

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	Carlos Werner Hackradt
Project title	Population Status, Genetic Structure and the Need of Conservation Measures for a Brazilian Endemic and Endangered Species of Parrotfish: <i>Scarus trispinosus</i>
RSG reference	14865-1
Reporting period	01/10/2014 until 01/09/2015
Amount of grant	£6000
Your email address	hackradtcw@gmail.com
Date of this report	01/10/2015

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
Estimate the mean abundance, relative biomass and age-size classes of <i>Scarus trispinosus</i> through their geographical range of distribution			X	All sampling sites (five localities) have been visited in which we observed a mean abundance value of 1,75 ind/m ² <i>S. trispinosus</i> fish per locality, with average size of 28 cm.
Evaluate the effect of marine protected areas on population dynamics			X	The five localities visited have marine protected areas in their coastal area. In three of them, fish density of <i>S. trispinosus</i> individuals were higher inside MPAs, and especially in one of them the occurrence of this species was only observed inside this protected areas (APA Costa dos Corais – PE). In the others localities fish was as abundant inside as outside no-take areas. See text for further comment.
Investigate the existence of genetic structure on adult population of <i>S. trispinosus</i>		X		We collected tissue samples for genetic analysis in all localities. We sampled in total 170 individuals regarding all localities. Tamandaré was the only locality in which we have few samples (four) due to the fact that this species is already under heavy fishing pressure. At this moment we are finishing DNA extraction and amplification. There is a master degree student working on this analysis which are planned to be accomplished by the end of 1 st semester of 2016.
Measure the level of connectivity between populations along the coast		X		As this objective is directly related to the last one (genetic analysis), it will only be accomplished when all samples have been analysed.
Propose and recommend management measures for		X		Although we can recommend some local management measures only with visual

<p>the remnant populations of <i>S. trispinosus</i> in order to promote their conservation and consequently their habitat at Brazilian coast</p>				<p>census data acquired, we prefer to wait for the additional genetic analysis results that will give us a broader view of how populations are connected along the coast to propose a more applied and effective management measures for <i>S. trispinosus</i> populations.</p>
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2. Please explain any unforeseen difficulties that arose during the project and how these were tackled (if relevant).

At one locality in which *S. trispinosus* is heavily fished (Tamandaré - PE), we have some difficulties to acquire the tissue samples due to the fact that fishermen knows that a fish moratorium will soon be installed and our presence indicate them that we were there to collect data to prohibit the fishery. So, they did not want to collaborate with us in this task.

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

The first important outcome is that spatial conservation measures as MPAs are really effective for heavily fished species as *S. trispinosus*, by firstly protecting parental stock, increasing their abundance (Fig. 1, Table 1) and size, and potentially benefit surrounding areas by exporting larvae and adult fish. In the case of marine protected areas studied, most of them (60%) presented higher densities inside no-take areas; otherwise others (APA Recife de Corais - RN, "APARC" e RESEX Corumbau – BA, "CMR") presented equal or higher abundances either outside or inside no-take areas. However, there is some particularities in these two areas that must be discussed. The first one is a large marine protected area in which tourism is high implemented. Therefore, the presence of tourism, especially in outside area named UP2 (Fig. 1), hinders fishing pressure and acts like a no-take area. In the case of Corumbau extractive reserve (named CMR) all outside sampling points are within the regimen of fishing management undertaken inside marine reserve, and therefore controlled. So, it is not surprising that abundance levels outside and inside no-take areas was almost the same.

Additionally, this fish is an emblematic species from coral reef fauna, and it is very attractive for underwater tourists. Local entrepreneur already noticed that live fish can be more profitable than a dead one, and they are developing ways to undertake underwater tourism, which is less disturbing for coral reefs environment. Nevertheless, training courses and community education must be done in order to control and organize this economic activity.

Table 1: Mean density abundance of *Scarus trispinosus* in coastal areas of each MPA evaluated.

MPA	Mean Density (\pm SE)
Environmental Protection Area Recifes de Corais (APARC)	4,23 ind/m ² \pm 3,03
Environmental Protection Area Costa dos Corais (APACC)	0,005 ind/m ² \pm 0,03
Recife de Fora Municipal Marine Park (RFMP)	0,79 ind/m ² \pm 1,72
Marine Extractive Reserve of Corumbau (CMR)	2,38 ind/m ² \pm 1,04
Abrolhos National Marine Park (ANMP)	3,10 ind/m ² \pm 1,34

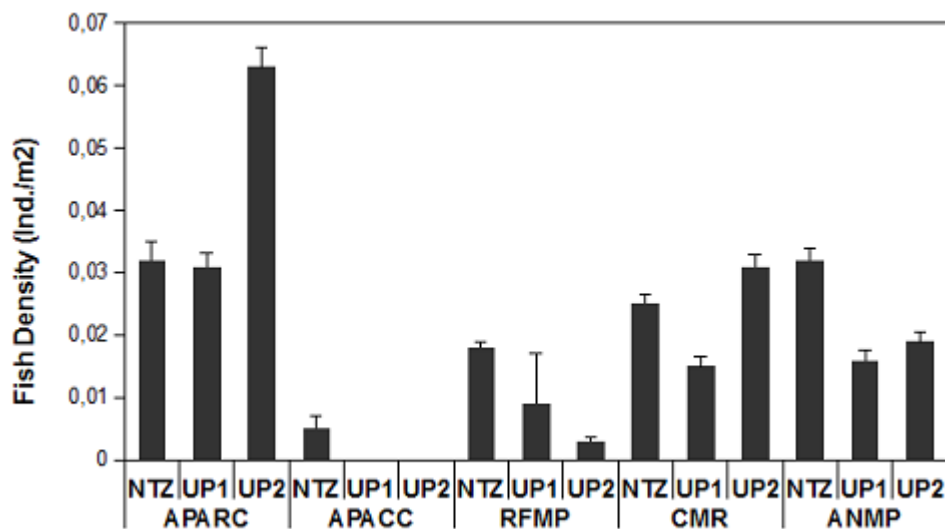


Figure 1. Fish density at 5 sampled localities (APARC, Environmental Protection Area Recife de Corais – RN; APACC, Environmental Protection Area Costa dos Corais – PE; RFMP, Recife de Fora Municipal Marine Park – BA; CMR, Marine Extractive Reserve Corumbau – BA and ANMP, Abrolhos National Marine Park – BA).

Lastly, community involvement is essential for any management purposes including the creation of new MPAs. The reserves which are created considering a bottom-up perspective are more effective than others, and have more beneficial effects for their users in shorter period of time.

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

In all localities but the ones commented above in which some difficulties have appeared, we have a good reception of local fishing community and tourism sector. In fact, they were responsible for taking us to dive in all sampling points and at the closest localities we left them responsible for collecting tissues samples and collect it later in a second visit as they do not have all samples needed during campaign. In all localities, prior sampling, we undertook

a brief speech to local community of what we are going to do there and the purpose of it. They all understand that there was a baseline study for collecting information of this threatened species which if not properly managed will soon disappear. In addition to the economic value they could understand the ecological value of this species as an algal growth controller and the consequences of the disappearance for coral reefs.

5. Are there any plans to continue this work?

Apart from the genetic results that will largely complement the baseline assessment done in localities studies, which will be soon incorporated in these results, we would like to continue this work by assessing deeper reefs located in the same localities visited. Many fishermen told us that they did not fish any more in shallow reefs but otherwise in deeper zone. Therefore, these deeper reefs are been empty out even before we can measure the local abundance. In this context is urgent to visit these places in order to map their abundance and size structure and include them in a spatial proposal of priority areas for protecting *S. trispinosus* species in Brazilian coast.

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

Besides academic products which are master dissertations, reports and articles published, we intend to produce a short report of all results to be electronically distributed to all Brazilian MPA managers and a 1 page folder with most important achievements using simple words to be distributed manually to local community as a way of retrieving the results generated by them as well.

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 grant amount was used continually during the entire duration of the project as it was mostly used to access sampling localities and pay all campaign expenses. Also, we used part of the budget to complement some laboratory materials that were mostly bought by other project in course to do genetic analysis. The previewed and achieved chronogram were almost identical. Only some budget have been relocated (car to boat rental) to allow team displacement and cover some campaigns costs, but most of them were exactly the same.

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
Displacement	£1,500	£1,500	£0	Used to buy plane tickets for researchers displacement to attend field campaign (Recife-Natal 3 people; Recife-Porto Seguro 1 person).
Accommodation	£750	£750	£0	Accommodation costs in Corumbau, Praia do Forte and Caravelas as well as alimentation of research team on sampling campaigns.
Boat rental			+£20	We substitute car rental by boat rental.
Car rental	£300	£0	-£300	We used private car to move between localities.
Fuel	£200	£300	+£100	We invest part of budget to rent a car in fuel used in the private vehicle.
Dive equipment rental/tank recharge	£500	£500	£0	Rental of tanks and others material (like jackets and regulator) when necessary.
UVC material (transect, diving sheet)	£200	£200	£0	Acquisition of material to conduce underwater visual censuses.
Dive equipment	£400	£400	£0	Acquisition of material to conduce underwater visual censuses.
Laboratory supplies	£150	£150	£0	Acquisition of pipettes, eppendorfs, and other plastic material.
Genetic markers	£250	£250	£0	Used to buy part of DNA microsattelites.
Paper	£30	£30	£0	Used to acquire underwater paper for census tables and A4 paper to print reports.
Print toner	£150	£150	£0	Used in 3 print toners for laser printer; reports, visual census tables and other visual material.
Pencils and permanent markers	£10	£10	£0	Used in underwater censuses and labelling tissue samples.
Report production and results dissemination	£60	£60	£0	Used to build poster and material for academic presentation and community speeches.
DNA genotyping	£500	£500	£0	Acquisition of material and reagents for genotyping samples.
Total	£6,000			

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

For us the most important steps are: 1. finish the genetic analysis and build the connectivity pathways for *S. trispinosus* species along localities sampled, 2. to investigate deeper reef areas in the same visited places, and 3. expand northerly (Maranhão and Pará) and southerly (Espírito Santo and Rio de Janeiro estates) the investigated localities. These steps will give us a completely view of species actual abundance and distribution along Brazilian coast and the importance of some places for population conservation.

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?

During the project many speeches have been done at the local communities visited, in all of them the visual material used brings RSGF logo in the title page and at the Acknowledgements. Additionally, this project is supporting the work of two master students (one focused on genetic analysis and the other with MPAs effects on species abundance) and other four undergraduate research students that are engaged on monitoring fishing markets in different regions in Bahia estate. They all have been participating in many academic encounters such as "Semana Nacional da Mata Atlantica - 2015", "Semana Nacional de Ciencia e Tecnologia da UFSB - 2015", "Encontro Brasileiro de Ichthyologia - 2017" among others, besides all scientific products that will be produced soon. Below, we show some of the materials used for publish the project.

11. Any other comments?

The species has entered into the national list of threatened species, however it needs additional time for local and regional regulation. We hope to proportionate new and relevant data at this phase so national regulation could be based on scientific knowledge obtained in a broader geographical basis.