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

June 8, 2007

Board of Land
and Natural Resources
Honolulu, Hawai'i

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Dr. Paul L. Jokiel, University of Hawai'i, Hawai'i Institute of Marine Biology (HIMB) for Access to State Waters to Conduct Benthic Habitat Mapping 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 Dr. Paul L. Jokiel, HIMB, pursuant to § 13-60.5, *Hawaii Administrative Rules*, and § 187A-6, *Hawaii Revised Statutes,* and all other applicable laws and regulations. The Research Permit, described below, will allow activity to occur in the Northwestern Hawaiian Islands State Marine Refuge (0-3 miles) waters surrounding Nihoa Island, Gardner Pinnacles, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, and Kure Atoll. The activities will occur from July 7, 2007 through July 31, 2007, as outlined below and in the attached permit application.

INTENDED ACTIVITIES

The purpose of the applicant's research is to evaluate and enhance the existing benthic habitat maps for the Northwestern Hawaiian Islands (NWHI), and to describe ecology of reef habitats. This project will perform accurate ground-truthing and habitat characterization activities. This project will supplement and update data collected during a 2001 mapping survey in the NWHI that was used to develop the existing National Oceanic and Atmospheric Administration (NOAA) habitat maps.

PROCEDURES

Field Methods

The following field activities will be performed and described below: *in situ* habitat map ground-truth surveys, drop camera ground-truth surveys and detailed reef transect surveys. All activities will be performed from small boats launched from the NOAA support vessel, Hi'ialakai, with a three-person AAUS-certified dive team that travels to survey locations. At all survey locations, the team will perform one of the ground-truth survey methods (visual or drop camera) and at a subset of the survey locations, will perform detailed reef transect surveys on SCUBA.

Rapid Visual/Camera Ground-Truth Surveys

Randomly-generated locations will be surveyed and the corresponding benthic habitat types noted, videotaped, or photographed. This will be accomplished using GPS positions created from draft benthic habitat maps which have areas of uncertainty as to the substrate type. The same procedures will be used as those in the 2001 NWHI survey that led to the development of the existing habitat maps (National Oceanic and Atmospheric Administration 2003). The researchers evaluate and classify the habitat and record a digital image of the habitat at each site. The methodology involves using either an underwater viewing look-box to see the benthic habitat type, skin dive technique or a small digital video drop camera depending on the situation. The digital video camera never comes in contact with the substrate, and the video collected is archived with the georeferenced GPS positional data.

Detailed Habitat Transect Surveys

At a subset of ground-truth locations, more extensive surveys will be performed with SCUBA. Reef community characteristics will be assessed using the methods developed from the Hawaiian Coral Reef Assessment and Monitoring Program (Brown et al. 2004). To assess benthic cover and composition, non-overlapping high resolution digital images will be taken along a 10 m transect using an Olympus 5050 zoom digital camera with an Olympus PT050 underwater housing. The camera will be mounted to an aluminum monopod frame, 1.7 m from the substrate to provide a 50x69 cm image. A 6 cm bar will provide a measurement scale

To assess sediment composition, a small sediment sample (approximately 50 cm^3) will be collected from each detailed habitat survey location. This sample will be collected and sealed in a plastic bag, then transported to the NOAA vessel Hi'ialakai where it will be dried out on deck. These will later be sieved for grain size and analyzed for carbonate and organics. Rugosity measurements to determine topographical relief and spatial complexity will be conducted along each transect. A light 15 m chain marked at 1 m intervals with 1.3 cm links will be draped along the length of the transect (10 m) following the contours of the benthos. Transect locations will be determined using pre-selected random points. SCUBA divers swimming along one 25 m x 5 m transect (125 m^2) at each station will record species, quantity, and total fish length.

REVIEW PROCESS:

The permit application was sent out for review and comment to the following scientific entities: Division of Aquatic Resources staff, Papahānaumokuākea Marine National Monument, NOAA Pacific Islands Regional Office (NOAA-PIRO), and United States Fish and Wildlife Service. The Office of Hawaiian Affairs (OHA), and the Kaho'olawe Island Reserve Commission (KIRC) were also consulted.

Comments received from the scientific community and the applicants written responses are summarized as follows:

Scientific Reviewer's Concerns (concerns in bullets, applicant response follow):

•If Hawaiian Monk Seals are in the area while performing any transect, camera drop, SCUBA operations, fishing activity, or sampling activity, the activity shall cease until the animal(s) depart the area.

Response: We will follow this guideline to the best of our ability. We will be moving around a lot and will spend very short time intervals at each station, so we should be able to avoid areas where seals are present, or vacate and go to the next site if they are persistently staying in the area. Our experience during a similar survey in 2001 is that they occasionally show up out of curiosity but move on quickly and do not seem to be disturbed by our presence.

• Applicants must abide by new Disease Protocols

Response: This will be an established routine on board during the cruise for all divers and we will follow these protocols.

•Why are they asking to touch corals? Seems it should be possible to complete the project without touching corals.

Response: Although we do not intend to "touch corals, living or dead" during our project, we checked this as an applicable activity since there is a chance that this will occur sometime during the proposed activities. If this option is only meant for projects that directly intend to handle coral colonies as part of their research protocol then we should have left this box blank and just checked the "Removing, moving...disturbing... any living or nonliving monument resource" box.

•The ground truthing for habitat mapping is clearly defined but the purpose of the detailed transect surveys is unclear. How do the transect surveys mesh with past and ongoing assessment and monitoring efforts?

•Unclear how transect surveys add to the mapping effort. Are these surveys in lieu of regular NWHI assessment and monitoring surveys of the type conducted in the past? Is the methodology of the proposed surveys the same as that used previously? Unless clarification and better justification is provided they likely should be eliminated with the focus of the work remaining on ground truthing for the habitat maps.

•Questions regarding the purpose, necessity, compatibility and usefulness of the transect surveys need to be addressed. If they are just an independent supplementary effort it would be better to focus work primarily on the ground truthing components

Response:

Note that we have already conducted a comparison between the various benthic habitat transecting methods used in the NWHI and found that all of the methods produce similar estimates of coral cover:

Jokiel, P. L., K. S. Rodgers, E.K. Brown, J. Kenyon, G. Aeby, W. R. Smith and F. Farrell (2005) Comparison of methods used to estimate coral cover in the Hawaiian Islands. Report to the Northwestern Hawaiian Islands Ecosystem Reserve. 22 pp.

The purpose of the detailed transects is threefold: first, they will provide detailed information to quantitatively assess the accuracy of the ground truth methods and categorizations; second, they will be used to collect detailed information on the within-habitat variability of the existing benthic habitat categories; and finally, they will be available as a high resolution quantitative dataset for use to "train" the next round of NWHI habitat maps. The proposed transect methodologies for data collection is directly comparable with the methodologies used for past monitoring efforts in the NWHI by NOAA CRED and in the Main Hawaiian Islands by CRAMP and NOAA CRED. Since the 2007 Monument RAMP monitoring cruise will only visit four atolls (MID, PEARL, LIS, FFS) then our proposed quantitative transect information on benthic communities will be the only data collected this year at Nihoa, Laysan, Gardner, and Kure (unless cruise plans change for other activities). In addition, the data at the other sites (Midway, Pearl, Lisianski) we propose to work at will be used to augment the data collected during the NWHI RAMP cruise and may provide a within-season temporal comparison. In addition, field logistics will allow the simultaneously collection of ground truth information and performance of quantitative transects with little time sacrificed for performing the detailed transects. The bulk of time spent on ground truthing is collecting a series of GPS fixes for the ground truth location. While one team member collects the fix from the boat, the two divers collect transect data. Few (if any) previous transect survey efforts in the NWHI have had this level of spatial precision to locate habitat descriptions and benthic community data to a particular point on the map. Given the large area of the NWHI it is important to increase spatial coverage.

Comments received from the Native Hawaiian community are summarized as follows (Concerns in bullets, applicant response follows):

•OHA requests that the research vessel have at least one cultural practitioner on board.

Response: We believe this will be handled though OHA agreement to provide by a briefing with a practitioner and we will attend the briefing.

•OHA urges the State to find all applications incomplete (and therefore will not be processed) if they do not include a reference to cultural research, consultation, and resulting protocol.

Response: If this is a requirement it should be so indicated on the application. Incidentally, we are concerned about traditional Hawaiian culture and have a paper in review that is relevant.

Jokiel, Paul L., Ku'ulei S. Rodgers, William J. Walsh and Dan Polhemus. (manuscript submitted and in review) The traditional Hawaiian system in relation to the western approach of coral reef resource management. Submitted to Journal of Environmental Management.

DAR STAFF RESPONSE:

A meeting was held between HIMB researchers and administrators, and DAR staff, to discuss reviewer's (Scientific, Policy, and Cultural) concerns. The applicant's responses (above) are an outcome of this meeting. The concerns raised by OHA were also discussed at the meeting. It was the consensus of those in attendance, that in order to address the requests from OHA, more information is required from OHA. Specifically, a list of acknowledged cultural practitioners who are available to accompany specific research cruises should be provided by OHA; additionally, a briefing for science researchers should be provided by OHA or a designate, to provide the information needed by individual applicants in order to address OHA's request for cultural impact analysis.

IMPACT ANALYSIS

Although some minor disturbances to Monument resources may be necessary to achieve the objective of this project, this research is non-invasive, and should have minimal impact on Monument resources. The project will provide valuable habitat information which is required for proper management of Monument resources. Therefore, the value of this research far outweighs the minimal effects of the research activities.

FINAL STAFF RECOMMENDATIONS:

DAR staff is of the opinion that Applicant has properly demonstrated valid justifications for his application and 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 Research Permit General Conditions:

1. Require Applicant to inform and consult with DAR regarding their cruise plan before each trip to the NWHI.

2. Research operations must cease if monk seals are present in the immediate vicinity.

3. No fishing is allowed in State Marine Refuge waters except as authorized under State law for subsistence, traditional, and customary practices by Native Hawaiians.

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

5. Tender and dive vessels operating within the Monument are encouraged to operate at slow speed and with a bow lookout in shallow water coral reef areas in order to minimize prop or bow damage to three dimensional coral reef habitat or endangered monk seals or sea turtles.

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

7. Refueling of tenders and all small vessels must be done at the NOAA ship Hi'ialakai and outside the confines of the lagoons or near-shore waters.

8. This permit is not to be used for nor does it authorize the sale of collected organisms. Under this permit, the authorized research activity, including work involving a bioassay or bioprospecting, must be for non-commercial purposes, i.e., not involving the use or sale of any organisms, byproducts, or material collected within the Monument for obtaining patents or intellectual property rights for profit.

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

RECOMMENDATION:

"That the Board authorize and approve, with stated conditions, a Research Permit to Dr. Paul L. Jokiel."

Respectfully submitted,

DAN POLHEMUS
Administrator

APPROVED FOR SUBMITTAL

ALLAN A. SMITH
Acting Chairperson

Department of Land and Natural Resources
Northwestern Hawaiian Islands Permit Application Review

Permit Type: Management ☐ Recreation ☐ Research ☒
Education ☐ Cultural ☐ Special Ocean Use ☐

Working Title: Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Research Permit to Dr. Paul L. Jokiel, University of Hawai'i, Hawai'i Institute of Marine Biology (HIMB) for Access to State Waters to Conduct Benthic Habitat Mapping Activities

Project Applicant: Dr. Paul L. Jokiel, HIMB

Project Location(s) *(Both State Waters and Monument)*: Nihoa Island, Gardner Pinnacles, Laysan Island, Lisianski Island, Pearl and Hermes Atoll, and Kure Atoll.

Project Dates and Duration: July 7, 2007 through September 31, 2007

Project Précis & Background *(Summary of project and why this is proposed)*:

The purpose of the applicant's research is to evaluate and enhance the existing benthic habitat maps for the Northwestern Hawaiian Islands (NWHI), and to describe ecology of reef habitats.

Are there other relevant permits that have/will be issued with regard to this project? No ☒

What is the relevance to management and/or the improved understanding of NWHI & MHI?

The project will provide valuable habitat information which is required for proper management of Monument resources.

Could work be conducted outside the NWHI?: Yes ☐ **No** ☒

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

Recommendations:
DAR Staff: Approve this permit application ☒ Reject this permit application ☐
NH CWG: Approve this permit application ☐ Reject this permit application ☐
Additional Comments:

Northwestern Hawaiian Islands Marine National Monument

Permit Application

NOTE: ***This Permit Application (and associated Instructions) are for activities to be conducted in the Northwestern Hawaiian Islands Marine National Monument, including Hawaiian Islands National Wildlife Refuge, the Midway Atoll National Wildlife Refuge, Battle of Midway National Memorial, Northwestern Hawaiian Islands State Marine Refuge, Kure Atoll Hawaii State Seabird Sanctuary, and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. The Co-Trustees are required to determine that issuing the requested permit is compatible with the findings of Presidential Proclamation 8031. Within this Application, please 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, historical and cultural resources of the NWHI Marine National Monument (Monument).***

Summary Information

Applicant name:
Paul L. Jokiel, Ph.D.

Permit categories:
☐ Research – Please fill out Sections A-D (as applicable) and Appendix A
☒ Conservation and Management - Please fill out Sections A-D (as applicable) and Appendix A
☐ Education - Please fill out Sections A-D (as applicable) and Appendix B
☐ Native Hawaiian Practices - Please fill out Sections A-D (as applicable) and Appendix C
☐ Recreation (Midway ONLY) - Please fill out Sections A-D (as applicable) and Appendix D
☐ Special Ocean Use - Please fill out Sections A-D (as applicable) and Appendix E

Briefly describe permit activity:
To evaluate and enhance the existing benthic habitat maps for the Northwestern Hawaiian Islands, and describe ecology of reef habitats, this project will perform accurate ground truthing and habitat characterization activities. This project will supplement and update data collected during a 2001 mapping survey in the NWHI that was used to develop the existing NOAA habitat maps. This project will utilize the same methods that were used in 2001. In addition, in situ diver transect surveys and digital drop video camera surveys will be perfomed. The digital drop video camera will be used in deeper waters (to dept of 30 m) to allow faster and more accurate characterization in some situations without multiple SCUBA dives. No organisms will be collected, but small sediment samples will be gathered for analysis. Permanent digital images will be used for benthic analysis and eventual archiving.

☐ This application is for a RENEWAL of an existing permitted project.
☒ This application is for a NEW project.

When will the activity take place?
From: JUNE 1, 2007 To:JULY 15, 2007

NOTE: INCOMPLETE APPLICATIONS WILL NOT BE CONSIDERED
Please Send Permit Applications to:
NWHI Marine National Monument Permit Coordinator
6600 Kalaniana'ole Hwy. # 300

Honolulu, HI 96825
nwhipermit@noaa.gov
PHONE: (808) 397-2660 FAX: (808) 397-2662

NOTE: SUBMITTAL VIA ELECTRONIC MAIL IS PREFERRED BUT NOT REQUIRED. FOR ADDITIONAL SUBMITTAL INSTRUCTIONS, PLEASE SEE PG 7.

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Jokiel, Paul L.

Title: Ph.D., Researcher, Hawai'i Institute of Marine Biology, University of Hawai'i (c.v. available at http://www.hawaii.edu/HIMB/Faculty/jokiel.html)

2. Mailing address (street/P.O. box, city, state, country, zip): Hawai'i Institute of Marine Biology, PO Box 1346, Kaneohe, HI, USA, 96744 (for Fed-Ex: 46-007 Lilipuna Road, Kaneohe, HI 96744)

Phone: (808) 236-7440

Fax: (808) 236-7443

Email: jokiel@hawaii.edu

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

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

4. Additional persons to be covered by permit:
Kuulei Rodgers (Ph.D., HIMB), Erik C. Franklin (HIMB Researcher), Will Smith (HIMB Researcher), UH Scientific Diver TBD

Section B: Project Information

5a. Project location(s):

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

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

Location Description:
GPS coordinates outlining boundaries for all planned activities are included below. Precise locations can be provided post-cruise.

Location	
Longitude	Latitude
Kure Atoll	
-178.19706	28.55825
-178.19624	28.29958
-178.45988	28.29958
-178.46071	28.55742
Midway Atoll	
-177.19638	28.37420
-177.19721	28.13377
-177.52801	28.13460
-177.52801	28.37420
Pearl and Hermes Atoll	
-176.08851	28.04643
-175.63289	28.04540
-175.63289	27.70729
-176.08954	27.70626
Lisianski Island	
-173.67293	26.25151
-173.67293	25.83943
-174.23095	25.83943
-174.23095	26.25151
Laysan Island	
-171.47900	25.96027
-171.47725	25.65597
-171.97918	25.65772
-171.97918	25.96202
Gardner Pinnacles	
-167.74832	25.26071
-167.75087	24.34878
-168.36222	24.35133

-168.36477	25.26071
Nihoa Island	
-161.66032	23.23817
-161.66287	22.94013
-162.05005	22.94268
-162.05260	23.23562

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:*

The overall intent of the proposed fieldwork in the Northwest Hawaiian Islands is to produce accuracy assessment and ground validation/truthing and other field data equivalent to that obtained for that completed at other locations during 2006-2007 for the main Hawaiian islands, American Samoa, Guam, CNMI and Palau benthic habitat maps. This effort will require extensive field work and we propose to start that effort during 2007 with the intent of continuing over the next few years. The work will be done by trained individuals following NOAA/NOS classification scheme, common data entry format, same GIS-based habitat base maps, digital georeferenced photo and video gallery of habitat types, modifiers, and ecological units for incorporation into the subsequent habitat classification manual, etc.). The formal NWHI accuracy assessment will be similar to that used for the main Hawaiian Islands maps (error matrix at the major and detailed habitat levels, including users and producers accuracy; Tau coefficient).The habitat descriptions, GPS points and georeferenced digital video clips are used to supplement and update the existing benthic habitat maps for the areas of uncertainty. The final map products will be a data base and eventually improved thematic digital benthic habitat maps for much of the shallow water areas of the NWHI.

Management Need

Benthic habitat maps are an integral part to the characterization, monitoring, and assessment of marine resources in the Northwestern Hawaiian Islands Marine National Monument. The existing maps cover only 60% of the shallow water in the NWHI and are only about 70% accurate due to lack of sufficient ground truth points. Improved habitat maps and biological characterization of these habitats are essential to future management activities. In order to produce such maps accurate ground truthing and habitat characterization activities are essential. Better spatial coverage of benthic organism cover and fish communities is needed.

Scope

The proposed project involves the observation and measurement of coral reef organisms and geomorphological reef characteristics to evaluate and enhance the accuracy of existing benthic habitat maps and provide quantitative reef community metrics that describe the surveyed habitats. This effort will supplement existing data collected during a 2001 mapping survey in the NWHI that was the basis of the present draft habitat maps produced by NOAA. This surve will utilize the same methods. In addition, in situ diver transect surveys and digital drop video camera surveys will be perfomed to provide more detailed shallow water surveys and faster and more accurate characterization of deeper water habitats. The 2001 survey cruise was a 6 week effort focused completely on data collection at all of the NWHI. However, due to the magnitude of the area the data fall short of what is needed. This cruise will allow for additional data collection for field verification and habitat classification at potentially six island/atolls which greatly increases the scope of the spatial assessment efforts. Fieldwork in remote areas like the NWHI is difficult to conduct without ample boat time. At the detailed habitat level, we will attempt to eventually collect enough field sites to produce statistically sound analysis and accurate benthic habitat maps. This sample size will be based on a combination of factors, including power analysis conducted on the previous mapping efforts for detailed habitat type using similar methods, and weather/field conditions during surveying. Ship time will be one deciding factor on the amount of new fieldwork conducted.

We propose to incorporate current and pending monitoring and assessment work from the NWHI into the multi-agency pacific-wide mapping efforts. We are in a position to incorporate summary results from current projects into the mapping efforts, and can work as part of the integrating force in habitat classification and mapping coral reefs across the entire Hawaiian Island archipelago (Jokiel et al. 2004). We can include existing data sets, monitoring data, and assessment data into the proposed NWHI mapping efforts at an appropriate scale and resolution for mapping which is useful to both scientists and resource managers at the Northwest Hawaiian Islands Monument. Inclusion of these data into an overall archipelago-wide database will facilitate resource management throughout Hawaii. We do not propose to initiate or create this database, but will work with those agencies tasked with these efforts (e.g. NOAA National Oceanic Data Center) to ensure available NWHI data are included when appropriate. These data will aid in both proposed and ongoing mapping efforts. Several US federal and state agencies have been involved with the Hawaiian mapping project. The following links will detail who is creating and using these benthic habitat maps, along with the materials and methods used in their creation.

Further information is available at the following web sites:
Hawaii Coral Reef Assessment and Monitoring Program of the University of Hawaii
http://cramp.wcc.hawaii.edu/LT_Montoring_files/lt_Cooperative_Programs_NOAA-ALH.htm
NOAA CCMA Biogeography Team General Overview Website

http://ccma.nos.noaa.gov/about/biogeography/welcome.html
NOAA CCMA Biogeography Hawaii Benthic Habitat Mapping Website
http://ccma.nos.noaa.gov/ecosystems/coralreef/main8hi_mapping.html
NOAA Benthic Habitats of the Main 8 Hawaiian Islands Interim Mapping Product
http://ccma.nos.noaa.gov/products/biogeography/hawaii_cd/index.htm

7. As explained further in the instructions, please provide any 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, historical and cultural resources of the Monument:

The proposed activities are compatible with the conservation and management goals of the MNM, NWR, and Hawaii state reserve, and in fact are essential to management requirements as they will lead to the production of improved habitat maps and characterization of benthic and fish communities. The first two research needs listed for the Northwestern Hawaiian Islands in the NOAA Coral Reef Ecosystem Research Plan for FY 2007 to 2011 are to "map, characterize, and assess coral reefs and their associated habitats" and "...assess the quality...of [existing] data/programs". This project seeks to initiate activities to directly address those research needs for the Northwestern Hawaiian Islands and supplement data taken during the 2001 mapping survey (National Oceanic and Atmospheric Administration 2003) using the same methods plus the addition of a digital drop video camera that enables faster and better mapping in deeper water. The existing maps cover only 60% of the shallow water in the NWHI and are only about 70% accurate due to lack of sufficient ground truth points

The proposed research procedures are primarily accomplished through observation, data recording on slates and through photo capture and are designed for minimal impact to the survey sites. The project leader, Paul Jokiel, has over 30 years experience in this field, including prior experience on research cruises to the NWHI and is qualified to execute the proposed project.

8. Procedures:

Field Methods

In order to achieve the project goals, the following field activities will be performed and described below: in situ habitat map ground-truth surveys, drop camera ground-truth surveys and detailed reef transect surveys. All activities will be performed from small boats launched from the Hi'ialakai with a three-person AAUS-certified dive team that travels to survey locations. At all survey locations, the team performs one of the ground-truth survey methods (visual or drop camera) and at a subset of the survey locations, performs detailed reef transect surveys on SCUBA.

Rapid Visual/Camera Ground-Truth Surveys

Randomly generated survey locations will be surveyed and the corresponding benthic habitat types are noted and videoed or photographed. This is accomplished using GPS positions created from draft benthic habitat maps which have areas of uncertainty as to the substrate type. The same procedures will be used as those in the 2001 NWHI survey that led to the development of the existing habitat maps (National Oceanic and Atmospheric Administration 2003). The GPS points are occupied by the vessel or small watercraft launced from the NOAA vessel Hi'ialakai. Equipment used for the NWHI surveys includes radios, GPS data logger, digital camera, depth finder charts with random points, depth pinger and Electronic Positioning Emergency Radio Beacon (EPERB) in watertight containers (Figure 3). The procedure is to navigate to a pre-determined random point using GPS. The researchers evaluate and classify the habitat and record a digital image of the habitat at each site. The methodology involves using either an underwater viewing look box to see the benthic habitat type, skin dive technique or use a small digital video drop camera depending on the situation. The digital video camera never comes in contact with the substrate, and the video collected is archived with the georeferenced GPS positional data.

Detailed Habitat Transect Surveys

At a subset of ground-truth locations, more extensive surveys will be performed on SCUBA. Reef community characteristics willl be assessed using the methods developed for the Hawaiian Coral Reef Assessent and Monitoring Program (Brown et al 2004). To assess benthic cover and composition, non-overlapping high resolution digital images are taken along a 10 m transect using an Olympus 5050 zoom digital camera with an Olympus PT050 underwater housing. The camera is mounted to an aluminum monopod frame, 1.7 m from the substrate to provide a 50x69 cm image. A 6 cm bar provides a measurement scale. The software program is used to quantify percent cover, richness and diversity of corals, algal functional groups and substrate cover. Images are downloaded and the 20 non-

overlapping images from each 10 m transect are imported into the software where 50 randomly selected points are projected onto each image for a total of 1,000 points per transect. These data are saved in a comma separated values (CSV) file, proofread in Excel and imported into Microsoft Access XP, a relational database. Access data can then be queried and exported to statistical programs for analyses.

To assess sediment composition, a small sediment sample (approximately 50 cm3) will be collected from each detailed habitat survey location. This sample will be collected and sealed in a plastic bag, then transported to the NOAA vessel Hi'ialakai where it will be dried out on deck. These will later be sieved for grain size and analyzed for carbonate and organics. Rugosity measurements to determine topographical relief and spatial complexity are conducted along each transect. A light 15 m chain marked at 1 m intervals with 1.3 cm links is draped along the length of the transect (10 m) following the contours of the benthos. An index of rugosity is calculated using the ratio of the reef contour distance as measured by chain length, to the linear, horizontal distance. Fish populations are quantified using standard visual belt transects or stationary point count surveys . Transect location is determined using pre-selected random points. SCUBA divers swim along one 25 m x 5 m transect (125 m2) at each station recording species, quantity and total fish length. All fishes are identified to the lowest taxon possible. Total length is estimated to the nearest cm in the field and converted to biomass estimates (tons/hectare) using length-weight fitting parameters.

Literature Cited

Brown E, Cox E, Jokiel P, Rodgers K, Smith W, Tissot B, Coles S and Hultquist J. (2004) Development of Benthic Sampling Methods for the Coral Reef Assessment and Monitoring Program (CRAMP) in Hawai'i . Pacific Science 58 (2): 145-158.

Jokiel PL, Brown EK, Friedlander A, Rodgers SK and Smith WR (2004) Hawai'i Coral Reef Assessment and Monitoring Program: Spatial Patterns and Temporal Dynamics in Reef Coral Communities. Pacific Science 58: 159-174.

National Oceanic and Atmospheric Administration 2003. Atlas of the Shallow-Water Benthic Habitats of the Northwestern Hawaiian Islands (Draft). Center for Coastal Monitoring and Assessment, Silver Spring, MD. 160 pp.
The benthic transect surveys were developed for the Hawaii Coral Reef Assessment and Monitoring Program

Section C: Logistics

9. Other permits (list and attach documentation of all other related Federal or State permits):
N/A

9a. For each of the permits listed, please identify any permit violations or any permit that was suspended, amended, modified or revoked for cause. Please explain the circumstances surrounding the violation or permit suspension, amendment, modification or revocation.
N/A

10. Funding sources (Please attach copies of your budget, specific to proposed activities under this permit and include funding sources. Please see instructions for more information):
Detailed budget information is available upon request from the Monument Permit Coordinators, and sufficient funding exists 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 Ocean Service/NOAA

11. Time frame:
Activity start: 2007

Activity completion: 2009

Dates actively inside the Monument:
From: ~8 June 2007
To: ~28 June 2007

Please describe any limiting factors in declaring specific dates of the proposed activity at the time of application:
Expedition dates are somewhat fluid so we have asked that the permit be issued for June 1 – July 15, 2007. We are awaiting final word from the NOAA vessel Hi'ialakai regarding the exact dates of departure and return.

Personnel schedule in the Monument:
All personnel will be at the same location as dictated by the travel schedule of the NOAA vessel Hi'ialakai. The tentative 2007 June cruise schedule is:

08 June 2007	Depart Honolulu 0800, transit to Nihoa (245 NM)
09 June 2007	Arrive Nihoa, full day dive ops
10 June 2007	Full day dive ops at Nihoa, Depart 1830 for Gardner Pinnacles (355 NM)
11 June 2007	Transit
12 June 2007	Arrive Gardner 0600, full day diving, depart 1830 for Lisianski (335 NM)
13 June 2007	Transit
14 June 2007	Arrive Lisianski 0600, full day dive ops
15 June 2007	Full day dive ops at Lisianski, Depart 1830 for Pearl & Hermes (256 NM)
16 June 2007	Arrive Pearl & Hermes 0730, full day dive ops
17 June 2007	Full day dive ops at Pearl & Hermes, Depart 1830 for Kure (135 NM)
18 June 2007	Arrive Kure 0730, full day dive ops
19 June 2007	Full day dive ops at Kure, Depart 1930 for Midway (60 NM)
20 June 2007	Arrive Midway early AM, 2/3 day dive ops
21 June 2007	2/3 day dive ops at Midway, Depart 1830 for Laysan (335 NM)
22 June 2007	Transit
23 June 2007	Arrive Laysan 0600, full day dive ops
24 June 2007	Full day dive ops at Laysan, Depart 1830 for Honolulu (810 NM)
25 June 2007	Transit
26 June 2007	Transit
27 June 2007	Transit
28 June 2007	Arrive Honolulu early AM

12. Please 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 scientific personnel aboard the NOAA vessel Hi'ialakai will be covered by insurance from their respective institutions, as indicated in Section A-4. The majority are covered by University of Hawaii.

13. Please check the appropriate box to indicate how personnel will enter the Monument:

☒ Vessel
☐ Aircraft

Provide Vessel and Aircraft information:
NOAA Vessel Hi'ialakai

14. What certifications/inspections do you have scheduled for your vessel? Please fill in scheduled date (attach documentation):

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

15. 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 :

How will you comply with the 'No Discharge' regulations stipulated in Presidential Proclamation 8031? Describe in detail. If applicable, please attach schematics of the vessel's discharge and treatment systems:

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

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

VMS Email:

Inmarsat ID#:

16. Tender information:

On what workboats (tenders) will personnel, gear and materials be transported within the Monument? Please list the number of tenders/skiffs aboard and specific types of motors:
The Hi'ialakai tender vessels include:
HI-1 (8m) in-board diesel jet
HI-2 (10m) in-board diesel jet
Inflatable craft and Boston whaler with 60 hp outboard motor

Section D: Additional Information for Land Based Operations

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

18. Room and board requirements on island:

19. Work space needs:

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.

Signature Date

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

NWHI 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
- ☒ Electronic and Hard Copy of Application with Signature
- ☐ 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
- ☐ Statement of information you wish to be kept confidential

Appendix A: Research OR Conservation and Management Application

NOTE: If land or marine archeological activities are involved, please 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, please contact the Monument office on the first page of this application.

1a. Collection of specimens - collecting activities (would apply to any activity): organisms or objects (List of species, if applicable, attach additional sheets if necessary):
Sediment samples collected underwater with plastic sample bags. The samples will be dried-out onboard and stored in plastic containers in a closed setting.

Common name:
N/A

Scientific name:
N/A

& size of specimens:
50 cm3 of sediment

Collection location:
Nihoa Island, Gardner Pinnacles, Lisianski Island, Pearl and Hermes Atoll, Kure Atoll, Midway Atoll.

☐ Whole Organism ☐ Partial Organism

1b. What will be done with the specimens after the project has ended?
After sediment composition has been sieved and characterized, the samples will be sterilized and disposed of through municipal waste.

1c. Will the organisms be kept alive after collection? ☐ **Yes** ☒ **No**

- Specific site/location:

- 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?

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

Aboard the NOAA vessel Hi'ialakai in sediment sample containers housed in larger plastic containers.

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

Habitat map ground-truth data and coral reef community survey data will be integrated with the ongoing NOAA and other agency activities in the Monument to characterize, monitor, and assess the status of NWHI resources. The sediment samples collected from the NWHI can be made available to any interested researchers.

4a. Gear and materials:

Materials include snorkel and scuba gear (mask, fins, snorkel, wetsuit, tank, BCD), sediment collection containers and a high resolution digital camera in an underwater housing to photo-document the collections.

4b. Please list all Hazardous Materials you propose to take to and use within the Monument:

None

5. Fixed installations and instrumentation:

None

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

We expect sampling for habitat ground truthing to require multiple cruises and expect the activity to be mostly complete by 2008, then analysis of data is usually completed within roughly a year. Data analysis and write-up usually take no more than an additional year, although the turn-around time for some journals can exceed 300 days, so time to publication can still be considerable post-submission of the study.
Results from these studies are made available to Monument, FWS, and stat managers as quickly as possible. Monthly brown-bag luncheons at HIMB allow researchers to highlight important or interesting new results and discuss them with the management personnel. In addition, we hold biannual symposia during which researchers present the most current findings from their ongoing research in the Monument. These efforts ensure that research results are provided to the Monument co-trustees almost as quickly as they become available.

7. List all publications directly related to the proposed project:

Brown E, Cox E, Jokiel P, Rodgers K, Smith W, Tissot B, Coles S and Hultquist J. (2004) Development of Benthic Sampling Methods for the Coral Reef Assessment and Monitoring Program (CRAMP) in Hawai'i . Pacific Science 58 (2): 145-158.

Coleman, David E., Paul Jokiel, Eric Hill, and Naomi Bentivoglio. 2002. Better Document Management Through Georeferencing. ArcUser 5(2): 26-29. Also available from ESRI ArcUser OnLine Journal. April-June 2002. pp 1-3. http://www.esri.com/news/arcuser/0402/docmanage1of3.html

Coyne, M. S., M. E. Monaco, M. Anderson, W. Smith, and P. Jokiel. 2001a. Classification scheme for benthic habitats: Main Eight Hawaiian Islands. NOAA/NOS Biogeography Program Tech Rep. Silver Spring, MD. 16 pp. (http://biogeo.nos.noaa.gov/).

Coyne, M. S., M. E. Monaco, M. Anderson, W. Smith, and P. Jokiel. 2001b. Classification scheme for benthic habitats: Northwest Hawaiian Islands. NOAA/NOS Biogeography Program Tech Rep. Silver Spring, MD. 14 pp. (http://biogeo.nos.noaa.gov/).

Coyne, M. S., T. A. Battista, M. Anderson, J. Waddell, W. Smith, P. Jokiel, M. S. Kendell and M. E. Monaco. 2003. NOAA Technical Memorandum NOS NCCOS CCMA 152 (On-line). Benthic Habitats of the Main Hawaiian Islands URL:http://biogeo.nos.noaa.gov/projects/mapping/pacific/. Also available on U.S. National Oceanic and Atmospheric Administration, National Ocean Service, National Centers for coastal Ocean Science, Biogeography Program. 2003. (48 pp. and CD-ROM). Benthic Habitats of the Main Hawaiian Islands. Silver Spring, MD: National Oceanic and Atmospheric Administration.

Friedlander, A., G. Aeby, R. Brainard, E. Brown, A. Clark, S. Coles, E. Demartini, S. Dollar, S. Godwin, C. Hunter, P. Jokiel, J. Kenyon, R. Kosaki, J. Maragos, P. Vroom, W. Walsh, I. Williams and W. Wiltse. 2004. Status of Coral Reefs in the Hawaiian Archipelago. pp. 411-430 In: Wilkenson, C. (ed.), Coral Reefs of the World Volume 2, Australia Institute of Marine Science, Townsville, Australia

Godwin, Scott, Ku'ulei S. Rodgers and Paul L. Jokiel. 2006. Reducing Potential Impact of Invasive Marine Species in the Northwestern Hawaiian Islands Marine National Monument. Report submitted to Northwest Hawaiian Islands Marine National Monument Administration, Honolulu, August 2006. 66 pp. Available from NTIS (http://www.fedworld.gov/onow/) and from the Hawaii Coral Reef Assessment and Monitoring Program (CRAMP) at http://cramp.wcc.hawaii.edu/

Jokiel, P. L. and K.. S. Rodgers. (in press). Ranking coral ecosystem "health" and "value" for the islands of the Hawaiian Archipelago. Pacific Conservation Biology.

Jokiel, P. L., S. P. Kolinski, J. Naughton and J. E. Maragos (2006) Review of coral reef restoration and mitigation in Hawaii and the U. S.- Affiliated Pacific Islands. Pp. 271-290 In: W. F. Precht (ed.), Coral Reef Restoration Handbook – The Rehabilitation of an Ecosystem Under Siege. CRC Press, Boca Raton, FL

Jokiel, P. L. (2006) Impact of storm waves and storm floods on Hawaiian reefs. Proc. Tenth Int. Coral Reef Symp. 390-398.

Jokiel, P. L., K.. S. Rodgers, E.K. Brown, J. Kenyon, G. Aeby, W. R. Smith and F. Farrell (2005) Comparison of methods used to estimate coral cover in the Hawaiian Islands. Report to the Northwestern Hawaiian Islands Ecosystem Reserve. 22 pp.

Jokiel, P. L. and Eric K. Brown. 2004. Global warming, regional trends and inshore environmental conditions influence coral bleaching in Hawaii. Global Change Biology 10:1627-1641.

Jokiel PL, Brown EK, Friedlander A, Rodgers SK and Smith WR (2004) Hawai'i Coral Reef Assessment and Monitoring Program: Spatial Patterns and Temporal Dynamics in Reef Coral Communities. Pacific Science 58: 159-174.

National Oceanic and Atmospheric Administration 2003. Atlas of the Shallow-Water Benthic Habitats of the Northwestern Hawaiian Islands (Draft). Center for Coastal Monitoring and Assessment, Silver Spring, MD. 160 pp. The benthic transect surveys were developed for the Hawaii Coral Reef Assessment and Monitoring Program

Storlazzi, Curt D., Michael E. Field, James D. Dykes, Paul L. Jokiel and Eric Brown. 2002. Wave control on reef morphology and coral distribution: Molokai, Hawaii. Proc. Fourth Int. Symp. Waves. pp.784-793.

DID YOU INCLUDE THESE?

☐ Material Safety Data Sheets for Hazardous Materials

Appendix B: Education Application

1. Are you collaborating with others in any way to reduce duplicative activities in the Monument or elsewhere?

2. Gear and materials:

3. Fixed installations and instrumentation:

4. Is your proposed activity based on a State Department of Education Standards Based Curriculum? If so, please describe:

5. What materials, products or deliverables will be developed as a result of your proposed activity? Provide a time line for write-up and publication of information or production of educational materials:

6. List all publications/references directly related to the proposed project:

7a. 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:

Scientific name:

& size of specimens:

Collection location:

☐ Whole Organism ☐ Partial Organism

7b. What will be done with the specimens after the project has ended?

7c. Will the organisms be kept alive after collection? ☐ **Yes** ☐ **No**

- Specific site/location:

- 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?

8. If applicable, how will the collected samples be transported out of the Monument?

Appendix C: Native Hawaiian Practices Application

1. Please state how the purpose and intent of the activity are appropriate and deemed necessary by traditional standards in the Native Hawaiian culture (pono), and demonstrate an understanding of, and background in, the traditional practice, and its associated values and protocols:

2. Please state how the activity benefits the resources of the Northwestern Hawaiian Islands and the Native Hawaiian community:

3. Please state how the activity supports or advances the perpetuation of traditional knowledge and ancestral connections of Native Hawaiians to the Northwestern Hawaiian Islands:

4. Will you be collecting any Monument resource? ☐ **Yes** ☐ **No**
If so, please provide the following information:

4a. 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 and/or Scientific name:

& size of specimens:

Collection location:

☐ Whole Organism ☐ Partial Organism

4b. What will be done with the specimens after the Native Hawaiian cultural practice is complete?

4c. Will organisms be kept alive after collection? ☐ **Yes** ☐ **No**

• Specific site/location:

• 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?

NOTE: Any Monument resource harvested from the Monument for the purpose of Native Hawaiian practices will be consumed in the Monument.

5. Are you collaborating with others in any way to reduce duplicative activities in the Monument or elsewhere?

6. Gear and materials:

7. Will you erect any Native Hawaiian cultural structures or leave any offerings in the Monument? ☐ Yes ☐ No

If so, please describe:

8. Will you produce any publications, educational materials or other deliverables?
☐ Yes ☐ No

Provide a time line for write-up and publication of information or production of materials:

Appendix D: Recreation Application

For Activities in the Midway Atoll Special Management Area Only

1. Please explain how the activity is for the purpose of recreation as defined: An activity conducted for personal enjoyment that does not result in the extraction of Monument resources and that does not involve a fee-for-service transaction:

2. Other Associated Monument Permits:

3. Gear and materials:

4. Fixed installations and instrumentation:

Appendix E: Special Ocean Use Application

NOTE: If this is a first time Special Ocean Use activity, it will be subject to a pilot project.

1. Please provide proof of general liability insurance, or indicate that you will be posting an equivalent bond against claims arising out of activities conducted under the permit:

2. Are you collaborating with others in any way to reduce duplicative activities in the Monument or elsewhere?

3. Gear and materials:

4. Fixed installations and instrumentation:

5. List all publications directly related to the proposed project:

For projects occurring with the Midway Atoll Special Management Area answer the following questions:

6. Please explain how your activity has been found compatible with the purposes for which the Midway Atoll National Wildlife Refuge was designated?

7. Please explain how your activity meets the requirement of furthering conservation and management of the Monument:

For projects occurring outside of the Midway Atoll Special Management Area answer the following questions:

8. Please explain how the proposed activity will directly benefit the conservation and management of the Monument:

9. Please explain how the purpose of the proposed activity is for research and education related to resources or qualities of the Monument:

NOTE: SPECIAL OCEAN USE PERMITS OUTSIDE THE MIDWAY ATOLL SPECIAL MANAGEMENT AREA DO NOT ALLOW THE USE OF A COMMERCIAL PASSENGER

VESSEL. A commercial passenger vessel is defined by the monument regulations as a vessel that carries individuals who have paid for such carriage.