

**1. Long-Term Monitoring Efforts and Abalone Size-Frequency Surveys in Humboldt County****2. Reef Check Foundation****3. Tristin McHugh, North Coast Regional Manager**

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**4. Project Background Description and Location****Reef Check Foundation**

Reef Check Foundation is a California based 501(c)3 non-profit organization dedicated to the conservation of the world's reefs. Reef Check's mission is to empower people to save our reefs and oceans, stimulating action through a combination of education, training, and targeted collaborations. Internationally, we have volunteers in over 90 countries whom monitor their local coral and temperate reef habitats, providing essential data for effective marine management and conservation. In addition to providing a platform for divers to survey their local reefs, our training offers the public a rare window into underwater ecology, building a sense of direct personal investment in the preservation of the world's oceans.

**Reef Check Foundation pursues four principle goals:**

- To educate the public and governments about the value of underwater reef ecosystems, and to bridge the information gap between scientists and citizens.
- To stimulate local action to protect remaining pristine reefs and rehabilitate damaged reefs worldwide
- To create a global network of volunteer teams, trained and led by scientists, that regularly monitor and report on reef health using a uniform and consistent sampling methods
- To design and implement ecologically and economically sustainable monitoring efforts through collaborations with community groups, governments, universities, and businesses

**Long-Term Marine Protected Area Monitoring**

In compliance with the 1999 Marine Life Protection Act (MLPA), the statewide network of Marine Protected Areas (MPAs) continues to be surveyed by Reef Check California (RCCA) divers. RCCA has helped establish the ecological baselines to evaluate the performance of the MPAs. Subsequently, RCCA has continued to monitor these MPAs every year and is committed to surveying the MPA network for the long-term as the only statewide group monitoring California's reefs. RCCA was established in 2005 and is the largest statewide citizen-scientist monitoring program, involving over 1,500 divers and training more than 250 divers annually.

Since its beginning in 2005, our program has continued to grow in the number of involved volunteers, businesses, universities and communities. With its statewide dataset spanning more than a decade now, RCCA is in a unique position to track the health of the ocean and the performance of our management practices as we continue our long-term monitoring efforts throughout the state. RCCA surveys have been used statewide for MPA monitoring and evaluation. RCCA data have been compared to academic monitoring programs and found to be compatible with the state's needs for scientific monitoring data as recognized in a Memorandum of Understanding between the California Department of Fish and Wildlife and the Reef Check Foundation. As such, RCCA data are a key information source for the State of California in the management of its marine resources through MPAs and other management approaches.

### **Abalone Size-Frequency Surveys**

Over the last few years we have documented dramatic changes to the nearshore ecosystem along California's North Coast. The sea star wasting disease and consequent loss of the kelp forest and explosion of purple urchin populations have created difficult living conditions for abalone whom rely on kelp for food. Because very little data on abalone populations in Humboldt County is available, we are proposing to conduct size-frequency surveys of abalone populations using local RCCA trained divers. Conducting size-frequency measurements will allow marine resource managers to understand the density and sizes of abalone in various locations within Humboldt County, providing a local understanding of the fishery. This is particularly timely, as the California Fish and Game Commission will consider a new Red Abalone Fisheries Management Plan this year. Draft plans have called for the use of citizen science data, such as collected by RCCA, as a critical data source for managing local fisheries. After the closure of the recreational abalone fishery this approach of collecting information will allow stakeholders to get directly involved in the efforts to regain a sustainable fishier in the future.

### **Projects Locations:**

In 2014, RCCA developed a North Coast Region, and hired a dedicated North Coast Regional Manager to target monitoring efforts in Del Norte, Humboldt and Mendocino Counties. Within Humboldt County, we have two sites: Trinidad Cove, Flat Iron Rocks and Shelter Cove. Trinidad Cove has been surveyed in 2008, 2013, and 2018, and Flat Iron Rocks is one of our new sites and was established in 2017. Within Shelter Cove, Sea Lion Gulch State Marine Reserve has yet to be surveyed by subtidal research teams to assess fish, invertebrate and algae populations and community assemblages.

In addition to these sites, RCCA is actively involved in monitoring the status of abalone populations along the North Coast. Abalone surveys will be conducted in as many locations as possible, with a minimum of four additional locations.

Conducting research dives in Humboldt County comes with many limitations, the main one being poor ocean visibility which prevents divers from being able to see, and therefore, count target species. Very specific ocean and wind conditions can allow for favorable conditions, however they are hard to predict. Typically, RCCA surveys are scheduled months in advance, and with conditions along the Humboldt coast being inconsistent, the North Coast Regional Manager has had to cancel many planned sampling efforts. However, last year RCCA was able to hire a Divemaster, whom resides in Humboldt County, to help facilitate surveys when ocean conditions are good and build a constituency within Humboldt County. This allowed us to opportunistically survey our Trinidad site in May 2018, and build a strong relationship with the Humboldt State University Dive Program and local divers.

A grant from the Humboldt Fish and Game Commission in 2018 will ensure that RCCA has the funds necessary to staff a lead diver in Humboldt County.

## **5. Project and Work Procedure Description**

With the assistance of the Local Divemaster, the North Coast Regional Manager will be responsible for planning and executing: 1) **Long-Term Monitoring Project** and 2) **Abalone Size-Frequency Surveys**.

### **Survey Methods – Long-Term Monitoring Efforts Project**

Reef Check California surveys consist of visual surveys performed by scuba divers. At each site, buddy teams of divers conduct eighteen 30 m x 2 m benthic transects, to monitor key species of fishes (35 species), invertebrates (33 species) and algae (5 species & 4 invasive species) and to characterize the reef substrate and relief.

Fish are counted and sized by the divers along 18 transects at each site. Fish are identified to species and their total length is recorded. Fish are counted by searching along a 30 m long x 2 m wide swath on the substrate and up to 2 meters into the water column. Cracks and crevices in the reef are searched using flashlights but no rocks are moved to during the search.

Individual invertebrates and algae are counted along six 30 m long x 2 m wide transects at each site. Typically, a diver slowly swims one direction counting targeted invertebrates and then swims back counting targeted algae. Cracks and crevices are searched and understory algae are pushed aside to search for invertebrates. No organisms are removed.

In addition to these surveys, roving abalone data collection will be conducted. Divers will be equipped with calipers designed by The Nature Conservancy and the Abalone Working Group to take measurements of abalone sizes to the nearest millimeter.

Data is entered in the Nearshore Ecosystem Database and undergoes strict quality assurance and control protocols before being published. Once published data is made available at [data.reefcheck.org](http://data.reefcheck.org) where it is available for public download. All of RCCA's data is also made available to the California Department of Fish and Wildlife and other relevant management agencies.

### **Survey Methods- Abalone Size-Frequency Surveys**

All abalone size-frequency surveys will also be conducted on SCUBA, and we will use calipers to measure abalone to the nearest millimeter. Divers will be conducting two dives per day, and data collected will be given to the North Coast Regional manager for quality assurance.

### **6. Project Objective**

The purpose of the **Long-Term Monitoring Efforts Project** and the **Abalone Size-Frequency Surveys Project** is to: 1) Collect data on Humboldt county's rocky reefs and abalone populations to use for ecosystem-based management 2) Involve Humboldt County divers in data collection efforts happening locally 3) Increase RCCA presence in Humboldt County and provide opportunities for involvement in resource management for the local community.

### **7. Work Schedule**

RCCA will opportunistically find "good weather windows" to conduct both projects. This means that when weather is good, divers will plan to dive two times in a given day, and hopefully complete one site in a given weekend.

### **8. Proposers Qualification**

The projects will be led by Tristin McHugh and overseen by Dr. Jan Freiwald.

Tristin McHugh, the North Coast Regional Manager, began working for Reef Check California in March of 2018 and is based in Fort Bragg. Tristin received her Bachelor of Science in Marine Biology and Legal Studies from the University of California, Santa Cruz in 2013. Following graduation, Tristin assisted and led a number of projects spanning the Pacific Northwest, and gained an appreciation for the divers and researchers involved in protecting such an invaluable resource through the collection of long-term data sets. In 2015, Tristin left Santa Cruz to pursue her Master's in Biology degree at San Diego State University (SDSU), where she focused on how storm disturbances impact subtidal algal communities, and how the physiology of red algae structures community assemblages. In addition to her thesis, Tristin was a Divemaster and Boating Safety Officer for projects based Alaska and Mexico, and was the Graduate Student representative for the Diving Control Board at SDSU until her graduation in December 2017. Lastly, Tristin has over 1,000 dives in California waters and has extensive experience leading and executing a variety

of field-based diving operations.

Dr. Jan Freiwald is the Executive Director of the Reef Check Foundation. Jan has deep expertise in reef community ecology, marine management, citizen science and marine conservation. Prior to becoming Executive Director, Jan led the Reef Check California program for eight years. He has grown this program into a statewide marine protected area monitoring network of citizen scientists. Jan is responsible for implementing a climate change research project for the Reef Check California program, which is studying the effects of ocean acidification and hypoxic zones on the reefs and kelp forests along the California coast. He studied biology in Germany before receiving a Bachelor of Science in Marine Biology from the University of California Santa Cruz. Prior to joining Reef Check, Jan obtained a PhD in Ecology and Evolutionary Biology from the University of California Santa Cruz where he used approaches ranging from acoustic telemetry, to community surveys to genetic analyses to investigate kelp forest community ecology and marine protected area design.

**9. Amount Requested:**

\$5,000

**10. Other Funding Sources and Amounts**

The Nature Conservancy (TNC): \$44,000 for abalone surveys entire north coast

Ocean Protection Council: \$272,000 statewide MPA monitoring

Resources Legacy Foundation: \$175,000 statewide MPA monitoring

**11. Annual Project Budget**

**a. Salaries (total): \$2,000**

- Local Divemaster: \$2,000

**b. Materials and Supplies (total): \$850**

- (10) Calipers for abalone measurements (\$85/unit): \$850

**c. Operating expenses (total, and itemize below): \$2150**

- i. Boat rental: \$1500 (surveys Shelter Cove)
- ii. Travel: \$650 (surveys and outreach)

**d. Budget Grand Total: \$5000**

**12. Volunteer Participation, if any:**

Other than the North Coast Regional Manager and the local Divemaster, the rest of RCCA divers are all volunteers. Citizen science and volunteer participation is the crux of the Reef Check Foundation, and the reason why we are able to survey so many reefs all over the world.

In May, we held our first Humboldt County-based training in Arcata to teach: 1) Long-Term Monitoring Efforts Survey Protocols: RCCA's statewide protocols, during which the divers learned how to conduct subtidal surveys of fish, algae, invertebrates and the benthic habitat 2) Abalone Size-Frequency Survey Protocols. These divers are now able to assist on RCCA surveys throughout the state. A grant from Humboldt Fish and Game Commission will facilitate further research and outreach endeavors specifically in Humboldt County.