fuerte	906	1070	+164	Boats rent was a bit more expensive than budgeted but within the range. Even when the additional sampling points, mentioned in the point 1, were paid with this budget.
Airfare: flights Bogotá-San Andrés, San Andrés-Providencia, Bogotá-Cartagena round trip for 2 researchers	598	642	+44	
Lab analyses				Covered by Nat Geo and UNESCO grants
Lab tests				Covered by Nat Geo and UNESCO grants
TOTAL	**5000**	**5000**		1 GBP = 3,675.768 COP (rate used at the moment of the bank transference)

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

- Continue studying the processes that are affecting seagrass conservation the most.
- Take the information produced to a political level to create and promote easy management strategies in which local communities have to be the direct responsible of the implementation and outcomes. Of course, it needs to be developed with the technical support of an institution or a project.
- Strengthen the links between universities, NGOs, local institutions and communities to promote eco-tourism provided in small and medium scale by local people with activities that bring value added (e.g. scuba diving, hiking, coral, seagrass and mangrove restoration, local food and traditional experiences)

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?

Just through digital presentations for the talks, workshops and other activities. The logo will be used in posters or presentations in academic congresses and seminaries where the research results are going to be presented, as well as in the press article that will be published in the University Newspaper, where the foundation will be widely publicised.

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

Miguel David Barrios A
Project leader. Carried out all of the steps of the project, from the proposal and grant applications.

Mario Vargas Ramírez PhD.
Thesis supervisor. Support writing of the proposal, grant applications and final document, fieldwork in Providencia Island and lab work during the project.

Lina Barrios-Gardelis PhD.
Thesis co-supervisor. Support writing of the proposal and final document of the thesis, fieldwork in Albuquerque, Barú and Isla Palma, and lab work during the project.

Sophie Wulfing
Intern researcher. Support lab work and bioinformatics, and scientific paper writing.

Eduar Paez
Undergrad student at University of Cordoba. Support fieldwork in Isla Fuerte and Isla Tortuguilla.

John Carvajal
MSc. Student at National University of Colombia. Support fieldwork in San Andres

12. Any other comments?

The case of Sophie Wulfing's participation in the project is something that is worth mentioning. She is from Seattle (US) and studied a major in biology and a minor in mathematics at the Colorado College. She found my project on the Rufford website, looking for opportunities to come to Latin America to work in research and improve her Spanish, so we decided to help her. We registered her as a research visitor at the university and she came by her own resources to work with us in the project. She stayed in Colombia from August 20th to December 30th, 2019 supporting the lab work and bioinformatics analyses. All of it thanks to the information provided in the Rufford website.

External funding:

National Geographic Society Early Career Grant (£6006) was used instead of the Bank of the Republic of Colombia Grant for Scientific Studies (£4500) and Colombia Biodiversa Grant (£780).

UNESCO Young Scientists Award £ 2545) was used for additional sequencing and lab supplies needed to complete the analyses.