

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

April 24, 2009

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Stephen Karl, University of Hawaii, Hawaii Institute of Marine Biology, for Access to State Waters to Conduct Temperature Monitoring of Coral Reefs Research 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 Stephen Karl, associate researcher, University of Hawaii, Hawaii Institute of Marine Biology, pursuant to § 187A-6, Hawaii Revised Statutes (HRS), chapter 13-60.5, Hawaii Administrative Rules (HAR), and all other applicable laws and regulations.

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

- French Frigate Shoals
- Pearl and Hermes Atoll

The activities covered under this permit would occur from June 1, 2009 through July 31, 2009.

The proposed activities are a new component of ongoing work previously permitted and conducted in the Monument.

INTENDED ACTIVITIES

The applicant proposes to examine how temperature varies across a reef at a micro-spatial scale. To do this, he would record the temperature at his previously mapped coral colony locations by temporarily installing small temperature data loggers, which would record temperature every 15 minutes and would be recovered the following year. Similar research in the Main Hawaiian Islands indicates considerable and stable micro-spatial differences in temperature across a reef. Because temperature is a critical component to coral health, combining data on health, relatedness, and temperature will indicate reef health and resilience.

To perform these activities, the applicant would place small (1" diameter by 0.5" thick) HOBO Tidbit temperature data loggers four-meters apart in a grid pattern on a small patch reef at French

Frigate Shoals and another at Pearl and Hermes Atoll. All the individuals of two coral species on these reefs have been mapped and have been, or are being, genotyped. Each data logger would be placed on the grid in such a manner that it is secure but can be easily removed when recovered and does not harm the reef or surrounding organisms. At French Frigate Shoals, data loggers would be zip tied to non-living substrate whenever possible. When not possible, data loggers would be glued to bare rock using no-toxic marine underwater epoxy. At Pearl and Hermes, data loggers would be zip tied to dead finger corals. No more than 185 temperature data loggers would be installed (120 at Pearl and Hermes and 65 at French Frigate Shoals). All data loggers, zip ties, and glue remnants would be removed in the summer of 2010.

To facilitate recovery of the data loggers, meter long pieces of rebar would be inserted into the reef at three corners of the grid. These points would be geo-located using an underwater GPS buoy system. All survey equipment would be removed each day and not left on the reef at the end of surveying. All rebar would be removed in the summer of 2010.

No collections are requested as part of this work.

This research would help to better characterize the physical environment on the reefs and the role of temperature in coral health.

The activities proposed by the applicant directly support the Monument Management Plan's priority management needs 3.1 – Understanding and Interpreting the NWHI (through action plan 3.1.1 – Marine Conservation Science).

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

- 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
- Touching coral, living or dead
- 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 11th, 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.

Concerns raised were:

1. The purpose of the car battery that is mentioned in the application; and the measures in place to ensure it doesn't leak
2. Clarification of the total number of data loggers to be installed, as well as total number of rebar
3. A request was made for a picture of the data loggers that are to be used

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 in compliance with the National Environmental Policy Act.

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 DLNR/NWHI/06R009, PMNM-2007-042, PMNM-2008-030 to conduct related work in 2006 through 2008.

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

RESPONSE:

1. The applicant explains that the battery would be used to power a laptop computer and the deck receiving unit for the underwater GPS system. It is a standard, fully sealed 12V marine battery and cannot leak even under unusual circumstances. It is designed for use in the marine environment. Nonetheless, for ease of use and to protect the battery from salt water, it would also be in a secondary container.

2. The applicant states the maximum numbers of data loggers to be installed at Pearl and Hermes and French Frigate Shoals would not exceed 120 and 65, respectively. He estimated installing 115 data logger at Pearl and Hermes, and 58 at French Frigate Shoals. He also states that a total of 6 pieces of rebar would be installed, 3 at each location.
3. A picture of a HOBO temperature data logger (sitting next to a quarter) is attached as F-6c.

STAFF OPINION:

DAR staff is of the opinion that Applicant has properly demonstrated valid justifications for his application and, conditional on development of a peer-reviewed Monument transport protocol, should be allowed to enter the NWHI State waters and to conduct the activities therein as specified in the application with the following special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Conservation and Management Permit General Conditions. The following special conditions have been vetted through the legal counsel of the Co-Trustee agencies.

1. 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.
2. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.
3. 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 Marine Refuge
4. No fishing is allowed in State Waters except as authorized under State law for subsistence, traditional and customary practices by Native Hawaiians.

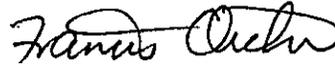
MONUMENT MANAGEMENT BOARD OPINION:

The MMB is of the opinion that the Applicant has met the findings of Presidential Proclamation 8031 and this activity, conditional on development of a peer-reviewed Monument transport protocol, 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, with stated conditions, a Research Permit to Stephen Karl, University of Hawaii, Hawaii Institute of Marine Biology.”

Respectfully submitted,



DAN POLHEMUS
Administrator

APPROVED FOR SUBMITTAL



LAURA H. THIELEN
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: Stephen A. Karl

Affiliation: Hawaii Institute of Marine Biology, University of Hawaii, Manoa

Permit Category: Research

Proposed Activity Dates: 06/10/2009 - 7/02/2009

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:

4

Estimated number of days in the Monument: 25

Description of proposed activities: (complete these sentences):

a.) The proposed activity would...
place small (1" diameter X 0.5" thick) temperatur data loggers at four meter intervals 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).

b.) To accomplish this activity we would
layout a temporary meter tape grid at 4 meter intervals and place data loggers at intersections attach to bare rock or dead coral rubble by non-toxic marine glue or zip ties (whichever is most appropriate for the substrate) and the least likely to cause damage.

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

Other information or background: This is an addition of previously permitted research

Section A - Applicant Information

1. Applicant

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

Title: Associate Reseracher

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 Science, 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):

Dr. Jill P. Zamzow, research diver
Mr. Kelvin Gorospe, research diver
Ms. Kim Tice, research diver

Section B: Project Information

5a. Project location(s):

<input type="checkbox"/> Nihoa Island	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Necker Island (Mokumanamana)	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input checked="" type="checkbox"/> French Frigate Shoals	<input type="checkbox"/> Land-based	<input checked="" type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Gardner Pinnacles	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Maro Reef			
<input type="checkbox"/> Laysan Island	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Lisianski Island, Neva Shoal	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input checked="" type="checkbox"/> Pearl and Hermes Atoll	<input type="checkbox"/> Land-based	<input checked="" type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Midway Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Kure Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Other			

Ocean Based

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).

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:*

Previously, small samples of coral colonies have been collected and are currently being genotyped to assess genetic relatedness among colonies. With the current research, we propose to temporarily install small temperature data loggers at 4-meter intervals in a grid pattern. These data loggers will record temperature every 15 minutes and will be recovered the following year (2010). Similar 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. Combining the data on health, relatedness, and temperature 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 Pahanauumokuakea Marine National Monument can be managed and protected based on policy founded 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 are non-toxic plastic and will be temporarily attached to bare rock or dead coral. The loggers will be recovered after approximately one year. All personnel will have attended cultural training classes to better understand and respect the cultural and spiritual importance of the Papahānaumokuākea 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 ecosystems work 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. No coral will be touched. Loggers will be reversibly attached to bare rock, dead coral or non-living reef substrate. The monument is approximately 360,000 Km² and French Frigate Shoals and Pearl & Hermes are approximately 800 Km², each. There

is about 13,500 Km² of coral reef habitat in the Monument. Our activities will be confined to two patch reefs which total approximately 0.0032 Km² or 0.000024% of the coral reef habitat in the monument. Negative impacts on the reef, atoll, and Monument are exceedingly small. The positive impact 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 returned to sites that we have worked at in previous years there is no indication that we had been there before. The coral colonies that we have sampled appear normal and do not look different from ones that were not sampled. The data that we are collecting, however, will help to understand what role genetics and temperature play in ecological integrity. How genetically diverse are the reefs in the Monument and is that genetic variability sufficient to maintain a healthy reef? Are sick and diseased 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 Papahānaumokuākea 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 Papahānaumokuākea 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 installing the data loggers on the reef will take a minimum of 3 and a maximum of 5 days at each reef. 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 (25 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 aboard the ship until all research 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 35 years. I have been an AAUS certified scientific diver for 29 years. My curriculum vita lists over 50 scientific publications on genetics and conservation. I have conducted similar research in the monument three 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) National Science Foundation
- 3) 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 upon 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 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 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 four 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 than 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 Papahānaumokuākea Monument based research in my laboratory focused on genetic aspects of coral health. We are in the process of genotyping all individuals of two species of coral on a patch reef at French Frigate Shoals and another at Pearl and Hermes Atoll. 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 Papahānaumokuākea Monument and if so, is it correlated with colony health?

To collect micro-spatial temperature data, we will temporarily place small (1" diameter by 0.5" thick) HOBO Tidbit temperature data loggers four-meters apart in a grid pattern on a small patch reef at French Frigate Shoals and another at Pearl and Hermes Atoll. All the individuals of two coral species on these reefs have been mapped and have been or are being genotyped. The

data loggers are waterproof hardened epoxy and can measure temperature to $\pm 0.2^{\circ}$ C every 15 minutes for over a year. To protect against fouling and facilitate easy recovery, the data loggers will be coated in bright orange, food grade Smooth-sil 940. This is a hard but flexible, waterproof gel that is commonly used for making candy molds. We will use common food coloring to make the gel orange. Each data logger will be placed on the grid in such a manner that it is secure but can be easily removed when recovered and does not harm the reef or surrounding organisms. The reefs at French Frigate Shoals and Pearl and Hermes Atoll are very different in substrate. At French Frigate Shoals, corals are attached to a hard rock surface. Whenever possible, data loggers will be zip tied to non-living substrate. When not possible, data loggers will be glued to bare rock using non-toxic marine underwater epoxy. At Pearl and Hermes Atoll, coral is growing on a mixture of rock and the dead skeletons of Finger coral (*Porites compressa*). Here, if possible, all data loggers will be zip tied to dead finger coral and not epoxied to the reef. All data loggers, zip ties, and glue remnants will be removed in the summer of 2010.

To facilitate recovery of all data loggers, meter long pieces of Smooth-sil 940 coated rebar will be inserted into the reef at three corners of the grid. The tape measures used to set the four-meter grid will use these markers as starting points. The rebar will be sealed with Smooth-sil 940 so that they do not rust. All rebar will be removed in the summer of 2010. These starting points will be geo-located using an underwater buoy system. The GPS Buoy System (GBS) consists of four buoys with underwater acoustic receivers connected to above water GPS units. Divers carry a small, depth-recording acoustic transmitter with which the receivers can triangulate a position. The system has demonstrated sub-meter accuracy (~20 cm).

The NOAA vessel *Hi'ialakai* will be used as transport to the NWHI. At each site, divers will be taken to the collecting site 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:
n/a

Scientific name:
n/a

& size of specimens:
n/a

Collection location:

n/a

Whole Organism Partial Organism

9b. What will be done with the specimens after the project has ended?

n/a

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

n/a

• General site/location for collections:

n/a

• Is it an open or closed system? Open Closed

n/a

• Is there an outfall? Yes No

n/a

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

n/a

• Will organisms be released?

n/a

10. If applicable, how will the collected samples or specimens be transported out of the Monument?

n/a

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

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

Standard open-circuit SCUBA and snorkeling equipment. Underwater GPS system. This system consists of 4 buoys that float on the surface equipped with hydrophones and GPS units. Divers carry a sonic transmitter that the buoys use to triangulate the divers' location. Surveying will use underwater cameras, rulers, and meter tapes. All equipment will be removed each day and no survey equipment will be left on the reef at the end of surveying. HOBO Tidbit temperature data loggers.

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

Car Battery - MSDS attached.

13. Describe any fixed installations and instrumentation proposed to be set in the Monument:

Approximately 100 temperature data loggers will be temporarily placed on each reef. These data loggers are about the diameter of a quarter and 0.5" thick. They are designed for use underwater and can measure temperature $\pm 0.2^{\circ}$ C every 15 minutes for over a year. All loggers will be removed in the summer of 2010. We will also install three meter-long pieces of coated rebar as markers to facilitate recovery of the data loggers. These will be removed in the summer of 2010.

14. Provide a time line for sample analysis, data analysis, write-up and publication of information:

Data analysis will start after recovery of 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 Biology* 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

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):

Stephen Karl – Principal Investigator and Diver, HIMB
Kelvin Gorospe – Diver, HIMB
Jill Zamzow – Diver, HIMB
Ben Wainwright – Diver, HIMB

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

French Frigate Shoals patch reef – 166° 15.78' W, 23° 49.94' N (Reef 29)
Pearl and Hermes patch reef – 175° 48.24' W, 27° 49.83' N

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

None

3a. 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.

None

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

Detailed budget information is available upon request from the Monument Permit Coordinators. This research is funded by NWHIMNM-HIMB partnership.

5. Time frame:

Activity start: 1 January 2006
Activity completion: 30 May 2011

Dates actively inside the Monument:

From: 9 June 2009
To: 3 July 2009

Describe any limiting factors in declaring specific dates of the proposed activity at the time of application:

All dates are tentative and dependent upon ship and weather conditions. Ocean conditions strongly influence the dates that vessels can enter Monument waters, as well as when research can be conducted while in the Monument waters. Dates are also dependent on vessel and personnel schedules. Co-trustees will be notified of any changes to the dates currently provided

Personnel schedule in the Monument:

All personnel will remain on the NOAA vessel Hi'ialakai (or on small boats that are transported to the Monument by the main vessel) throughout the cruise duration. No individual will be on land to conduct this research.

DATE	PORT	Departure time	Distance
6/09/09	Pearl Harbor	0900 hrs	500nm to FFS @9.5 kts ~ 53hrs
6/10/09	Transit	Transit	
6/11/09	Transit	Arrive FFS- half day of ops	
6/12/09	FFS	Full Day	
6/13/09	FFS	Full Day	
6/14/09	FFS	Full Day Depart 1830	257nm to Maro @9.5 kts ~ 27hrs
6/15/09	Transit	Arrive Maro pm	
6/16/09	Maro	Full Day	
6/17/09	Maro	Full Day depart 1830	317nm to P&H @ 9.5 kts ~33hrs
6/18/09	Transit	Arrive P&H pm	
6/19/09	P&H	Full Day	
6/20/09	P&H	Full Day	
6/21/09	P&H	Full Day depart 1830	85nm to Midway @ 9.5 kts ~9hrs
6/22/09	Midway	Arrive Midway-full day ops	
6/23/09	Midway	Full Day	
6/24/09	Midway	Full Day	
6/25/09	Midway	Full Day	
6/26/09	Midway	Half Day depart 1200 to Laysan	336nm to Laysan @9kts~37 hrs
6/27/09	Transit	Transit	
6/28/09	Laysan	Arrive Laysan full day day	
6/29/09	Laysan	Full day depart 1830	804nm to HNL @9 kts ~ 89hrs
6/30/09	Transit	Transit	
7/01/09	Transit	Transit	
7/02/09	Transit	Transit	
7/03/09	Arrive Pearl Harbor	~1000	

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 workers 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:

NOAA vessel 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 (m3):

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#:

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:

TBD by NOAA crew aboard vessel Hi'ialakai. Generally, two inboard jet boats and a zodiac with an outboard.

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