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: Stephen A. Karl
Affiliation: University of Hawaii, Manoa, Hawaii Institute of Marine Biology

Permit Category: Research
Proposed Activity Dates: 1 June 2012 - 1 October 2012
Proposed Method of Entry (Vessel/Plane): NOAA Ship HI`IALAKAI
Proposed Locations: French Frigate Shoals, Maro, and Laysan

Estimated number of individuals (including Applicant) to be covered under this permit:
4
Estimated number of days in the Monument: 29

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…
sample Acropora cytherea colonies at each of 5 reefs at each Atoll (total 250 samples per Atoll). Tissue will be taken from healthy as well as diseased (i.e., individuals with growth anomolies) individuals. Healthy and diseased tissue will be collected from the same individual as well as healthy tissue from individuals with no obvious signs of disease.

b.) To accomplish this activity we would ….
sample 50 - 3 cm^3 nubbins using bone shears.

c.) This activity would help the Monument by …
improving our understanding of the underlying causes of growth anomalies in Acropora cytherea. Understanding the causes of the disease will allow managers to assay areas where A. cytherea may be at high risk for developing this disease and assess degree and areas of vulnerability.

Other information or background:

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Karl, Stephen A.

Title: Associate Researcher

1a. Intended field Principal Investigator (See instructions for more information):

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

[redacted]

[redacted]

[redacted]

[redacted]

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

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

Hawaii Institute of Marine Biology, University of Hawaii, 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):

Jonathan Whitney, research diver
Amanda Shore, research diver
Maya Walton, 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:
Five patch reefs at each atoll where A. cytherea is found (exact location to be determined when on site).

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:***

There are many threats to the persistence of coral reefs. A major one is disease. There are several diseases of coral and many of them result in rapid death of the coral colony. Very little is known about the causes of coral disease. Without a understanding of the causes of a disease there is no chance of devising a cure or to do a risk assessment. Colony growth anomalies (GA) are common in Acropora cytherea and primarily at French Frigate Shoals (FFS). We propose to sample healthy and diseased individuals and healthy and diseased tissue from diseased individuals to determin the degree to which GAs are a genetic disease. We will also sample individuals at Maro Reef and Laysan Island, if they are encountered. A. cytherea has been seen at these two Atolls previously.

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?

Our overriding goal is to provide scientific information to managers so that the Pahanaumokuakea Marine National Monument can be managed and protected based on policy grounded in sound science. Our divers are experienced in moving in and around coral and coral reefs so as to not cause damage. Each diver has been through intensive dive training and is a certified scientific diver with the American Association of Underwater Scientists. We have conducted similar activities before in the Monument and have assessed that they do not impact the reefs. All personnel will have attended cultural training classes to better understand and respect the cultural and spiritual importance of the Papahanaumokuakea Monument.

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?

In order to manage any ecosystem, fundamental information on how the systems works is necessary. For example, if some coral colonies are diseased and others are not, knowing if the diseased individuals are genetically predisposed to sickness will allow managers to accurately assess risk and to better determine priorities. The single, small coral samples (i.e., 3 cm^3) collected from colonies are smaller than the number and size usually removed by parrotfish and other coral-eating organisms. The monument is approximately 360,000 km^2 and FFS is approximately 800 km^2. There is about 13,500 km^2 of coral reef habitat in the Monument. Our sampling activities will be confined less than 15 patch reefs totaling approximately 0.019 Km^2 or 0.00014% of the coral reef habitat in the monument. Negative impacts on the reefs, atoll, and Monument are exceedingly small. The positive impacts of the results of our research are Monument-wide and wider.

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. Our research is aimed at understanding the basis of GA that are commonly found at FFS. There is no practical alternative to doing this in the Monument because it is the reefs in the Monument that will need to be managed. For example, the same information from reefs in the main Hawaiian Islands is interesting, but there is no basis upon which to say that the reefs in the Monument are like the Main Hawaiian Island reefs or does it identify at risk reefs in the Monument. Given the vastly different ages and general makeup of reefs in the monument, it is likely that they are different than those in the Main Hawaiian Islands and elsewhere.

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 negative impacts that we might have are essentially non-existent. When we return to sites where we have worked in previous years there is no indication that we had ever been there before. The coral colonies that we have sampled appear normal and do not look different from ones in other areas that were not sampled. The data that we are collecting, however, will help managers to understand what role genetics plays in coral disease. The data that we are collecting will help managers understand if the extent of GA in A. cytherea found in the Monument is due to some individuals being genetically predisposed to disease. Knowing this connection will allow managers to assess the vulnerability of areas that currently do not have GA as well as the potential spread of GA where it does occur. The Papahanaumokuakea Monument is a sacred place in native Hawaiian culture, and coral, in particular, play a central role in the Hawaiian's understanding of how the world was created. As said in the first few lines of the Hawaiian creation chant, the Kumulipo: "Born was the male, born was the female, born was the coral polyp, from which the coral came forth." Stewardship of natural resources is a central theme in the relationship that Native Hawaiians have with the environment and, thus, there is no difference between a natural and cultural resource. Our research is very much in line with this practice. What we are doing will place stewardship practices on a foundation of knowledge and insight into how best to manage and protect coral reefs of the Papahanaumokuakea Monument. Just as Native Hawaiians learned when and where important food fish were spawning and then protected these times and areas, we will be learning fundamental aspects of the biology of coral reefs. This knowledge will then be used to protect and manage the resources of the Monument in the same way Native Hawaiian fishers (lawai'a) protected and managed resources of their ahupua'a.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.

It is anticipated that collecting samples will take a minimum of 3 and a maximum of 5 days at each Atoll. We are minimizing the number of divers (4) in the water at any time so as to minimize the possibility of impacting the reef. This then requires that we spend more time at the site. The ship is deployed for a specified amount of time (~29 days) so that all researchers can

complete their studies at the various atolls. Our research activities will only be done at French Frigate Shoals, Maro Reef, and Laysan, but we must stay onboard the ship until all cruise is completed.

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 a certified SCUBA diver for 39 years. I have been an AAUS certified scientific diver for 33 years. My curriculum vita lists over 50 scientific publications on genetics and conservation. My Ph.D. is in genetics. I have conducted similar research in the monument five prior years. I have worked on a variety of ecological, genetic, and field projects dating back to 1979.

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.

Detailed budget information is available upon request from the Monument Permit Coordinators, and sufficient funding exists or will be obtained to complete the research outlined herein. This research is currently, or has been previously, funded by a combination of the following agency sources:
1) NWHIMNM-HIMB partnership
2) The University of Hawaii.

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.

We are using standard field survey techniques that have proven successful both generally and specifically in the Monument. Sites within an Atoll will be chosen based on where Acropora cytherea is growing. Small scale sampling will be done at each reef. That is, 25 samples will be collected from individuals that are immediate neighbors. This will allow us to understand the degree of clonality in this species. The remainder of the samples will be collected haphazardly (i.e., collect, swim 3 kicks, collect again) from the rest of the reef. Separate reefs at an Atoll will be no closer than 25 meters, when possible. The genetic approaches have been previously proven appropriate and capable of uniquely identifying individuals and providing the type of data we need. Any negative impacts of our study are minimal and temporary and should not alter the Monument's cultural, natural and historic resources, qualities or ecological integrity. An average colony is about ~60 cm in diameter and we are sampling a piece that is no larger than a single bite from a parrotfish; which normally take several. This is an insignificant loss to the colony and the reef. The positive impacts of our study will help guide appropriate stewardship practices to preserve and manage the qualities and integrity of the Monument's cultural and natural and historic resources. Our data is necessary to provide a strong scientific understanding of coral reef ecosystem 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?
Yes, we are using a NOAA ship supplied by the Monument.

j. Demonstrate that there are no other factors that would make the issuance of a permit for the activity inappropriate.

I have fully complied with all previous permit requirements and have no past, current, or pending restrictions applicable to this permit. I have fully disclosed my intentions in this permit application. To my knowledge, there are no other factors that would make the issuance of a permit inappropriate.

8. Procedures/Methods:

In the NWHI, Acropora cytherea growth anomalies (GA) are common in some areas of French Frigate Shoals. One site, previously surveyed and monitored, has experienced a significant reduction in the density of A. cytherea due to colonies dying from this disease. Unfortunately, very little is known about this disease and nothing is known about its cause. We are going to investigate if this disease might be genetically based and similar to cancer in humans. To do this, we will collect small pieces of tissue from healthy and diseased tissue from a single, affected individuals and healthy tissue from a healthy individuals. We will do this primarily at FFS but will also collect A. cytherea at Maro Reef and Laysan, where it has been previously seen in low density. Over the past few years, significant advances in the technology of DNA sequencing (i.e., determining the order of the DNA building blocks in the genome) have resulted in genetic tools that allow easy, cost effective, and fast determination of the DNA code for an entire genome. We will use a version that will allow us to determine an individual's genotype at tens of thousands of genes. By doing this, we can compare the healthy and diseased tissue and healthy and diseased individuals genotypes to look for genes that may be associated with GA. Acropora cytherea can reproduce sexually or asexually by fragmentation. Very little is known about the degree of asexual reproduction in A. cytherea. We will also determine if the diseased individuals are clones of a single individual or genetically unique. If they are all clones, then the spread of the disease may be well confined and not a harbinger for whole-scale loss of A. cytherea from the Papahanaumokuakea Marine Monument. If they are not clones, then more attention to how the disease is spreading is needed. If we find specific genes that are associated with the disease, we can use this as a means to assess the vulnerability of other A. cytherea colonies at other sites throughout the Monument.

The NOAA vessel Hi'ialakai will be used as transport to the NWHI. At each site, divers will be taken to the reefs in an AMBAR Marine jet boat. The jet boat will be anchored in the sand near the reef or unanchored but maintaning station near the divers. No other areas will need to be accessed. No assistance from Monument staff will be needed to maintain equipment or collect data or samples.

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:
Table coral

Scientific name:
Acropora cytherea

& size of specimens:
50 - 3 cm^3 pieces from each of 5 reefs at French Frigate Shoals, Maro Reef, and Laysan (maximum 250 total per Atoll).

Collection location:
Five reefs at French Frigate Shoals, Maro, and Laysan to be determined when on site and by availability.

☐ Whole Organism ☒ Partial Organism

9b. What will be done with the specimens after the project has ended?
Most of the sample will be destroyed in processing. Any samples that are not will be maintained, preserved, at HIMB.

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?

Preserved in Ethyl alcohol (MSDS attached) or salt saturated dimethylsulfoxide (MSDS attached).

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:

HIMB and NOAA monument staff hold semiannual meeting and annual meetings with other agencies working in the monument so that research projects and resources available are widely known. HIMB researchers discuss potential areas of overlap informally and share samples whenever possible. Dr. Greta Aeby of HIMB will also be working with samples of Acropora cytherea for disease studies and I am the field PI for her permit application. We will not be doubly collecting Acropora cytherea but will be sharing samples when appropriate. That is, where she needs GA (or healthy) tissue, one collection will be made and she will receive half of the sample and I will retain the other.

12a. List all specialized gear and materials to be used in this activity:

Standard open-circuit SCUBA and snorkling equipment. Samples of coral will be collected with bone shears and placed into ziplock bags. On the ship, samples will be placed in plactic tubes filled with ethyl alcohol or salt saturated dimethyl sulfate.

12b. List all Hazardous Materials you propose to take to and use within the Monument:

Ethyl alcohol.

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 will start immediately after returning to the Hawaii Institute of Marine Biology. Publications of this and the related work should be available within the next two - three years.

15. List all Applicants' publications directly related to the proposed project:

Jokiel, P.L., K.S. Rodgers, S.A. Karl. Genetic structure of a reef coral population (Porites rus): comparison of grafting vs. molecular genetic technique. In preparation.

Gorospe, K.D., S.A. Karl. Genetic Relatedness Does Not Retain Spatial Pattern Across Multiple Spatial Scales: Dispersal and Colonization in the Coral, Pocillopora damicornis. Submitted 1/2012 PlosONE.

Baranets, V., Z.H. Forsman, and S.A. Karl. 2011. Microsatellite loci for the plate-and-pillar coral. Porites rus. Conservation Genetics Resources, 3:519-521.

Wiener, C.S., M.A.J. Rivera, R.J. Toonen, J.C. Leong, R.K. Kosaki, S.A. Karl, K. Keller, and H. Johnson. 2011. Creating Effective Partnerships in Ecosystem Based Management: A Culture of Science and Management. Journal of Marine Biology, 2011, doi:10.1155/2011/241610

Severance, EG and SA Karl. 2006. Contrasting population genetic structures of sympatric massspawning Caribbean corals. Marine Biologyg 150:57-68.

Severance, EG, AM Szmant, and SA Karl. 2004. Microsatellite loci isolated from the Caribbean coral, Montastraea annularis. Mol. Ecol. Note. 4:74-76.

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