

Papahānaumokuākea Marine National Monument
RESEARCH Permit Application

NOTE: *This Permit Application (and associated Instructions) are to propose activities to be conducted in the Papahānaumokuākea Marine National Monument. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, provide all information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Papahānaumokuākea Marine National Monument (Monument).*

ADDITIONAL IMPORTANT INFORMATION:

- Any or all of the information within this application may be posted to the Monument website informing the public on projects proposed to occur in the Monument.
- In addition to the permit application, the Applicant must either download the Monument Compliance Information Sheet from the Monument website OR request a hard copy from the Monument Permit Coordinator (contact information below). The Monument Compliance Information Sheet must be submitted to the Monument Permit Coordinator after initial application consultation.
- Issuance of a Monument permit is dependent upon the completion and review of the application and Compliance Information Sheet.

INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED

Send Permit Applications to:

Papahānaumokuākea Marine National Monument Permit Coordinator

6600 Kalaniana'ole Hwy. # 300

Honolulu, HI 96825

nwhipermit@noaa.gov

PHONE: (808) 397-2660 FAX: (808) 397-2662

SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, SEE THE LAST PAGE.

Papahānaumokuākea Marine National Monument Permit Application Cover Sheet

This Permit Application Cover Sheet is intended to provide summary information and status to the public on permit applications for activities proposed to be conducted in the Papahānaumokuākea Marine National Monument. While a permit application has been received, it has not been fully reviewed nor approved by the Monument Management Board to date. The Monument permit process also ensures that all environmental reviews are conducted prior to the issuance of a Monument permit.

Summary Information

Applicant Name: Christopher Wall

Affiliation: UH Manoa, Hawai'i Institute of Marine Biology (HIMB)

Permit Category: Research

Proposed Activity Dates: May 1st - December 31st, 2015 (specific dates TBD)

Proposed Method of Entry (Vessel/Plane): R/V Hi'ialakai

Proposed Locations: (Shallow water reef (<100 ft depth), TBD, dependent on NOAA field cruise destinations)

Estimated number of individuals (including Applicant) to be covered under this permit: 4 Christopher Wall, Dr. Courtney Couch, two TBD UH Manoa Scientific Divers (* no more than 3 divers will enter the Monument at a time for the purpose of this research plan).

Estimated number of days in the Monument: 30

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...

assess the bleaching recovery in reef corals from shallow-water reefs throughout the Papahānaumokuākea Marine National Monument. In 2014, extensive and severe coral bleaching occurred across PMNM and the Main Hawaiian Islands. Dr. Courtney Couch and NOAA documented this bleaching event by recording the extent of bleaching along randomly selected sites (RAMP) and permanent transects in PMNM. To better understand how high temperature stress affected bleaching susceptibility and recovery of corals from the physiological to community scale, we propose to use non-destructive field ecology and minimally invasive sampling. This analysis will reveal the coral taxa most vulnerable and resilient to coral bleaching and identify physiological factors contributing to bleaching resilience across reef habitats. Further, these data will contribute valuable baseline data for coral health and bleaching recovery in the PMNM.

b.) To accomplish this activity we would

conduct ecological surveys by SCUBA on shallow-water reefs to determine whether changes in coral cover and species diversity at each site and reef habitat can be attributed to the 2014 bleaching. In August and September 2014, bleaching prevalence and severity, as well as benthic community structure (e.g. % cover of benthic taxa), were quantified in PMNM along permanent transects at French Frigate Shoals, Lisianski Island, Midway Atoll, and Pearl and Hermes Atoll. In 2015, we will visit the sites sampled in 2014 to assess post-bleaching recovery using field ecology methods employed in 2014 (i.e., photographs, transects, video). These data will be leveraged with bleaching information collected in 2014 to determine the impacts of bleaching on the PMNM reef coral community. Additionally, we will examine the physiological basis for coral bleaching recovery to test for site-specific traits conferring resilience to bleaching using the coral *Montipora* spp. as a model organism. Physiological assessments will include: examining the diversity of the coral's symbiotic alga community, and the nutritional and energetic status of coral biomass in small fragments (<4cm² fragment). *Montipora* spp. is abundant across the Hawaiian archipelago and has been shown to be sensitive to bleaching stress, therefore this coral taxa is an ideal system to explore the dynamics of bleaching and recovery in the PMNM. Finally, to evaluate the contribution of potential nutritional sources to bleaching recovery water samples (10L), seawater samples (10mL), and plankton will be collected and analyzed at the Hawai'i Institute of Marine Biology on O'ahu.

c.) This activity would help the Monument by ...
examining the ecological outcomes of coral bleaching on Papahānaumokuākea Marine National Monument reef coral communities; identifying reef habitats and coral taxa resilient to bleaching stress; and examining the physiological characteristics conferring resilience to bleaching. This study provides the ideal opportunity to implement the PMNM Climate Change Action Plan by developing a monitoring strategy to survey climate change impacts within the Monument and directly builds from previous PMNM research (PMNM-2014-012 Couch). Through this study, we will augment the invaluable ecological baseline data and conduct the first study on the physiological outcomes of bleaching in the Monument. As a result of anthropogenic climate change, the frequency and magnitude of coral bleaching is expected to increase over the course of this century. Therefore, evaluating the impacts of climate change and bleaching on corals within the PMNM is imperative for the long-term management of this valuable ecosystem.

Other information or background:

In order to understand and manage for the impacts of climate change on marine ecosystems, particularly within marine sanctuaries, long-term monitoring is needed to address the impacts of ocean warming on coral reefs and identify factors contributing to bleaching resistance and recovery. Coral bleaching has contributed to declining coral abundance worldwide and is a leading cause of coral mortality. Ocean warming and climate change is predicted to increase the frequency and magnitude of bleaching events. Since 2002, three widespread bleaching events have occurred in PMNM with

2014 being the most extensive and severe bleaching to date, suggesting that ocean warming is already affecting the remote islands of PMNM. While ecological studies provide invaluable information on the communities-level responses of reef corals to these events, coral physiological assessments provide insight into the underlying mechanisms driving these larger-scale patterns in bleaching response. Lipid biomass and heterotrophic nutrition associate with bleaching resilience. Therefore identifying environmental factors supporting alternative sources of nutrition (e.g., lipid biosynthesis, heterotrophy) will provide insight into bleaching susceptibility and recovery. This research will directly address the science needs specified by the Office of Marine Sanctuaries for the PMNM by determining the ecological impacts of an archipelagic-bleaching event. Additionally, this research will contribute to effective management strategies in the PMNM and other global reef systems by (1) identifying factors affecting bleaching and bleaching recovery and (2) enabling resource managers to identify reef systems resilient or vulnerable to climate change stress in order to support science- and ecosystem-based management in Hawai'i.