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

Grant Recipient Details	
Your name	Rocio Alvarez Varas
Project title	Research and Conservation at the Southernmost Foraging Site for Black Sea Turtles (*Chelonia mydas agassizii*) in the South Eastern Pacific
RSG reference	15833-1
Reporting period	November 2014-November 2015
Amount of grant	£4920
Your email address	garaparatomachi@gmail.com
Date of this report	01/02/2015

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
To determine the importance of sea grass in black turtle's diet through stable isotopes techniques			X	Even though we only analysed skin samples, our study helped us to out rule the importance of seagrass in black turtle's diet.
To educate, raise awareness and involve the surrounding human communities in the conservation of coastal and marine biodiversity of Salado Bay			X	We carried out oral presentations in local community schools. We also did workshops with fishermen, as well as discussion tables with the local community. All of which was done within the schedule stipulated in our project proposal. The activities described previously, were very successful. However, we detected through the surveys that were carried out with fishermen, a lack of basic knowledge about sea turtles. That is why we had to adapt the content of the workshops, in order to have the desired effect. These workshops were focused on basic features of sea turtle biology, and how to act in cases of sea turtle entanglement in fishing gear (40% of fishermen have had sea turtle bycatch in their fishing nets). We managed to generate a contact network with local fishermen, as well as a very good relationship with them. That is why we hope to start new workshops of sea turtle monitoring, in the present year (we are going to do this with the collaboration of another NGO which is dedicated to sea turtle bycatch in the Eastern Pacific).
To establish along these communities, sustainable economic proposals based on the natural resources of the area and its surroundings.		X		The strong social conflict related with a thermoelectric plant construction (local community of Totoral with different opinions) complicated the phase of economic proposals during the development of our work. Due to the latter, we had to adjust, and as a first step stablish a close relationship with the

				local community. We managed to do this, sharing knowledge about sea turtle biology, as well as information about our study, and also discussing some alternatives of legal protection of the study area. Stablishing sustainable economic proposals based on the natural resources of the area and its surroundings will be a topic that we will have to approach in the near future.

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

Due to technical laboratory difficulties, we could not analyze blood and carapace samples (we only analyzed skin). However, through the skin samples we obtained relevant results about black turtle diet in the study area. The latter, allowed us to fulfill our project objectives that were proposed initially. We hope to process the rest of the tissues (blood and carapace), within the following months.

Fishermen workshops contents had to be adapted due to the survey results. That is why, workshops were focused on basic sea turtle biology and sea turtle bycatch. We did not include topics related with sea turtle monitoring in Bahía Salado. We considered that it was more necessary to train them, in order to manage cases of sea turtle entanglement in fish nets (due to the high number of cases registered through surveys). Then, we taught them how to monitor sea turtle population. We hope to continue with these workshops, focusing more in sea turtle population monitoring in the present year.

Some difficulties emerged related with sustainable economic proposals for the community of Totoral. This happened, because there are antagonist opinions regarding a thermoelectric plant construction (some families have even received money and goods from the planners of the thermoelectric project). The previously explained matter, forced us to modify our plans, by focusing in the first place, in gaining the trust of the local community, in order to suggest a discussion of sustainable economy in this locality. Fortunately, we managed to stablish an excellent relationship with people, so our next step is to discuss this topic with the local government, with which we have a very good relationship and also credibility.

During the end of the project, we had difficulties informing our stable isotopes results, because of a delay of the lab report. The latter, delayed mainly the delivery of the final report. However, this situation was informed to the project manager (Jane Raymond) with whom we agree on a new due date.

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

a) The results of our Stable Isotope Analysis (SIA) indicated that seagrass (*Zostera chilensis*) and brown algae (*Macrocystis pyrifera*) were the principal components in

black turtle diet at Bahia Salado (Figure 1 and 2, Table 1). The seagrass appeared with a mean contribution of 30.3% as the principal compound of the putative diet sources analyzed, ranging from 8 – 53% in an estimated 95% high density region (hdr) (Figure 2, Table 1). Seagrass was closely followed by the brown algae *Macrocystis*, with a mean proportion of 25% and a 95% hdr ranging between 1.5 – 44%. Lesser contributions were estimated for *Ulva* with a mean proportion of 18.33%, Anemones with 15.6% and red algae with 11%, however did the 95% hdr of red algae and *Ulva* both include 0, suggesting that their overall diet contribution might be less.

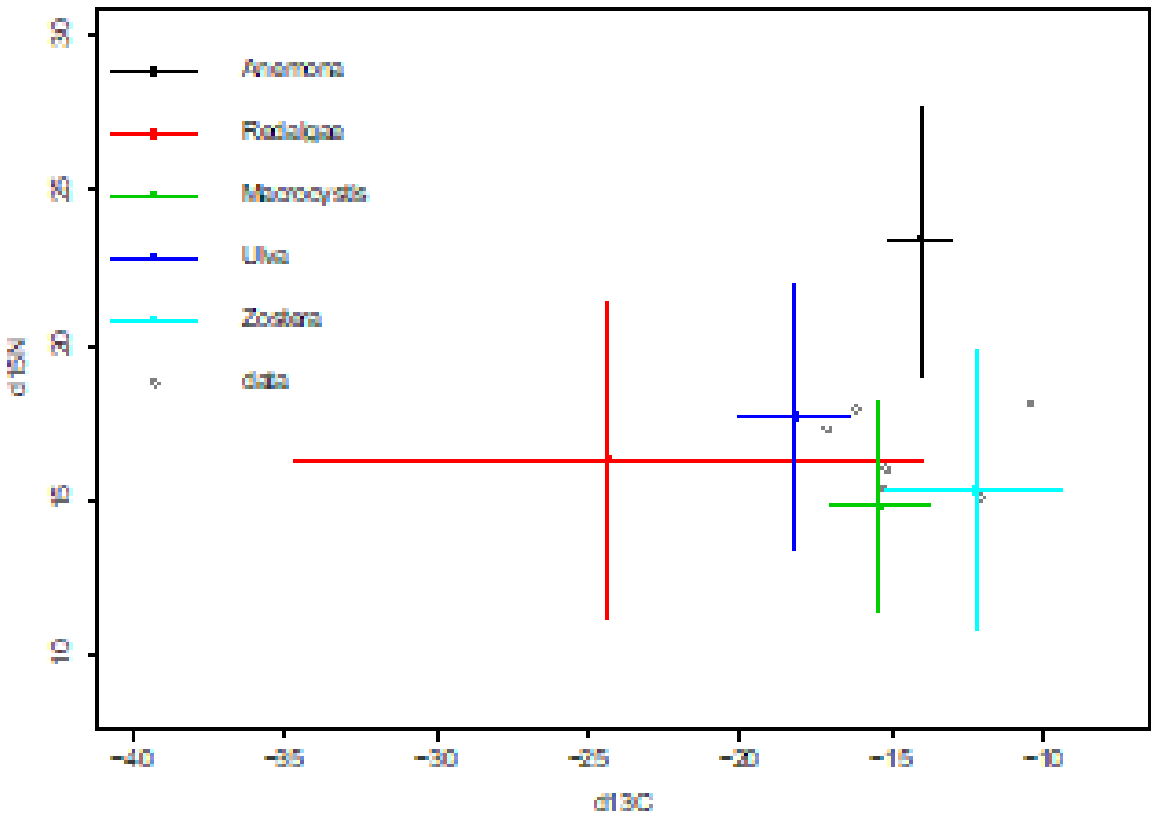

Figure 1: Stable Isotope plot for all black turtle (*Chelonia mydas*) values (dots) accounting for tissue-specific discrimination factors with putative prey species and their mean and standard deviations.

Table 1: $\delta^{15}N$ and $\delta^{13}C$ values for putative prey species sampled at Bahía Salado. %N and %C content is given when available

Putative prey species	N	**$\delta^{15}N$ ‰**	**$\delta^{13}C$ ‰**	**%N**	**%C**
Anemones					
Anthothoe chilensis	3	18.91 ± 2.67	-13.89 ± 0.43	5.68 ± 1.61	35.93 ± 9.44
Phymanthea pluvia	3	21.72 ± 2.22	-14.20 ± 0.16	8.27 ± 2.60	38.77 ± 10.51
Anemonia	3	21.23 ± 0.65	-14.58 ± 0.77	7.28 ±	36.97 ±

alicemartinae				3.05	14.11
Mean	9	20.62 ± 2.19	-14.22 ± 0.54	7.08 ± 2.44	37.22 ± 10.06
Red algae					
Asparagopsis armata	3	11.82 ± 2.32	-31.29 ± 0.92	-	-
Ceramium sp	3	16.32 ± 0.88	-21.93 ± 0.79	-	-
Chondrus canaliculatus	3	12.34 ± 1.49	-20.32 ± 0.84	-	-
Mean	9	13.49 ± 2.57	-24.51 ± 5.18	-	-
Brown algae					
Macrocystis pyrifera	5	12.00 ± 1.71	-15.61 ± 0.84	-	-
Green algae					
Ulva sp	3	14.89 ± 2.16	-18.36 ± 0.91	-	-
Seagrass					
Zostera chilensis	3	12.53 ± 2.29	-12.44 ± 1.48	-	-

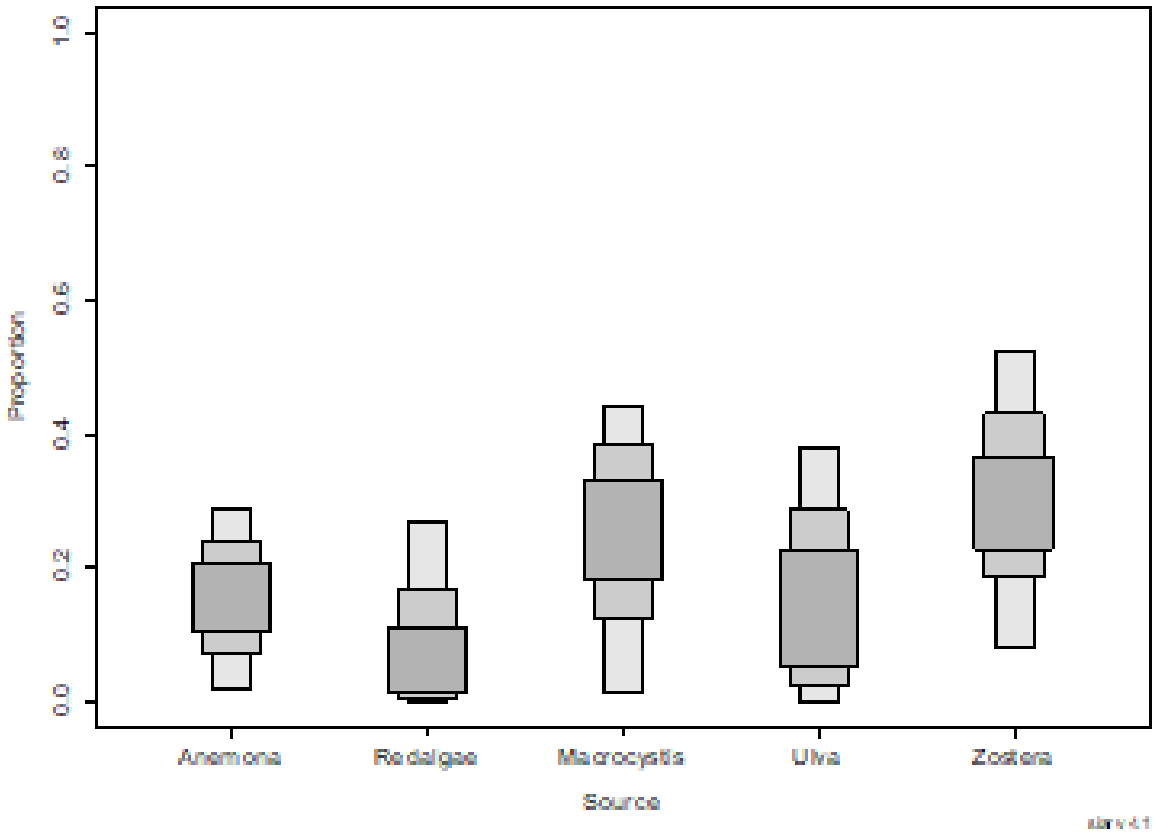

Figure 2: Box plots illustrating the contribution ranges following stable isotope analysis of five putative diet compounds for black turtles (*Chelonia mydas*) at Bahía Salado. 5, 25, 50, 75 and 95% credibility intervals are shown.

b) Demonstrate the importance of seagrass in black turtle diet (both species are classified as Endangered by the IUCN) at Bahía Salado. This will allow us to objectify the ecological value of this place, and therefore to facilitate its protection by the local and national government. This information with be used as a key tool, in environmental education for the conservation of this marine ecosystem. On another hand, this study constitutes the first project studying trophic ecology of black turtles in Chile, being a huge contribution to the scientific community.

c) All the information generated about black turtle ecology and health, at Bahía Salado, allowed us to create the "Pilot plan of sea turtle conservation and management at Bahía Salado, Chile". This plan was handed to the Environmental Secretary of the Atacama Region, in July 2015. This action plan included detected threats, control and mitigation measures, as well as legal figure of protection and administration (Marine Reserve). All this information, also allowed us to collaborate with the Environment Ministry of Chile, in order to re-classify *Chelonia mydas* in the National Species Classification Regulations (RCE, by its Spanish abbreviation), changing its classification from "Insufficiently Known" to "Endangered".

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

- We carried out semi-structured surveys to fishermen living in surrounding areas, in which we obtained information about the knowledge, perception and attitude of fishermen towards marina biodiversity at Bahía Salado. This allowed us to furtherly do fishermen workshops, which were focused on sea turtle biology, and what to do in cases of sea turtle entanglement in fish nets (theoretical and practical sessions). Fifty fishermen were beneficiated with the knowledge and skills given by this activity.
- We did educational talks in two public elementary schools at Caldera, for eight-year-old students. This activity was carried out through two sessions: a theoretical one (classroom participation) and a practical one (games). The sessions were focused on topics related with marine environment care, as well as the importance of Bahía Salado as a habitat for black turtles and seagrass meadows. 150 children benefited from this activity.
- We carried out local community discussion tables with the local community of Totoral between November 2014 and February 2015. We shared knowledge about sea turtles and seagrass biology, as well as results from our study at Bahía Salado. Furthermore, we discussed about some alternatives of legal protection for the study area. Thirty-five people participated of this activity.
- In June 2015 we did an activity with Caldera's Municipality, embedded in our campaign "Say NO to plastics". 120 people participated of this activity.
- Within all the outreach activities included in the present Project (between November 2014 and November 2015) that were carried out at the Atacama and Metropolitan (where our headquarters are located) Regions, we estimate a total of 1,970 participants, including children and adults.

5. Are there any plans to continue this work?

Yes, we continue monitoring this black turtle population. Furthermore, since September 2015, we started an ecological and genetic study on seagrass (*Zostera chilensis*) in collaboration with the Universidad de Valparaíso. In the present year, we are going to continue with fishermen workshops, in order to train them in sea turtle monitoring at Bahía Salado. Our idea is to hand them file cards, a photographic camera and a first aid kit with tools for measuring animals. Furthermore, we are going to continue with oral presentations and talks, in other public schools of Caldera. We are also going to continue with discussion tables with the local community, to discuss sustainable economic alternatives at Bahía Salado. In the same manner we have done it in previous years, we are currently applying to foreign continuity funds and grants, for our research and environmental education activities. On another hand, all the information generated in this project is being gathered in a single document, which main purpose is to make a formal proposal to the Environmental Ministry of Chile, to create a "Marine Reserve" at Bahía Salado.

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

Results obtained during the development of this project have being shared by different means:

a) General public: through environmental fairs, where we put our stand with information, and we carry out educative activities mainly for children. Some examples: Chilean Wildlife National Day (November 2014 and 2015), Ecological fair of Caldera (June 2015), Taller Siete Colores (July 2015), San Bernardo's Environmental Fair (August 2015), El Bosque's Municipality Environmental Fair (August 2015), Santiago's Environmental Fair (FEMAS by its Spanish abbreviation; November 2015).

b) Universities and NGOs: through oral presentations as well as workshops on specific topics. Some example are the oral presentations done at the "Marine Wildlife Conservation Seminar", carried out at Universidad Mayor (November 2014) and at the seminar "(Re) Thinking Nature Conservation: Chilean challenges for the next decade", carried out at the National Zoo of Chile (August 2015).

c) Congresses and scientific meetings: both national and international. Some examples are:

- Cortés, V. & Álvarez-Varas, R. 2014. Artisanal fishermen interaction with sea turtles at Bahía Salado, Atacama Region. XVIII Veterinary Medicine Congress, Santiago de Chile. Poster.
- Contardo, J., Figari, E., Kuzmicic, B. & Norambuena, F. 2015. Environment and sea turtle conservation workshops for local community at Atacama Region, Northern Chile. 35th Symposium on Sea Turtle Biology and Conservation, Dalaman, Mugla, Turquía. Oral presentation.

- Cortés, V., Stowhas, P., Vuskovic, T. & Álvarez-Varas, R. 2015. Sea turtles and bycatch in northern Chile: the need to create management strategies that engage the artisanal fisheries. 35th Symposium on Sea Turtle Biology and Conservation, Dalaman, Mugla, Turkey. Oral presentation.
- Brito-Carrasco, B., Contardo, J., Bahamondes, P., Forero-Rozo, L. & Álvarez-Varas, R. 2015. Bahía Salado's sea turtles and seagrasses: a productive and high ecological value ecosystem. 35th Symposium on Sea Turtle Biology and Conservation, Dalaman, Mugla, Turkey. Poster.
- Álvarez-Varas, R. 2015. Qarapara Sea Turtles Chile NGO. Latin-American Regional Meeting (RETOMALA, by its abbreviation in Spanish), 35th Symposium on Sea Turtle Biology and Conservation, Dalaman, Mugla, Turkey. Oral presentation.
- Pereira, S., Contardo, J., Brito, B. & Álvarez-Varas, R. 2015. Photo-identification as a backup technic to traditional marking of black turtles (*Chelonia mydas*) at Bahía Salado, Atacama Region. XXXV Sea Sciences Congress, Coquimbo, Chile. Oral presentation and poster.

Furthermore, this year other posters are going to be presented at the 36th Annual Symposium on Sea Turtle Biology and Conservation in Lima, Peru:

- Álvarez-Varas, R., Bahamondes, P., Cortés, V., Brain, M.J., Medrano, C., Forero-Rozo, L., Heidemeyer, M. & Contardo, J. Living at the southern tip: characterization of the most austral Eastern Pacific green turtle (*Chelonia mydas*) aggregation and its habitat in Bahía Salado, northern Chile. Poster
- Contardo, J., Jáuregui, M., Heidemeyer, M. & Álvarez-Varas, R. First approach of black turtle (*Chelonia mydas*) trophic ecology in Bahía Salado, Northern Chile, using stable isotope analysis. Poster.
- Pereira, S, Contardo, J, & Álvarez-Varas, R. Population characterization and photo-identification of black turtle (*Chelonia mydas*) aggregation at Bahía Salado, northern Chile. Poster.

d) Publications: we are currently preparing a scientific note about health, genetic and stable isotopes results for the Journal of Marine Biology and Oceanography (Revista de Biología Marina y Oceanografia in Spanish).

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 carried out within the period of 12 months as it was planned. The delay in sending the final report was due to technical problems of the stable isotope's lab.

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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Diving equipment	420	420	0	
Car rental (2 field campaigns)	2800	5600	2800	Two campaigns in order to complete the year (for each season) were financed by Qarapara Sea Turtles NGO.
Haematology and biochemical blood laboratory analysis (x30 samples)	0	0	0	This analysis was part of an undergraduate thesis of veterinary medicine. Therefore, it was carried out by a student of Universidad de Chile. Analysis costs were covered by the university as well as other funds granted to the NGO.
Pollutant laboratory analysis (x30 samples)	0	0	0	This was financed by other funds granted to the NGO.
Stable isotopes laboratory analysis (x30 samples)	500	500	0	These analyses were done at Chile. The costs of skin analysis were the same that we planned from the beginning (500). That is because we finally analysed skin turtle samples, as well as food items samples.
Food supplies (4 field campaigns)	200	400	200	We requested a higher number of volunteers during the summer and spring campaigns, which elevated food supplies costs. These extra costs were covered by the NGO.
Educative materials	400	800	400	We invested more funding in educative and outreach activities. These extra costs were covered by the NGO.
Stipends	600	600	0	
Total	4920	**4920**	3400	In general, extra costs were covered by NGO internal funds granted in 2014 and 2015.

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

Our next steps include:

- Continue monitoring seagrass meadows and sea turtles at Bahía Salado.
- Train local fishermen, in order to involve them with sea turtle monitoring at Bahía Salado.
- Continue with oral presentations and educative activities with children at public schools of Caldera.
- Continue carrying out discussion tables with local people of Totoral, to discuss and stablish sustainable economic proposals.
- Propose converting Bahía Salado in a Marine Reserve to the Environmental Ministry of Chile.
- Continue applying to foreign financing funds, which would allow us to finance environmental education and research campaigns.
- Publish our main results through a scientific note in the Journal of Marine Biology and Oceanography.

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

The Rufford Foundation logo was included in all the oral presentations done at congresses, scientific meetings, talks and workshops. Even more, it was included in all the stands installed during environmental outreach activities.

11. Any other comments?

We are grateful of the funds granted by the Rufford Foundation, because it allowed us to continue developing research and environmental education activities at Bahía Salado, including local communities. This fund, specifically allowed us to elucidate the importance of seagrass in black turtle diet at this bay, giving our work an outstanding ecological value. By these means, our work also set the basis for an effective protection and conservation of this particular ecosystem, as well as all its components. We hope that these results will allow us to stablish a Marine Reserve in a short-term at this place. We also hope that our results will help to avoid the execution of large-scale projects that would jeopardize the conservation of this ecosystem as well as the economy of the local communities, such us thermoelectric plants or industrial ports. We are very happy with our results, achievements and fulfilled objectives of this project. Thank you!!!