

The Rufford Small Grants Foundation

Final Report

Congratulations on the completion of your project that was supported by The Rufford Small Grants Foundation.

We ask all grant recipients to complete a Final Report Form that helps us to gauge the success of our grant giving. 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. 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	Iris Segura
Project title	Conservation and management of small cetacean species, <i>Tursiops truncatus</i> and <i>Delphinus</i> spp., in the Gulf of California, Mexico
RSG reference	02.05.08
Reporting period	September 2008 – September 2009
Amount of grant	£5705
Your email address	i.h.segura-garcia@dur.ac.uk
Date of this report	30th November 2009

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
Collection of new samples		YES		We gathered additional samples for both species, which successfully increased our DNA archive and sample sizes for this project (Biopsy samples: bottlenose dolphin n= 36, common dolphin n= 62. Tooth and bone samples: bottlenose dolphin = 15, common dolphin n= 30). More samples are needed still for bottlenose dolphin coastal populations across the length of the gulf. Regarding common dolphin species, it would be worth increasing sample size from the northern region, to better evaluate the stock identity of these dolphins groups within the gulf.
To asses level of population structure of bottlenose dolphins			YES	Molecular analyses of mtDNA control region sequences and 10 microsatellite loci data suggest the distinction of three management stocks of bottlenose dolphins (two coastal populations: northern Gulf and lower mainland coast, and an offshore population, which includes the offshore dolphins sampled from the Midriff Islands to the mouth of the gulf.
To asses level of population structure of long-beaked common dolphins			YES	Molecular analyses of mtDNA control region sequences suggested the occurrence of two management stocks of long-beaked common dolphins within the Gulf of California (Northern-Central Gulf and Southern Gulf). However, the results based on 18 microsatellite loci suggested that long-beaked common dolphins within the gulf are a pan-mictic population. We strongly suggest that increasing the sample size in the northern region of the gulf; could increase the statistical power of the molecular analyses. Thus, we can evaluate accurately the level of population genetic structure of the long-beaked common dolphin.

To assess dietary preferences of the cetacean species studied		YES		We found significant differences in both $\delta^{13}C$ and $\delta^{15}N$ values among dolphins from different regions of the gulf and between species. This result supports the existence of a regionalization pattern across the length of the gulf. Moreover, it suggests a long-term ecological affinity of dolphin individuals; this might also suggest a certain degree of residence in a particular region. However, more samples from the northern region are needed to better evaluate the resource specialization of dolphins and regionalization of the gulf.
To join the “Vaquita Project” As recommended by RSG.				We managed to connect the current project to the “Vaquita Project”. The results of the present study are of a crucial importance to improve and support the conservation actions that are effectively taking place in the northern region of the gulf.

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

I) Swine Flue

Our main difficulty was the occurrence of swine flu. Given the contingency program carried out in the Mexico, almost all the research centres, besides schools and universities, were closed for a long period of time, which halted the normal progress of the project. Our major difficulty was travelling among sample localities - given the severity and the rate of infections, the federal government strongly suggested prevention of travel.

II) Analyses delay

The second difficulty was the delay of the stable isotope analysis. In the first place, the stable isotope analysis was planned to be conducted at Durham University. Unfortunately, the mass spectrometer was out of order for some time. We agreed to conduct the analysis in collaboration with a research centre in La Paz, Baja California, but given the swine flu contingency we could not travel to La Paz, moreover the centre was closed. To overcome this situation we processed the biopsy samples for the stable isotopes analyses at Ensenada, Baja California in collaboration with CICESE and processed samples were sent off to UC-Davis facility for analyses. Fortunately, funds were sufficient to overcome the situation and to achieve this objective.

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

1) Identification of bottlenose dolphin management stocks within the Gulf of California

Mitochondrial and microsatellite data analyses revealed a fine geographic scale genetic structure of GC bottlenose dolphins. The results strongly suggest the identification of three population stocks within the gulf. The population stocks identified are: the Northern Gulf coastal population, the

lower coast mainland population (Guaymas-Sinaloa-Jalisco) and finally, the offshore population from the Midriff Islands to the mouth of the Gulf. The stable isotope analyses showed differences between dolphins sampled around the Midriff Islands and those from the mouth of the Gulf (analyses conducted by Díaz-Gamboa), suggesting long-term ecological affinity of the offshore population across the length of the Gulf. Unfortunately, the sample sizes of the coastal populations limited our results interpretation for the coastal population stocks. Supplementary sampling effort will be needed in specific areas, for instance the Upper Gulf of California, in order to accurately test the hypothesis of resource specialization driving population differentiation in these highly mobile animals.

2) Bio-regionalization: the Northern Gulf distinction

The distinction of the bottlenose dolphin northern population is consistent with the general pattern of regionalization of the Gulf. Moreover, this population differentiation is strongly coherent with the biogeographic pattern of several taxa, which suggests the presence of evolutionary forces is leading to population differentiation within the Gulf of California, even in highly mobile animals. This result also emphasized the evolutionary and ecological uniqueness of this region. The northern region of the Gulf is currently recognized as a priority for conservation actions, given its uniqueness and level of endemism, for instance the vaquita (*Phocena sinus*), the smallest and the most endangered cetacean species in the world. This result will reinforce the new protection policies increasingly taking place in the Upper Gulf, such as total ban of fishing practices within this particular region. Therefore, the new regulation of the fishing practices: 1) protects the vaquita from entangling in fishing nets; 2) reduces the by-catch rates of other small cetaceans inhabiting the region, for example common dolphins; and 3) prevents environment and critical habitat destruction.

3) Long-beaked common dolphins gulf population-stock

In contrast to bottlenose dolphin, the preliminary results on the population structure of long-beaked common dolphin show ambiguous results. The mtDNA analyses indicated certain extent of population subdivision, while the microsatellite data suggested that long-beaked common dolphins within the gulf are a pan-mictic population. The discrepancy between both molecular markers results suggests that existence of gene flow mediated mainly by males. Moreover, we were able to compare the molecular data from the Gulf population with data obtained from dolphins of the Pacific coast of northern Baja California; the results suggested that the long-beaked common dolphins represent an isolated population stock from the Pacific Ocean. Further and ongoing analyses will enhance our interpretations.

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

Fishermen and their families were the main sector of the local communities that benefitted from and were involved in this project. For the current project we aimed to hire local fishermen, not only for their sailing skills, but in order to bring in another attractive economical activity and income than fishing. We also tried to integrate their families, mainly children, by teaching them what are dolphins, what is their roll in the marine environment, and why we were there looking for dolphins. I am please to say they responded fully interested. We strongly believe that working closely with community members reduce social rejection of scientific research in the region, which is common among ethnic groups, for example the Yaquis along the coast of Sonora.

5. Are there any plans to continue this work?

Yes, absolutely. There remain unanswered questions on the mechanisms driving population structure of small cetacean species within the Gulf of California. We have initiated a new collaboration that will bring in additional samples from the central region of the Gulf. We would also like to complete our DNA archive by increasing the sample effort in the northern region. Ongoing analyses and further collaboration with NOAA will also allow the comparison of gulf populations with the Pacific Ocean populations.

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

We have presented our main results at different national and international conferences:

Segura, I. 2009. Conservation from genes to ecosystems: The Gulf of California dolphin case. Ustinov Seminar, Ustinov College-Durham University, February 2009, Durham, UK.

Segura, I and A. R. Hoelzel. 2009. Population structure and local adaptation of small cetacean species along the western coast of Baja California and within the Gulf of California. Postgraduate research week-School of Biological and Biomedical Sciences, Durham University, March, 2009, Durham, UK.

Segura, I and A. R. Hoelzel. 2009. Genetic differentiation of common dolphins, *Delphinus spp.*, in the western coast of Baja California and within the Gulf of California. Annual meeting of the International Whaling Commission, May 2009, Madeira, Portugal.

Beside the above communications we are working in at least two peer review papers:

Genetic population structure of bottlenose dolphin, *Tursiops truncatus*, within the Gulf of California and western coast of Baja California, Mexico.

Genetic population structure of the long-beaked common dolphin, *Delphinus capensis*, within the Gulf of California and western coast of Baja California, Mexico.

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

We used the RSG for the entire period of the project from November 2008 to October 2009.

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
Boat surveys	1900	2250	+350	An unforeseen increment on fuel costs resulted in a variation on the survey expenses.
Biopsy equipment Modified darts	250	400	+150	During the first surveys we lost a couple of darts, so we needed to purchase more to replace them.
Travel expenses	305	350	+45	Changes in airfares

4x4 Truck rental	500	430	-70	We used an institutional vehicle a few times that we only need to pay for fuel.
Meals and lodging	1750	1530	-220	We got a discount in accommodation on a few occasions.
Stable isotope analyses	1000	800	-200	Due to the delay on this analysis, we could not process as many samples as were planned originally.
TOTAL	5705	5760	+ 55	

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

Next important steps are:

- continue the sampling effort along the coast of the gulf and if possible the Pacific coast;
- promote the existence of stranding networks, which will improve the mortality records beside this being a great opportunity to increase DNA archive;
- complete comparisons of the Gulf of California and the Pacific coast populations;
- analyse the vulnerability of dolphin population stocks identified and to assess the health of the environment, by evaluating the genetic diversity of nuclear genes associated with immune response.

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

The RSGF logo was used in all our presentations and posters at local and international meetings. We also acknowledged RSG for their financial support at the end of our two articles.

11. Any other comments?

I would like to thank RSG for their support. This work would have not been possible without your help and support.