

Final Evaluation Report

We ask all grant recipients to complete a project evaluation that helps us to gauge the success of your project. This must be sent in **MS Word and not PDF 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 – remember that negative experiences are just as valuable as positive ones if they help others to learn from them.

Please DO NOT fill in and submit this form until the project has been completed.

Complete the form in English. Note that the information may be edited before posting on our website.

Please email this report to jane@rufford.org.

Your Details	
Full Name	Tainá Luchese Gaspar
Project Title	Blue Carbon: The role of rhodolith beds from Fernando de Noronha Archipelago, Southwestern Atlantic.
Application ID	41174-1
Date of this Report	13/08/2025

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
Investigate the composition of the species of calcareous algae that make up the rhodoliths of Fernando de Noronha				The equipment needed to achieve this objective, the Scanning Electron Microscope, has malfunctioned and cannot yet be used. There is no estimated time for the equipment's return to service. In the meantime, identification was carried out visually, using morphotypes of calcareous algae.
Investigate the fauna and flora associated with the rhodolith beds of Fernando de Noronha				All samples collected in Fernando de Noronha have already been analyzed in the reef environment ecology laboratory at the Federal University of Santa Catarina, allowing for a better understanding of the taxonomic groups and the diversity of the community that makes up the rhodolith beds of Ressureta.
Evaluate the role of the community in the rhodolith bed in the carbon flow through an in situ experiment.				<p>The incubations carried out allowed for the calculation of the organic and biogenic carbon production of the Ressureta rhodolith bed, unprecedented information for the ecosystem, which highlights its importance in the oceanic carbon cycle. However, it was not possible to carry out fieldwork on the other proposed rhodolith bed, at the Cagarras dive site, due to navigation and depth conditions, which would require a much larger team of divers for rotation and respect for decompression limits, or even technical dives, which would not fit within the budget.</p> <p>In the rhodolith bed of Resurreta, 14 dives were carried out, 12 for incubations and 2 for collecting rhodoliths to assess the species of calcareous algae and associated communities. To assess the community composition, 5 squares of 25 by 25 cm were collected, totaling 192 rhodoliths.</p>

2. Describe the three most important outcomes of your project.

a) Through this project, it was possible to characterize the nodules and the community associated with the rhodolith beds of Ressurreta in Fernando de Noronha. The rhodolith bed of Fernando de Noronha presents a density of 617 ± 152 nodules per square meter. The nodules presented an average volume of 33 ± 34 mL, ranging from 5 to 210 mL, and an average diameter of 39 ± 18 cm, ranging from 8 to 218 cm. These data show high variability because they include both superficial rhodoliths and those buried up to 10 cm deep in the bed, thus representing a large variability of nodules. Through the collection of rhodoliths for evaluation of the associated community, 192 rhodoliths were analyzed, resulting in 5871 associated organisms, with an average density of 30 ± 29 invertebrates per rhodolith, ranging from 0 to 207 organisms/rhodolith. The main groups of invertebrates were: polychaetes (65%) and crustaceans (23%), and in smaller abundance algae, mollusks, corals and fish were found. Through this collection and analysis, it was possible to highlight the important role of rhodolith beds as habitat structuring elements, providing shelter and refuge for diverse organisms (Figure 1).

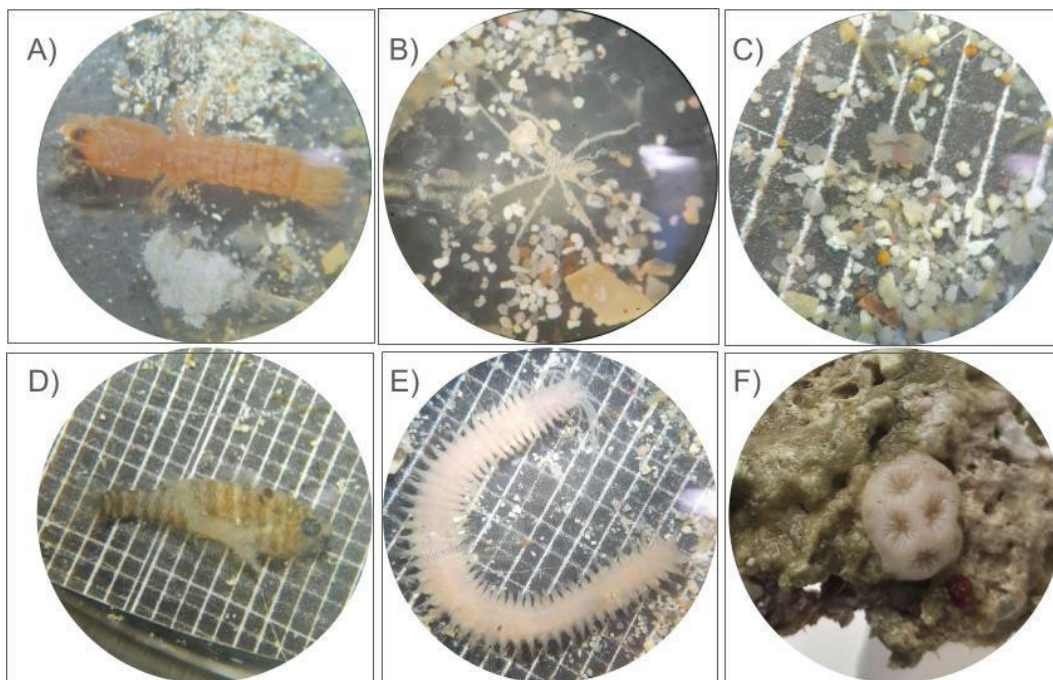


Figure 1: Examples of organisms found in the rhodoliths of Fernando de Noronha. A) Stomatopod. B) Arthropod (Pycnogonida). C) Anemone. D) Fish (genus *Lythrypnus*). E) Polychaete. F) Coral (genus *Siderastrea*).

b) In addition to the community evaluation, the project enabled the evaluation of the organic and biogenic carbon production of the Ressurreta rhodolith bed community. Through incubations, it was possible to measure the positive net primary productivity

of the Ressurreta rhodolith bed at $42 \pm 12 \text{ mmol O}_2 \text{ m}^{-2} \text{ day}^{-1}$. Carbonate production per day was evaluated at $45 \pm 7 \text{ mmol CaCO}_3 \text{ m}^{-2} \text{ day}^{-1}$. This allowed us to confirm the positive net primary and carbonate productivity of this important environment in Fernando de Noronha. In this regard, a scientific article was submitted to the journal *Marine Environmental Research*, which publishes original research articles on chemical, physical, and biological interactions in oceans and coastal waters. The submitted article, entitled "Biological and Biogenic Carbon Production in Southwestern Atlantic Coralline Algal Beds," was produced in partnership with the team from the proposal submitted to the Rufford Foundation (Barbara Segal, Marina Sissini, Nadine Schubert), as well as researchers who assisted in the data acquisition and processing, such as researchers and professors from the Federal University of Santa Catarina, Paulo Horta and Eduardo Bastos. The manuscript is currently under review and addresses the metabolism of rhodolith bed communities at three points on the Brazilian coast: Ilha do Arvoredo, João Pessoa, and Fernando de Noronha. We applied the same methodology submitted in the proposal along a wide latitudinal gradient in the Southwest Atlantic ($3\text{--}27^\circ\text{S}$) during the austral summer to assess the net primary productivity (NPP) and net calcification (NCC) of the community. All three beds showed assessed net autotrophic activity, with NPP differing between tropical and subtropical beds. At the subtropical limit, the Arvoredo Island bed showed the highest daily NCC rates, followed by the tropical beds, Fernando de Noronha and João Pessoa, which did not differ from each other. NCC showed the same pattern, however, Arvoredo Island was similar to Fernando de Noronha, with values higher than those of João Pessoa. The data suggest that primary and carbonate productivity was mainly driven by light availability, but is influenced by the composition of communities associated with rhodolith beds, including macroalgae and invertebrates. The submitted manuscript is attached to the email containing this document.

c) Finally, sharing the knowledge generated with the local population through the lecture and flyers enabled valuable exchanges. It was highly beneficial to highlight the importance of the rhodolith bed of Fernando de Noronha in providing ecosystem services, such as oxygen and carbonate production, habitats for marine life and the consequent trophic chain, boosting the presence of top predators that stimulate scuba diving tourism on the island.

3. Explain any unforeseen difficulties that arose during the project and how these were tackled.

Fieldwork on oceanic islands is always challenging, both because of the meteorological and oceanographic conditions, and because the supply of materials is limited. Therefore, prior planning and knowledge of local logistics by the team was fundamental. Despite extensive planning, in situ experiments in the marine environment need to deal with varying sea conditions over short periods. The greatest

difficulty encountered was the occurrence of a large swell during our stay in Fernando de Noronha, which threatened to close the port and diving operations. However, faced with the imminent cancellation of diving trips, the team planned to carry out the fieldwork under adverse conditions and in less time, without compromising data acquisition. To achieve the initial goal of identifying calcareous algae species, another difficulty arose that has not yet been overcome: the malfunction of the equipment necessary for species identification, the Scanning Electron Microscope at the Central Electron Microscopy Laboratory of the Federal University of Santa Catarina. To circumvent this, the species are initially being visually identified by morphotype. This practice is well-accepted given the difficulty in recognizing and identifying calcareous algae species, even with the use of specific equipment, since the calcareous coating makes it more difficult to visualize structures used in species identification. With the return of the equipment, it is hoped that species can be identified more robustly.

4. Describe the involvement of local communities and how they have benefited from the project.

The involvement of the local community was excellent. It began in the field with the participation of the diving team that supported data collection. From the ship's captain to the support divers, everyone wanted to deepen their knowledge of the ecosystem, as well as the methodology used and its importance for the conservation of the Fernando de Noronha Archipelago. The participation, commitment, and assistance of the entire team were fundamental to the success of the fieldwork. The ship's captain, "Milsinho," a native and well-known figure in Fernando de Noronha, was featured on the cover of the distributed brochure (see the attachment). In addition, staff members were involved in outreach activities on social media related to these topics, and prepared two videos publicizing the activities on the diving school's instagram page:

<https://www.instagram.com/reel/DGOt5PERpJr/>

<https://www.instagram.com/reel/DGQY9GAR-gl/>

Furthermore, we prepared a lecture for the entire community, which was attended by a diverse group of over 30 people, including diving professionals, environmental agents, and tourists, as well as various age groups, such as children from local schools and older tourists (photo 1). The relaxed tone of the lecture, in an unconventional teaching space (in a square with a projector and chairs), allowed for the mutual exchange of information and learning, and the use of tactile teaching tools, such as rhodolith samples, further sensitized those present. Attached to this email is a video that captured a moment from the lecture. During the fieldwork, a sign was placed at the experiment site to prevent any recreational divers from tampering with the structures (Photo 2); the sign remained in place throughout the fieldwork days and was removed at the end. After the fieldwork and data collection, it was possible to compile important information and produce a brochure that was distributed at

strategic points on the island of Fernando de Noronha. The brochure was distributed at the environmental education centers of the TAMAR Project (<https://www.tamar.org.br/>) and the Fernando de Noronha Marine Park, as well as at the two local state schools (Escola Arquipélago and the Bem-Me-Quer preschool), and diving schools (Àguas Claras, Atlantis, Noronha Divers and Sea Paradise). The document used to produce the brochure is attached to the email containing this report.



Photo 1: Opening of the lecture given in Fernando de Noronha in February 2025.



Photo 2: The plate was placed and left at the experiment site on the rhodolith bed of Resurreta during the fieldwork days.

5. Are there any plans to continue this work?

The experiment, whose methodology was established within the research group and proved functional for the proposed objective, provided several insights into community metabolism in different seasons. We were prompted to consider seasonal fields to estimate annual primary productivity and carbonate of the rhodolith bed in Fernando de Noronha.

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

The results were shared through a brochure developed and distributed in strategic locations on the island, as mentioned earlier. We still have some brochures and intend to replenish those already delivered to strategic points in Fernando de Noronha. Furthermore, the results regarding the community's metabolism, including primary and carbonate productivity, will also be disseminated through the publication of a scientific article, which has been submitted to the journal *Marine Environmental Research*, as previously mentioned and attached to the email containing this report. Another article on the associated community is expected to be developed and submitted next year.

After the publications are completed, it is expected that publications will be made on the Instagram page of the Reef Environment Ecology Laboratory, in order to expand the dissemination of the results beyond the scientific community. Oral presentations on the work were also given at two meetings of the Intergramar Research Network (integramar.org/home), the first held in São Paulo - SP in December 2024 and in Florianópolis - SC in 2025. As part of the Intergramar Research Network (Call PPBio/CNPq/MCTI/FNDCT No. 07/2023; Grant #441226/2023-0), a scientific research network dedicated to Brazilian marine ecosystems that brings together experts with the aim of integrating knowledge to promote the conservation and management of biodiversity and marine-coastal services in the country, summary reports will also be produced at the end of the research network's term, scheduled to be developed in 2026.

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

One of the themes that deserves further exploration is the detailed identification of the associated community, which can be achieved through partnerships with taxonomists something we aim to do through the Intergramar research network. Furthermore, expanding in situ experimental sampling of primary productivity and carbonate in other seasons and depths is fundamental for our robust understanding about the rhodolith beds in the carbon flux in the ocean.

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

Yes, some materials were developed and all were previously sent to the foundation for image use authorization.

A post was made on the Reef Environment Ecology Laboratory Instagram page to promote the lecture: www.instagram.com/p/DF8PJU7xQLX/?img_index=2. Before the fieldwork in Fernando de Noronha, a sign was created to be placed at the experiment site, requesting that no one disturb the structures left between the days of fieldwork. In addition, a leaflet was produced to publicize the results, which has already been mentioned. The logo was also included in the promotional material for my doctoral qualification in the Postgraduate Program in Ecology at the Federal University of Santa Catarina. Finally, with the help of the Integramar network, shirts were made for the team members. All the developed materials are attached to the email containing this report, including a video of the sign positioned on the rhodolith bed.

9. Provide a full list of all the members of your team and their role in the project.

- Marina Narsi Sissini: contributed to the sample design, fieldwork, data and sample acquisition, development and distribution of dissemination materials, writing of the submitted article, and supervision of the process of obtaining the final results.
- Barbara Segal Ramos: contributed to the sample design, fieldwork, data and sample acquisition, development of dissemination materials, review of the submitted article, and supervision of the process of obtaining the final results.
- Nadine Schubert: contributed to the sample design, applied methodology, review of the submitted article, and supervision of the process of obtaining the final results.
- In recognition of their essential role in the success of the fieldwork, the dive operator staff are included as key team members:
- Silvio: contributed to the fieldwork and data and sample acquisition.
- Fernando Rodrigues: contributed to the fieldwork and data and sample acquisition.
- Maicon Messias: contributed to the fieldwork and data and sample acquisition.
- Milsinho: contributed to the fieldwork and data and sample acquisition.

Furthermore, we had the collaboration of a partner researcher, whose participation was also very helpful:

- Cesar Cordeiro: contributed to the fieldwork and data and sample acquisition.

10. Any other comments?

Overall, the funding enabled the first assessment of the metabolism of the rhodolith bed community in a tropical rhodolith bed in the Southwestern Atlantic (Fernando de Noronha Archipelago), contributing to the understanding of the metabolism of these still neglected and understudied ecosystems.

ANNEX – Financial Report
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