State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

June 27, 2014

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Dr. Megan Donahue, Hawai'i Institute of Marine Biology, University of Hawai'i, for Access to State Waters to Conduct *Pocillopora meandrina* (POME) Community Characterization Activities

The Division of Aquatic Resources (DAR) hereby submits a request for your authorization and approval for issuance of a Papahānaumokuākea Marine National Monument research permit to applicants Dr. Megan Donahue, Associate Professor, Hawai'i Institute of Marine Biology, University of Hawai'i, pursuant to § 187A-6, Hawaii Revised Statutes (HRS), chapter13-60.5, Hawaii Administrative Rules (HAR), and all other applicable laws and regulations.

The research permit, as described below, would allow entry and management activities to occur in Papahānaumokuākea Marine National Monument (Monument), including the NWHI State Marine Refuge and the waters (0-3 nautical miles) surrounding the following site:

- Nihoa Island
- Necker Island (Mokumanamana)
- French Frigate Shoals
- Laysan Island
- Maro Reef
- Gardner Pinnacles
- Lisianski Island, Neva Shoal
- Pearl and Hermes Atoll
- Kure Atoll State Wildlife Sanctuary

The activities covered under this permit would occur between August 1, 2014 and July 31, 2015.

The applicant has been permitted to conduct activities in the Monument in the past. Proposed activities are new, though methodology used in fish and invertebrate surveys and sample collections have been permitted in the Monument in the past.

INTENDED ACTIVITIES

The proposed objectives include: (1) the characterization of cryptic fish and invertebrate communities that live within *Pocillopora meandrina* (POME) colonies, and (2) document

within-species genetic diversity and between-species community diversity. The applicant would provide the Monument with information regarding connectivity, cryptic species diversity, and species interactions at scales on coral reefs not yet addressed in other surveys. These data could enable researchers and managers to develop models of reef metacommunities that can be used to predict community responses to global climate change at local and regional spatial scales thereby strengthening information used for ecosystem-based management. It merges genetic connectivity and ecological dynamics, helping Monument managers to relate archipelago-wide connectivity to large-scale community connectivity and resilience. NOAA CRED has been capturing cryptic and encrusting benthic reef species community composition and this study would complement these data by describing species richness, interactions, and genetic diversity in semi-cryptic assemblages living in POME communities.

Up to eleven (11) individuals would be authorized to enter the Monument and conduct activities. Proposed activities would initially occur from the R/V HI'IALAKAI (separately permitted under PMNM-2014-005) from August 7 – 31, 2014, and potentially again in the August or September 2015, at all island locations. The proposed activities would include: (1) visually surveying the communities (fish and mobile invertebrates) living within the structure created by the POME colonies at forereef sites spanning a depth range of 30 to 100 ft at up to sixteen (16) sites on up to four (4) atolls; (2) placing video cameras to record species interactions in three (3) POME colonies at each site for 30 to 60 minutes; (3) collecting tissue samples and analyze genetic data (in coordination with Drs. Brian Bowen and Rob Toonen) to assess intraspecific genetic diversity and connectivity between sites; and (4) relating community composition, diversity, and behavior to remotely sensed and in situ environmental data from NASA and NOAA CRED (including pH, temperature, salinity, and chlorophyll). Sites would measure up to 1 hectare with a total of thirty POMEs surveyed in 3 to 5 days.

Up to fifty (50) of one fish and up to fifty (50) of one invertebrate would be collected per site. One of two fish species, speckled scorpionfish or dwarf scorpinfish, would be sampled lethally using a miniature speargun. One of two species of invertebrate species, common guard crab or red-spotted guard crab, would be sampled non-lethally by taking a piece of tissue less than 1 cm^2. Which of the two fish and invertebrate species sampled would be determined after completing the first visual surveys in the Monument and individual numbers of the species sampled would be in high enough densities within POME communities for sampling. Additionally, voucher specimens may be collected (following Monument *Voucher Specimen Guidelines*).

The activities proposed by the applicants directly support the Monument Management Plan's priority management need 3.1 – Understanding and Interpreting the NWHI, 3.1.1 – Marine Science Action Plan, Activity MCS-1.2: Continuing monitoring of shallow-water coral reef ecosystems to protect ecological integrity (PMNM MMP Vol. 1, p. 123, 2008). This Activity emphasizes the importance of conducting quantitative surveys in shallow-water coral reef ecosystems to better define resource baselines for comparisons in protection and management efforts.

The activities described above may require the following regulated activities to occur in State waters:

☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource
☒ Touching coral, living or dead
☒ Possessing fishing gear except when stowed and not available for immediate using during passage without interruption through the Monument
☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

REVIEW PROCESS

The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since March 17, 2014, giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Comments received from the scientific community are summarized as follows:

Scientific reviews support the acceptance of this application.

The following questions were raised:

Questions:

1. **What, if any, are the results indicating from current research within Kāne'ohe Bay? And what, if any, differences do you expect to find within Papahānaumokuākea?**

The applicant states, since they submitted their permit, they have analyzed data from their O'ahu surveys, including Kāne'ohe Bay, and can report some interesting results that they were unable to include in their permit application. Their sampling has focused on the fish and invertebrate communities that reside in the Pocillopora meandrina (POME) heads. Around O'ahu, they have now surveyed 420 POME heads at 13 sites, including 151 POME heads at 5 sites in Kāne'ohe Bay. They expect to add another 6-8 sites around O'ahu.

The applicant further explains, across all coral heads, they have observed 42 fish species and 37 macroinvertebrate species; among these, 7 fish species and 9 invertebrate species were found on >5% of the POME heads. (Table 1)

Table 1: Fish and invertebrates species found in >5% of surveyed POME colonies

Family	Common Name	Latin Name	Abbrev	Tot No.	No. Sites	% of Corals
Cirrhitidae	Arc-eye Hawkfish	*Paracirrhites arcatus*	PAAR	126	8	24.3
Scorpaenidae	Dwarf Scorpionfish	*Sebastapistes fowleri*	SEFO	144	8	18.8

Family	Common Name	Latin Name	Abbrev	Tot No.	No. Sites	% of Corals
Pomacentridae	Domino Damselfish	*Dascyllus albisella*	DAAL	471	9	18.3
Pomacentridae	Blue Eye Damselfish	*Plectroglyphididon johnstonianus*	PLJO	80	9	12.9
Labridae	Saddle Wrasse	*Thalassoma duperrey*	THDU	72	8	11.9
Scorpaenidae	Speckled Scorpionfish	*Sebastapistes coniorta*	SECO	92	12	11.9
Scorpaenidae	HI Orbicular Velvetfish	*Caracanthus typicus*	CATY	30	8	5.0
Trapeziidae	Common Guard Crab	*Trapezia intermedia*	TRIN	333	13.0	52.6
Ophiocomidae	Yellow Spotted Brittle Star	*Ophiocoma pica*	OPPI	338	13.0	41.9
Trapeziidae	Red Spotted Guard Crab	*Trapezia tigrina*	TRTI	191	11.0	27.1
Alpheidae	Lottin's Snapping Shrimp	*Alpheus lottini*	ALLO	150	13.0	26.0
Pontoniinae	Flattened Coral Shrimp	*Harpiliopsis depressa*	HADE	80	12.0	14.5
Trapeziidae	Brown Guard Crab	*Trapezia digitalis*	TRDI	70	9.0	11.4
Sabellidae	Feather Duster Worm	*Sabellastarte spectabilis*	SASP	118	4.0	10.5
Ophiocomidae	Spiny Brittle Star	*Ophiocoma erinaceus*	OPER	35	9.0	6.7
Trapeziidae	Yellow Spotted Guar Crab	*Trapezia flavopunctata*	TRFL	42	6.0	6.0

The applicant states, while these are the most common species overall, there were differences inside and outside of Kāne'ohe Bay (Figure 1): P. arcatus *and* S. fowleri *were not present in the Bay, despite relatively high sampling effort;* S. spectabilis *was found only at Kāne'ohe Bay sites; and the relative abundance of the* Trapezia *species differed inside and outside of the Bay. They also see notably higher densities of damselfish* D. albisella *in Kāne'ohe Bay.*

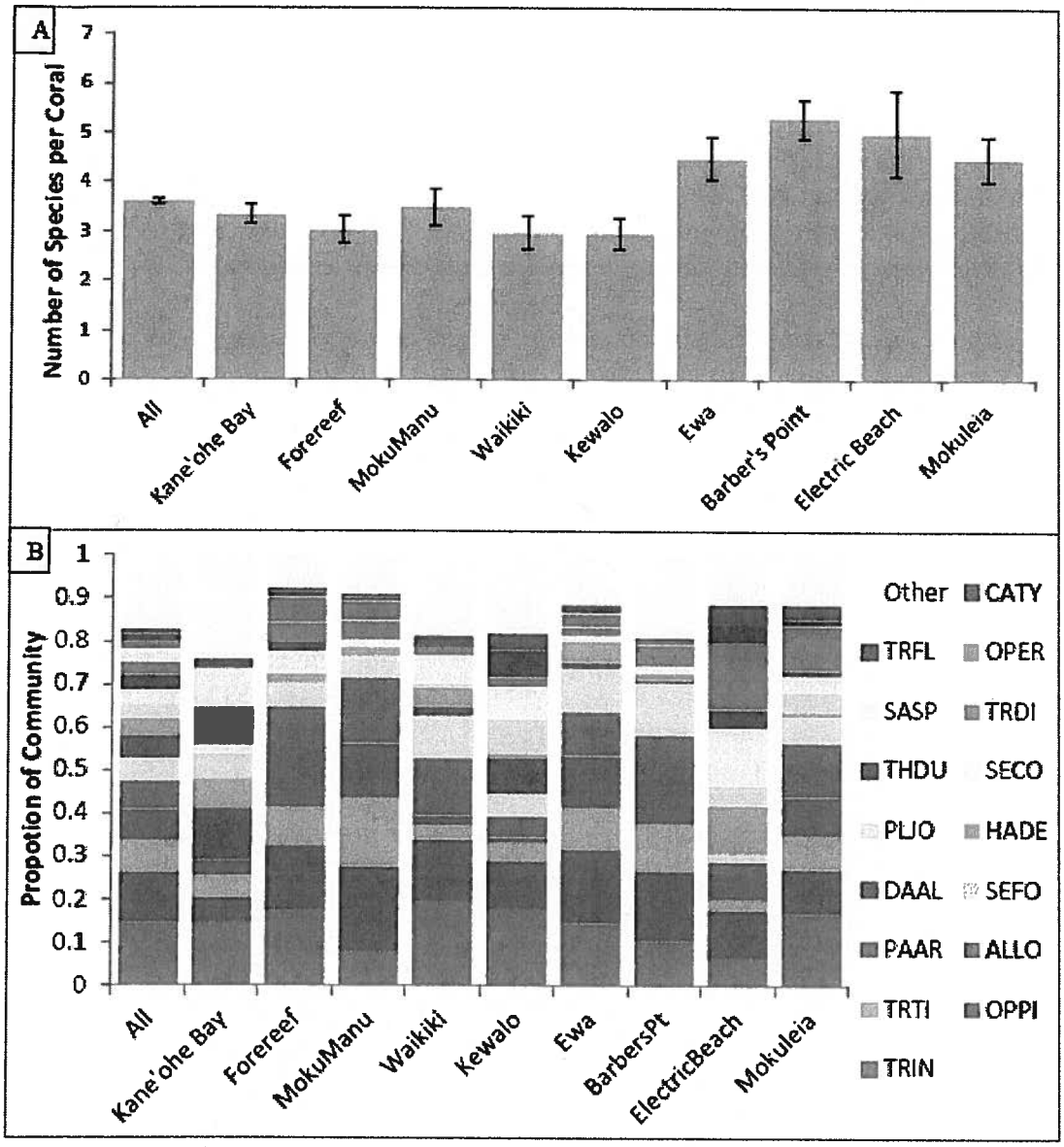

Figure 1: Average (+/- SE) number of fish and invertebrate species and individual per coral head bars [A] and the community composition [B] at 9 different sites.

The applicant explains, comparing their O'ahu dataset (which we plan to expand to other MHI sites) to the POME communities in the NWHI, they can address how the structure of non-target communities are influenced by the dramatic differences in the biomass of higher trophic level and, particularly, target fishery species. They expect that fishing in the MHI decreases both predation risk and competitive pressure on the POME communities. This may lead to lower overall densities in POME communities in the NWHI, but also higher diversity communities, as competitively dominant species are kept in check. They will also compare whether the differences between forereef and Kāne'ohe Bay sites on O'ahu are similar to those in lagoon/forereef comparisons in the NWHI.

2. Why is a minimum of 30 samples necessary for adequate results?

The applicant states, they have proposed to measure 30 POME colonies at each site as a compromise between survey intensity (colonies within a site) and survey extent (number of sites). They would like our survey methods to adequately measure the density of species that occur in 5-10% of colonies; those species will inhabit just 1-3 of 30 surveyed colonies. Surveying fewer coral heads per site will not allow adequate estimation of site density. While they could survey more POME colonies per site, our prior experience suggests that a maximum of 30 colonies can be completed in 2 dives (for 40-60 ft sites), and we can better assess atoll-level patterns if we have adequate replication of sites within atolls.

The applicant explains, they have also proposed a sample size of 30 individuals per species per site for genetic samples. This number of individuals per site would be necessary to assess both within and between atoll connectivity for these species. However, it will not be possible or desirable to sample all of the proposed species at all sites with that intensity. Based on our analysis of the O'ahu dataset, Trapezia intermedia *and* Sebastapistes fowleri *are abundant enough to realistically sample 20-30 individuals per site at sites with high POME abundance. They further discuss our intended genetic sampling in response to question 5, below.*

3. **It is unclear to me how observing behavioral differences between the PMNM and the MHI POME communities helps us to better manage the PMNM. The genetic information may be of more interest but the general drift of genetic material appears to be from the MHI to the PMNM, not the opposite.**

The applicant explains, they would expect to see behavioral differences between the NWHI and MHI because of the greater abundance of predatory fishes in the NWHI. These observations will help us understand the behavioral consequences to non-target communities of the removal of predatory and high trophic-level fishes in the MHI. Fundamentally, this research addresses the value of maintaining the protected status of the PMNM.

The applicant questions, are there specific management consequences of this behavioral research? Perhaps. These behavioral observations will help them understand whether these non-target communities experience fitness consequences due to the removal of high-trophic level fishes. Why might this matter? An interesting theme in the past decade of behavioral ecology has focused on "behavioral syndromes" in a variety of organisms (from spiders to vertebrates). These behavioral syndromes are suites of correlated, heritable traits that result in comparable fitness: for instance, some individuals follow a risk-taking/fast growth/early reproduction/ high mortality strategy while other individuals follow a risk-averse/slow growth/later reproduction/high survivorship strategy. While the environment may influence which of these syndromes is better in any particular year, for this diversity of syndromes to be maintained, the long run fitness of all syndromes should be similar. Now consider: if non-target fish in the MHI experience consistently low predation pressure, this may select for a high-risk behavioral strategy or break down the tight association of traits in the behavioral syndrome. With directional gene flow from the MHI to the NWHI, fish recruiting from the MHI would be poorly adapted to the higher risk environment of the NWHI. Will the permitted research establish this complex line of evidence from behavior to maladaptation?

No, but the first step in this inquiry is to assess whether behavioral responses of non-target species are different in the MHI and NWHI.

4. **The four fish species in the POME study does not appear to me to be as common as is stated. Some density information on how common these species are in Kaneohe Bay/MHI POME communities would be helpful.**

For reference, in the original application, the applicant requested sampling four fish species. Their request has been reduced to one fish species for their final application.

The applicant states, the four fish species mentioned are observed in relatively high densities around O'ahu, although not within Kāne'ohe Bay where the abundance of predatory fish species is relatively low (please see our response to Question 1). Sepastapistes coniorta *(SECO) was observed on 12% of all coral heads (17% outside of Kāne'ohe Bay), with an average of 2 individuals and a maximum of 8 individuals per occupied POME.* Sebastapistes fowleri *(SECO) is observed on 30% of POME outside of Kāne'ohe Bay, with an average of 1.2 individuals per occupied POME (4 - 6 individuals in a single POME is not uncommon). They will restrict our genetic collection to SECO or SEFO: please see our response to Question 5.*

5. **It appears that the different studies are quite ambitious and I am concerned that the number of samples needed in the POME genetic study may not be obtained. I would suggest that the study be conducted in the Main Hawaiian Islands prior to the methodology being used in the PMNM, with results either provided or published. The current studies on Oahu should be presented to show that common species are in fact common and there is a reasonable expectation of success.**

The applicant states, they have included the summary of our data in response to Question 1 to provide the appropriate context for the abundance of the focal species in our permit application. In addition, further information on the cruise itinerary (FFS, PHR, LIS, MID), available boat time, as well as the synthesis of this existing data from O'ahu, have allowed us to tighten the scope of the sampling that they propose. This new scope is as follows:

a) *Surveys: they expect to survey 30 POME heads at 4-6 sites on FFS, PHR, LIS, and MID (160 – 240 POME surveys total). They expect this to take 2 days of survey effort per atoll.*
b) *Video Observations of Behavior: the video will be deployed for the duration of each survey dive, for a total of 32 – 48 hours of video*
c) *Genetic Sampling: they will focus our genetic sampling on the most common fish (either SEFO or SECO) and the most common invertebrate (either TRIN or TRTI) that are tightly associated with the POME. To assess the genetic diversity and archipelagic connectivity for these highly site-attached organisms, they will collect 30 individuals per atoll at three atolls. At the fourth atoll, they will assess within-atoll diversity and connectivity by collecting 30 individuals from each of 4-6 sites. In*

total, they will collect no more than 300 individuals from each of two species across the archipelago.

6. **Why do this study now? How does this study benefit management of the Monument now? It would be helpful to have information on POME communities from the MHI before conducting studies in PMNM.**

The applicant states, they have summarized the findings of their O'ahu surveys above. In addition, they have generated an internal report from initial surveys around O'ahu; they can share this more detailed report with interested reviewers. They would like to note that, while excellent data on reef communities in the NWHI has been collected on RAMP surveys, the semi-cryptic communities living within POME are not well-captured by the RAMP survey method. This research will highlight how the Monument protects these non-target, semi-cryptic communities.

Comments:

1. **NMFS has no questions or comments on this application, but requests that the applicant use nonlethal sampling techniques to the maximum extent possible in order to minimize impacts on PMNM resources.**

The applicant states, thank you for this comment! They do not like killing fish and invertebrates and are doing our best to devise methods of non-lethal sampling for these challenging communities. Regrettably, the use of clove oil or 'auhuhu as a fish anesthetic has not yet been permitted in PMNM, although prior research has demonstrated that clove oil is not toxic to corals in field-relevant concentrations and flow conditions (Robertson & Smith-Vaniz 2010). This limitation on anesthetic greatly limits our ability to sample fish and invertebrates without killing them or damaging their coral host. However, they have successfully and non-lethally sampled TRIN by causing limb autotomy, and we are working on methods to use a forceps biopsy punch on SECO. If they cannot successfully biopsy SECO in the POME, then they will use a tiny spear to sample lethally. If they must sample lethally, then they will retain the specimen to share for further analysis.

2. **One discrepancy in the permit application is that it lists different amounts of collected samples on different sections (525 on page 14, and 630 on page 15). It should be clarified how many samples will be collected in total.**

The applicant requests, please see their response to Question 5, where they clarify the scope of the genetic sampling in the project.

3. **We recognize the importance of scientific research for Papahānaumokuākea Marine National Monument and its benefits to increase our biological understanding of the place. However, we recommend that the applicant take the time to reflect on how their project proposal can directly affect change and benefit the people of Hawai'i and enhance the cultural/spiritual resources of Papahānaumokuākea once their**

research is complete. If a permit should be issued, we look forward to discussing this topic more with the applicant at the required cultural briefing.

The applicant states, they look forward to discussing Hawaiian cultural and spiritual perspectives on these POME communities and our science with the cultural advisor at the briefing. They value the cultural briefing as a moment to reflect on the privilege of entering the PMNM in the flurry of pre-cruise activities.

4. **We also appreciate the effort to share discarded and unused specimens for future research opportunities with other interested parties.**

The applicant explains, as they mentioned in response to Comment 1, they are working to develop non-lethal sampling techniques for the fish in this study. If they do need to sample lethally, they will freeze the specimens for further life-history analysis by Dr. Erik Franklin at HIMB.

5. **The ecosystems in the PMNM and MHI are very different and it should not be assumed that the MHI should or would be like the PMNM, even if there were no humans in the MHI. That being said, observing differences between the POME communities in the two areas and attributing those differences to differing levels of predation risk or competitive pressure may be a false assumption. Those differences between the PMNM and the MHI are likely being caused by the cumulative effects of the two ecosystems and not just a few causes. Basically, it's not that simple.**

   The information provided uses the terms "target" and "non-target" species, of which I am assuming you mean those species that are targeted by fishing activities or not. I would note that aquarium collectors do take the non-target species so I would question the assumption that these are non-targeted species. I recognize that your study design may not be detailed enough to matter if these are or are not targeted, but I mention this so you don't assume that they are not targeted.
   I was surprised to see that Trapezia is so common (above 50%) and Sebastapistes (~20%) in Kaneohe bay so I would not be opposed to the requested numbers, assuming a similar rate of occurrence in the PMNM.

   Lastly, I am still unsure about the relevancy of the study results to management of the PMNM. I would think it more feasible to conduct this study in different places in the MHI (for example, Kaneohe, Kaupo, Maui, or Kekaha, Kauai) to see what differences you can observe first. Reporting those results would be a good precursor to a PMNM request. Show us what kinds of results you get first, then see how they compare to the PMNM.

The applicant states, this is a great point that the ecosystems in the PMNM and MHI are very different for a variety of reasons. By including video analysis of interactions between the community and resident species, they may be able to elucidate some of the mechanisms behind observed differences in community composition (if differences are observed). However, they agree there are a lot factors that differentiate the communities in the PMNM

and the MHI aside from human density. The point that these ecosystems are very different does further emphasize the importance of surveying this community in the PMNM to gather baseline data regarding this common component of the PMNM's protected resources. Based on this premise, they expect these semi-cryptic communities to be quite different in the PMNM and one benefit of this work to the monument would be documenting the details of community, a common asset on shallow (10 to 90 feet) reefs. Another excellent point that many species that are not targets for consumption fisheries are targeted by aquarium collectors. The species within our focal community are not heavily targeted by the aquarium market. An exception to is the domino damselfish; however, they do not often observe them in their focal community at sites outside of Kaneohe Bay. They are seeing differences in the community composition not only between shorelines of O'ahu but also at survey sites along the same shorelines in O'ahu (preliminary data provided in answer to question 1). They are working with collaborators on the island of Hawai'i to survey our focal community at another location within the MHI. They anticipate the differences between the communities in the PMNM and the communities in the MHI will be substantially more pronounced than differences between the communities around different islands within the MHI.

Comments received from the Native Hawaiian community are summarized as follows:

Cultural reviews support the acceptance of this application. No concerns were raised.

Comments received from the public are summarized as follows:

No comments were received from the public on this application.

Additional reviews and permit history:

Are there other relevant/necessary permits or environmental reviews that have or will be issued with regard to this project? (e.g., MMPA, ESA, EA) Yes ☒ No ☐
If so, please list or explain:

- The proposed activities are incompliance with the National Environmental Policy Act.
- The proposed activities are in compliance with the National Historic Preservation Act.
- The National Marine Fisheries Service (NMFS) provided a letter of concurrence dated June 6, 2014 in regards to a Section 7 informal consultation pursuant to the Endangered Species Act of 1973 is which analyzed the effects of conducting the proposed activities on protected species and monk seal within designated critical habitat See Attachment (Letter to David Swatland from Michael Tosatto dated June 6, 2014).
- The Department has made an exemption determination for this permit in accordance chapter 343, HRS, and Chapter 11-200, HAR. See Attachment ("DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT RESEARCH PERMIT TO DR. MEGAN DONAHUE, HAWAI'I INSTITUTE OF MARINE BIOLOGY, UNIVERSITY OF HAWAI'I, FOR ACCESS TO STATE WATERS TO CONDUCT *POCILLOPORA MEANDRINA* (POME) COMMUNITY CHARACTERIZATION ACTIVITIES UNDER PERMIT PMNM-2014-025")

Has Applicant been granted a permit from the State in the past? Yes ☒ No ☐
If so, please summarize past permits:

- The applicant was granted permits for unrelated activities in 2011 and 2012, PMNM-2011-032 and PMNM-2012-033, respectively.

Have there been any a) violations: Yes ☐ No ☒
b) Late/incomplete post-activity reports: Yes ☐ No ☒

Are there any other relevant concerns from previous permits? Yes ☐ No ☒

STAFF OPINION

DAR staff is of the opinion that the applicants have properly demonstrated valid justification for their application and should be allowed to enter the NWHI State waters and conduct the activities therein as specified in the application with certain special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Research Permit General Conditions. All suggested special conditions have been vetted through the legal counsel of the Co-Trustee agencies (see Recommendation section).

MONUMENT MANAGEMENT BOARD OPINION

The MMB is of the opinion that the applicants have met the findings of Presidential Proclamation 8031 and this activity may be conducted subject to completion of all compliance requirements. The MMB concurs with the special conditions recommended by DAR staff.

RECOMMENDATION:

That the Board authorize and approve a Research Permit to Dr. Megan Donahue, Hawai'i Institute of Marine Biology, University of Hawai'i, with the following special conditions:

1. This permit is not to be used for nor does it authorize the sale of collected organisms. Under this permit, the authorized activities must be for noncommercial purposes not involving the use or sale of any organism, by-products, or materials collected within the Monument for obtaining patent or intellectual property rights.

2. The permittee may not convey, transfer, or distribute, in any fashion (including, but not limited to, selling, trading, giving, or loaning) any coral, live rock, or organism collected under this permit without the express written permission of the Co-Trustees.

3. To prevent introduction of disease or the unintended transport of live organisms, the permittee must comply with the disease and transport protocols attached to this permit.

4. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.

5. Refueling of tenders and all small vessels must be done at the support ships and outside the confines of lagoons or near-shore waters in the State NWHI Marine Refuge.

6. If there is any Hawaiian monk seal or any other protected species in the area when performing any permitted activity, the activity shall cease until the animal(s) depart the area.

Respectfully submitted,

Frazer McGilvray
Administrator

APPROVED FOR SUBMITTAL

WILLIAM J. AILA JR.
Chairperson

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: Megan Donahue
Affiliation: Hawaii Institute of Marine Biology

Permit Category: Research
Proposed Activity Dates: 06/01/14-11/15/14
Proposed Method of Entry (Vessel/Plane): R/V Hi'ialakai
Proposed Locations: Shallow water reef (<100 ft depth) focused on Pocillopora colonies in forereef and pinnacle habitats. Specific locations for the study will depend on cruise logistics but ideally will include sites around French Frigate Shoals, Midway, Lisianski, Pearl & Hermes, and/or Kure.

Estimated number of individuals (including Applicant) to be covered under this permit: 11
Estimated number of days in the Monument: 30

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…

(i) characterize the cryptic fish and invertebrate communities that live within Pocillopora meandrina (POME) colonies across the Hawaiian Archipelago, including the (ii) within-species genetic diversity and between-species community diversity. This study merges genetic connectivity and ecological dynamics, helping PMNM managers to relate Archipelago-wide connectivity to local-scale community connectivity and resilience. By focusing genetic and ecological survey efforts on a fairly discrete community unit, this project will provide Monument management with information regarding connectivity, cryptic species diversity, and species interactions within PMNM coral reefs at scales that are not being addressed by ongoing surveys. These results will enable us to develop models of reef metacommunities that can be used to predict community responses to global change at local and regional spatial scales, thereby strengthening our ability to establish effective ecosystem-based marine management strategies.

b.) To accomplish this activity we would ….

(i) visually survey the communities (fishes and mobile invertebrates) living within the structure created by POME colonies at forereef sites spanning a depth range of 30 to 100 feet at several sites at each atoll. The size and health status of POME colonies will be assessed in situ and in photographs.

(ii) place video cameras to record species interactions in 3 POME colonies at each site for 30 to 60 minutes. The interactions recorded on these videos will be scored to improve our understanding of community dynamics, and evaluate differences in community dynamics between the MHI and NWHI.

(iii) collect tissue samples and analyze genetic data (in coordination with Drs Brian Bowen and Rob Toonen) to assess intraspecific genetic diversity and connectivity between sites. In particular, we would survey for 4 fish species and 7 invertebrate species at all visual survey sites, using small polespears and handnets to collect fish, nonlethal tissue biopsies for invertebrates, and DNA sequencing to assess genetic diversity and connectivity among reef habitats.

(iv) relate community composition, diversity, and behavior to remotely sensed and in situ environmental data from NASA and NOAA CRED (including pH, temperature, salinity, and chlorophyll).

c.) This activity would help the Monument by …
characterizing a community that is not captured by current survey efforts, including several Hawai'i endemics. Although POME colony size and density are assessed in current benthic RAMP surveys, the specialist semi-cryptic community of invertebrates and fishes that live within POME colonies have not been systematically assessed. Therefore, this study will provide a baseline for these semi-cryptic POME communities within the NWHI. This study will also document within species genetic variability and connectivity at smaller scales than those evaluated by Drs Toonen and Bowen providing Monument managers details on natural barriers to connectivity at the individual island scale. At the nexus of genetic connectivity and ecological dynamics, this study will combine these measures of diversity and connectivity with the relative strength of species interactions (from video footage) to develop metacommunity models. These models will be used to assess community resilience at local and regional scales.

Other information or background: To the extent practicable, forereef sites will be co-located with NOAA-CRED sites to minimize impact and ease collaboration of data resources. We are actively coordinating with Drs. Toonen and Bowen to ensure that there is not a duplication of effort in the genetic sampling. These POME communities have not been targeted in previous surveys for genetic connectivity by Bowen and Toonen, and Field PI Chelsie Counsell will work closely with them on the collection and analysis of samples. Our active coordination and collaboration with Drs. Bowen and Toonen will minimize the take of individuals from the Monument.

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Donahue, Megan, J

Title: Associate Researcher, Hawai'i Institute of Marine Biology

1a. Intended field Principal Investigator (See instructions for more information):
Chelsie W Counsell, graduate student

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

[redacted] major professor's name, telephone and email address:

3. Affiliation (institution/agency/organization directly related to the proposed project):
Hawai'i Institute of Marine Biology (HIMB), School of Ocean and Earth Science and Technology, University of Hawai'i at Manoa

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):
Megan Donahue, PI, research diver
Chelsie Counsell, Field PI, research diver
Brian Bowen, research diver
Nyssa Silbiger, research diver
Joshua Copus, HIMB grad student
Jonathan Whitney, research diver

Section B: Project Information

5a. Project location(s):

		Ocean Based	
☒ Nihoa Island	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Necker Island (Mokumanamana)	☐ Land-based	☒ Shallow water	☐ Deep water
☒ French Frigate Shoals	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Gardner Pinnacles	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Maro Reef			
☒ Laysan Island	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Lisianski Island, Neva Shoal	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Pearl and Hermes Atoll	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Midway Atoll	☐ Land-based	☒ Shallow water	☐ Deep water
☒ Kure Atoll	☐ Land-based	☒ Shallow water	☐ Deep water
☐ Other			

NOTE: There is a fee schedule for people visiting Midway Atoll National Wildlife Refuge via vessel and aircraft.

Location Description:
Specific locations for the study will depend on cruise logistics. To ensure maximum flexibility (for weather or other unforeseen changes to the cruise schedule), we have included a list of coordinates outlining areas within which all surveys would occur.

Location:	Longitude	Latitude
Kure Atoll	-178.19706492000	28.55825235580
Kure Atoll	-178.19623585400	28.29958375730
Kure Atoll	-178.45987884800	28.29958375730
Kure Atoll	-178.46070791400	28.55742328970
Midway Atoll	-177.19638223300	28.37419969920
Midway Atoll	-177.19721129900	28.13377055310
Midway Atoll	-177.52800864100	28.13459961920
Midway Atoll	-177.52800864100	28.37419969920
Pearl and Hermes Atoll	-176.08850981800	28.04643025580
Pearl and Hermes Atoll	-175.63289162600	28.04539944540
Pearl and Hermes Atoll	-175.63289162600	27.70729363750
Pearl and Hermes Atoll	-176.08954062900	27.70626282710
Lisianski Island	-173.67292570900	26.25150771120
Lisianski Island	-173.67292570900	25.83942708400
Lisianski Island	-174.23095155800	25.83942708400
Lisianski Island	-174.23095155800	26.25150771120
Laysan Island	-171.47900122300	25.96027179830
Laysan Island	-171.47725234300	25.65596666490
Laysan Island	-171.97918092500	25.65771554490
Laysan Island	-171.97918092500	25.96202067840

Maro Reef	-170.18133220600	25.69968866680
Maro Reef	-170.17958332600	25.21524888540
Maro Reef	-171.00505472200	25.21524888540
Maro Reef	-171.00505472200	25.69968866680
Gardner Pinnacles	-167.74832319300	25.26070709440
Gardner Pinnacles	-167.75087047400	24.34878019150
Gardner Pinnacles	-168.36221811900	24.35132747340
Gardner Pinnacles	-168.36476540100	25.26070709440
French Frigate Shoals	-165.93465851400	23.94630965900
French Frigate Shoals	-165.93465851400	23.56421738120
French Frigate Shoals	-166.45685129400	23.56421738120
French Frigate Shoals	-166.45685129400	23.94630965900
Necker Island	-164.13627752700	23.71705429230
Necker Island	-164.13373024500	23.20505064020
Necker Island	-164.92084033700	23.20505064020
Necker Island	-164.92338761900	23.71960157420
Nihoa Island	-161.66031956700	23.23816530420
Nihoa Island	-161.66286684900	22.94013332760
Nihoa Island	-162.05005369100	22.94268060940
Nihoa Island	-162.05260097200	23.23561802240

5b. Check all applicable regulated activities proposed to be conducted in the Monument:
☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource
☐ Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
☐ Anchoring a vessel
☐ Deserting a vessel aground, at anchor, or adrift
☐ Discharging or depositing any material or matter into the Monument
☒ Touching coral, living or dead
☒ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
☐ Attracting any living Monument resource
☐ Sustenance fishing (Federal waters only, outside of Special Preservation Areas, Ecological Reserves and Special Management Areas)
☐ Subsistence fishing (State waters only)
☒ Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

6 Purpose/Need/Scope ***State purpose of proposed activities:***
Within the NWHI, a decade of RAMP surveys have documented the composition of fishes, corals, algae, and some macroinvertebrates in the benthic reef communities, and Autonomous Reef Monitoring Structures (ARMS) are capturing cryptic and encrusting benthic reef species. This project will complement these ongoing studies by describing the species richness, species interactions, and patterns of genetic diversity in the semi-cryptic assemblages that live in Pocillopora meandrina (POME) colonies . This study will focus on a closely-interacting community that is not well-surveyed by existing efforts. To date, genetic work within the NWHI has clarified archipelago-wide connectivity patterns for a variety of species (Toonen et al. 2011). By analyzing genetic samples taken at a finer resolution, this project will determine natural barriers to connectivity at the scale of individual islands and the relative connectivity of closely interacting species. This project has four main objectives.

1st Objective: Document a baseline of diversity within POME reef communities.
In addition to its intrinsic value, biodiversity helps to maintain ecosystem function (Cavender-Bares et al. 2009; Martens et al. 2003) making it a fundamental attribute of the Monument's ecological resources. POME colonies are a common feature of Hawaiian reefs that provide habitat for a closely associated fish and invertebrates, including several Hawaiian endemics. We will conduct surveys of these cryptic communities on forereef sites within the Monument. The size and abundance of fish and invertebrate species within 30 coral heads at 4 to 8 distinct sites (each site is an area of 1 hectare) per atoll will be recorded. In addition, tissue samples will be taken from individuals of up to 4 fish and 6 invertebrate species at each site. These data will enable us to determine diversity at a variety of scales: within species genetic diversity, species diversity within each colony, diversity among colonies with-in sites, diversity at the island-scale, and diversity within different regions across the archipelago. Documenting diversity across scales can depict patterns of ecosystem structure and indicate the spatial scales at which resilience mechanisms operate. Despite being protected from direct anthropogenic effects, the ecological resources of the Monument are still susceptible to stressors from global change. Within-species genetic diversity provides important insight into a species' ability to adapt to changing conditions, and greater genetic diversity can confer resilience to the community.

2nd Objective: Investigate fish and invertebrate behavior in semi-cryptic reef communities that are exposed to natural levels of transient predatory species.
Biodiversity promotes ecosystem stability and productivity (Balvanera et al. 2006, Cardinale et al. 2006, Worm et al. 2006) through different mechanisms. Sometimes a few species have disproportionately large functional roles and increased biodiversity stabilizes the community through an increased probability of including these key species. In other systems, species play complementary roles in an ecosystem, and the added value of each species drives the stabilizing effect of biodiversity. We will use characterize species interactions to assess the relative value of each species to the community by monitoring species behavior in the communities occupying POME colonies. Video surveys will be conducted using a stationary

multi-camera setup on a subset of the coral colonies (see Objective 1). The recorded behaviors will be scored to determine the functional redundancy of species, the strength of species interactions, and the relevance of transient community members. Preliminary behavioral observations on communities around Oahu suggest competition between the Hawaiian Dascyllus and the blue eyed damselfish will be an important species interaction. Functional redundancy may be found between the speckled scorpionfish, the dwarf scorpionfish, the Hawaiiian velvetfish, and the Hawaiian lionfish. PMNM is the only place where the behavior of these communities can be considered with natural levels of transient community members including predatory fishes.

3rd Objective: Determine small-scale patterns of connectivity in the absence of localized anthropogenic effects.
Research continues to support the idea that connectivity patterns are driven by a complex assortment of factors including currents, chemical and audible cues from the benthic habitat (Igulu et al. 2013; Tolimieri et al. 2000), and availability of settlement structure. While previous studies have focused on the patterns of connectivity at the archipelago-scale (e.g., Toonen et al. 2011), these studies do not address natural barriers to connectivity within the Monument at the scale of individual islands. Focusing on highly site-attached, POME-associated species, including four fish species (Hawaiian lionfish, speckled scorpionfish, dwarf scorpionfish, Hawaiian velvetfish) and six invertebrate species (common guard crab, yellow-spotted guard crab, brown guard crab, rusty guard crab, cauliflower coral shrimp, elate drupe) that are commonly found within POME colonies, this project will analyze within-atoll connectivity. PMNM provides a unique study site where correlations can be made between patterns of local connectivity and natural features (e.g., benthic cover, bathymetry) without the confounding effects of anthropogenic inputs that are found in most reef communities (e.g., chemicals in runoff, boat traffic sounds).

4th Objective: Develop a metacommunity model and run sensitivity analyses on community composition to global changes across a gradient of local anthropogenic impact.
The dynamics of biodiversity can be theoretically assessed through the conceptual framework of metacommunities - local communities linked by the dispersal of species and influenced by heterogeneity in environmental variables, species interactions, and recruitment limitations (Mouquet & Loreau 2003). Because each POME colony contains a fairly distinct community and POME has relatively fast growth and high mortality rates, these communities occur on discrete spatial and temporal scales making them ideal for studying metacommunity dynamics. Traditional ecology focuses on understanding processes at either the local or the ecosystem scale; metacommunity models provide a way to combine local dynamics with spatial heterogeneity to make more realistic predictions about community resilience at both local and ecosystem scales (Chesson et al. 2005). The fine-scale connectivity, diversity, and species interaction data collected in this project will be combined with data from parallel surveys conducted around Oahu and complementary environmental data from the RAMP surveys, to develop metacommunity models with POME colonies as the functional community unit. By altering various components within the model, we will be able to

theoretically perturb the community dynamics (e.g., connectivity, diversity, environmental parameters) to predict species and community resilience at the scale of a POME colony and at the scale of the Hawaiian archipelago. These simulations will help Monument management anticipate changes to the reef community based on different potential risk scenarios (e.g., removal of a species or functional group due to disease, increased variability in weather patterns due to global change).

Summary of Purpose:
This study merges genetic connectivity and ecological dynamics, helping PMNM managers to relate Archipelago-wide connectivity to local-scale community connectivity and resilience. By focusing genetic and ecological survey efforts on a fairly discrete community unit, this project will provide Monument management with information regarding connectivity, cryptic species diversity, and species interactions within PMNM coral reefs at scales that are not being addressed by ongoing surveys. These results will enable us to develop models of reef metacommunities that can be used to predict community responses to global change at local and regional spatial scales, thereby strengthening our ability to establish effective ecosystem based marine management strategies.

7. Answer the Findings below by providing 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 Monument:

The Findings are as follows:

a. How can the activity be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument?

We are a team of conservation biologists, teaching and studying the science of how best to manage and conserve the ecological integrity of marine ecosystems. Therefore, minimizing our impact to the ecosystem is a natural and inherent part of any research we conduct, especially within the Monument. It is my goal to inculcate in students and trainees that work with me a respect for the resources that we study. This respect requires that we carefully consider the impact of our study design, that our study design is robust and will produce useful results, and that our work is disseminated to scientists and managers to improve the conservation efforts in these systems. In developing our research methods, we have taken care to minimize any potential negative impacts to the system as outlined in the methods section below. We believe that we have implemented every reasonable safeguard for the natural resources and ecological integrity of the Monument in our research, and we do not expect any detectable impact from our research sampling. Our sample size and methodologies have all been selected to provide robust and scientifically rigorous information to managers with the least possible impact to the natural resources of the Monument. Our work will not impact historic resources: we do not set foot on land within the Monument, and we report but do not touch any submerged artifacts discovered during our diving activities.

When obtaining tissues for genetic data, lethal sampling will only be used as needed if the species are widespread and abundant. We will collect from multiple locations to ensure we are collecting at a low density in any one area. Specimen collections will total less than a few kilograms per island or atoll. Considering that apex predators remove 30,000 tons of fish annually on each atoll (Sudekum et al. 1991; Freidlander and DeMartini 2002), the impact our removal will have on the ecosystem is negligible.

As in previous years, each participant is required to participate in a Cultural Briefing prior to departure on the Hi'ialakai. Each member of my team is aware of the unique ecological status of the Monument, and this briefing reminds all team members of the cultural significance of the place. However, this separation of natural, cultural, and historic resources is itself a western construct. Stewardship of natural resources is a central theme in the relationship that Hawaiians have with the natural world and, thus, there is no difference between a natural and cultural resource.

Papahanaumokuakea is a sacred place to native Hawaiians; a place that is included in the oral history of chants and meles; a place where native Hawaiians have travelled for hundreds of years. We strive to approach our work in the Monument with the same humility, wonder, and regard for the natural world as these travelers. We intend that our research in the Monument will give a strong foundation to stewardship practices that best manage and protect the coral reef ecosystems of Papahanaumokuakea. Native Hawaiians learned when and where important food fish were spawning and, understanding their potential impact on fish populations, protected these times and areas. In a similar way, we will be learning about the community dynamics of coral reef communities in the Monument and using this knowledge to understand and mitigate the impacts of anthropogenic global change on Hawaiian reef ecosystems.

b. How will the activity be conducted in a manner compatible with the management direction of this proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument cultural, natural and historic resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects? The research proposed here is the type of research directly mandated by the Proclamation: it is "research designed to further understanding of monument resources and qualities… [and] will assist in the conservation and management of the monument". The research we propose is necessary to both maintain ecosystem integrity and provide for adaptive ecosystem management in the face global climate change. Because of concerns about cumulative impacts, a threat assessment of the activities in the Monument has been conducted (et al. 2008), and a compiled cumulative impact threat map of the Monument (Selkoe et al. 2009) has been provided to the co-trustees for use in future management decisions.

Our proposed activities are minimally invasive. On forereefs, divers will survey POME colony communities with the help of flashlights, photography, and short term videography. Any negative impacts on the reefs, atolls, and Monument of this work are exceedingly small (e.g. temporary altering the behavior of smaller species within the reef community via our appearance within their environment, potentially touching the Pocillopora colonies to assist in efficiently surveying the communities living within their structural features) while the positive impacts of

the results of our research are Monument-wide. Removal of tissues/specimen for genetic data will be conducted following a careful systematic approach to ensure minimal impacts to the Monument's resources at both small and large scales. As outlined above and below, we have implemented every reasonable safegaurd for the resources integrity of the Monument, and there will be no detectable impact on Monument resources.

Our overriding goal is to provide scientific information to managers so that the Papahanaumokuakea Marine National Monument can be managed and protected based on policy grounded in sound science. Our divers are experienced in surveying coral reef communities with minimal impact. Each diver has been through intensive dive training and is a certified scientific diver with the American Association of Underwater Scientists. We are already conducting similar POME surveys in Kane'ohe Bay and around Oahu, honing our methods and ensuring efficient work with negligible impact on the reef ecosystem.

c. Is there a practicable alternative to conducting the activity within the Monument? If not, explain why your activities must be conducted in the Monument.
There are no alternatives to conducting this activity within the Monument. Documenting the biodiversity of pristine POME communities that include endemic Hawaiian species requires conducting surveys on highly protected Hawaiian reefs. To understand small scale patterns in connectivity relative to natural barriers, genetic surveys must be conducted in an area without confounding local anthropogenic effects. To develop realistic metacommunity models that can predict how reef communities respond to the loss of a species or changes in environmental variables, we need information regarding the naturally occurring community compositions, species behavior within a pristine environment (i.e. with abundant predatory fishes), and connectivity between communities on a small scale.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?
The end value of this activity will greatly outweigh its imperceptible impact on the resources of the Monument. Our tissue/specimen collections will total only a few kilograms of fish and invertebrates and this will be spread across various sites within the Monument, this is a miniscule removal compared to the harvest removed by large predators. In addition, no monitoring devices or other field gear would be left behind. An increased understanding of the cryptic reef biodiversity, species behavior, and small scale community connectivity within the Monument will enhance our knowledge about the ecological resources we are protecting and may improve the design of resource management within the MHI. The ability to make realistic predictions relative to cryptic reef community stability and risk scenarios the Monument may face also has a large end value for alerting managers to what scenarios warrant the most concern.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.
Based on preliminary surveys in the MHI, a site survey will take 3-5 dives by 3-4 divers. Therefore, we expect surveying will proceed at a rate of about one site per day. We anticipate surveying 8-16 sites and we will focus on forereef habitat of one or a few atoll(s), although specific survey locations will depend on cruise logistics. Given travel time on the R/V

Hi'ialakai, we estimate that 30 days within the Monument would be necessary to accomplish the research goals outlined in this permit application.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
I have been an AAUS certified scuba diver and NAUI instructor for 19 years. I have used diving for research and trained others to dive on projects in the Gulf of Maine, California, and Hawaii, including research in other protected areas like the Channel Islands National Park. I have a PhD in Ecology from the University of California, Davis and have publications on marine ecology and spatial population dynamics relevant to this study. I was privileged to enter the Monument for the first time in May 2010 to support Scott Godwin's (PMNM) surveys of invasive species and Rob Toonen's connectivity sampling. I entered the Monument in July 2011 on my own permit to study bioerosion rates. My experience on previous cruises has been excellent preparation for the study proposed here. This is my third permit application for work in the Monument.

The field PI for this application is Chelsie Counsell. She is an AAUS certified scuba diver (since 2011) and a PADI dive master (since 2010). She has conducted research on SCUBA on reef communities in the Caribbean, the Gulf of Mexico, and Hawaii. She has played an integral role in organizing and conducting preliminary surveys of the POME reef communities around Oahu including mentoring an undergraduate research intern. Chelsie received her Master's degree from Florida State University and is currently a doctoral student in my laboratory; she is an experienced coral reef diver having worked as a marine biologist in the Florida Keys and the Turks and Caicos Islands prior to her MS.

g. Provide information demonstrating that you have adequate financial resources available to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
The project proposed here is a collaboration between the Donahue (metacommunity diversity sampling) and Bowen and Toonen (fish and invertebrate interspecific diversity quantification) laboratories at the Hawaii Institute of Marine Biology. Chelsie is currently supported by NSF and is applying for a variety of small research grants to support this work. In addition, there are adequate finances in the Donahue lab and Toonen-Bowen lab to support the described work.

h. Explain how your methods and procedures are appropriate to achieve the proposed activity's goals in relation to their impacts to Monument cultural, natural and historic resources, qualities, and ecological integrity.
Our choice of sites will be guided by the vessel and Monument staff while aboard the NOAA vessel Hi'ialakai. We generally avoid any sites that are identified as culturally significant, and focus our activities in regions that maximize the safety of the crew while ensuring that the proposed work will be completed. The questions we are addressing are central to understanding metacommunity dynamics in the Monument and predicting the ability of these communities to respond to global scale changes. The impacts of our study will help guide stewardship practices that appropriately preserve and manage the qualities and integrity of the Monument's cultural and natural and historic resources. Our data will provide a strong scientific understanding of coral

reef ecosystem community processes by which proper management protocols can be designed. These data also are invaluable in providing a baseline with which to monitor the success of management efforts.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?
We will be on board NOAA's vessel Hi'ialakai.

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.
In 2011, 2012, and 2013 Donahue held a permit for research activities in the Monument and demonstrated compliance with all permit and reporting requirements.

8. Procedures/Methods:
The proposed surveys of the semi-cryptic community living within the structural features of Pocillopora meandrina (POME) colonies have 3 main field components: (1) documenting diversity by surveying the fish and invertebrate species at different sites around atoll(s), (2) using video to document species' behaviors within a subset of the POMEs, (3) collecting a statistically appropriate yet ecologically tiny sample of select fish and invertebrate species from the POMEs. The survey design is an expansion of ongoing surveys around Oahu. The 3 main field components are described below.

(1) The communities that live within the structural features of POMEs are often partially hidden within the coral. To survey these communities, a diver will slowly approach a colony while recording the size and number of fish that may have ventured out into the peripheral portion of the colony's shelter. Once a diver is in close proximity of the coral, they will utilize a dive light to survey the community living within the POME branches, identifying and estimating the size of all mobile fish and invertebrate species. Photographs of each focal POME will be taken to characterize the colony (e.g., size, percent live tissue, branch gaps) and its surrounding habitat (e.g., overall coral cover, nearest conspecific neighbor distance). Tissue samples will be obtained from each survey site (see 3 for further details). At each site (up to 1 hectare), 30 POMEs will be surveyed over the course of 3-5 dives. The divers will tow a surface GPS unit to approximate the location of each coral colony and to record the survey tracks.

(2) After the first two POMEs are surveyed on each dive, 2 GoPro video cameras will be oriented around the POMEs so that one is angled down into the coral branches and the other is angled to catch activity at the outer top edges of the POME. These cameras will be attached to a Pelican surface float to ensure their retrieval at the end of each dive. These GoPros will record the activity immediately around and within focal coral colonies for 30 min to an hour (the duration of the dive and any additional time that can be spared as the divers break down their gear). Post dive, the recorded behaviors will be coded and scored to characterize positive and negative interactions between species. The footage will also be used to evaluate

the importance of transient community members. Please see the attached diagram of the camera set-up.

(3) To analyze small-scale connectivity and genetic diversity patterns, genetic samples will be collected at a rate of 30-50 individuals per species per site. These genetic surveys will focus on species that are commonly found within POMEs: four fish species (Hawaiian lionfish, speckled scorpionfish, dwarf scorpionfish, Hawaiian velvetfish) and seven invertebrate species (common guard crab, yellow-spotted guard crab, brown guard crab, rusty guard crab, cauliflower coral shrimp, elated drupe). The tissue collections will be made at a low density (approximately 30 individuals per hectare) using nets and small polespears when nonlethal approaches are ineffective. For invertebrates (and fish when possible), we will sample non-lethally, remove a leg (or other small piece of tissue) and then release the animal in the location from which it was collected. Our sample size reflects careful consideration. Statistical rigor requires a minimum sample size of 30 individuals per location (Ruzzante 1998). Therefore, in the interest of collecting data with statistical rigor while minimizing the number of samples collected, our target sample size will be 30 specimens per species per site with 50 per site as an upper bound only to be reached with species for which nonlethal sampling is successful. DNA aliquots will be maintained in long-term storage at HIMB so that the genetic material is available for future studies. Every effort will be made to minimize the impact of these collections on the natural communities. Please note that we recognize the challenge of sampling these cryptic communities without using chemical anesthetics but have had some success hand sampling these communities around O'ahu. If we are unable to aquire adequate sample sizes to assess within-atoll variation and connectivity, we will still be able to assess larger scale connectivity across the Archipelago (connectivity of these species has not been assessed previously), as well as addressing the ecological questions posed in Objectives 1, 2, and 4.

This project includes a fourth main objective where the data collected will be synthesized with complementary data sets to develop a metacommunity model. This model will be used to assess community resilience to perturbation.

NOTE: If land or marine archeological activities are involved, contact the Monument Permit Coordinator at the address on the general application form before proceeding, as a customized application will be needed. For more information, contact the Monument office on the first page of this application.

9a. Collection of specimens - collecting activities (would apply to any activity): organisms or objects (List of species, if applicable, attach additional sheets if necessary):

Common name:
Hawaiian lionfish, speckled scorpionfish, dwarf scorpionfish, Hawaiian velvetfish, common guard crab, yellow-spotted guard crab, brown guard crab, rusty guard crab, cauliflower coral shrimp, elated drupe

Scientific name:
Dendrochirus barberi, Sebastapistes coniorta, Sebastapistes fowleri, Caracanthus typicus, Trapezia intermedia, Trapezia flavopunctata, Trapezia digitalis, Trapezia bidentata, Alpheus lottini, Drupella cornus

& size of specimens:
30-50/species/site, 8-16 sites; all sizes

Collection location:
French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan, Lisianski, Pearl and Hermes, Midway, Kure, Nihoa, Mokumanamana (we are planning to collect at a minimum of 8 sites, maximum of 16, ideally spread around 1 to 4 atolls)

☒ Whole Organism ☒ Partial Organism

9b. What will be done with the specimens after the project has ended?
To the greatest extent possible, specimens will be frozen and vouchered so that future research efforts can use archived material instead of collecting new specimens. Preserved tissue samples suitable for DNA work will be archived at HIMB for future permitted uses. No samples will be provided to researchers outside HIMB unless a material transfer agreement is provided by the Monument.

9c. Will the organisms be kept alive after collection? ☐ **Yes** ☒ **No**

• General site/location for collections:

• Is it an open or closed system? ☐ Open ☐ Closed

• Is there an outfall? ☐ Yes ☐ No

• Will these organisms be housed with other organisms? If so, what are the other organisms?

• Will organisms be released?

10. If applicable, how will the collected samples or specimens be transported out of the Monument?
Frozen fin clips, tissue samples, and fish collected for genetic analysis will be transported aboard the RV Hi'ialakai.

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:
All HIMB researchers working on similar species have coordinated to share samples and avoid duplicate sampling. This project reflects this coordination, as a joint effort between the Donahue, Toonen, and Bowen laboratories at HIMB.
The species included in this study have not previously been sampled by the Toonen and Bowen laboratories; these samples, as well as any relevant past and future collections, will be shared. At this point, we anticipate sharing these samples with Dr. Robert Toonen, [redacted] Dr. Brian Bowen, [redacted] We are open to sharing with other scientists who express interested, with appropriate monument approval.

12a. List all specialized gear and materials to be used in this activity:
Divers with use standard open-circuit SCUBA and snorkeling equipment .
Survey data will be collected using underwater flashlights, dive slates, a high resolution digital camera in underwater housing, and GoPro high definition video cameras.
Genetic data will be collected using a collection bag, polespear, hand nets, and tissue biopsy tools. Tissue preservative solutions will be used post tissue collection.

12b. List all Hazardous Materials you propose to take to and use within the Monument:
Tissue preservative solutions for DNA analyses include: 95% ethanol (EtOH; MSDS attached), and saturated salt buffer with dimethylsulfoxide (DMSO; MSDS attached).

13. Describe any fixed installations and instrumentation proposed to be set in the Monument:
None.

14. Provide a time line for sample analysis, data analysis, write-up and publication of information:
Data analysis, write-up of observed metacommunity dynamics including species interactions from the video footage, and development of a realistic metacommunity model will be completed within 1-3 years of this cruise. Regardless of the time to publication, the results from these studies will be made available to Monument managers as quickly as possible through the brown-bag luncheons, semi-annual reports, and semi-annual mini symposium during which all researchers involved in this project present the most current findings from their ongoing research to the broader management community. We will also communicate with NGO community and general public through presentations at the Hawaii Conservation Conference, Hanauma Bay seminar series, and other education and outreach venues. In sum, these efforts ensure that research results are provided to the Monument co-trustees almost as quickly as they become

available, and made available to the greater management community within a year of the data being collected.

15. List all Applicants' publications directly related to the proposed project:
This is a new project, and we do not yet have any published results. However, Donahue has published previously on metacommunity models (listed below). Please see attached CVs for other publications that are not directly related to this project.

Chesson P, MJ Donahue, B Melbourne, and AL Sears. 2005. Scale transition theory for understanding mechanisms in metacommunities. In M. Holyoak, M. Leibold, and R. Holt, editors. Metacommunties: spatial dynamics and ecological communities.
Melbourne B, AL Sears, MJ Donahue, and P Chesson. 2005. Applying scale transition theory to metacommunities in the field. In M. Holyoak, M. Leibold, and R. Holt, editors. Metacommunties: spatial dynamics and ecological communities.

Literature Cited:

Balvanera, P., A.B. Pfisterer, N. Buchmann, J.S. He, T. Nakashizuka, D. Raffaelli, B. Schmid. 2006. Quantifying the evidence for biodiversity effects on ecosystem functioning and services. Ecology Letters 9: 1146-1156.

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Cavender-Bares, J., K.H. Kozak, P.V.A. Fine, S.W. Kembel. 2009. The merging of community ecology and phylogenetic biology. Ecology Letters 12: 693-715.

Chesson, P., M.J. Donahue, B. Melbourne, A.L. Sears. 2005. Scale transition theory for understanding mechanisms in metacommunities. In M. Holyoak, M. Leibold, and R. Holt, editors. Metacommunities: spatial dynamics and ecological communities.

Friedlander, A.M., E.E DeMartini. 2002. Contrasts in density, size, and biomass of reef fishes between the northwestern and the main Hawaiian Islands: the effects of fishing down apex predators. Mar Ecol Prog Ser 230:253–264.

Gerlach, G., J. Atema, M.J. Kingsford, K.P. Black, V. Miller-Sims. 2007. Smelling home can prevent dispersal of reef fish larvae. PNAS 104(3): 858-863.

Igulu, M.M., I. Nagelkerken, M. van der Beek, M. Schippers, R. van Eck, Y.D. Mgaya. 2013. Orientation from open water to settlement habitats by coral reef fish: behavioral flexibility in the use of multiple reliable cues. Marine Ecology Progress Series 493: 243-257.

Jaap, W.C., J. Wheaton. 1975. Observation on Florida reef corals treated with fish-collecting chemicals. Florida Marine Research Publications 10: 1 – 18.

Mouquet, N., M. Loreau. 2003. Community patterns in source-sink metacommunities. The American Naturalist 162(5): 554-557.

Martens, P., J. Rotmans, D. de Groot. 2003. Biodiversity: luxury or necessity? Global Environmental Change 13: 75-81.

Ruzzante, D. 1998. A comparison of several measures of genetic distance and population structure with microsatellite data: bias and sampling variance. Can. J. Fish. Aquat. Sci. Vol. 55, 1-14.

Selkoe, KA, BS Halpern, RJ Toonen. 2008. Evaluating anthropogenic threats to the Northwestern Hawaiian Islands. Aquatic Conservation. 18(7): 1149-1165.

Selkoe KA, BS Halpern, CM Ebert, EC Franklin, ER Selig, KS Casey, J Bruno, RJ Toonen. 2009. A map of human impacts t a pristin coral reef ecosystem, the Papahanaumokuakea Marine National Monument. Coral Reefs 28(3): 635-650.

Sudekum, A.E., Parrish J.D., Radtke R.L., Ralston S. 1991. Life history and ecology of large jacks in undisturbed, shallow, oceanic communities. Fish Bull 89:493–513.

Tolimieri, N., A. Jeffs, J.C. Montgomery. 2000. Ambient sound as a cue for navigation by the pelagic larvae of reef fishes. Marine Ecology Progress Series 207: 219-224.

Toonen, R.J., K.R. Andrews, I.B. Baums, C.E. Bird, C.T. Concepcion, T.S. Daly-Engel, J.A. Eble, A. Faucci, M.R. Gaither, M. Iacchei, J.B. Puritz, J.K. Schultz, D.J. Skillings, M. Timmers, B.W. Bowen. 2011. Defining boundaries for applying ecosystem-based management: A multispecies case study of marine connectivity across the Hawaiian Archipelago. Journal of Marine Biology, Article ID 460173

Worm, B., E.B. Barbier, N. Beaumont, J.E. Duffy, C. Folke, B.S. Halpern, J.B.C. Jackson, H.K. Lotze, F. Micheli, S.R. Palumbi, E. Sala, K.A. Selkoe, J.J. Stachowicz, R. Watson. 2006. Impacts of biodiversity loss on ocean ecosystem services. Science 314: 787-790.

With knowledge of the penalties for false or incomplete statements, as provided by 18 U.S.C. 1001, and for perjury, as provided by 18 U.S.C. 1621, I hereby certify to the best of my abilities under penalty of perjury of that the information I have provided on this application form is true and correct. I agree that the Co-Trustees may post this application in its entirety on the Internet. I understand that the Co-Trustees will consider deleting all information that I have identified as "confidential" prior to posting the application.

Signature Date

SEND ONE SIGNED APPLICATION VIA MAIL TO THE MONUMENT OFFICE BELOW:

Papahānaumokuākea Marine National Monument Permit Coordinator
6600 Kalaniana'ole Hwy. # 300
Honolulu, HI 96825
FAX: (808) 397-2662

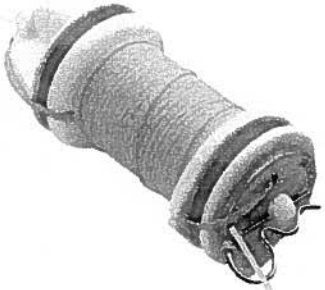
DID YOU INCLUDE THESE?

☒ Applicant CV/Resume/Biography
☒ Intended field Principal Investigator CV/Resume/Biography
☒ Electronic and Hard Copy of Application with Signature
☐ Statement of information you wish to be kept confidential
☒ Material Safety Data Sheets for Hazardous Materials

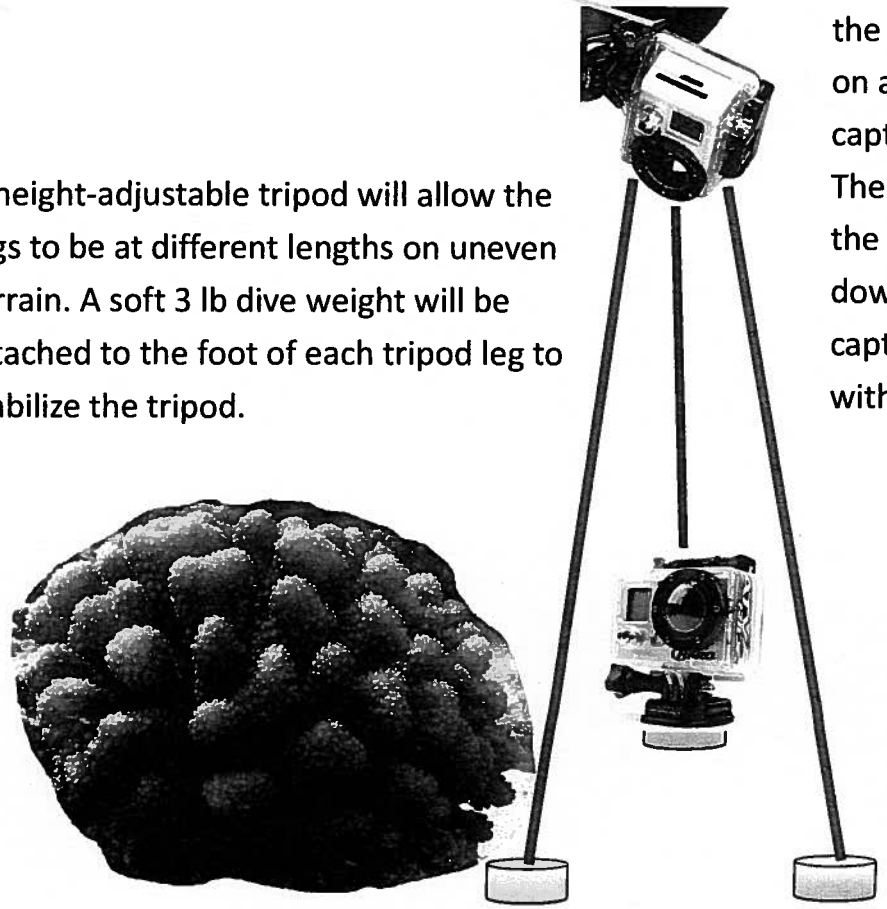
Species	Sites*	Individuals per Site (count)	Size Range	Lethal Sampling (Y/N)
Hawaiian lionfish, *Dendrochirus barberi*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30	3-10 cm, TL	Y
Speckled scorpionfish, *Sebastapistes coniorta*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30	3-10 cm, TL	Y
Dwarf scorpionfish, *Sebastapistes fowleri*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30	3-10 cm, TL	Y
Hawaiian velvetfish, *Caracanthus typicus*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30	3-10 cm, TL	Y
Common guard crab, *Trapezia intermedia*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30-50	1-5 cm CW	N
Yellow-spotted guard crab, *Trapezia flavopunctata*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30-50	1-5 cm CW	N
Brown guard crab, *Trapezia digitalis*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30-50	1-5 cm CW	N
Rusty guard crab, *Trapezia bidentata*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30-50	1-5 cm CW	N
Cauliflower coral shrimp, *Alpheus lottini*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30-50	1-3 cm CL	N
Elated drupe, *Drupella cornus*	4-8 FFS sites, 4-8 PHR sites, 4 Midway sites, 4 Kure sites	30	1-4 cm SL	Y

*Ideally we will sample from 8 distinct sites around French Frigate Shoals (FSS) and 8 distinct sites around Pearl and Hermes (PHR). If cruise logistics are such that there is not enough time for 8 sites at these two locations, but there is enough time to sample 4 sites at these locations and at two other locations, then we will survey at 4 sites around each of four locations (e.g., FFS, PHR, Midway, and Kure). Each site is up to one hectare in size.

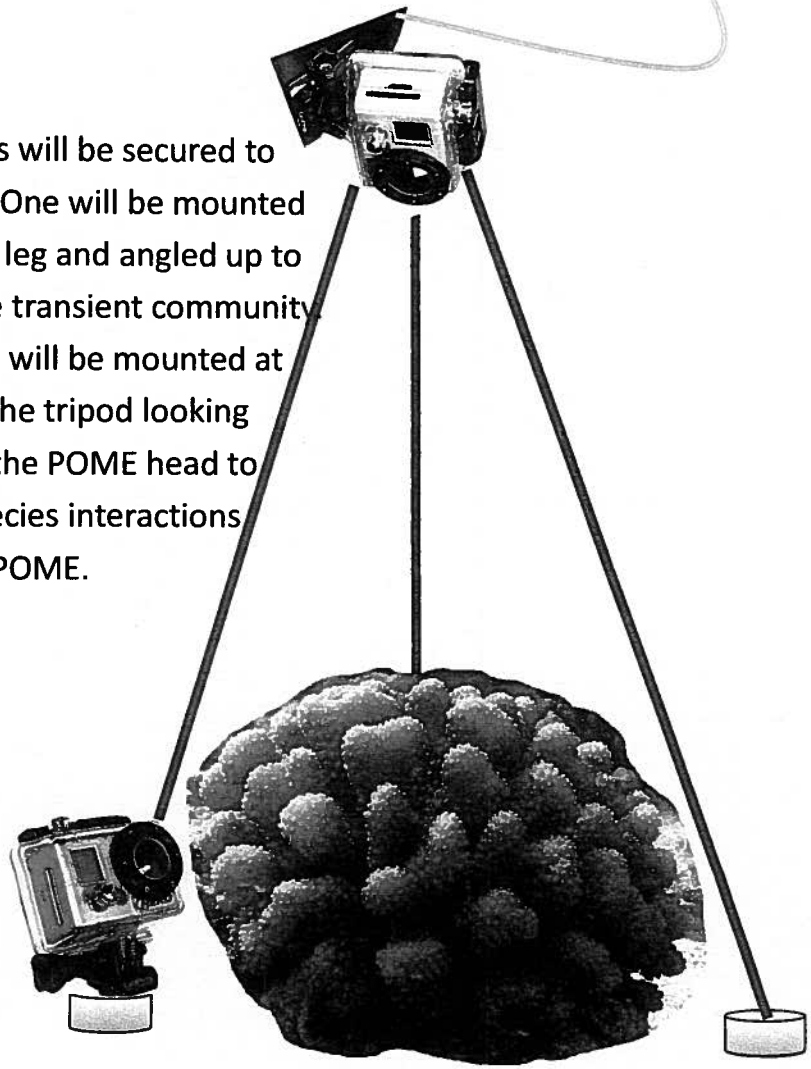
A Pelican float will be attached to each tripod. Pelican floats will allow retrieval of the camera system from the boat, after the divers have surfaced. Plenty of slack will be available in the line to account for wave action. The the surface floats will only be deployed when there is no surface current.



A height-adjustable tripod will allow the legs to be at different lengths on uneven terrain. A soft 3 lb dive weight will be attached to the foot of each tripod leg to stabilize the tripod.



Two GoPros will be secured to the tripod. One will be mounted on a tripod leg and angled up to capture the transient community. The second will be mounted at the top of the tripod looking down into the POME head to capture species interactions within the POME.



Papahānaumokuākea Marine National Monument
Compliance Information Sheet

1. Updated list of personnel to be covered by permit. List all personnel names and their roles here (e.g. John Doe, Diver; Jane Doe, Field Technician, Jerry Doe, Medical Assistant):

Megan Donahue, PI, Diver
Hawai'i Inst of Marine Biology
46-007 Lilipuna Rd, Kāne'ohe, HI 96744
808-236-7417
donahuem@hawaii.edu

Chelsie Counsell, Field PI, Diver
Hawai'i Inst of Marine Biology
46-007 Lilipuna Rd, Kāne'ohe, HI 96744
808-236-7424
counsell@hawaii.edu

Nyssa Silbiger, Field PI, Diver
Hawai'i Inst of Marine Biology
46-007 Lilipuna Rd, Kāne'ohe, HI 96744
808-236-7424
silbiger@hawaii.edu

TBD, Diver

2. Specific Site Location(s): (Attach copies of specific collection locations):

The activities of this permit (PMNM-2014-25) will coordinate with the activities of PMNM-2014-24). The following is a list of targeted sites for PMNM-2014-24, and we will perform surveys and collections at these forereef locations, when appropriate habitat is available at these sites.

Island/Atoll	Site Name	Latitude (Decimal Degrees)	Long itude (Decimal Degrees)
French Frigate Shoals	FFS-34	23.62792	-166.13538
French Frigate Shoals	FFS-12	23.63835	-166.18005
French Frigate Shoals	FFS-H6	23.88046	-166.27306
French Frigate Shoals	FFS-21	23.84695	-166.32701
French Frigate Shoals	FFS-33	23.83651	-166.26669
Pearl and Hermes Atoll	PHR-39	27.94045941	-175.8613056
Pearl and Hermes Atoll	PHR-44	27.91026	-175.90483
Pearl and Hermes Atoll	PHR-42	27.75312882	-175.9489414
Pearl and Hermes Atoll	PHR-R26	27.78583	-175.78028

Pearl and Hermes Atoll	PHR-R33	27.78546679	-175.82355
Kure Atoll	KUR-12	28.38231	-178.32448
Kure Atoll	KUR-R33	28.41677	-178.37843
Kure Atoll	KUR-02	28.45363	-178.34402
Kure Atoll	KUR-04	28.42665	-178.28587
Kure Atoll	KUR-06	28.38678	-178.34792
Lisianski Island Marine Area	LIS-18	26.00428	-173.99403
Lisianski Island Marine Area	LIS-R14	26.07841	-173.99701
Lisianski Island Marine Area	LIS-R9	26.03941	-174.01254
Lisianski Island Marine Area	LIS-R10	25.94452	-173.95351
Lisianski Island Marine Area	LIS-09	25.95807	-173.88239

While the above table represents our targeted sites, our sampling depends entirely on cruise logistics and on the availability of appropriate forereef habitat with *Pocillopora meandrina* heads. Therefore, we request flexibility to visit alternative forereef sites throughout PMNM, which are encompassed in the coordinates below. This would allow us to look at trends in POME-community composition and connectivity across the Archipelago.

Island/Atoll	Latitude (Decimal Degrees)	Longitude (Decimal Degrees)
Kure	-178.1970649	28.55825236
Kure	-178.1962359	28.29958376
Kure	-178.4598788	28.29958376
Kure	-178.4607079	28.55742329
Midway	-177.1963822	28.3741997
Midway	-177.1972113	28.13377055
Midway	-177.5280086	28.13459962
Midway	-177.5280086	28.3741997
PHR	-176.0885098	28.04643026
PHR	-175.6328916	28.04539945
PHR	-175.6328916	27.70729364
PHR	-176.0895406	27.70626283
Lisianski	-173.6729257	26.25150771
Lisianski	-173.6729257	25.83942708
Lisianski	-174.2309516	25.83942708
Lisianski	-174.2309516	26.25150771
Laysan	-171.4790012	25.9602718
Laysan	-171.4772523	25.65596666
Laysan	-171.9791809	25.65771554
Laysan	-171.9791809	25.96202068
Maro	-170.1813322	25.69968867
Maro	-170.1795833	25.21524889

Maro	-171.0050547	25.21524889
Maro	-171.0050547	25.69968867
Gardner	-167.7483232	25.26070709
Gardner	-167.7508705	24.34878019
Gardner	-168.3622181	24.35132747
Gardner	-168.3647654	25.26070709
FFS	-165.9346585	23.94630966
FFS	-165.9346585	23.56421738
FFS	-166.4568513	23.56421738
FFS	-166.4568513	23.94630966

3. Other permits (list and attach documentation of all other related Federal or State permits):

None

a. For each of the permits listed, identify any permit violations or any permit that was suspended, amended, modified or revoked for cause. Explain the circumstances surrounding the violation or permit suspension, amendment, modification or revocation.

N/A

4. Funding sources (Attach copies of your budget, specific to proposed activities under this permit and include funding sources. See instructions for more information):

The primary costs for this project are personnel, and Chelsie Counsell (graduate student with PI Donahue, and Field PI for this project) is fully supported by an NSF Graduate Research Fellowship. Counsell and Donahue are coordinating with Bowen to seek funds to support the molecular analysis associated with this work.

5. Time frame:

The proposed activities will occur in the Monument between July 1, 2014 and October 31, 2014; the specific dates depend entirely on the cruise dates for the R/V Hi'ialakai.

6. Indicate (with attached documentation) what insurance policies, bonding coverage, and/or financial resources are in place to pay for or reimburse the Monument trustees for the necessary search and rescue, evacuation, and/or removal of any or all persons covered by the permit from the Monument:

All divers are requested to carry DAN insurance in addition to UH Worker's Compensation that will cover any diving related injury or an accident that occurs while on a diving research cruise.

7. **Check the appropriate box to indicate how personnel will enter the Monument:**

☒ Vessel
☐ Aircraft

Provide Vessel and Aircraft information: We will enter the Monument on the NOAA R/V Hi'ialakai

8. **The certifications/inspections (below) must be completed prior to departure for vessels (and associated tenders) entering the Monument. Fill in scheduled date (attach documentation):**

☐ Rodent free, Date:
☐ Tender vessel, Date:
☐ Ballast water, Date:
☐ Gear/equipment, Date:
☐ Hull inspection, Date:

9. **Vessel information (NOTE: if you are traveling aboard a National Oceanic and Atmospheric Administration vessel, skip this question):**
Vessel name:
Vessel owner:
Captain's name:
IMO#:
Vessel ID#:
Flag:
Vessel type:
Call sign:
Embarkation port:
Last port vessel will have been at prior to this embarkation:
Length:
Gross tonnage:
Total ballast water capacity volume (m^3):
Total number of ballast water tanks on ship:
Total fuel capacity:
Total number of fuel tanks on ship:
Marine Sanitation Device:
Type:

Explain in detail how you will comply with the regulations regarding discharge in the Monument. Describe in detail. If applicable, attach schematics of the vessel's discharge and treatment systems:

Other fuel/hazardous materials to be carried on board and amounts:

Provide proof of a National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement-approved Vessel Monitoring System (VMS). Provide the name and contact information of the contractor responsible for installing the VMS system. Also describe VMS unit name and type:

VMS Email:
Inmarsat ID#:
Contact:

*Individuals MUST ENSURE that a type-approved VMS unit is installed and that its automatic position reports are being properly received by the NOAA OLE system prior to the issuance of a permit. To make sure your VMS is properly configured for the NOAA OLE system, please contact NOAA OLE at (808) 203-2503 or (808) 203-2500.

*PERMITS WILL NOT BE ISSUED TO INDIVIDUALS ENTERING THE MONUMENT VIA VESSEL UNTIL NOAA OLE HAS CONTACTED THE MONUMENT PERMIT COORDINATOR WITH A 'POSITIVE CHECK' READING.

10. Tender information:

On what workboats (tenders) will personnel, gear and materials be transported within the Monument? List the number of tenders/skiffs aboard and specific types of motors:

Additional Information for Land Based Operations

11. Proposed movement of personnel, gear, materials, and, if applicable, samples:

12. Room and board requirements on island:

13. Work space needs:

DID YOU INCLUDE THESE?

- ☐ Map(s) or GPS point(s) of Project Location(s), if applicable
- ☐ Funding Proposal(s)
- ☐ Funding and Award Documentation, if already received
- ☐ Documentation of Insurance, if already received
- ☐ Documentation of Inspections
- ☐ Documentation of all required Federal and State Permits or applications for permits

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

JESSE K. SOUKI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

June 27, 2014

TO: Division of Aquatic Resources File

THROUGH: William J. Aila Jr., Chairperson

FROM: Frazer McGilvray
Division of Aquatic Resources

DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT RESEARCH PERMIT TO DR. MEGAN DONAHUE, HAWAI'I INSTITUTE OF MARINE BIOLOGY, UNIVERSITY OF HAWAI'I, FOR ACCESS TO STATE WATERS TO CONDUCT *POCILLOPORA MEANDRINA* (POME) COMMUNITY CHARACTERIZATION ACTIVITIES UNDER PERMIT PMNM-2014-025.

The following permitted activities are found to be exempted from preparation of an environmental assessment under the authority of Chapter 343, HRS and Chapter 11-200, HAR:

Project Title:
Papahānaumokuākea Marine National Monument Research Permit to Dr. Megan Donahue, Associate Professor, Hawai'i Institute of Marine Biology, University of Hawai'i, for Access to State Waters to Conduct *Pocillopora meandrina* (POME) Community Characterization Activities.

Permit Number: PMNM-2014-025

Project Description:
The research permit, as described below, would allow entry and activities to occur in Papahānaumokuākea Marine National Monument (Monument), including the NWHI State waters from August 1, 2014 through July 31, 2015.

The proposed objectives include: (1) the characterization of cryptic fish and invertebrate communities that live within Pocillopora meandrina (POME) colonies, and (2) document within-species genetic diversity and between-species community diversity. The applicant would provide the Monument with information regarding connectivity, cryptic species diversity, and species interactions at scales on coral reefs not yet addressed in other surveys.

Up to eleven (11) individuals would be authorized to enter the Monument and conduct activities. Proposed activities would initially occur from the RV HI'IALAKAI (separately permitted under PMNM-2014-005) from August 7 – 31, 2014, and potentially again in the August or September 2015, at all island locations.

Using snorkeling and/or SCUBA, data would be collected from up to sixteen (16) sites at four (4) atolls. Sites would measure up to 1 hectare with a total of thirty POMEs surveyed in 3 to 5 days. The proposed activities at each site would include:

1. Visually surveying the communities (fish and mobile invertebrates) living within the structure created by the POME colonies at forereef sites spanning a depth range of 30 to 100 ft. Divers would record the number of fish, species of fish and invertebrates, POME colony characteristics (size, percent live tissue, branch gaps), and habitat. Photographs and GPS coordinates would be taken;
2. Placing two (2) video cameras to record species interactions in three (3) POME colonies for 30 to 60 minutes. One (1) camera would be oriented to capture activity within the coral branches, while the other would be angled to capture activity around the outer top edges of the branches;
3. Collecting tissue samples and analyze genetic data (in coordination with Drs. Brian Bowen and Rob Toonen) to assess intraspecific genetic diversity and connectivity between sites (described further below); and
4. Relating community composition, diversity, and behavior to remotely sensed and in situ environmental data from NASA and NOAA CRED (including pH, temperature, salinity, and chlorophyll).

Up to fifty (50) of one fish species and up to fifty (50) of one invertebrate species would be collected per site. One of two fish species, speckled scorpionfish or dwarf scorpinfish, would be sampled lethally using a miniature speargun. One of two species of invertebrate species, common guard crab or red-spotted guard crab, would be sampled non-lethally by taking a piece of tissue less than 1 cm^2. Which of the two fish and invertebrate species sampled would be determined after completing the first visual surveys in the Monument and individual numbers of the species sampled would be in high enough densities within POME communities for sampling. Voucher specimens may be collected (following Monument *Voucher Specimen Guidelines*).

The proposed activities are in direct support of the Monument Management Plan's priority management needs 3.1 – Understanding and Interpreting the NWHI (through action plan 3.1.1 Marine Conservation Science). This action plan specifies to "marine research, characterization, and monitoring designed to support an ecosystem-based approach to protection and management" (Activity MCS-1.2: Continue monitoring of shallow-water coral reef ecosystems to protect ecological integrity, PMNM MMP Vol 1, p. 123). It also notes that this activity would offer up-to-date research findings for the project area, helping to understand effective use of resources for management. Activities to support marine conservation science, including community composition studies such as those to be carried out by the permittee, are also addressed in the Monument Management Plan (MMP) Environmental Assessment (EA) (FONSI, December 2008). This EA summarizes that understanding the populations change could be helpful to forecast, prepare for and

mediate potential threats to populations within the Monument (PMNM MMP Vol 2, p. 171). Assessments of POME community composition, such as those proposed in this baseline and potential follow-up study, would enhance this understanding.

Consulted Parties:
The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since March 17, 2014 giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Exemption Determination:
After reviewing HAR § 11-200-8, including the criteria used to determine significance under HAR § 11-200-12, DLNR has concluded that the activities under this permit would have minimal or no significant effect on the environment and that issuance of the permit is categorically exempt from the requirement to prepare an environmental assessment based on the following analysis:

1. All activities associated with this permit; including the visual fish and invertebrate surveys, photography, video recording, and collecting samples; have been evaluated as a single action. As a preliminary matter, multiple or phased actions, such as when a group of actions are part of a larger undertaking, or when an individual project is precedent to or represents a commitment to a larger project, must be grouped together and evaluated as a single action. HAR § 11-200-7. This permit may involve an activity that is precedent to a later planned activity, i.e. the continuation of POME community assessments; the categorical exemption determination here will treat all planned activities as a single action.

2. The Exemption Class for Scientific Research with no Serious or Major Environmental Disturbance Appears to Apply. Chapter 343, HRS, and § 11-200-8, HAR, provide for a list of classes of actions exempt from environmental assessment requirements. HAR §11-200-8.A.5. exempts the class of actions which involve "basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource." The proposed removal activities here appear to fall squarely under the exemption class #5, exempt item #2 as described under the Division of Forestry and Wildlife exemption list published on June 12, 2008. This exemption class has been interpreted to include "surveys, new transect lines, recording, and sampling", such as those being proposed. As discussed below, no significant disturbance to any environmental resource is anticipated in the POME community assessment studies. Thus, so long as the below considerations are met, an exemption class should include the action now contemplated.

To minimize the potential of disease introduction or transfer during field sampling and diving activities, the applicant would follow Monument Best Management Practice (BMP) 011 – Disease

and Introduced Species Prevention. For sample storage and transport, the applicant would follow Monument BMP 006 – General Storage and Transport Protocols for Collected Samples. The applicant would also follow Monument BMP 004 – Boat Operations and Diving Activities to eliminate any adverse impacts of protected marine species during boating and diving activities. Precautions would be taken with respect to protected species and the camera set-up by following BMP 010 – Marine Wildlife Viewing Guidelines and recommendations from the ESA Section 7 informal consultation.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Potentially Particularly Sensitive Environment Will Not be Significant. Even where a categorical exemption appears to include a proposed action, the action cannot be declared exempt if "the cumulative impact of planned successive actions in the same place, over time, is significant, or when an action that is normally insignificant in its impact on the environment may be significant in a particularly sensitive environment." HAR § 11-200-8.B. To gauge whether a significant impact or effect is probable, an exempting agency must consider every phase of a proposed action, any expected primary and secondary consequences, the long-term and short-term effects of the action, the overall and cumulative effect of the action, and the sum effects of an action on the quality of the environment. HAR § 11-200-12. Examples of actions which commonly have a significant effect on the environment are listed under HAR § 11-200-12.

The proposed project, including activities associated with POME community assessments, is new, though similar activities have been permitted within the Monument in the past, with no deleterious impacts. With this in mind, significant cumulative impacts are not anticipated as a result of this activity, and numerous safeguards further ensure that the potentially sensitive environment of the project area will not be significantly affected. All activities will be conducted in a manner compatible with the management direction of the Monument Proclamation in that activities do not diminish monument resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects. The joint permit review process did not reveal any anticipated indirect or cumulative impacts, nor did it raise any cultural concerns, that would occur as a result of these activities.

The proposed project would be supported by the NOAA ship R/V HI'IALAKAI (PMNM-2014-005), from August 7 - 31, 2014 and potentially again in August or September 2015. Table 1 lists additional activities that are anticipated to take place on the August 2014 cruise pending approval of permit applications. Though proposed permits from Dr. Courtney Couch (PMNM-2014-012) and Loren Scott Godwin (PMNM-2014-018) would be conducting activities in the same area as this proposed permit, no cumulative impacts are anticipated. Table 2 lists activities potentially occurring in August 2014 as well. At this time, no other concurrent activities are known. The culmination of this permit, occurring throughout the Monument over approximately one month, is not anticipated to have significant cumulative impacts.

Table 1: Concurrent projects aboard NOAA Ship HI'IALAKAI

Permit	Purpose and scope	Location
PMNM-2014-005 Ellis-Simon HI'IALAKAI (approved)	This permit allows the NOAA Ship HI'IALAKAI entry into the Monument. Personnel aboard the vessel would be permitted under separate permits	All locations
PMNM-2014-014 Meyer (proposed)	This proposed action would be to conduct top predator research consisting of fishing for various shark and fish species.	French Frigate Shoals, Pearl and Hermes, Midway
PMNM-2014-012 Couch (proposed)	This proposed action would be to conduct coral health and community structure assessment surveys in the NWHI.	All locations
PMNM-2014-024 Donahue (proposed)	This proposed action would be to evaluate coral reef bioerosion in the NWHI from August 7 – 31, 2014.	All locations
PMNM-2014-018 Godwin (proposed)	This proposed action would be conduct Pacific Reef Assessment and Monitoring Program.	All locations

Table 2: Concurrent projects about NOAA ship SETTE

Permit	Purpose and scope	Location
PMNM-2014-005 Koes SETTE (approved)	This permit allows the NOAA SETTE entry into the Monument. Personnel aboard the vessel would be permitted under separate permits	All locations
PMNM-2014-001 Co-Trustee (approved)	This permit allows monk seal field camp operations with activities from June - September 2014.	French Frigate Shoals, Lisianski Island, Pearl and Hermes Atoll, Midway Atoll, Kure Atoll

Since no significant cumulative impacts or significant impacts with respect to any particularly sensitive aspect of the project area are anticipated, the categorical exemptions identified above should remain applicable.

4. Overall Impacts will Probably be Minimal and Insignificant Any foreseeable impacts from the proposed activity will probably be minimal, and further mitigated by general and specific conditions attached to the permit. Specifically, all conservation and management activities covered by this permit will be carried out with strict safeguards for the natural, historic, and cultural resources of the Monument as required by Presidential Proclamation 8031, other applicable law and agency policies and standard operating procedures.

Conclusion. Upon consideration of the permit to be approved by the Board of Land and Natural Resources, the potential effects of the above listed project as provided by Chapter 343, HRS and Chapter 11-200 HAR, have been determined to be of probable minimal or no significant effect on the environment and exempt from the preparation of an environmental assessment.

_____ _____

William J. Aila Jr. Date
Board of Land and Natural Resources

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JUN 06 2014

David Swatland
Acting Superintendent
Papahanaumokuakea Marine National Monument
Office of National Marine Sanctuaries
6600 Kalaniana`ole Hwy, Suite 300
Honolulu, HI 96825

Dear Mr. Swatland:

This letter responds to your May 22, 2014 Request for Consultation regarding issuance of a permit to applicant Donahue to conduct coral reef research, surveys, and video monitoring within the Papahanaumokuakea Marine National Monument, and the issuance of up to five research permits over the next five years to applicant Gleason to conduct tow-board surveys and magnetometer deployments to search for and document new maritime archeological sites (PMNM 2014). You have requested our concurrence under Section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. §1531 et seq.), with your determination that the proposed action may affect but is not likely to adversely affect green, hawksbill, leatherback, olive ridley, and north Pacific loggerhead sea turtles; humpback whales, blue whales, fin whales, sei whales, sperm whales, north Pacific right whales, and Hawaiian monk seals.

Proposed Action/Action Area: The proposed activity is described in your request for consultation and the associated biological evaluation (PMNM 2014) and further clarified via email exchange (NMFS and PMNM 2014). In summary, the proposed action consists of issuing a 2014 permit to applicant Donahue to conduct underwater surveys and video recording to describe cryptic species living in coral colonies within the Papahanaumokuakea Marine National Monument. Activities will take place in shallow water (30 to 100 feet) and consist of swimming, snorkeling, and SCUBA, visual surveys and photography/videography of coral colonies, and sample collection from fish and invertebrates. Video recording stations would include two GoPro cameras mounted to an adjustable tripod stabilized by three-pound weights attached to each tripod foot. A surface buoy will be tethered to the tripod with 20 feet of scope (slack line) at each depth deployment to avoid wave action toppling over the station. Target deployment depths would be 30 to 80 feet and camera stations would be deployed for 30 to 60 minutes. Only one video station would be

deployed at any given time and the total time of deployment over the entire research period would not exceed 16 hours (in increments of one hour or less).

Additional but separate activities included in the consultation request include the issuance of up to five permits over the next five years (2014 – 2018) to applicant Gleason to conduct tow board and magnetometer surveys to search for new maritime archeological sites within the Monument. Tow-board surveys will consist of two snorkelers towed 75 feet behind the boat at speeds of up to 4 miles per hour. Over a five year period, it is estimated that the applicant would conduct approximately 500 hours of tow-board surveys. In addition, magnetometer surveys would consist of towing a passive magnetometer approximately 50 feet behind the boat at speeds up to 4 miles per hour. Over a five year period, it is estimated that the applicant would conduct approximately 500 hours of magnetometer surveys. The action area includes all nearshore marine areas within PMNM.

Species That May Be Affected: PMNM determined that the proposed action may affect but is not likely to adversely affect Hawaiian monk seals (*Monachus schauinslandi*), green sea turtles (*Chelonia mydas*), hawksbill sea turtles (*Eretmochelys imbricata*), the north Pacific distinct population segment of loggerhead sea turtles (*Caretta caretta*), olive ridley sea turtles (*Lepidochelys olivacea*), leatherback sea turtles (*Dermochelys coriacea*), humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), fin whales (*Balaenoptera physalus*), blue whales (*Balaenoptera musculus*), sei whales (*Balaenoptera borealis*), and north Pacific right whales (*Eubalaena japonica*). Detailed information about the biology, habitat, and conservation status of sea turtles can be found in their recovery plans and other sources at http://www.nmfs.noaa.gov/pr/species/turtles/. The same can be found for Hawaiian monk seals and cetaceans at http://www.nmfs.noaa.gov/pr/species/mammals/.

Critical Habitat: The proposed action would take place within designated monk seal critical habitat. Critical habitat was designated under the ESA for the Hawaiian monk seal on April 30, 1986 and revised on May 26, 1988. Designated critical habitat includes all beach areas, lagoon waters, and ocean waters out to a depth of 20 fathoms around Kure Atoll; Midway Islands (except Sand Island), Pearl and Hermes Reef, Lisianski Island, Laysan Island, Gardner Pinnacles, French Frigate Shoals, Necker Island, Maro Reef, and Nihoa Island. On June 2, 2011, NMFS proposed revising critical habitat for monk seals by extending the current designation out to the 500 meter depth contour and including Sand Island at Midway Island but this proposal is not yet final.

Analysis of Effects: In order to determine that a proposed action is not likely to adversely affect listed species, NMFS must find that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the joint USFWS-NMFS Endangered Species Consultation Handbook: (1) insignificant effects relate to the size of the impact and should never reach the scale where take occurs; (2) discountable effects are those that are extremely unlikely to occur; and (3) beneficial effects are positive effects without any adverse

effects (USFWS & NMFS 1998). This standard, as well as consideration of the probable duration, frequency, and severity of potential interactions between the marine listed species and the proposed action, were applied during the analysis of effects on ESA-listed marine species as described in the PMNM initiation request and supplemental emails. PMNM determined that the potential for temporary disturbance of protected species is insignificant and potential for entanglement, vessel collisions, and impacts to monk seal critical habitat is discountable for both applicants' proposed activities. PMNM addressed all of these stressors in the consultation request and supplemental materials providing mitigation measures, best management practices, and impact analyses to justify your determinations (PMNM 2014; NMFS and PMNM 2014). Therefore, based on the description of the proposed action, the described Best Management Practices, the effects analyses provided by PMNM, and the best information available to describe the behaviors and biological needs of the species considered here, NMFS agrees that the proposed action would result in insignificant impacts, or the likelihood of impacts would be discountable, for ESA-listed green, hawksbill, leatherback, olive ridley, and north Pacific loggerhead sea turtles; humpback whales, blue whales, fin whales, sei whales, sperm whales, north Pacific right whales, and Hawaiian monk seals.

Conclusion: NMFS concurs with your determination that the proposed action may affect, but is not likely to adversely affect ESA-listed marine species or designated critical habitat. Our concurrence is based on the finding that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the joint USFWS-NMFS Endangered Species Consultation Handbook (USFWS & NMFS 1998) and summarized at the beginning of the Analysis of Effects section above. This concludes your consultation responsibilities under the ESA for species under NMFS's jurisdiction. However, this consultation focused solely on compliance with the ESA. Additional compliance review that may be required of NMFS for this action (such as assessing impacts on Essential Fish Habitat) would be completed by NMFS Habitat Conservation Division in separate communication, if applicable.

ESA Consultation must be reinitiated if: 1) a take occurs; 2) new information reveals effects of the action that may affect listed species or designated critical habitat in a manner or to an extent not previously considered; 3) the identified action is subsequently modified in a manner causing effects to listed species or designated critical habitat not previously considered; or 4) a new species is listed or critical habitat designated that may be affected by the identified action.

If you have further questions please contact Kim Maison on my staff at (808) 725-5143. Thank you for working with NMFS to protect our nation's living marine resources.

Sincerely,

Michael D. Tosatto
Regional Administrator

cc: Justin Rivera, Papahanaumokuakea Marine National Monument
Aaron Nadig, ESA Section 7 Program, USFWS, Honolulu

NMFS File No.: PIR-2014-9485
PIRO Reference No.: I-PI-14-1184-LVA

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