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 May 2010 - 1 Septemper 2010
Proposed Method of Entry (Vessel/Plane): NOAA Ship HI`IALAKAI
Proposed Locations: French Frigate Shoals and Pearl & Hermes Atoll

Estimated number of individuals (including Applicant) to be covered under this permit:
5
Estimated number of days in the Monument: 29

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…
recover small (1" diameter X 0.5" thick) temperature data loggers installed June 2009 in a grid pattern on a patch reef at French Frigate Shoals (166 °15.78' W, 23° 49.94' N; reef 29) and Pearl & Hermes Atoll (175° 48.236W, 27° 49.828N). Sample 3 cm^2 pieces from no more than 50 individual Policopora damicornis and Porites lobata colonies at each of 5 reefs in the areas surrounding these reefs (total 250 colonies of each species per area)

b.) To accomplish this activity we would ….
layout a temporary meter tape grid to aid in locating previously installed dataloggers. Locate and carefully remove each logger using small prybars (e.g., screwdrivers). Haphazardly sample 3 cm^2 nubbins from 50 colonies using bone shears at 5 nearby reefs.

c.) This activity would help the Monument by …
better characterizing the physical environment on these reefs and the role of temperature in coral health. All individuals of Porites lobata and Pocillopora damicornis have perviously been sampled and are currently being genotyped. Coral diversity and temperature have direct bearing on reef health and robustness. Samples from nearby reefs will indicate if the results from genetic

studies of samples from the above focal reefs are typical and generalizable through the Atoll and Monument.

Other information or background: This is the continuation of previous work in the monument.

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
Michael Stat, research diver
Kim Tenggardjaja, research diver
Joseph DiBattista, 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:
A small patch reef at French Frigate Shoals (166 °15.78' W, 23° 49.94' N; reef 29) and Pearl & Hermes (175° 48.236W, 27° 49.828N) and five patch reefs in each of the surrounding areas.

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:***

In 2009, we placed small temperature data loggers in a grid pattern across a reef at French Frigate Shoals (FFS) and Pearl & Hermes (P&H). Research we've done in the main Hawaiian Islands has indicated that there are considerable and stable micro-spatial differences in temperature across a reef. Temperature is a critical component to coral health, particularly bleaching. Now that these loggers have been recording temperature every 15 minutes since June 2009, we need to remove them from the environment and download the data. Our analysis of coral genetic diversity at the focal reefs at P&H and FFS indicate a very high and unexpected degree of clonality. We, therefore, wish to take samples from each of five neighboring reefs to see if the pattern we see on the focal reefs is general and typical of reefs in the area. Combining the temperature and genetic data will indicate reef health and resilience.

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 these activities before and have assessed that they do not impact the reefs. Data loggers were attached to bare rock or dead coral and will be carefuly removed. All areas perviously occupied by data loggers are expected to quickly (within weeks) return to their original state. 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. If diseased or bleach colonies are near localized hot or cold spots, then temperature can be considered a proximate cause or contributing factor. Our activities are minimally invasive. Loggers were attached to bare rock or dead coral and will be removed with a minimum of disturbance. The single, small coral samples (i.e., 3 cm^3) collected from colonies at neighboring reefs 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 and P&H are approximately 800 km^2, each. There is about 13,500 km^2 of coral reef habitat in the Monument. Our sampling activities will be confined to 10 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.

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 how coral reefs in the Monument are genetically structured and how individual colony health is related to the thermal environment in which it lives. 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. 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 and temperature play in ecological integrity. How genetically diverse are the reefs in the Monument and is that variability sufficient to maintain a healthy reef? Are sick and diseasted colonies associated with micro-spatial temperature hot spots? The data that we are collecting will help managers understand what constitutes a normal, healthy reef and thereby better monitor the integrity of coral reefs in the Monument. 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 removing the data loggers on the reef will take a minimum of 2 and a maximum of 4 days at each reef. The sampling we propose to do will take a minimum of 1 to a maximum of 3 days. We are minimizing the number of divers (3-5) 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 and Pearl & Hermes, 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 37 years. I have been an AAUS certified scientific diver for 31 years. My curriculum vita lists over 50 scientific publications on genetics and conservation. I have conducted similar research in the monument four prior years. I have worked on a variety of ecological 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. The genetic approaches have been previously proven appropriate and capable of uniquely identifying individuals. Temperature data loggers are of the standard, commercially available type and commonly used in similar situations. 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. 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:

Ocean temperature is a critical consideration in coral bleaching and health. Not only is the absolute temperature important, but also high variability in temperature over time can adversely affect coral health. Corals are very sensitive to temperature and when sea-surface temperatures reach even 1° C above the maximum monthly mean, corals become stressed and are at risk of bleaching or disease. We propose to explore how temperature varies across a reef at a micro-spatial scale. Colony bleaching on coral reefs is often very patchy where one colony can be healthy but living right next to another colony that has bleached or is diseased. Our research in the main Hawaiian Islands indicates that temperature can differ significantly between locations that are only four meters apart and these differences are stable over time (i.e., weeks and months). This also is not related to depth. There are deep spots that are frequently (e.g., ~30% of the time) significantly warmer than a shallower spot just meters away. Given how sensitive corals are to temperature induced bleaching and stress, this level of patchiness may be involved in causing the patchy nature of disease and bleaching. If coral colonies in these patches are genetically different then the rest of the reef, then they may be heat tolerant. Understanding both the genetic and the environmental data can be invaluable in reef restoration.

Previous Papahanaumokuakea Monument based research in my laboratory focused on genetic aspects of coral health. We genotyped all individuals of one species (Pocillopora damicornis) on a patch reef at French Frigate Shoals (FFS) and another at Pearl and Hermes Atoll (P&H). We are in the process of genotyping all individuals of Porites lobata from FFS (this species is not found on the reef at P&H). We are asking the question: Is the patchy nature of coral bleaching and disease related to the genotype of the individual colonies? Since temperature plays a central role in coral health, with the proposed research we are asking: Does temperature vary over micro-spatial scales on reefs in the Papahanaumokuakea Monument and if so, is it correlated with colony health?

The genetic data indicate that P. damicornis is highly clonal and most of the individuals at the reefs at FFS and P&H are copies (i.e., clones) of six or nine individuals (i.e., unique genotypes), respectively. That is to say, although there may be 100's or 1,000s of separate colonies of this species on a reef, it is mostly the same six individuals repeated over and over. Since we only sampled one reef from each Atoll, to determine if this pattern is typical of reefs at these Atolls and likely of the entire monument, we need to samples from other, small nearby reefs. Given our exhaustive knowledge of the genetic structure of each of the reefs at FFS and P&H, we will be able to tell if our results are typical to the remainder of the Monument.

To collect micro-spatial temperature data, we temporarily place small (1" diameter by 0.5" thick) HOBO Tidbit temperature data loggers two-meters apart in a grid pattern on a small patch reef at FFS and four-meters apart at another at P&H Atoll. The data loggers are waterproof

hardened epoxy and can measure temperature to ± 0.2° C every 15 minutes for over a year. To protect against fouling and facilitate easy recovery, the data loggers were protected with red electrical tape. Each data logger was placed on the grid in such a manner that it was secure but could easily be removed when recovered and will not harm the reef or surrounding organisms. The reefs at FFS and P&H Atoll are very different in substrate. At FFS, corals are attached to a hard rock surface. Data loggers were attached to bare rock using non-toxic marine underwater epoxy (ZSpar). At P&H Atoll, coral is growing on a mixture of rock and the dead skeletons of Finger coral (Porites compressa). Here, data loggers were attached to dead finger coral. All data loggers and glue remnants will be removed in the summer of 2010.

To facilitate recovery of all data loggers, meter long pieces of rebar were be inserted into the reef at three corners of the grid. Although originally we proposed to remove these during the 2010 cruise, I would like to keep them in place at least until the 2011 cruise season. By that time we will have finished the data collection and will know if there are micro-spatial differences across the reef. If there are not, then the rebar should be removed in 2011. If there are differences, then leaving the rebar in place will provide a critically important, absolute reference point for future monitoring. That is to say, with these pieces of rebar we can pinpoint the location where the temperature data loggers were and be able to correlate any future bleaching or disease events with genotype and temperature.

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. 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:
Lace coral
Lobe coral

Scientific name:
Pocillopora damicornis
Porites lobata

& size of specimens:
3 cm^2 pieces from 50 individual from eacho of 5 reefs for each species at Pearl & Hermes and French Frigate Shoals (250 total of each species per Atoll).

Collection location:
Five patch reefs at French Frigate Shoals in the vacinity of 166 °15.78' W, 23° 49.94' N (i.e., reef 29) and five patch reefs at Pearl & Hermes in the vacinity of 175° 48.236W, 27° 49.828N.

☐ 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 reserchers discuss potential areas of overlap informally and share samples whenever possible. To my knowledge, no other collections of our target species in these needed locations will be made duing the 2010 cruise season.

12a. List all specialized gear and materials to be used in this activity:
Standard open-circuit SCUBA and snorkling equipment. Surveying will use underwater cameras and meter tapes. Data loggers will be removed with small prybars (e.g., screwdrivers).

All equipment will be removed each day and no survey equipment will be left on the reef at the end of surveying. 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 recovering the data loggers and should take 6 months. Publications of this and the related work should be available within the next two years.

15. List all Applicants' publications directly related to the proposed project:
Severance, EG and SA Karl. 2006. Contrasting population genetic structures of sympatric massspawning Caribbean corals. Marine Bioloyg 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