

Final Evaluation Report

Your Details	
Full Name	Saul Ovidio Gonzalez Murcia
Project Title	Understanding the role of sponges and invasive ascidians and their impact in fish diversity conservation
Application ID	28747-1
Grant Amount	6000£
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Date of this Report	January 20 th 2022

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
To assess the diversity of sponges and ascidians in Kimbe and their interactions with corals				Multiple samples were collected in cooperation with local institutions and support from local leaders. The results have been published in many websites and conferences. Publications in scientific journals are in progress.
To assess the negative impacts that sponge cover can have on coral reefs systems and fish communities				This component was partially achieved since the monitoring of the quadrats was suspended due to the pandemic. Achieving this goal will depend on favourable conditions and safety in the study area and if permits to travel are granted.
To assess the negative impacts that ascidian cover can have on coral reefs systems and fish communities				We partly achieved this component of the project. Removal and evaluation of ascidian cover was performed but it was cancelled due to COVID-19. Monitoring this area will not continue due to the location of the study site.
To create social awareness about the diversity of sponges in Kimbe Bay.				Workshops, field tours and exploration activities with locals and students from Kimbe were performed. However, activities involving human interactions were restricted due to COVID and cancelled since the situation in the area was not favourable.

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

The COVID-19 pandemic had a strong impact on the development and achievement of many activities of the project. Restrictions on travel imposed by the Australian Government and Papua New Guinea Government limited the development of some activities in Kimbe Bay, Papua New Guinea. Moreover, regulations and restrictions on meetings, gatherings other activities prevented to perform some workshops with students. To address these situations many alternative approaches were followed.

Financially, the cost of some items for the project increased or it was difficult to acquire them in the timeframes that were expected due to shortcuts in laboratory equipment caused because of the pandemic. Moreover, the financial support of

third parties in the development of the project was compromised and the extent of their participation was limited. In these cases, there was a re-evaluation of the budget and funds were relocated to cover costs of activities that could be executed in Australia and were less likely to be affected by the restrictions imposed. Thus, chemical reagents and laboratory materials were acquired to conduct the preparation of samples in the laboratories of James Cook University, Townsville-Bebegu Yumba Campus, Australia. Information generated in this process was stored in files that could support workshops in the future.

Additionally, changes in the situation related with the pandemic of COVID-19 that extended to 2020 and 2021 generated multiple adjustments and modifications that curtailed the extent of our activities. Identification workshops were postponed multiple times based on potential opening of the borders of Australia with other countries and Papua New Guinea. Moreover, fieldwork programmed based on borders opening were delayed and postponed based on official projections of the Australian Government and suspended due to delays and re adjustments in the of opening of the borders. These factors precluded the entrance of team members to Australia to conduct sponge preparation and identification process. Therefore, a taxonomist of sponges from Australian Museums was invited to support the initiative and positive responses from the Museum of Tropical Queensland in Brisbane were obtained. Two identification journeys were conducted at the Museum of Tropical Queensland and many of the samples were stored in the collection following process of validation at the museum. The information that was generated was published in different media sources targeting diverse audiences and continues being accessible and cited.

Activities in Papua New Guinea could not be conducted as planned. Face to face workshops were not allowed because of health and safety regulations and the school period was altered because of the same reasons. Thus, coordination for workshops was challenging and generally unfeasible. Alternatives to conduct these activities virtually were planned but cancelled due to the low attendance and limited access to internet in Kimbe Bay. The progress in these activities has been delayed and it is hard to predict with accuracy when and how they might be executed since they rely on aspects that are hard to predict.

The international travel restrictions also impacted the capacity of institutions that were cooperating in the project to achieve their activities as planned. Mahonia Na Dari Foundation budget was limited and had to be reoriented to core activities to keep the organisation running. Unfortunately, it implied the reduction of personal and delayed the logistics for many projects including the "Understanding the role of sponges and invasive ascidians and their impact in fish diversity conservation" project that we have been executing. We have tried to stay in contact and keep updated with the changes in the organisation and the situation that they have experienced, and we hope that as soon as the conditions improve and become more stable some of the activities can be reincorporated in the agenda.

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

1. We have documented the diversity of sponges and ascidians in Kimbe Bay and filled a gap of information for this group of organisms in the area and contributed to support the documentation of biodiversity of sponges in the world. In this sense we have publicised this information using different techniques to reach more audience and engage and inform about the importance of sponges in coral systems.
2. We have assessed potential negative impacts that sponges and ascidians have on coral reef systems and provided some evidence of potential problems that can be confronted on reef ecosystems once they are disturbed. We have reported this information to stakeholders, resource managers and other institutions to create awareness of the potential role that some sponges can play if coral reef degrade.
3. We have supported educational programmes for students in Kimbe and constructed networks to contribute understanding and documenting the diversity of sponges in coral reef systems in Kimbe Bay. A total of 40 students of elementary and high school have been benefited from practical and theoretical classes about marine biodiversity and sponges in Kimbe. The information will also be available to be used for future student cohorts and it is being uploaded in different sources online for the general public.

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

Students, members of non-governmental organisations and local leaders were involved in the project. They participated in educational activities workshops and attending talks related with discovering the biodiversity of the environments surrounding Kimbe Bay. Some leaders of local communities participated during the field trips to explore the diversity of sponges in the area. Moreover, part of the project supported gender equity and participation of female local scientist in the field work, laboratory work and teaching activities. These actions empowered local researchers with knowledge and practical skills related with the project that can be used as teaching material and in other educational programmes for schools and communities in Kimbe. However, their participation was reduced since they were involved in other activities and work and after the COVID pandemic impacted the country because restrictions for many activities were imposed.

5. Are there any plans to continue this work?

1. We expect to follow up on this programme and expand on the activities that we have conducted via workshops. These initiatives will depend on the limitations and restrictions in place caused by the pandemic. It is difficult to predict dates so far since outbreaks of COVID-19 have been reported in the area and the strategies to manage and control of the pandemic by the government has been unsuccessful. Potential dates to visit Kimbe Bay are May 2022. Nonetheless, due dynamics of migration in Kimbe the organisation of sectors of interest and communities might have changed, and the execution of some activities could be compromised.

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

The information generated on this project has been shared through different communication channels. The technique used depended on the audience that was expected to receive the information.

Workshops, talks and presentations were conducted in Kimbe Bay for high school students. Moreover, research staff of Mahonia Na Dari Foundation joined field trips and laboratory activities in which we provided information about sponges and some ideas to continue expanding and sharing the knowledge with peers, local leaders, and students. That information was also included in educational programmes that were given to locals. Information on biodiversity of sponges and techniques to study sponges have been shared with undergraduate students at James Cook University. Part of the preliminary results of the project were presented at the College of Science and Engineering Symposium and awarded by the Competitive Research Training Grant 2021 in June 2021.

Moreover, notes and posts have been included in websites provided by National Geographic field notes programme:

<https://fieldnotes.nationalgeographic.org/expedition/sponges>

multiple posts in informative blogs that target a more general audience:

<https://neotropicalfishes.wordpress.com/coral-sponges-interactions-and-reef-fish-biodiversity/>

Websites to promote divulgation of the project with peers and academics:

<https://www.researchgate.net/profile/Saul-Gonzalez-Murcia/publications>

The information about the project has also been presented in symposiums and conferences that reach national and international audiences.

Some of public presentations can still be accessed in the YouTube on the link: (<https://www.youtube.com/watch?v=ew7AtPwng1o&list=PLO1PEYBjX6ZlwQzEWQ7XzWXkJYkVQWjBf>).

Currently, one of the research documents has been submitted and accepted for publication into the prestigious journal Marine Ecology Progress Series (MEPS), and it will be publicised in their official website and their Facebook and Twitter accounts. The reference of the document is:

González-Murcia S, Coppock AG, Ekins M, Battershill C, Jones GP (2021) Effects of exposure, bathymetry (depth) and aspect on sponge communities on a coral reef. Marine Ecology Progress Series DOI: <https://doi.org/10.3354/meps13981>

Reports will be submitted in the near future to other scientific journals, and we expect that these articles will be available by June 2022. Moreover, part of the information will be presented in the International Coral Reef Society Symposium in

June 2022. We also will continue promoting this information in different formats such as posters, public presentations, social media and blogs mentioned previously to share updates about the project with the current audience and trying to reach a wider audience as well.

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

The grant was used from January 2020 to December 2021. This difference in the proposed and actual length of the duration of project has been caused by delays and enforcement of protocols and guidelines of health and safety institutions that need to be followed in order to conduct many activities of the project.

As pointed out in previous sections, laboratory work depended on the availability of reagents and chemicals that were scarce by the time the activities were programmed. Moreover, many team members could not travel due to international border restrictions and in some cases virtual meetings could not achieve the outcomes that we expected on the timeframes that were set.

Restructuring activities, adapting protocols, and adjusting processes to the new conditions included extra variables that were time consuming and, in some cases, due to the novelty of the processes, they involved amendments that increased the amount of time three to four times more than it regularly does.

8. Budget: 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. It is important that you retain the management accounts and all paid invoices relating to the project for at least 2 years as these may be required for inspection at our discretion.

Item	Budgeted Amount	Actual amount	Difference	Comments
Underwater camera and housing	827	897	+70	There were variations in the prices of the items required.
Tags for quadrats	400	155	-245	The items were acquired expecting to be used on the field based on the potential opening of the borders, but the amount need has been reduced and the activity readapted to current conditions
Diving equipment maintenance	600	641	+41	Maintenance and acquisition of diving equipment was performed in preparation for field trips.

Boating	700	1615	+915	The situation of the pandemic of COVID-19 was foreseen. Thus, the amount of work had to be increased to achieve some goals of the project incurring in cost for extra hours and higher consumption of fuel.
Cameras video recording	400	321	-79	The items were acquired expecting to be used on the field based on the potential opening of the borders in June 2021.
Field microscope	500	87	-413	It was possible to attach a camera to one of the microscopes in the laboratory, reducing the cost of buying a new microscope with camera. It reduced the cost to the acquisition of a camera for a microscope only.
Chemical reagents	60	294	+234	The process of identifications of sponges required additional reagents and materials. Moreover, the number of samples collected was higher than expected which implied more costs to process the samples.
Underwater paper	150	112	-38	The items were acquired expecting to be used on the field based on the potential opening of the borders in 2021.
GPS	200	77	-123	Abrupt differences between providers caused differences in the prices of the GPS
Visible elastomer tags	800		-800	This item was not required based on the uncertainty in borders opening at it was used to cover expenses of other materials and chemical reagents
Clove oil	120	293	+173	The reagents and equipment were acquired expecting the opening of the borders in 2021
Bags and nets	60	307	+247	The reagents and equipment were acquired expecting the opening of the borders in 2021
Batteries and chargers	80	108	+28	The reagents and equipment were acquired expecting the opening of the borders in 2021

Vials	100		-100	These items were not acquired as since there were spare vials from other projects that could be used and were obtained via donations.
SD cards	80	118	+38	There were more cards needed to store images of sponge pictures and back up the process of identification
Hard Drives	180	356	+176	It was necessary to increase the capacity and number of documents, thus we acquired 3 hard drives.
Cable ties	60		-60	The number of ties required was supplemented by spare parts and left over from other projects. Moreover, there was no need of extra materials since the rest of trip was cancelled due to COVID-19.
Callipers	80		-80	The amount of equipment needed initially was replaced by donations from other sources and use of these tools was unlikely due to changes in the activities base on COVID-19 conditions
Buoys	30	27	-3	The company reduced the price slightly at the time the items were bought
Control for underwater drone	328	292	-36	The company reduced the price slightly at the time the items were bought
Cable for underwater drone	245	218	-27	The company reduced the price slightly at the time the items were bought
Shipping cost for underwater cable and cost		118	+118	Shipping costs were not considered beforehand.
TOTAL	6000	6036	+36	The conversion rate was 1 £ Sterling Pound = 1.85 Australian Dollars. The excess on the amount budgeted was covered by other financial sources for the project.

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

There are multiple steps that can be considered to improve the management of the marine ecosystems in Kimbe bay and the diversity of sponges in reef systems of Kimbe Bay. In the short term, actions to reinforce and empower local communities about the importance of healthy reef systems could increase the commitment that

these communities have with the conservation of their coral reefs systems. After the lag and suspension of activities caused by COVID-19 it would be necessary to reassess the resources and the stakeholders that remain active and are willing to participate in conservations initiatives like the sponge ascidians project in Kimbe Bay.

Monitoring programmes are of paramount relevance, and now they can be supported by the information generated in this project. Constant records on the conditions of the reefs and early detection of changes in cover of sponges could aid to reduce the impacts that sponge outbreaks can have in coral reef systems. Moreover, early detection can facilitate the allocation of resources to manage and control changes in coral reef systems caused by sponges.

Guided field trips seem to have a profound impact on the awareness of students about the diversity in the area. These activities can be emphasised and could potentially be reinforced with more theory to highlight the importance of prioritising conservation and management of the area.

Working on the construction of contacts and networking, particularly approaching industries in Kimbe Bay could facilitate support and involvement of an important group for the conservation of natural resources of the area. Currently, there is some distancing between industries and local communities and other stakeholders that have created bridges that contradict and undermine the goals of conservation. However, creating spaces in which they can interact, negotiate, share their views and perspectives, and find solutions together could be a relevant step to achieve synergistically the protection of the environment.

10. 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?

The logo of The Rufford Foundation was permanently displayed in posts and short notes about sponges and ascidians on blogs, that are open access:

<https://wordpress.com/page/neotropicalfishes.wordpress.com/156>

<https://neotropicalfishes.wordpress.com/2022/01/03/esponjas-y-sus-idiosincracias/>

The logo of Rufford foundation was displayed in the acknowledgments slide at the end of the presentation of symposium of the Australian Research Council for the Centre of Excellence for Coral Reefs Studies. This presentation is part of the archives of the centre and can be accessed for free on the link:

<https://www.youtube.com/watch?v=ew7AtPwng1o&list=PLO1PEYBjX6ZlwQzEWQ7XzWXkJYkVQWjBf>

The logo of the foundation was also included during the presentation for the College of Science and Engineering at James Cook University

Moreover, the logo of Rufford foundation will be displayed in the International Coral Reef Society Symposium that will be held in Germany in 2022, if the restrictions and

conditions are safe, in terms of the risk for the COVID-19 pandemic. Otherwise, they will be displayed in my participation during the virtual version of the symposium. I will make sure to share the link to my presentation.

11. Please provide a full list of all the members of your team and briefly what was their role in the project.

Geoffrey P. Jones, professor at James Cook University and research supervisor. Has supported the development of the project on the field, laboratory and logistic activities.

Christopher Battershill, Professor and Chair, Coastal Science, University of Waikato, New Zealand. He has supported with academic advice, field work, and identification of sponge specimens.

Merrick Ekins, invertebrate's taxonomist at the Queensland Museum. His participation as research supervisor and support on identification of sponges and ascidians has been valuable for the development of the project

Tom Bridge Coral taxonomist at the Queensland Museum. He has provided support in the identification of corals and feedback on research documents.

Garry Russ professor at James Cook University and research supervisor. Has supported the development of the project on the field, laboratory, and logistic activities.

Maren Toor, marine biologist supporting field work and data analyses. Likewise, participating in tours to guide local students on the field activities about exploring the biodiversity of sponges in Kimbe Bay.

Gina Tan, marine biologist supporting logistics, data collection and analyses. Participates in the guided tours to explore the diversity of sponges with local students in Kimbe Bay.

Amy Coppock, supported and assisted on field work and laboratory work activities. She provided advice and editorial comments on documents generated in this project.

Maya Srinivasan, associate researcher at James Cook University, provides support on the logistics and laboratory work for sponge identification.

Mahonia Na Dari Foundation Staff Members:

Peter Miller, director of Mahonia Na Dari Foundation. He has supported logistics and field work. He has coordinated sessions to provide information to students about sponges and organized guided field tours for high school students from Kimbe.

Somei Jonda, staff at mahonia Na Dari Foundation. Support in logistics during field work and coordinates activities with high school students during the tours in the coral reefs systems to discover the diversity of organisms in Kimbe Bay.

Elizabeth Jonda staff at mahonia Na Dari Foundation. With Somei, they coordinate field trips and support guided tours to teach students about the diversity of sponges and other organisms in Kimbe Bay.

Lena Mula, research officer at Mahonia Na Dari Foundation. She supported field work, collection of data and samples that were used for teaching and for scientific studies. She conducted teaching journeys in the laboratory and on the field providing information and assistance to students.

Nelson Sikatua, resident of Kimbe Bay, Tamare Kilu, that joined field work and supported activities related with boating and diving.

Jonathan Sikatua, resident of Kimbe Bay, Tamare Kilu, that joined field work and supported activities of boating diving and equipment preparation logistics

Jerry Sikatua, resident of Kimbe Bay, Tamare Kilu, that joined field work and supported activities related with boating, diving and data collection.

Staff of Walindi Plantation Resort diving station: support during field work and assistance in logistics for sampling collection.

Wontae Chung Director of the diving station at Kimbe Bay. He coordinated the logistics and all the processes related with diving at Kimbe. Moreover, he provided insightful advice about diving conditions and important sites for the study.

James Bubu dive officer that provided support, orientation, guidance, and assistance during diving activities at Kimbe Bay.

Barbara Aigilo, diving station secretary, assisted on logistics and orientation about diving processes and diving activities in Kimbe Bay.

James Cook University Students

Marta Panero, student at James Cook University, assisted during laboratory activities and supported sampling logistics and processing, documentation of images and storage of samples.

Ingrid Nachwitz, student at James Cook University, assisted during preparation of samples and identification of sponges. She participated in sponge identification training and laboratory activities and supported sampling logistics and processing.

Sandra Erdmann, student at James Cook University, assisted in samples logistic, preparation of slides of samples and identification of sponges and ascidians. She participated and assisted in sponge identification training and laboratory activities.

Kelsey Weber, student at James Cook University, helped in samples preparation and logistic support

12. Any other comments?

I am grateful for the support that Rufford Foundation has provided me to execute this project. Without Rufford Foundation support I could not achieve the goals and generated the amount of information that I had acquired. Moreover, it brought a diverse team of people together, from scientists, NGOs, students, and local leaders that contributed along the process of this project. It has been challenging and rewarding to be part of this initiative and I am satisfied with all the progress we have achieved, and I appreciate that even during these complicated times Rufford Foundation support has been with us.



Lena Mula, research officer at Mahonia Na Dari Foundation, conducting identification and preservation of sponges and ascidians.



Lena Mula and Saul González Murcia conducting studies of sponges the laboratory at Mahonia Na Dari Foundation, Kimbe Bay.



Research team on sponges and ascidians. Left to right Lena Mula, Maren Toor, Gina Tan and Saul González Murcia Kimbe Bay.



Exploring the sponges in our tropical ocean, students from Numundo and Kimbe conducting snorkelling activities to observe the diversity of marine organisms in coral reefs. © Somei Jonda.



Exploring the sponges in our tropical ocean, students from Kilu and Kimbe ready to start a trip to discover the diversity of marine organism in reefs of Kimbe Bay. © Maren Toor.



Exploring the sponges in our tropical ocean, students from Kilu and Kimbe ready to start a trip to discover the diversity of marine organism in reefs of Kimbe Bay. © Saul González Murcia.



Removal of ascidians from coral reefs in Kimbe Bay. © Maren Toor.



James Bubu, staff at Walindi Planation Resort Diving station organizing logistics and supporting trips for educational purposes with students. © Saul Gonzalez Murcia.



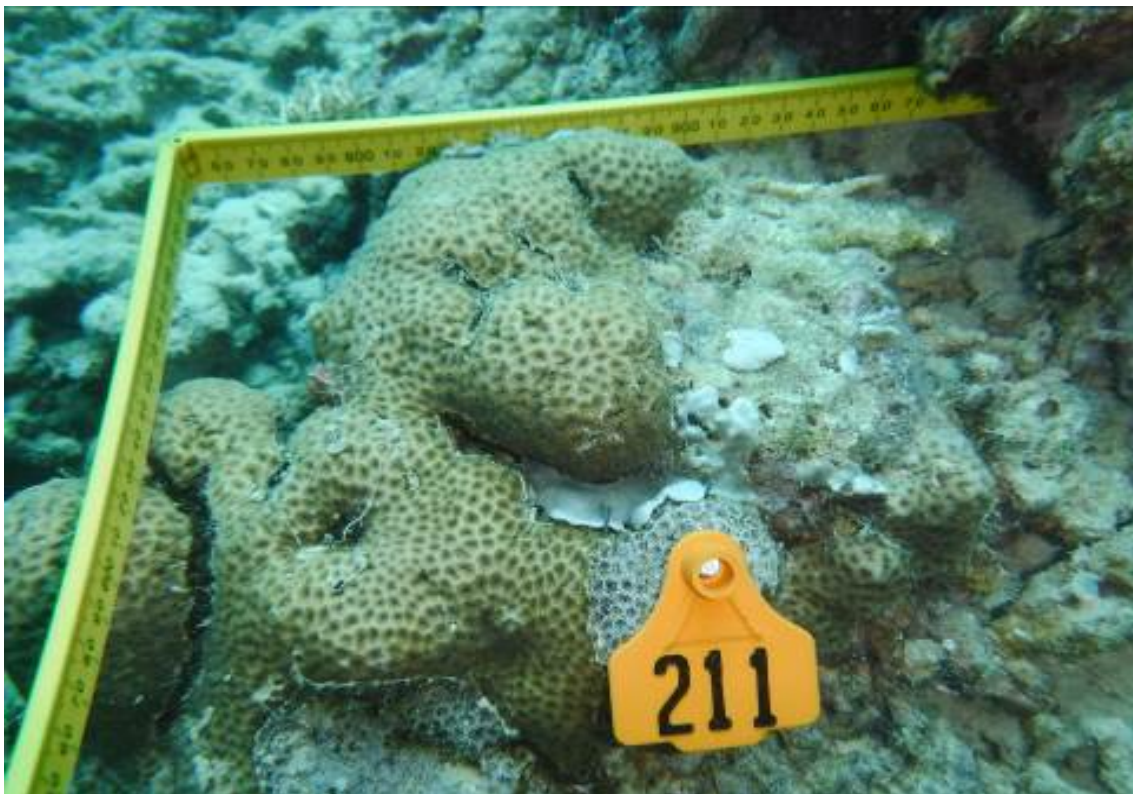
Measuring the impact of invasive ascidians on coral reefs systems at Kimbe Bay. © Gina Tan.



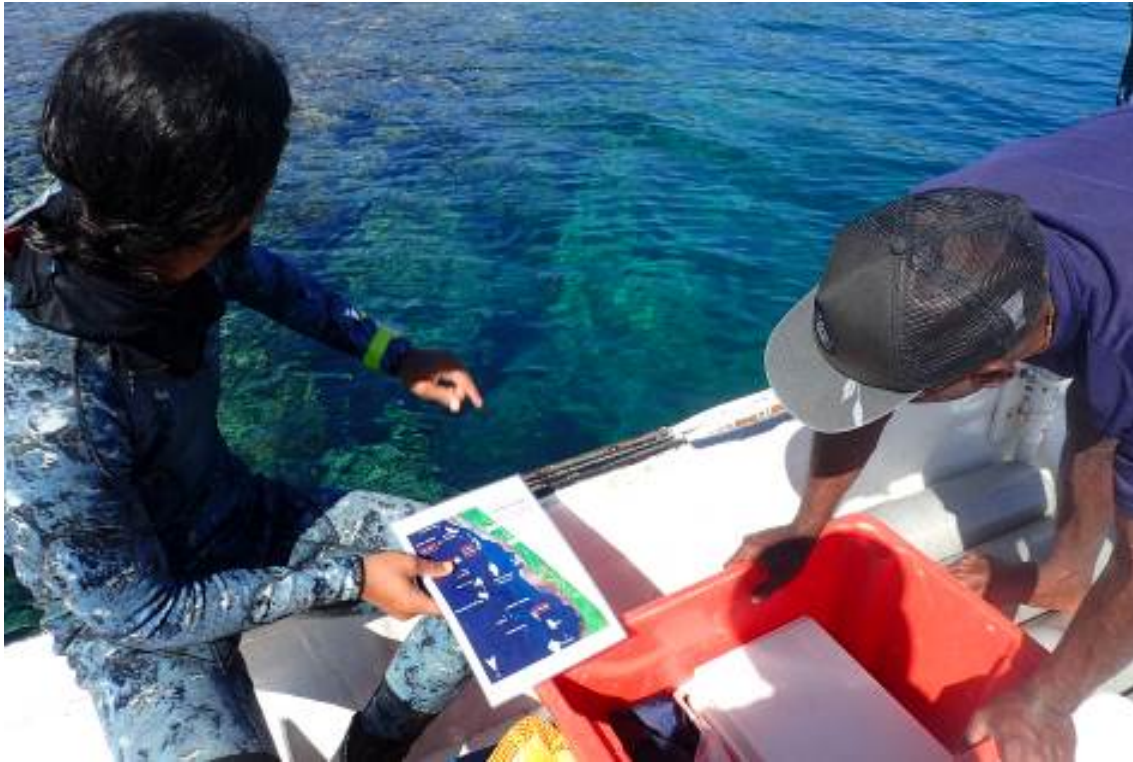
Measuring the impact of sponges in structural complexity on coral reefs systems at Kimbe Bay. © Gina Tan.



Experiments of ascidians removals conducted on coral reefs systems at Kimbe Bay. © Maren Toor.



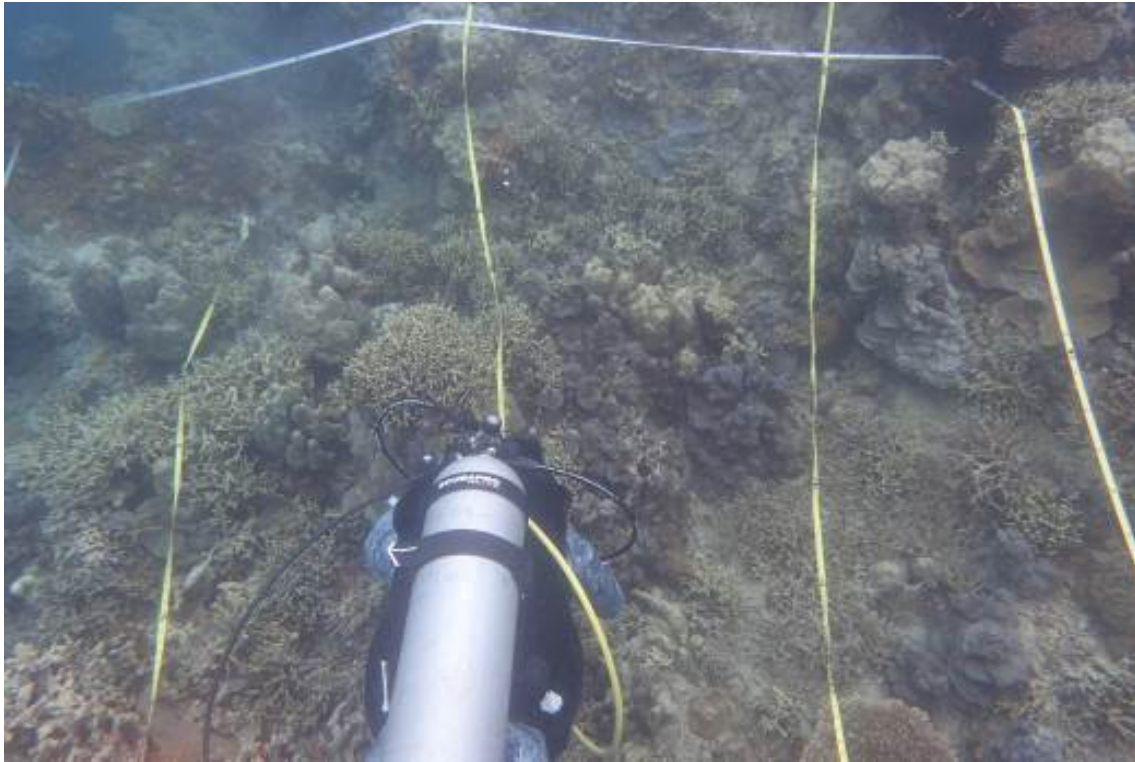
Detection and measurement of sponge and coral interactions.



Sampling process at inshore reef in Kimbe Bay with the assistance of locals. © Maren Toor.



Panoramic view of inshore reef systems at Kimbe Bay. © Maren Toor.



Establishment of permanent quadrats for experiments at Kimbe Bay. © Maren Toor.



Fish associated to sponge dominated environments in coral reef systems of Kimbe Bay. © Saúl González Murcia.



Research activities supported by locals, Nelson Sikatua on the picture before starting the mapping of sponges and coral interactions at inshore reef ins Kimbe Bay. © Maren Toor.



Research team on sponges and ascidians. Left to right Nelson Sikatua, Saul González Murcia, Maren Toor and Gina Tan Kimbe Bay.



Sponges overgrowing corals © Saúl González Murcia.



Ancient barrel sponges in corals of Kimbe Bay. © Gina Tan.



Tags that were deployed to delimit and identify quadrats where the sponges and ascidians are removed. © Saúl González Murcia.



Field trip to sample and explore sponge and ascidian diversity in Kimbe. © Gina Tan.



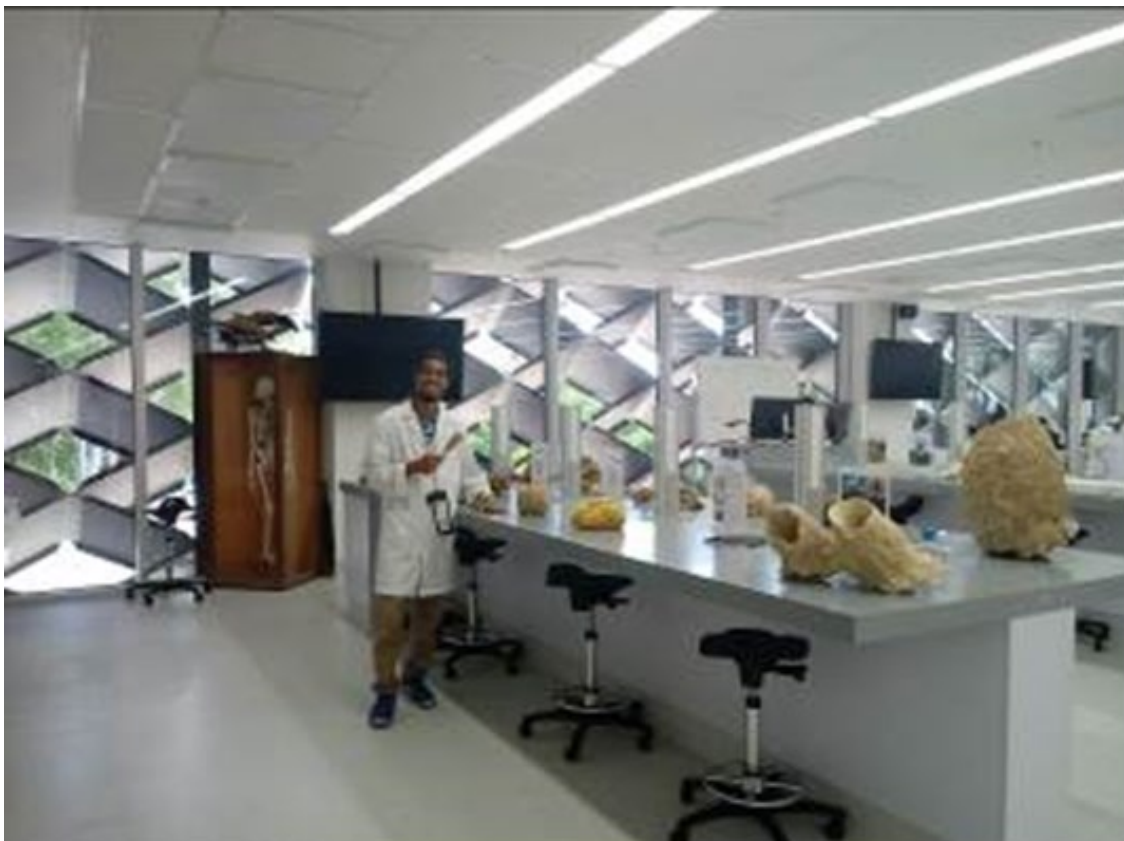
Healthy coral reefs systems at Kimbe Bay. © Saúl González Murcia.



Maren E. Toor during the exploration of different sites where reefs have been overgrown by sponges at Kimbe Bay. © Saúl González Murcia.



Samples of sponges that were collected and are ready to be processed for identification. © Saúl González Murcia.



Diversity of sponge and coral skeletons. © Saúl González Murcia.



Observation of sponge samples at the microscope. © Saúl González Murcia.



Observation of characteristics of barrel sponges. © Saúl González Murcia.



Microstructure of spicules that form part of the skeleton of some sponges. © Saúl González Murcia.



Microstructure of sponge fibres and spicules that form part of the skeleton of some sponges. © Marta Panero.



Identification and codes assignment of sponge samples at the collection of sponges of the Museum of Tropical Queensland, Brisbane. © Dr. Merrick Ekins.



Storage and management of samples of sponges. © Marta Panero.



Slides of sponge samples before identification process. © Marta Panero.



Identification of sponge species at the collection of sponges of the Museum of Tropical Queensland, Brisbane, leaded by staff taxonomist Dr. Merrick Ekins. © Saúl González Murcia.



Different spicule shapes in marine sponges. Photo: Marta Panero.