

# The Rufford 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	Ricardo Jessouroun de Miranda
Project title	Assessment of Management Actions and Impacts of Invasive Cup Coral on Ecological Processes (recruitment and herbivory) in Brazilian Coral Reef
RSG reference	16441-2
Reporting period	March 2015 – November 2016
Amount of grant	£4902
Your email address	ricardojdemiranda@gmail.com
Date of this report	November 24, 2016



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 perform			х	We conducted experimental removal		
				on reer sites with low dilen cordi cover		
and continuous				$(\geq 1\%)$ that has been recently invaded		
arrival of invasivo				(2015 drid 2016) Inner leers in the rodos		
recruits on cord roof				os santos bay. The monitoling of recruits		
area				was performed.		
To investigate the		Y		We concluded the herbivory		
effects of Cup Coral		^		experiment The recruitment		
(Tubastraea				experiment was implanted in		
taausensis) invasion				December 2015 and will be concluded		
success on two				in December 2016. Although partial		
relevant ecological				results of recruitment experiment show		
processes, coral				that the invader recruits density was		
recruitment and				higher in areas with high invader cover,		
herbivory (by reef				native coral recruitment need be		
fishes).				analysed yet.		

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

The recruitment experiment deployment required high human cost (physical effort to fix recruitment plates on the substrate) and excellent water visibility (>10 m, only during summer season from December to March). We expend four expeditions to deploy the recruitment plates and it was concluded later than predicted (December 2015). Due to necessity to run experiment during one year to enable native coral reproductive events, the conclusion of experiment (removal plates) will occur in December 2016. In addition, the alien coral removal actions on the reef sites with high alien coral cover (Cascos Reef) had also high human cost (number and physical power divers) and because this we performed manual removal on reef sites with low alien coral cover to reduce cost and potentially increase efficiency to



control alien populations. However, the realisation period of this project was not sufficient to evaluate the efficiency of the manual removal method.

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

The monitoring of the alien coral invasion in the estuarine and reef systems of the Todos os Santos Bay showed range expansion inside the bay from 15 to 22 invaded sites. We showed that alien invasion on outside TSB' reef (Cascos reefs) altered roles performed by reef fishes. Foraging activities of reef fish community varied along the alien coral cover gradient. Bite rates of fishes were exponentially lower on higher alien coral covers. This effect was stronger on roving herbivores (i.e. acanthurids and scarids) that avoided foraging on alien coral covers. In addition, alien coral recruitment was higher on areas with high alien coral cover. Thus, on this reef site (Cascos Reef) few remove colonies actions were not enough to prevent alien coral impacts on coral reef processes. Moreover, our project also contributed to wide information dissemination about alien invasion problem to environmental public agencies, universities, civil society through technical texts, scientific, lectures, courses, and digital media. Lastly, we are assisting federal environmental agencies in elaboration of the "Cup Coral Plan" a management tool of the Brazilian Government (Portaria MMA N° 94, de 6 de Abril de 2016). This plan will be used to support monitoring, control, and prevention actions of the alien coral invasions along the Brazilian coast.

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

The local community involvement occurred during the monitoring and control actions of the invasive coral.

#### 5. Are there any plans to continue this work?

Yes. Long-term monitoring of the mapped areas in the TSB to evaluate alien coral impact on native community and effectiveness of management actions. Control the alien coral establishment where their populations are low (<1% alien cover) (e.g. reefs inside the bay) which probably involves lower cost and higher efficiency. To evaluate alien coral control capacity by fireworm (*Hermodice carunculate*, see Sampaio et al., 2012) in the TSB reefs. To provide continuous technical/scientific support to Brazilian environmental agencies sharing information generated by our project as well to social community.



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

We are already sharing information generated by our project to social and scientific community as well as federal government:

1) Medias: <u>www.facebook.com/projetocoraisdabaia</u>, <u>http://ciencianarua.net/coral-invasor-se-expande-na-baia-de-todos-os-santos/</u>, <u>http://ciencianarua.net/ecologia-marinha-a-beleza-como-canal-de-</u> <u>comunicacao/</u>,

http://g1.globo.com/bahia/batv/videos/t/edicoes/v/pesquisadores-alertam-parainvasao-do-coral-sol-no-litoral-baiano/4052751/.

2) Scientific papers: Miranda et al. (2016a) Marine Biology, Miranda et al. (2016b) Marine Biodivesity Records, Creed et al. (2016) Biological Invasion.

3) Academic documents: PhD thesis Ricardo J. Miranda (in progress).

4) Conferences: talks and abstract in Congresso Brasileiro de Oceanografia (<u>www.cbo2016.org.br</u>).

5) Technical meetings: <u>http://www.mcti.gov.br/noticia/-</u> /asset\_publisher/epbV0pr6eIS0/content/pesquisadores-buscam-solucoes-contra-%E2%80%9Cinvasao%E2%80%9D-de-coral-nocivo-a-biodiversidademarinha;jsessionid=96FBD2CF2E5BA272A9DDD6D7566EDADC.rima

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

The RSG was used along the year fulfilling the expected duration 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.

Item	Budgeted Amount	Actual Amount	Difference	Comments
Car Fuel	319	319		
Boat Rental	2068	2068		



Scuba Tank Rental	763	763	
Scuba Buoyancy	478	478	
Compensator Rental	478	478	
Fieldworks Meals	796	796	
TOTAL	4902	4902	

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

(i) Revisit all studied sites in TSB to monitor invasion progress; (ii) conduct manual control of the alien coral populations in the coral reefs with low alien coral cover (>1%); (iii) conduct survey of fireworm abundance in TSB and conduct experiment to evaluate predation impact on alien coral.

# 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 Rufford logo received permanent publicity in our Facebook project page: <u>www.facebook.com/projetocoraisdabaia</u> and in my personal page <u>www.ricardojmiranda.blogspot.com.br</u>. Moreover, the Rufford logo or only the was publicized in classes, lectures, technical meetings, digital and printed medias and in all published papers of the project (Miranda et al. 2016a, Miranda et al. 2016b, Creed et al. 2016).

#### 11. Any other comments?

The financial Rufford support has been fundamental to monitoring, assessment of impacts and management actions of the alien coral invasion in TSB with effective contribution for conservation of the marine ecosystems. The need for continuation of this project is critically important to building scientific data and to create management alternatives on alien coral invasion in TSB.