

STATEMENT OF GRANT PURPOSE

Sophie Wulfin, Indonesia, Fisheries

The effects of mangrove restoration on fish stocks and marine biodiversity in Indonesia

Background: Mangroves provide key services to the surrounding environment such as flood and tsunami protection, carbon sequestration, and by acting as a refuge for many species of juvenile fish due to abundance of food and reduced predation. About 55% of total fish catch biomass in Indonesia is made up of species dependent on mangrove habitats. Unfortunately, coastal communities in the country have experienced alarming rates of mangrove degradation due to anthropogenic activity. To address this issue, the Indonesian government has committed to restoring 600,000 hectares of mangroves in the country by 2024, the most ambitious mangrove rehabilitation program in the world. While these efforts have resulted in increased flood prevention and ecotourism, little research has been done to assess the improvements in marine biodiversity and benefits to fish stocks. I aim to understand how this restoration is affecting local marine biodiversity and the sustainability of commercially fished species. I will conduct this work with Dr. Rohani Ambo Rappe from the Universitas Hasanuddin in Makassar (see Letter of Affiliation) and will disseminate my findings through peer-reviewed scientific articles and presentations to other scientists at Universitas Hasanuddin to inform their own research on mangroves in South Sulawesi. I will also be working with the nonprofit group Blue Forests as they continue ongoing mangrove conservation research in South Sulawesi, and can introduce me to the community and help me communicate findings to local decision makers (see Letter of Affiliation). I have extensive background in fishery assessment and have lived in several coastal communities where I have learned the importance of the relationship between researchers and stakeholders. After my Fulbright year, I plan on continuing research in small-scale fisheries and hope to gain a deeper understanding of how conservation has tangible effects on local fishers.

Affiliations: Dr. Rohani Ambo Rappe is a seagrass ecologist who has worked extensively in South Sulawesi with both fisheries researchers and the local community in the region. She will provide expertise in the area, connect me with local fishers, and provide guidance in conducting science in tropical marine areas. I will work in Tompotana village on Tanakeke Island, South Sulawesi where mangrove forests were largely depleted due to shrimp aquaculture and charcoal production. To address this, mangrove restoration has been led by Blue Forests and the local community since 2010. I will work with Blue Forests to deploy Baited Remote Underwater Videos (BRUVs), a non-invasive and inexpensive camera contraption. This method has not been utilized in the area and does not require catching or killing fish to collect data. I will also develop stock assessments of species of local and commercial interest with Fishpath, a software used by researchers to evaluate different management scenarios. I will be doing stock assessments of squid, snappers, groupers, and milkfish, all of which are commercially fished species that have experienced declines recently due to overfishing but may also benefit from this mangrove conservation effort.

Project Timeline: September – November 2023: Focus on Bahasa Indonesia language learning in Java (contingent upon receiving the CLEA award). December 2023 – May 2024: Data collection. With the support of Blue Forests and the input of Dr. Ambo Rappe, I will deploy a BRUV at three different sites in Tompotana village: a site that was restored in the early 2010s, a recently restored site, and a site that still has not yet been recovered from mangrove loss. The BRUVs will have been purchased prior to the start of the grant using personal funds. Every day I will analyze these videos and note the species found, how long they remained detected by the BRUV, and time of day they were spotted. June 2024: I will clean and formalize the data for

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analysis, calculate the biodiversity index (a key metric in assessing ecological health), and use Fishpath to create population models and evaluate different management strategies. July – August 2024: I will discuss results with Dr. Ambo Rappe and begin writing our conclusions on the benefits of mangrove restoration. In this time, I will also work with Blue Forests in creating research presentations aimed at the local communities in which they work so that they can utilize the findings in their efforts.

Community engagement: When conducting research, it is essential to connect with the stakeholders of this work as this contextualizes findings and fosters mutually beneficial conservation decisions. To engage with Dr. Ambo Rappe's students in Makassar, I will teach weekly workshops in the statistical programming language R, a common analysis tool in ecology. I have run similar workshops both while working in Bogotá, Colombia, and during my current master's program, so I am familiar with the challenges new students face when learning to code. I also plan to write elementary school curricula on the benefits of mangroves to fish stocks for the Blue Forests annual field school for local children in the villages they work in.

Experience: I have extensive experience conducting fisheries research. In 2017, I interned for the National Oceanic and Atmospheric Administration, developing population models of Pacific fishes and identifying species in the Eastern Pacific. Currently, I am getting my master's degree at the University of New Hampshire. As a quantitative ecologist, my master's thesis addresses data deficiencies in small-scale fisheries and analyzes the process and outcomes of decision making by stakeholders. I hope to continue this field of research, which is why I plan to partner with Blue Forests during my Fulbright year. My past field experiences have also taught me when living in coastal communities, it is essential to build relationships between scientists and stakeholders. At Louisiana Universities Marine Consortium, I worked in a lab studying coastal restoration in Louisiana's marshland where coastal erosion is threatening the homes and livelihood of the local community. The goal of this project was not just to understand the impacts of coastal erosion, but to effectively communicate those impacts to the communities most affected. Having seen firsthand how marine conservation research impacts people living in coastal areas, I understand the importance of fostering relationships with the local community not only to build trust but also to incorporate local knowledge to better institute practical conservation practices. I hope to bring similar science-based management and restoration information to the communities I will work with in Sulawesi.

Conclusions: After Fulbright, I plan to apply for jobs at an NGO or government agency to better understand and quantify the status of our world's small-scale fisheries. This Fulbright project will be a building block toward that goal as it will continue my work in addressing the issues small-scale fisheries face. Most crucially, I will learn how to communicate these findings to the people most affected by environmental change. By publishing this fish assessment, my hope is that this work contributes to both the lives of those I work alongside in Tanakeke, and also to global research on small-scale fisheries. Further, as many NGOs work with global datasets, I hope to utilize the relationships and connections I make in Indonesia to help bridge the gap between small-scale fisheries and these large-scale databases. Indonesia is one of the top producers of fish and is home to one of the largest networks of small-scale fisheries in the world. Research on the effects of restoration in such a setting would be good training for future fish conservation research I hope to help with.