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Voices of the Reef: Weaving Together Traditional Stewardship and Science to Protect Palau's Coral Reefs

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Voices of the Reef: Weaving together traditional stewardship and science to protect Palau's coral reefs



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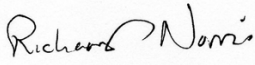
Master of Advanced Studies - Marine Biodiversity and Conservation
Final Capstone Report- June 2020

Scripps Institution of Oceanography
University of California, San Diego

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June 10, 2020

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Date

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June 11, 2020

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Report of Activities

Abstract/Executive Summary:

Coral reefs are some of the most biodiverse ecosystems in the world. However, human activities are creating increased stressors for coral reefs which are resulting in change. Today, Palauan coral reefs boast high levels of biodiversity and draw dive tourists from all over the world. Historically, Palauans have sustainably cared for and managed their reefs for time immemorial. As the reefs undergo change, it is important to return research information to the traditional stewards who can use the data and advocate for management. A communication strategy is needed that equally values science and traditional stewardship to inform future management decisions. This capstone project resulted in the development of a story map, which includes 3D fly throughs of coral reefs derived from data sets collected by the 100 Island Challenge and several short, informative videos. The story map follows the theme: “Coral Reefs: The Pride of Palau.” The story map was built to be used in a communication strategy that explains the value of science and traditional stewardship in the formulation of management decisions of coral reefs in Palau. The story map was specifically made for the Hatohobei community and the nonprofit OneReef, but the intent is to reach community audiences across the Micronesia region as well as government officials.

Background/Problem Statement:

The 100 Island Challenge

Scripps Institution of Oceanography (SIO) has developed cutting edge research tools that have led to new knowledge about the ocean environment. The 100 Island Challenge (100IC) is a project that has developed out of Stuart Sandin and Jennifer Smith’s labs at SIO. Through collecting photomosaic data, the 100IC has created 3D models of coral reefs. The models can be used to describe the structure of coral reefs and how the reefs change through time. The 100IC, as the name implies, is collecting data from 100 islands.¹ However, this capstone will focus solely on the island of Palau.

OneReef

OneReef is a 501(c)3 nonprofit organization whose mission is to serve communities who protect their reefs. They use a community partnership model, collaborating with communities that are directly taking care of the reefs. OneReef currently works exclusively in the region of Micronesia. At present, OneReef works with eight communities across Micronesia. In Palau, OneReef works with the Hatohobei and Ngarchelong communities. OneReef supports communities through creating marine management and fishing plans, delivering trainings and tools to protect reefs, science-based monitoring for impact, and building local capacity to recover reefs for future generations.²

Palau

The Republic of Palau is a 400-mile-long string of islands at the western most edge of Micronesia.³ It has four large reef systems: the Northern Reef, the reefs to the east and west of Babeldaob Island, the Southern Lagoon, and Hochtarihie (commonly known as Helen Reef).³ The

Hatohobei community is based on Tobi Island and Helen Island, which are two of the most remote places in the Republic of Palau. Koror, the capital of Palau is 400 miles northeast of Tobi Island. Ngarchelong is at the northernmost tip of the island of Babeldaob, the largest island in Palau.³ Both of these communities have strong interconnected ties with nature. Tobi Island and Helen Reef have a history of effective traditional stewardship and have lived in harmony with their environment for generations.

Though Palau is world renowned for the quality of its coral reefs, many Palauans have never seen a coral reef.⁴ However, this has not restricted the passage of oral tradition about coral reefs and reef fish over time. Baseline data for coral reefs is challenging to come by since SCUBA diving was only invented in 1943. Science can only tell us so much without having baseline data of what the reefs formerly looked like. However, traditional stewardship can fill these gaps. Palauans have traditionally been scientists in their own right. They have seen changes occurring over time, and they have passed this knowledge from one generation to the next. Weaving science with traditional stewardship is critical to understanding how Palauan coral reefs have changed over time and can provide important perspectives when making conservation decisions.⁴

The 100 Island Challenge, OneReef, and the Hatohobei community have partnered together to protect Palau's coral reefs. OneReef has facilitated partnerships between the 100 Island Challenge and the Hatohobei Community, the 100 Island Challenge has led trainings with the Hatohobei community to use the 3D camera equipment to collect images of the reefs, and the Hatohobei community has carried out the collection of images while also being a voice for the reef to decision makers, who make management decisions regarding the reef.

This project aims to highlight the work that all partners are doing to protect coral reefs, return scientific data to the communities, and address the lack of interactive/compelling communication products available for community members to visualize the changes that are happening to their reefs.

Specific Objectives:

The goal of this project is to weave scientific data from 3D models of coral reefs into a communication strategy in which Palauans tell the story of their relationship with coral reefs and how the reefs have changed overtime. The communication product will be used by Palauans and government officials to invoke individual and political changes, which will subsequently enhance and inform coral reef conservation outcomes. Specific objectives include:

1. Incorporate the perspectives and stories of Palauan stakeholders
2. Give the data back to the communities from which the data was collected
3. Develop relationships and cultivate trust with Palauan communities
4. Develop videos of the 100IC 3D models that are informative and understandable for the Palauan public as well as supporters of OneReef

5. Document Palauan traditional stewardship and share it with other communities across the Micronesia region
6. Identify how coral reefs have changed over time in Palau

Methodology to achieve the end product:

Through the winter quarter, regular phone calls and in-person meetings were conducted with Wayne Andrew, Senior Advisor for OneReef, and Madelsar Ngiraingas, Community Partnerships Manager for OneReef. They helped shape the project deliverable and formulate the story line for the story map and videos. On a weekly basis, Dick Norris helped storyboard out videos/story map and he discussed capstone direction. In the Spring Quarter, regular meetings with OneReef and 100IC were used to develop the Story Map and collect video interviews.

3D Fly Throughs:

For the first six weeks of the spring quarter, the VisCore software was used to set up coral reef models and build fly throughs of the coral reefs. For Tobi Island, images had only been collected for one year (2017); therefore, evaluation of change over time could not be determined for the reefs. Fly throughs were built to show the state of the reef around Tobi Island in 2017. The models of Helen Reef had been collected on two separate occasions, 2014 and 2017. As a result, fly throughs and sliders were made to show changes to the reef over a three-year time period from 2014 to 2017. The fly throughs were color coded in red and blue. Red showed parts of the reef that had disappeared over three years, and blue showed growth of the reef over three years. The sliders were made to move over two images of the reef, one from 2014 and one from 2017, to show change over time.

Videos:

Due to the coronavirus, I was unable to conduct the interviews or collect footage for the project myself. As a result, I developed interview questions and sent them to the OneReef team and Stuart Sandin to conduct their personal interviews and interviews with community members.

The OneReef team on the ground in Palau conducted interviews with Wayne Andrew and other community members. The team also collected video footage of imagery in Palau to match what was said in the interviews. They sent these videos to San Diego for further editing. Stuart Sandin conducted a remote interview and sent the footage to me for editing.

From San Diego, during weeks five through eight of the capstone project, I compiled the interviews and imagery to develop short films that followed the overarching theme of: "Coral Reefs: the Pride of Palau". The theme of each individual video was:

- Fishing and Coral Reef Ecosystem Services Provided to the Hatohobei Community
- Traditional Stewardship
- 100 Island Challenge and Palau
- Hatohobei Success in Stopping Illegal Fishing
- Traditional Stewardship and Science.

The videos are able to stand alone, but they also follow a greater story arc that allows them to fit together. They are able to stand alone so that they can be shown or shared on social media accounts individually, but they also fit together so that they follow the theme of the story map.

Story Map:

The story map is the overarching deliverable for this project. The story map was developed and edited from weeks two through 10 of the project. The fly throughs and videos have been added into the story map at key places to frame the story. The “and, but, therefore” statement for the story map is:

“Palauan coral reefs boast high levels of marine biodiversity **and** Palauans have been caring for the reefs for time immemorial, **but** as the reefs undergo change, traditional stewardship actions have been utilized less than scientific actions **therefore** a communication strategy is needed that equally values science and traditional stewardship to inform future management decisions.”

Throughout the story map, the fly throughs and the interviews are explained in a way that helps the viewer understand the importance of traditional stewardship, the value of scientific tools, the changes happening to the reefs, solutions to problems, and the value of partnerships in conservation.

During the final week of the project (week 10), final versions of the deliverables were sent to OneReef and the 100 Island Challenge.

Challenges:

There are a few things that I would change about this project, and part of it simply has to do with circumstances beyond my control. This project faced several challenges due to the coronavirus pandemic. The timeline of this project was from March 20- June 12, 2020, this is within the timeframe that the coronavirus was wreaking havoc globally. As a result, I was unable to travel to Palau to collect interviews and facilitate storytelling in the same manner I had planned. If I could build upon what I was able to start with this project, I would go to Palau, personally meet with community members, build trust, and conduct interviews with the community members. I would have liked to have spent time getting to know the communities and understanding what it is they would like to know about their coral reefs. I would have spent time collecting images above and below water. I would have liked to have conducted outreach efforts in Palau showing some of the models and the imagery of the reefs to communities and leaders. The products are useful educational tools and conducting outreach can have an impact on decision making and management.

That said, I am beyond grateful for the incredible team in Palau, who helped collect interviews and imagery when I could not be there myself. I am also grateful for my team in the United States who helped conduct remote interviews, collect imagery, and helped train me in the use of various software platforms.

Next Steps:

In the future, it would be useful to incorporate the fish survey data into this project. Because the 3D models do not capture things that move, fish are not included in the models. Communities are generally curious about the health of the fish communities because it factors into their fishing practices. As a result, incorporating fish data would facilitate greater community interest regarding coral reef conservation.

Another future project could include expanding the development of story maps to other islands and communities OneReef and the 100 Island Challenge work with. Ngarchelong, Ant Atoll, Nimpal, Ngulu, and Pohnpei are a few other communities who also have incredible stories of traditional stewardship that should be told and shared. Many of these communities already work with the 100 Island Challenge as well. The 100 Island Challenge works on many other islands around the world that could benefit from the sharing of their story and relationships with coral reefs. Videos, 3D models, and story maps are excellent communication tools that can help visualize scientific data, reach a broader audience, educate communities and decision makers to inform management. One of the greatest values of science is when the findings are acted upon. Scientific communication tools help bridge the gap from scientific findings to comprehension and subsequent action.

Conclusion:

Scientifically, qualitative observations of the reef imagery from Tobi Island and Helen Reef show that both have robust, but highly dynamic coral reefs. Reefs can change quickly. The 3D models from Helen Reef show that some corals grow a lot and others disappear. Based on preliminary observations it seems that *Acropora* table corals and *Montipora* corals grew from 2014 to 2017. *Acropora* corals that were branching, such as staghorn coral and elkhorn coral, as well as *Pocillopora* seemed to disappear between 2014 and 2017. This could possibly reflect the impact of storms on fragile branching corals and pocillopora. They are fragile and could have broken off due to wave action. These are strictly anecdotal observations, and further analysis should be conducted to validate or nullify these observations.

The reefs of Tobi Island and Helen Reef have been well protected and well managed by the Hatohobei Community for centuries. The community continues to use traditional stewardship, and they have relatively recently formed partnerships to stem illegal fishing, protect resources, and document changes to their reefs.

Partnerships are key to conservation success. OneReef, the 100 Island Challenge, and the Hatohobei community have created a lasting partnership that is not limited by funding or time restraints. They have created a true synergy between them that has created long-term investment in protection of coral reefs. Each party knows it can rely on the others to support their mission. Their relationship is necessary if the best science is going to be used in management.

Through partnership with the 100 Island Challenge and OneReef, the Hatohobei Community has obtained technological tools, funding, and training to support long-term

monitoring of coral reefs. This partnership enables visualization of the reef to a broader audience of community members. The partnership also ensures data collection in perpetuity, which ultimately leads to a social and scientific benefit. The social benefit is that the findings can impact community decision making. The scientific benefit is that the models can show change over time in measurable ways. Pace of change and episodicity of change can be evaluated. With a greater understanding of the reefs, down the line, the Hatohobei Community can use state of the art technology to track the reef and be a voice of the reef to decision-makers.

Traditional Stewardship and science should be equally valued. Traditional stewardship has grown and evolved over many generations. It is a form of decision making and it can be informed by science. Traditional stewardship works well in small communities where the decision-makers are local. This model becomes harder to implement on a large scale when there are many other voices. The stewardship problem is magnified when there are external market economies involved. This creates the possibility of over exploitation of even common resources, since the export market can absorb much more than any local system can produce. External market economies are becoming more prevalent in island nations, like Palau, that are reliant on imports and tourism. When a global economic downturn is experienced, such as what happened with the coronavirus, externally reliant island nations are among the first to feel the effects. Tourism, foreign aid, and foreign investment are among the first affected. The ability of an island to return to stability and self-sufficiency is dependent upon the extent to which traditional stewardship and traditional knowledge have been retained.⁵ Palau is making strides to maintain their self-sufficiency through closing 80% of their exclusive economic zone and through preventing illegal fishing. However, this act has also made their economy more reliant on tourism. A delicate balance between traditional stewardship, the economy, and self-sufficiency should be sought after.

Science helps to create on-the-ground common information. With respect to the 100 Island Challenge, the fly throughs have communication value for showing people detailed and engaging visions of what the reef looks like, which is hard to see even while diving. Management benefits stem from being able to track reef health, measure reef growth and community change, and potentially see the harbingers of changes in health that could be offset by changes in management. Science documents change to inform local action and can act as an early warning system for communities. Science can also help validate traditional stewardship. Depending on the findings, science can be a recapitulation of traditional stewardship and vice versa. There are intimate relationships across forms of human knowledge, and this includes traditional ecological knowledge and scientific knowledge. They dovetail together to provide a holistic understanding of an ecosystem.

Scientific communication and data sharing are critical to implementing effective conservation. Translation of science into a usable format for a community is a critical step between scientific collection and use by a community or conservation group. In some instances, scientific information is not actionable, or is presented in the language of research not of most people. Translation of science is a significant barrier to use of data in management. This project

aimed to address the need for understanding and communicating science to inspire action. Sharing science is also limited by expense, the ability to share large data files, poor internet connection, or a variety of other reasons. Scientists who collect data should make every effort to return the data to the communities from which the data was collected. The communities have the knowledge and power to act upon the findings of the data. Scientists who study an ecosystem, be it coral reef or otherwise, should value the ecosystem and feel the desire to preserve the ecosystem. The act of putting the data back into the hands of the community is a step in the direction of positive change and effective conservation. The 100 Island Challenge is a success story in its efforts to collaborate with communities and return the data to them.

The story map acts as a communication tool to describe the importance of partnerships, equally valuing traditional stewardship and science, and science communication through sharing scientific data. These three components have been important to the protection of Palau's coral reefs, and are evident through the actions of OneReef, 100 Island Challenge, and the Hatohobei community. This project serves as a starting point for sharing this data with communities and is an example of how data can be communicated and shared with other islands that work with OneReef and the 100 Island Challenge.

Success of this project will be dependent upon use by OneReef, 100 Island Challenge, and community members. Success is determined by how many views the short films receive and the number of times the story map is used for broader outreach by OneReef, the 100 Island Challenge, and community members in Palau. OneReef is considering using the deliverables for broader outreach at speaking events such as COP26 and Nia Tero, communicating with the President of Palau and the Minister of the Environment of Palau, advocating for funding, and sharing across the Micronesia region. The 100 Island Challenge is considering integrating the videos and story map on their website. Community members can share the story map and video links on their social media pages or through email. The intent is that the story map and videos reach communities in the Micronesia region, but a broader use is that the videos can be used for speaking engagements with important politicians in Palau, climate conferences on a global scale, traditional stewardship workshops, and beyond. The possibilities are vast.

Conservation of coral reefs requires the help and long-term investment of multiple partners, using traditional stewardship and science together, and sharing scientific knowledge in understandable and actionable ways. Together, they enable communities to have well-rounded knowledge of their ecosystems and be a voice for the reef when advocating for management changes.

Acknowledgements:

This project would not have been possible without the support of my Capstone Advisory Committee, OneReef team members, 100 Island Challenge team members, the Hatohobei Community partners, and Scripps Institution of Oceanography MAS-MBC staff. I am deeply thankful for the incredible amount of support and commitment you have provided this project. With all the challenges of the coronavirus, I am amazed at your dedication and ability to provide me with the essential materials to complete this project. Thank you for trusting me and allowing me to be a part of this project. I am confident this project will live on through your energy and dedication. I am honored to have played a small part in facilitating the great work you will do using these new tools.

Products and Materials

Story Map Link:

<https://storymaps.arcgis.com/stories/331a44384fd14f0b8857d65a9b9c0d08/>

QR code:



Video Links:

Fishing and Coral Reef Ecosystem Services Provided to the Hatohobei Community:

<https://www.youtube.com/watch?v=53khXLoSDJ8&t=1s>

Traditional Stewardship in the Hatohobei Community:

<https://www.youtube.com/watch?v=EDpDGRN1n3A&t=29s>

100 Island Challenge and Palau:

https://www.youtube.com/watch?v=v_MWTz9ODyI

Hatohobei Success in Stopping Illegal Fishing:

<https://www.youtube.com/watch?v=bKlpZEvjYOE>

Traditional Stewardship and Science Together:

<https://www.youtube.com/watch?v=rSrPujY-P48>

Wayne's full interview:

<https://www.youtube.com/watch?v=W5NCeZ4EjrM>

Slider Links:

Helen Reef Northwest (Site 15 Out):

<https://cdn.knightlab.com/libs/juxtapose/latest/embed/index.html?uid=f057b4aa-970c-11ea-a879-0edaf8f81e27>

Helen Reef Northwest (Site 15 Out) with Numbers:

<https://cdn.knightlab.com/libs/juxtapose/latest/embed/index.html?uid=423e5956-93e6-11ea-a879-0edaf8f81e27>

Helen Reef Inside (Site 25):

<https://cdn.knightlab.com/libs/juxtapose/latest/embed/index.html?uid=997c0904-8f39-11ea-a879-0edaf8f81e27>

Helen Reef Inside (Site 25) with Numbers:

<https://cdn.knightlab.com/libs/juxtapose/latest/embed/index.html?uid=cae986de-93e3-11ea-a879-0edaf8f81e27>

3D Fly Through Links:

Delivered to OneReef via Google Drive:

<https://drive.google.com/drive/u/2/folders/1WtIQ0UJdNlpthOR5V9xFgdviicnT7t1k>

Tobi North

<https://www.youtube.com/watch?v=Jm7MmloGd84>

Tobi East

<https://www.youtube.com/watch?v=7Oj01CKE6gY&t=4s>

Tobi South

<https://www.youtube.com/watch?v=cmGAIrik5yo&t=3s>

Tobi West

<https://www.youtube.com/watch?v=N5jH0bdR6WY>

Helen Reef Northeast

<https://www.youtube.com/watch?v=icfRjtGvnK4>

Helen Reef Southwest

https://www.youtube.com/watch?v=_e6ih-pw9sM

Helen Reef West

<https://www.youtube.com/watch?v=o5qWmaiBgus>

References:

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<http://100islandchallenge.org/>
2. One Reef. (2019, September 19). Retrieved February 12, 2020, from <https://onereef.org/>
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4. DeWitt, Rachael, et al. "Call with OneReef and Rachael." 29 Jan. 2020.
5. Johannes, R. E. (1992). *Words of the Lagoon: Fishing and Marine Lore in the Palau District of Micronesia*. Berkeley: Univ. of California Press.