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:
NOAA/Inouye Regional Center
NOS/ONMS/PMNM/Attn: Permit Coordinator
1845 Wasp Blvd, Building 176
Honolulu, HI 96818
nwhipermit@noaa.gov
PHONE: (808) 725-5800   FAX: (808) 455-3093

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: Amy Baco-Taylor
Affiliation: Florida State University

Permit Category: Research
Proposed Method of Entry (Vessel/Plane): RV Kilo Moana
Proposed Locations:
High seas sites: Koko Seamount, Yuryaku Seamount, Kammu Seamount, Colahan Seamount.
Sites do not include any state waters.

Estimated number of individuals (including Applicant) to be covered under this permit: 25
Estimated number of days in the Monument: 45

Description of proposed activities: (complete these sentences):
   a.) The proposed activity would…

Despite expectations that deep-sea scleractinian reefs could not exist under the harsh carbonate chemistry conditions of the N Pacific, reefs were recently discovered in the Northwestern Hawaiian Islands (NWHI) and the Emperor Seamount Chain (ESC), with 4 of 7 sites in waters undersaturated with respect to aragonite (aragonite saturation state (Ωar) range 0.71–1.33; Ωar<1 indicates undersaturation). Building on this discovery, the overarching question we will test with this work is: How is it that deep-sea scleractinian coral reefs can occur in undersaturated water, well below the hypothesized reef development limit of Ωar = 0.9? Although individual corals may be capable of calcifying in undersaturated water, it is unlikely that a three-dimensional reef structure could develop since deep-sea calcification rates are slow and most of the reef matrix is dead skeleton susceptible to dissolution. Therefore the hypotheses are: 1) These deep-sea reefs developed in saturated water and are now in undersaturated water because the aragonite saturation horizon (ASH) has shoaled over the last two centuries due to anthropogenic ocean
acidification; 2) The reefs in undersaturated water are now net dissolving; and 3) Environmental parameters other than $\Omega_{ar}$ are driving reef distribution.

b.) To accomplish this activity we would ….
To test these 3 hypotheses, 2 research cruises have been funded by NSF to characterize the reefs and environmental parameters of 9 seamounts across an $\Omega_{ar}$ gradient where reefs exist above and below the ASH. Coral and water samples will be collected, the ROV will conduct video transect surveys, and experimental dissolution blocks and in situ instrumentation will be deployed at the reef sites to investigate carbonate chemistry variability on diel (in situ instruments) to centennial (skeletal boron isotopes as a pH proxy) scales; calcification and dissolution rates; and reef ecology. Further, species distribution modeling will be used to examine the environmental factors that determine the distribution of these deep-sea reefs.

c.) This activity would help the Monument by ….
This project will both substantially increase our knowledge of the deep-water communities within the monument as well as provide critical insights into deep-sea reef formation, persistence, distribution, and the effects of changing $\Omega_{ar}$ due to ocean acidification. Additionally, two key deep-sea reefs sites, SE and NW Hancock, fall into the 2016 expansion area of the PMNM which means they have not been extensively explored. So far in the entire North Pacific, deep-sea reefs are limited to only 7 known locations, 3 of which fall into the PMNM and 4 of which fall into high seas areas. Because of active trawling at all 4 high seas locations, and shoaling aragonite saturation horizons due to ocean acidification, the PMNM sites will be critical for survival of these reefs.

**Other information or background:**
This work builds on discoveries from the work permitted under PMNM-2014-028, PMNM-2016-021, and is cruise #2 of the project permitted under PMNM-2021-010.
Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Baco-Taylor, Amy R.

Title: Professor

1a. Intended field Principal Investigator (See instructions for more information):
Amy Baco-Taylor

2. Mailing address (street/P.O. box, city, state, country, zip):

Phone:

Fax:

Email:

For students, major professor’s name, telephone and email address:

3. Affiliation (institution/agency/organization directly related to the proposed project):
Florida State University

4. Additional persons to be covered by permit. List all personnel roles and names (if known at time of application) here (e.g. John Doe, Research Diver; Jane Doe, Field Technician):
Brendan Roark, Co-PI, Texas A&M University
Kathryn Shamberger, Co-PI, Texas A&M University
Mauricio Silva, Postdoctoral Researcher, Florida State University
Virginia Biede, Student, Florida State University
Laura Anthony, Student, Florida State University
Allison Savoie, Student, Texas A&M University
Siobhan Kassem-Courtney, Student, Texas A&M University
Makeda Mills, Student, Texas A&M University
Bailey Skinner, Student, Texas A&M University
Kourtney Higgins, Texas A&M University
Alyssa Schultz, Texas A&M University
Jason Operations Crew, Woods Hole Oceanographic Institution