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 Details	
Full Name	Schery Umanzor
Project Title	Giant kelp restoration in Baja California, Mexico
Application ID	23217-1
Grant Amount	£ 5000
Email Address	scheryur@gmail.com
Date of this Report	September 19/2018

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
Install artificial reefs				We successfully installed 12 artificial modules constructed with relatively low cost materials that can allow scaling up. This pilot project covered approximately 175 m^2.
Grow giant kelp on the artificial reefs				We tested several planting methods to determine which one rendered higher survival rates.
Maintain and monitor kelp patches to promote ecological and socio-economic benefits				Contrary to what was expected, maintenance of the artificial structures was not laborious. We dedicated most of our efforts to monitor for recruitment, growth, and association of fauna.
Disseminate the information collected				We participated in workshops, presented during public seminars, and shared our experience with local and regional newspapers. We also initiated www.blueforest.mx, a webpage where we upload basic information on kelp forests, videos, and photos.
Build collaboration connections				Our project has caught the attention of several groups including fisher cooperatives, other research, and volunteers that are interested in starting or continuing collaboration efforts.

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

1) *Limited access to use the assigned boat as planned (due to un-programmed maintenance).*

We reallocated part of the funds assigned to *materials and supplies* to pay for transportation services provided by an artisanal fisherman. We also extended our working hours to minimize hiring this service.

2) *Delayed winter swells.*

Hostile maritime conditions started late winter restricting our activities during January and February 2018. To avoid extensive delays, we planned again our activities tackling specific targets. We also recruited highly qualified volunteers to help with every diving task.

3) Inadequate site selection.

We intended to explore a new site close to our docking facilities. This site showed to be unsuitable for kelp, presumably because high turbidity of the water column limited light penetration. We decided to remove all the artificial structures installed here and focus only on the site originally proposed.

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

a) We showed the feasibility of restoring giant kelp at a relatively low cost.

Before starting the project, our team was aware of the general opinion that restoring kelp is time consuming and expensive. In addition, comments abound on how little effective kelp restoration could because of reoccurring ocean heat waves and herbivory. We acknowledge that creating kelp patches requires a considerable amount of work but we also learned that the burden reduces as kelp individuals grow in size and number.

For this project, we carefully selected an area deprived of urchins. We also selected the ideal timing for transplantation. We transplanted kelp juveniles when waters were cool and rich in nutrients, which contributed to their overall development. As the experimental year progressed, we observed our patches follow the same trend as wild patches nearby, characterised by a rapid growth period in spring and summer, and followed by a slow decay as fall approached.

Moreover, we installed light weighted artificial structures that are also easy to remove. Our low-cost design did not exceed £ 1500 for the 12 units installed (approximately 6 m^2 each). Also, attach kelp individual to the structures we also used materials readily available. Altogether, this set of attributes invites for replication attempts by any interested person or organization.

b) We developed techniques and showed the feasibility to create underwater forests in areas never colonized by giant kelp.

We tested several planting methods and installed a series of light weighted artificial structures. These allowed us to explore the possibility of creating small kelp patches in areas where kelp cannot thrive due to the lack of hard substrate for attachment. This possibility opens a window of opportunity to enhance kelp propagation while providing working spots for fishers, new habitats, and recreational and educational sites.

c) Sharing our experience awakened interest by colleagues, primary users (mainly fishers), and the general public.

While presenting the general idea of this project, we received plenty of comments related to the high costs and unfeasibility of restoring kelp patches. Comments

abound on how this idea was already tested and how California, US has a long history of trials and errors. As months progressed and as we shared pictures and videos, we gain credibility and support to continue with our project. To date, our team includes volunteers with different backgrounds, ranging from researchers to students. We have also started conversations with fisher concessionaires and cooperatives to join efforts in growing kelp patches throughout different sites of interest.

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

This pilot project consisted of participatory research with local volunteers to assess the feasibility of restoring giant kelp patches. The motivation of this research derivate from general concerns related to the loss of giant kelp forests in northern Baja California. Throughout these 12 months, our team have interacted with and trained several volunteers that help us installing the artificial substrates, transplanting young kelp onto the artificial structures, growing and maintaining kelp in the laboratory, and overall assisted in maintaining and monitoring the operation. We have also shared our experience with boaters who agreed to contribute to the project by lowering the price of the services provided to us. This project has also contributed to small local businesses that provided the necessary supplies for diving at a special price.

More importantly, through our various public presentations, we showed a pathway to create small kelp patches. Our team has shared the basis of our approach focusing on its ease to be replicated as it requires no special skills or high training. As of today, public media and fisher cooperatives have approached requesting additional information and insights. Through our volunteering program, this grant has also (indirectly) supported a small section of one undergraduate and one graduate thesis. These two students further analyzed tissue samples from our routine collection.

5. Are there any plans to continue this work?

Yes, we will like to replicate this project by creating kelp patches on strategic sites. On this occasion, we will like to encourage restoration as a way of enhancing nutrient bio -extraction in coastal areas. Now that we have developed relatively low costs techniques to create giant kelp patches, we can evaluate different strains in their ability to remove excess nutrients from the ocean, thus contributing to a healthier seawater ecosystem.

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

Throughout the last 12-months, we have shared our objectives and preliminary results with local and national press and online media. We also gave two public seminars, participated in a news conference, and in a seaweed farming training.

Online and press media

- National Newspaper- El Universal

Recuperación de los mares (Recovering seas)
https://www.pressreader.com/mexico/el-universal/20180402/282711932588233

Bosques y praderas bajo el mar (Underwater forests and meadows)
http://www.eluniversal.com.mx/ciencia-y-salud/ciencia/bosques-y-praderas-bajo-el-mar

- National online scientific newspaper- Conacyt Agencia Informativa

Sargazo gigante para reforestar el mar (Giant kelp to reforest the sea)
http://www.conacytprensa.mx/index.php/ciencia/mundo-vivo/20089-sargazo-kelp-uabc-cicese

- Local newspaper- El Vigía

Sargazo gigante para reforestar el mar (Giant kelp to reforest the sea)
http://www.elvigia.net/general/2018/2/15/sargazo-gigante-para-reforestar-296061.html

- National online environmental media:

El declive del sargazo gigante (The decline of giant kelp)

1) *https://www.efeverde.com/noticias/declive-del-sargazo-gigante/*
2) http://www.elvigia.net/general/2018/2/15/sargazo-gigante-para-reforestar-296061.html

Presentations:

- Public seminar at Scientific Research Centre and Higher Education of Ensenada (CICESE) - Federal research institution in Ensenada, Baja California
- Public seminar at Instituto de Investigaciones Ocenológica (IIO) - State institution within the Autonomous University of Baja California.
- Seaweed Culture Course, 2018 instructed by the Marine Botany Laboratory (IIO).
- News conference: *Enfrentar el cambio climático: Cooperación Binacional y Recursos Transfronterizos (Face climate change: Binational cooperation and transboundary resources)*

We will also continue updating our webpage (www. Blueforest.mx) with pictures and videos collected throughout this 12 months. Our next step is to finalize processing data to prepare a scientific paper.

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

We used the grant over the intended 12-month period. We invested a large percentage of the funds during the first five months of operation, while the rest was used evenly throughout the remaining eight months.

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
Materials and supplies	560	1480	-920	Cost of steel and labor increased significantly from the time budgeted. Also, we constructed more artificial structures than originally planned. The additional construction will reduce costs for future operations.
Equipment	2200	1915	285	The difference reflects the special prices offered by our suppliers.
Fuel/transportation	1160	1361	-201	Mexico experiences monthly increases in fuel costs per liter. In addition, differences reflect the cost of hiring private boat services.
Food and beverages	1080	218	862	We minimized these costs to reallocate funds to the materials/supplies and fuel/transportation entries.

**currency exchange rate: £23.6 per Mexican Peso. Our bank account works with US dollars. Currency exchange to Mexican pesos was subject to significant daily changes.*

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

We have already identified the pathways and opportunities but also challenges to progress with kelp restoration. It is, therefore, of utmost importance to strengthen our relationship with the private sector and other public institutions. Strategic alliances will allow us to disseminate our experience further and to increase support labor and funding.

10. Did you use The Rufford Foundation logo in any materials produced about this project? Did the Foundation receive any publicity during the course of your work?

Yes, we included The Rufford Foundation logo in all the public presentations. The name "The Rufford Foundation" was also included in the online and press media articles. Lastly, the two students who further analysed kelp tissue collected for this project will also acknowledge The Rufford Foundation in their academic theses.

In fact, on several occasions, we were asked to provide more information about the foundation.

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

Schery Umanzor and **José Sandoval Gil** were the Principal Investigators of the project. Our role as dive leaders and coordinators was to set the logistics for the deployment, maintenance, and monitoring of kelp. We also approached media members, gave presentations, and recruited volunteers.

José Manuel Guzmán was our safety officer and captain. His duties included (but were not limited) to acquiring and preparing all necessary supplies, constructing the artificial structures, and driving the team on land and water.

Mariana Sánchez oversaw the production of kelp juveniles under laboratory conditions. These kelps were then installed onto the artificial reefs.

Volunteers:

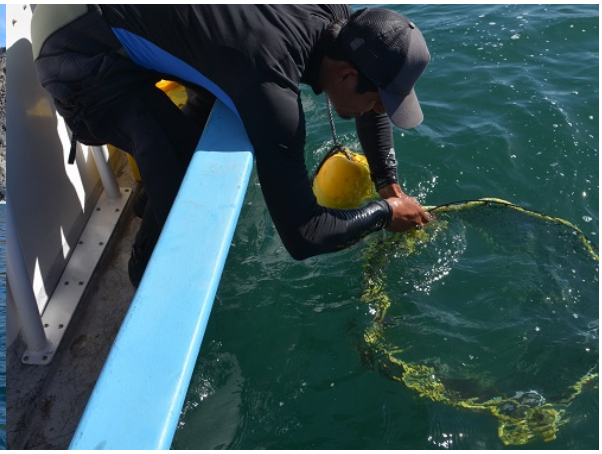
Diana Higuera	**Laura Cívico**	**Adolfo Loya**
Diego Guzmán	**Zarko Altamirano**	**Aaron Ibarra**
Eliot de la Cruz	**Sandra Huertas**	**Anahí Bermúdez**

All the volunteers assisted in either installing, maintaining or monitoring the kelp patches. All are certified divers that worked with us since we first started the project in October 2017 or joined later on.

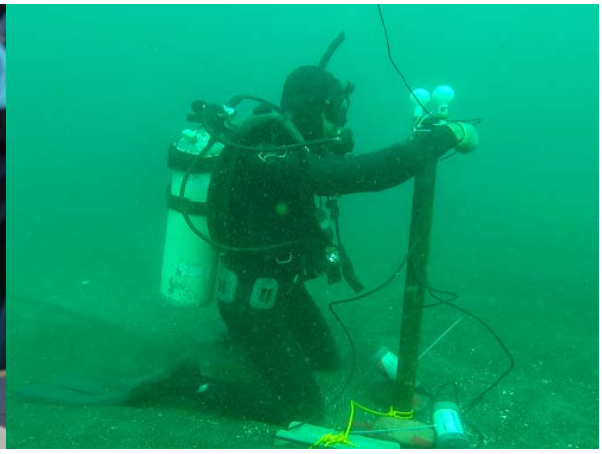
12. Any other comments?

Our team certainly appreciates the support and vote of trust by The Rufford Foundation. Through this project, we have demonstrated that we can take small but accurate steps towards building resiliency in coastal waters. As once advised, because we are a group of young researchers teaming up with even younger people, we are demonstrating that thinking outside the box can inspire change.

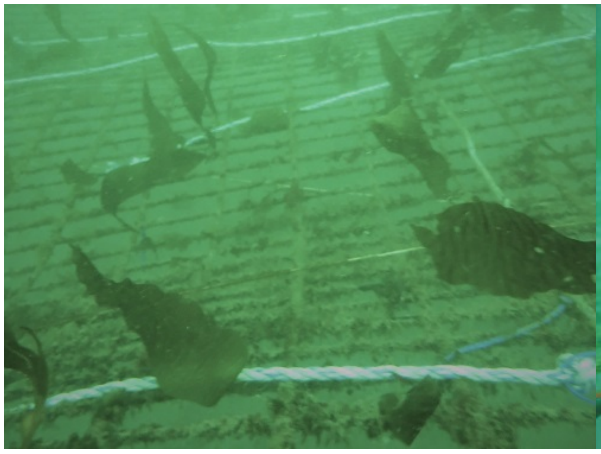
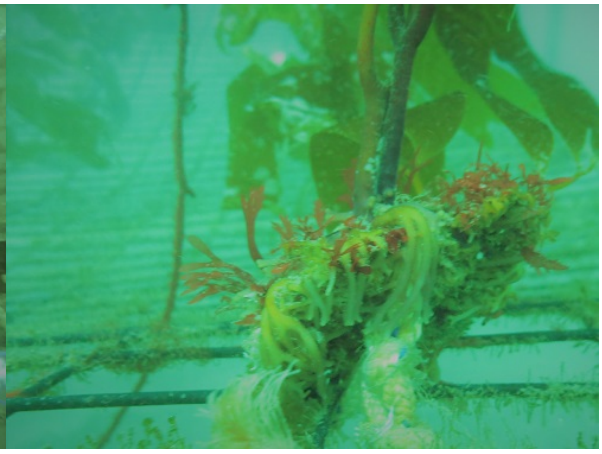
This proof of concept was only possible thanks to your support. We hope to use this experience and training to increase local and regional restoration efforts.

Left: Our team ready to dive. Right: Zarko Altamirano (volunteer), preparing to unload part of the artificial reefs.



Left: Light sensor installed at site prior to deploying the artificial reefs. Right: We installed some measuring equipment nearby our kelp patches.

Left: Initial transplants installed onto one of the artificial reefs. Right: Picture shows development of holdfast onto our artificial reefs.

Left: Our biggest kelp individuals grew up to 9 meters in length. Right: Kelp individuals after 4 months of transplant.