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The House of the Fish: Collaborative Coral Reef Awareness Project on Nosy Be

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SIT Study Abroad

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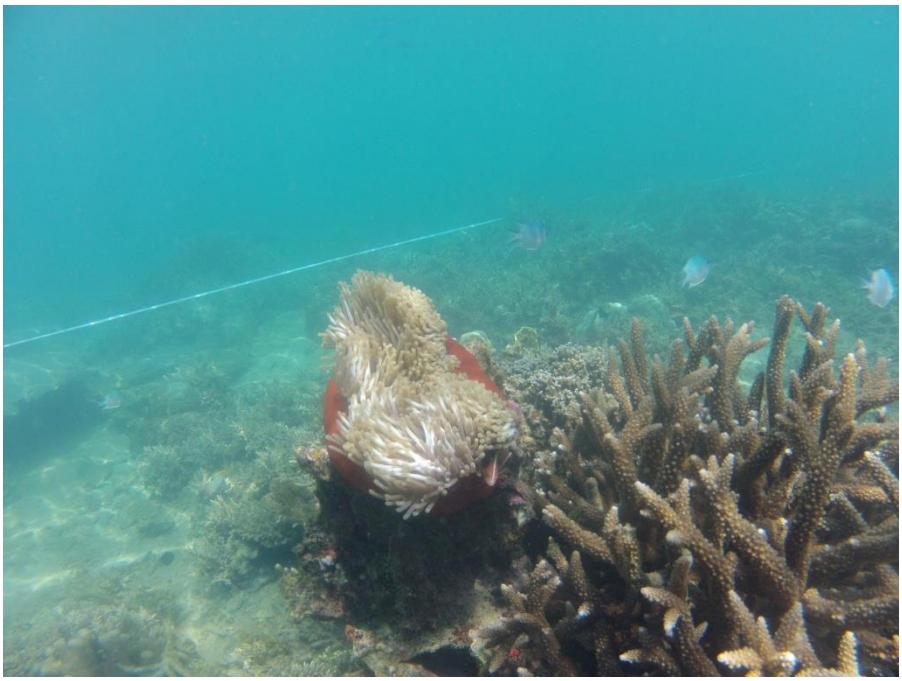

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Abstract

The purpose of this project was to initiate a place-based coral reef education project, with the ultimate goal of improved localized conservation efforts in the face of growing global threats. Three principal groups that interact with coral reefs on Nosy Be were interviewed: fishers, tourist guides, and conservationists. Research was conducted on the biology of coral reefs, and on the most prominent threats facing coral reefs in the Indian Ocean and around Nosy Be. Information and direct quotes from interviews, and the results of research, were incorporated into a photographic journal entitled "In the House of the Fish" or "An-tragno ny Laoko." The journal was written in English and translated into Malagasy and distributed to fishers and tourist guides on Nosy Be. The photo journal aimed to be collaborative, focusing on existing local stories and knowledge regarding coral reefs. The goal was to inspire conservation by reminding target groups of existing personal connections to, and efforts to protect, an ecosystem in danger.

Introduction

Climate change is causing extensive coral bleaching and mortality events around the world. Due to high baseline ocean temperatures, coral reefs surrounding Madagascar are expected to be particularly vulnerable to temperature increases (McClanahan *et al*., 2009). In 1998, for example, ocean temperatures around Madagascar were 2 degrees higher than normal, and coral mortality in some locations was 80 to 90% (Singha, n.d.). This problem is overwhelming, and dwarfs individual efforts to protect coral reefs. However, individuals do have agency to address localized stressors to reefs, which make coral more vulnerable to warming oceans and more likely to bleach and degrade (Maynard *et al*., 2017). Local conservation efforts, then, build the ecosystem's resistance and resilience to damage. When conservation can take the form of tangible changes to the everyday life of the individual, facing environmental destruction becomes less daunting and solutions to grand-scale problems seem less out of reach. This project focused on raising awareness of the problems facing coral reefs, both local and global scale pressures, and presented possible solutions to place the problem in a more manageable context.

A local conservation education project, like this one, had to involve the people that directly interact with the target ecosystem. The goal of this photo journal was to inform people about the problems facing coral reefs and, if necessary, inspire them to change their behavior to facilitate conservation. This project was collaborative, to avoid the imposition of information that was not needed or wanted. To accomplish its goal of conservation and education, the photo journal incorporated quotes and suggestions gathered from tourist guides, fishers, and conservationists.

Tourist guides were involved in this project because Nosy Be is currently one of the most popular tourism destinations in Madagascar, and the tourism industry here is growing ("Nosy Be

island," 2018). At the same time, there still exists a population of small scale local fishers who rely on many of the same resources as tourism. Also interacting within this system is a growing field of conservation, as demonstrated by Narindra Ramahandrimanana's and Erwan Boulvais's creation of the NGO R.E.E.F. Madagascar. One place where each of these very different industries coincide is on Nosy Be's coral reefs. These groups are the most knowledgeable regarding the state of coral reefs here, and have the most stake in and power over their future.

Healthy coral reefs draw tourists to Madagascar. Popular magazines and websites are beginning to cite Nosy Be as a "must-see" tourist destination, and documentaries like *Planet Earth* draw adventurers to the island ("Welcome to Nosy Be," 2019; Aligh & Cunningham, 2019). From 2015 to 2016, there was a 15% increase in tourist visitors to Madagascar ("More and more," 2017). Tourists are present for the short-term, and therefore can lack motivation to contribute to the protection and health of reefs for the long-term. Tourists who do not normally live among coral reefs, also, may simply be unfamiliar with safe ways to interact with them. The onus, then, is often on guides to ensure that the reefs are protected.

Of the fishing industry in Madagascar, traditional fishing is the main source of fishery resources and exports, comprising 53% of the total fish catch (Soumy, 2004). To address over-exploitation of fishery resources, the national government enacted laws increasing the allowable size of grid cells in fishing nets to avoid over catching of juveniles, and closing the fishery at certain times in the year (Soumy, 2004). The traditional fishing sector, as compared to industrial fishing, is more involved in responsible fishery management and enforcement of laws through local pressure. Nosy Be, in particular, has an abundance of coral reefs, where fishers are sure to find a successful days catch. The reefs, then, seem to be where most local fishing activity occurs on Nosy Be.

Inspired by the evident decline of Nosy Be's coral reefs and the United Nations Sustainable Development Goals, Narindra Ramahandrimanana and Erwan Boulvais created the conservation NGO R.E.E.F. Madagascar. The young NGO focuses on coral aquaculture and transplantation as a means of restoring coral reefs. ("R.E.E.F. Madagascar," n.d.). R.E.E.F. Madagascar is a half-Malagasy run and locally-based organization, created by two divers. It therefore has a firsthand view of changes to coral reefs, and expertise in incorporating local stewards into conservation projects.

As an outsider with little prior knowledge of Nosy Be's coral reefs, I wanted to create an educational photo journal that compiled information I gathered from local reef experts, fishers, and guides. By distributing a combination of this information to each group, I could consolidate the existing knowledge of Nosy Be's coral reefs. By compiling conservation suggestions from the people who have the greatest stake in reef protection, and the greatest power in enacting protective measures, the objective of the photo journal is to help different groups of people inspire each other to protect coral reefs.

Study Area

Figure 1. Map of Nosy Be and relevant villages (http://www.citiestips.com/view/-552679).

Nosy Be is an island in Northwest Madagascar. Overfishing and unsustainable fishing practices are significant threats facing coastal Madagascar, impacting its abundant offshore reefs ("The Three Largest," 2012). However, data regarding specific fishing laws on Nosy Be is scarce, since laws largely exist on the village level (Cinner, 2007). I met with fishers in the coastal villages Ambatozavavy, La Batterie, Andilana, and Sarodrovavy to gather their knowledge of and opinions on coral reefs.

Nosy Be is also a tourist destination, positioning tourism as another source of coral reef degradation, especially because tourism activity is concentrated along the coast. Conservation efforts, like those at Scuba Nosy Be (R.E.E.F Madagascar) are also located on the coast in the village of Ambondrona.

Reefs at Nosy Be are in good health compared to other major reefs in the Indian Ocean, but are still threatened by overexploitation of fish resources, coral harvesting for building materials, and hunting for species living within reef, using destructive iron bars to break open coral habitats (Ahmada *et al*., 2002). A study from 2002 attributed most local reef damage to boat anchors and fishery overexploitation, but lacked significant data (Ahmada *et al*., 2002). More recent research by a prior SIT student found that three coastal sites with human inhabitants: Nosy Komba, Ampasindava Hassanaly, and Ambalafary, were correlated with the highest rate of coral disease and algal growth on adjacent reefs (Allen-Waller, 2015). There is a link, then, between human activities and reef degradation.

Methodology

Interviews:

Interviews were conducted with five fishers in La Batterie, four fishers in Sarodrovavy, five fishers in Ambatozavavy, and three fishers in Andilana. Interviews were conducted in Malagasy, with translator Gisèle Bakary. Every fisher was asked the same set of five questions (Appendix 1). Then, an interview was conducted with five Nosy Be tourist guides. This was a group interview, where every participant was simultaneously asked a set of questions (Appendix 2). Interviews were also conducted with the two founders of R.E.E.F Madagascar, at Scuba Nosy Be in Ambondrona. These interviews took place on April 8, 2019 with Boulvais and April 10, 2019 with Ramahandrimanana. These were less structured conversations, and served as a means of gathering background information.

Research:

Background research was conducted on the biology of coral reefs. This research was conducted online, as well as through correspondence with senior research technician at the Centre Nationale Research Oceanographique (CNRO), Gisèle Bakary. Relevant information was incorporated into the photo journal.

Photography:

The photos were taken with a GoPro Hero 2, borrowed from Gisèle Bakary, and an iPhone 7. The first set of photos was taken on a coral reef off of Sarodrovay. CNRO technicians, working on a CNRO boat, helped access the reef. The other coral reef photos were taken at Tani-Kely national park, accessed by boat from La Batterie.

Photos were also taken at interview locations, including Sarodrovay and Ambatozavavy. Photos of coral transplantation were taken in Ambondrona, at Scuba Nosy Be. Photos of the Fish

Aggregating Device were taken off of Sarodrovay, where Katherine Helmer was researching FADs as a means of combating the impacts of reef degradation.

Writing:

Photos and interviews were compiled into a photographic journal. Interview quotes were incorporated into photo captions, as well as paraphrased information from interviews and embellished stories. The photo captions that explain reef biology use information from online research and correspondence with Gisèle Bakary.

The finished photo journal was translated into Malagasy, with the help of Gisèle Bakary. It was printed and bound, then distributed to an interested fishers' association on Nosy Be and a group of tourist guides. The guides were also given an electronic copy in both languages.

Results

Interviews:

I conducted a total of 20 interviews. 16 of these were with fishers (Table 1). 100% of the fishers reported that they frequently see dead coral on the reef. 100% also said they wanted to learn more about reef biology and conservation. The fishers all wished to remain anonymous or have only their first name used in the final publication.

Interviews with guides provided information on how tourists interact with coral reefs, and the connection guides have to reefs as compared to their clients, who are short-term visitors (Table 2). The guides requested that their names be used, and that their contact information be included in the book for potential clients.

Interviews with conservationist divers Erwan Boulvais and Narindra Ramahandrimanana offered broader information on the climate-related threats facing coral reefs. They explained their coral transplantation project with R.E.E.F. Madagascar, and their suggestions for continued reef protection. This information was incorporated into the final photo journal. Both agreed to have their full names included.

An interview with Gisèle Bakary was another source of background information on coral reef biology and coral transplantation as a conservation project.

Table 1. Fisher interviews logistical information.

Location	**Number of Subjects**	**Date**
La Batterie	4	April 2, 2019
Sarodrovavy	4	April 3, 2019
Ambatozavavy	5	April 4, 2019
Andilana	3	April 11, 2019

Table 2. Tourist guide interviews and their utility. From April 5, 2019 in Hellville.

Name	**Number of times directly quoted in photo journal**
Roger Cocoa	2
Jean-Pierre Tomana	2
Angelot Ravo	1
Olivio Adrianjara	1
Jean-Robert	0

Research:

Background research provided scientific information for the photo journal. An audio podcast based on recent scientific research (Clark, 2019) and personal correspondences with CNRO research technician Gisèle Bakary were used.

Photography:

Over 100 photos were taken on the reefs at Sarodrovay and Tani-Kely Marine Park in Nosy Be, as well as photos on land in La Batterie and Ambatozavavy. Twenty photos were incorporated into the photo journal. All photos are unedited in an attempt to capture the reality of the island.

Writing:

The ultimate result of this project was a twenty page photo journal, written in English and translated into Malagasy. It includes photos taken on reefs surrounding Nosy Be, paired with biological information about coral reefs, personal stories of interactions with coral reefs, information on the threats facing the ecosystem, and conservation suggestions from interviewees.

The two copies of the book printed on Nosy Be, one in English and one in Malagasy, were distributed. The Malagasy version was given to an organization of fishers on Nosy Be, in

the hopes that it will be accessible by fishers from a variety of villages. The English version was given to the group of tourist guides, for their own use and to share with tourists. The tourist guides were also given an electronic copy of the product in both languages.

Discussion

Narindra Ramahandrimanana, director of the NGO R.E.E.F. Madagascar, explained that when one aims to conserve coral reefs, one must also protect seagrass and mangroves because they are all interconnected. In particular, all three play an important role in protecting the land from storms. When coral reefs are in poor condition, seagrass takes up the responsibility and absorbs more of the power of the storm. Mangroves provide the final line of defense, against a storm surge that has been slowed by seagrass and reefs farther out to sea (Guannel *et al*., 2016).

This project focuses on coral reefs, but coral reefs rely also on their connections with other ecosystems. It is not as simple, then, as one system providing one service. Similarly, human interactions with coral reefs are not straightforward. Each fisher interviewed had a different perspective on the threats facing coral reefs, and varying ideas of how to protect them. The guides cited tourists as a threat to coral reefs, but the possibility of revenue from tourism as a motivation to conserve the reefs. The conservationists saw humanity at large, the cause of climate change, as the major threat facing coral reefs, but local humans as the most important conservationists. This photo journal, then, aims to provide perspectives from each of these groups in one place, using collaboration to avoid bias.

One thing that struck me most while interviewing for this project was the extent of personal connection fishers on Nosy Be feel with coral reefs. As the primary ecosystem they depend on for their livelihood, I expected the majority of fishers to value coral reefs mainly for the fish they provide. Many did. Others, however, were moved by the color of reefs, by their resemblance to undersea flowers, and the sound they make that only experienced fishers seem to be able to hear.

These are the stories I was interested in incorporating into the photo journal, as evidence

of the importance of coral reefs beyond the economic. I was moved by the psychological value of reefs. Aside from the final product, an aim of this project was to incite interviewees to think about this value, and inspire readers of the photo journal to do the same. Hopefully, this will improve environmental stewardship in the long term, by motivating conservation based on emotional connection to an ecosystem.

However, like any collaborative project, this one did not take shape exactly as expected. Since the outcome was based on information gathered from other people, it was unclear exactly what I would find and what the final project would look like. I ended up spending weeks instead of days on initial interviews. The project grew into something larger than just gathering fishers' perspectives on coral reefs, as I searched for a more comprehensive picture of coral reef perceptions on Nosy Be. As a result, instead of creating a short educational pamphlet, I created a long photo journal which includes biological information about the ecosystem and personal stories I collected. This meant that I was not able to conduct focus group interviews to revise the photo journal throughout the project, since I spent the duration of the research interviewing and creating the journal simultaneously. This was a trade-off that I felt was necessary to produce a product that was representative of the situation.

Also, I initially planned to translate the photo journal from English into French and Malagasy. However, based on anecdotal information from guides, the majority of tourists on Nosy Be are Italian, not French. I did not have the means to translate the project into Italian, so I translated it only into English and Malagasy. The Malagasy translation was a collaborative effort, and I received extensive help from my advisor Gisèle Bakary. Due to the length of the project, it was only feasible to translate into one language other than English.

While the outcome of an education project like this was uncertain, local opinion on Nosy Be revealed that the project was wanted and would be positively received. However, there are threats facing coral reefs in Nosy Be that require political action, beyond public education. One of these is industrial fishing pressures from developed countries. One interviewee mentioned this, and it was briefly included in the photo journal. This, however, is an important point to delve into more deeply, a point that I wish I pursued more thoroughly during the interview. Politically, there is a seemingly simple solution: enforcing coastal nations' exclusive economic zones. However, like each of the other threats facing coral reefs in Madagascar, this problem does not have an explicit answer. These large industrial vessels are in Malagasy waters illegally, poaching fish (Chinhuru, 2015). As a result, even if fishers and tourists are thoroughly educated regarding the pressures facing coral reefs, this overpowering threat will still exist and require decisive political action.

Conclusion

There was a high demand for this project among interviewees, and the final product was positively received. This study was limited by time, as I would have liked to review drafts of the project with fishers and guides on Nosy Be and translate the final product into more languages.

Currently, the final product has been distributed to one fishers' association and one group of guides on Nosy Be. My advisor, Gisèle Bakary, is a research technician at CNRO and will distribute the project there as well. However, it is not guaranteed that a wide range of people on Nosy Be will see this project. As is the nature of educational creative projects, there is also no guarantee that the target audience will read the photo journal or that it will change their behavior. The project was a success, however, in that it was produced with the input of the target audiences and because it has already been distributed to those audiences.

Recommendations

Future work on this project may involve, first, translating the photo journal into more languages for use by tourists that come from a variety of countries. Currently, the work exists in the two languages that seem to be most widely spoken on the island: Malagasy, and English for tourists. However, as tourism on Nosy Be increases, it is important to have a method to inform all visitors to the island about how to responsibly interact with coral reefs.

Also, in the future it would be beneficial to continue revisions on this project. This may involve meeting with focus groups of target audiences to receive feedback on the photo journal, and add other topics they would like to learn more about. Future versions of this project, then, have the potential to be more collaborative and as a result, more effective.

Future research may also seek to offer explicit political solutions to some of the threats facing Nosy Be's coral reefs. A political analysis, and potentially lobbying for political change to counter some of the larger threats like foreign poaching and lack of climate action, would be beneficial.

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Appendix One

Fisher Interview Questions

1. What's something you like about coral reefs- what's something that makes you happy when you are interacting with a coral reef?
2. Do you often see dead coral on the reefs? How does that make you feel?
3. What is the value of a living coral reef?
4. What's something that can be done to increase or preserve that value?
5. Would you be interested in learning more about the science of coral reefs, and how to protect them?

Appendix Two

Tourist Guide Interview Questions

1. What's something you like about coral reefs- what's something that makes you happy when you are interacting with a coral reef?
2. Have you seen tourists interacting with coral reefs in a way you don't like?
3. What is the value of a living coral reef?
4. What is something the tourism industry can do to increase or preserve that value?
5. Do you think tourists would interact more carefully with coral reefs if they knew more about their biology and how to protect them?
6. Are there fadys associated with coral reefs? Do tourists unknowingly break them?