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: Joshua Reece, M.S., Ph.D. Candidate
Affiliation: Washington University in Saint Louis

Permit Category: Research
Proposed Activity Dates: Three cruises between June 1, 2008 to September 20, 2008
Proposed Method of Entry (Vessel/Plane): Vessel
Proposed Locations: Nihoa, Ni'ihau, Necker, French Frigate Shoals, Gardner, Maro, Laysan, Lisianski, Pearl and Hermes, Midway, Kure

Estimated number of individuals (including Applicant) to be covered under this permit: 15
Estimated number of days in the Monument: Three cruises of approximately 25 days

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…

The 2008 NWHI Lobster tagging cruise uses Fathoms-Plus (F-plus) box-like funnel traps to sample and tag lobster. Moray eels are frequently caught as bycatch. The proposed activity would allow for a small number of moray eel species to be preserved for studies of molecular genetics, morphology, and diet. In addition, the pier at Midway Island is a highly productive area for sampling moray eels and can be easily sampled from land at night when boat operations are not permitted. The proposed activity would allow for a representative sample of moray eel species to be taken by the use of lobster traps. In addition, other researchers collecting during two other cruises would be allowed to deploy traps for use in non-lethal sampling of their target species and collecting moray eels caught as by-catch.

b.) To accomplish this activity we would ….

The proposed activity would allow researchers already conducting sampling of other species and catching moray eels as bycatch to broaden the scientific impact of their sampling by removing a representative sample of moray eels for future analyses. This sampling is not time consuming, dangerous or costly, and will greatly enhance our understanding of moray eels, connectivity among the Northwest Hawaiian Islands, and the ecological role of moray eels as key predators.

Moreover, the sample sizes requested are highly unlikely to impact local or regional populations of moray eels or their ecological role on the coral reef. This claim is based on our preliminary data documenting high levels of gene flow and large effective population sizes (see background information below) in moray eels within the Papahanaumokuakea Marine National Monument.

c.) This activity would help the Monumen**t** by …

This activity would help the monument in two ways. First, this work will identify population genetic structure in an abundant and ecologically important group of coral reef fishes. Population genetic structure describes the pattern of genetic diversity over a specified geographic area. Understanding how moray eel populations are connected or disjunct from one another informs management decisions that depend on estimates of gene flow and population size. Secondly, this research will elucidate species boundaries in moray eels. Our preliminary work is based on non-lethal sampling in which an organism was caught, keyed out to species, and then sampled for a rice grain sized piece of tissue and released. Non-lethal sampling is preferred when possible, however, our preliminary results identify extremely strange patterns. Repeatedly, individuals identified as the same species by morphology were not the same species genetically, and also individuals identified at different species by morphology were sometimes the same species genetically. This pattern is not limited to our work or to the Papahanaumokuakea Marine National Monument, and is repeated in museum collections for which voucher specimens are available, suggesting that the pattern is not due to misidentification but to a real pattern of phenotypic plasticity. Collection of voucher specimens from the Papahanaumokuakea Marine National Monument will allow for consistent species identification and detailed morphological and skeletal analyses to describe biologically realistic species. From the perspective of the monument, it is impossible to manage or protect species when the fundamental species unit is ambiguous or unknown. This small level of lethal sampling will have the long-lasting benefit of delimiting species boundaries for accurate management in the future.

Other information or background: The proposed sampling is largely based on a preliminary body of work generated by Joshua Reece at Washington University. His results are summarized through two figures in Appendix A. Figure 1 is a multilocus Bayesian phylogenetic reconstruction with an insert that depicts mitochondrial and nuclear phylogenetic reconstructions independently. This phylogeny demonstrates that species as defined by morphological characters do not form monophyletic groups, nor is there geographic clustering of species within the phylogeny. In other words, when we examine genetic patterns, we see that all organisms identified as one "species" do not form a single group that excludes all other "species." The congruency among loci in terms of phylogenetic placement rules out alternative explanations of hybridization or ancestral polymorphism, and leaves two alternatives: plasticity or misidentification. The only way to distinguish among these alternatives is by examining voucher specimens linked to DNA sequences to rule out misidentification and to specify which features currently used to identify species are uninformative. Figure 2 highlights and expands upon the lack of geographic clustering observed in Figure 1 by focusing on an example species, Gymnothorax undulatus. As the figure denotes, mitochondrial cytochrome b haplotypes are not clustered by geography, such that individuals sampled in Panama

are just as likely to be closely related genetically to individuals in South Africa as they are to other members of the same species in Panama. Moreover, three other species have genes that place them within the gene pool of Gymnothorax undulatus, but they clearly have morphologies that distinguish them as other species. The geographic expanse over which connectivity of mitochondrial haplotypes is maintained is incredible and spans over 20,000 kilometers. This suggests that moray eel larvae disperse great distances, which is not surprising given that moray eels have the longest pelagic larval durations among other coral reef fishes (Hourigan and Reese, 1987). Lastly, we have generated sufficient preliminary data to estimate effective population sizes based on standing genetic diversity. We have generated estimates of effective population sizes based on cytochrome b variation for reciprocally monophyletic clades for each of the following species sampled only from the Papahanaumokuakea Marine National Monument (estimated number of individuals in parentheses): Gymnothorax undulatus (2.75 million), Gymnothorax eurostus (3.14 million), Gymnothorax steindachneri (1.14 million), and Gymnothorax flavimarginatus (480,000). These estimates are exceedingly large and likely result from connectivity with reef systems outside of the Monument. In summary, given the high level of connectivity and large effective population sizes of moray eels in the Papahanaumokuakea Marine National Monument, lethal sampling is extremely unlikely to have any negative effects on demographic patterns on any time scale.

Section A - Applicant Information

1. Applicant

Name (last, first, middle initial): Reece, Joshua S

Title: Graduate Researcher- Ph.D. Candidate

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

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

Phone: [redacted]

Fax: [redacted]

Email: [redacted]

For students, major professor's name, telephone and email address: Allan Larson, Washington University in Saint Louis, [redacted]; Brian Bowen, Hawaii Institute of Marine Biology, [redacted]

3. Affiliation (institution/agency/organization directly related to the proposed project):
Washington University in Saint Louis; Hawaii Institute of Marine Biology

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):
Brian Bowen (Co-PI; Hawaii Institute of Marine Biology)
Joseph O'Malley (Field collaborator, NOAA)
Randall Kosaki (Research Diver, NOAA)
John Klavitter (Field collaborator) Midway Island
Barry Christenson (Field collaborator) Midway Island
Carl Meyer (Research Diver,
Jeff Eble (Research Diver) Hawaii Institute of Marine Biology,

Luiz Rocha (Research Diver) Hawaii Institute of Marine Biology
Matthew Craig (Research Diver) Hawaii Institute of Marine Biology
Michelle Gaither (Research Diver) Hawaii Institute of Marine Biology
Matthew Iacchei (Research Diver) Hawaii Institute of Marine Biology
Toby Daly-Engel (Research Diver) Hawaii Institute of Marine Biology
John Puritz (Research Diver) Hawaii Institute of Marine Biology

Section B: Project Information

5a. Project location(s):

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

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

Location Description:
Locations include shallow water near-shore sampling from small boats in all specified localities and trap deployment from the pier at Midway.

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 proposed sampling scheme will sample every major reef system in the Papahanaumokuakea Marine National Monument through collaborators on three research cruises. This sampling scheme attempts to maximize the geographic expanse of sampling to identify cryptic evolutionary units within the geographic range of individual species and also to maximize the number of species encountered by sampling different habitats. Moray eels escape from traps at a relatively high rate when left unmonitored overnight, thus we are proposing extensive sampling while expecting limited results. Essentially, we are casting a big net with the hope of landing a few fish. The proposed geographic spread is necessary to maximize the potential to sample all species at as many locations as possible, and include flexibility for each cruise to modify their sampling schemes according to unpredictable weather conditions. Moreover, no boat-based sampling will be done specifically for moray eels; these sampling sites will be restricted to those already being sampled by other researchers who potentially capture moray eels as bycatch. The land-based sampling at Midway is moray eel-specific and allows for constant monitoring of traps and maximizes capture rates by orders of magnitude. This sampling is at one of the very few locations where constant monitoring of traps is possible, and is a critical sampling point for capturing multiple moray eel species.

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?
I have extensively researched Native Hawaiian culture through resources provided by the Office of Hawaiian Affairs, and I have sent this application to that office for their input with respect to the cultural significance of the Papahanaumokuakea Marine National Monument. Hawaiian culture is ingrained in the responsible use of natural resources including Mālama ‘āina, or care for the ocean. This respect for the value and intricate interdependence of natural ecosystems results in the philosophy that one should only take what is absolutely needed from the environment. This approach is particularly relevant to predators, because native Hawaiians recognized the top-down role predators play on ecosystems. The proposed sampling is an evolution in sampling strategy. Most coral reef fish are sampled lethally from the environment, however, most coral reef fish are not top predators. Thus, to be sensitive to potentially smaller population sizes in predators, we proposed non-lethal sampling throughout the Papahanaumokuakea Marine National Monument. This approach was successful after several modifications (beginning in 2006), and the genetic studies based on specimens acquired in this manner and specimens acquired from museum voucher specimens suggest that species identified by morphology do not reflect species units in a multi-locus molecular gene phylogeny. Our results strongly indicate that two individuals that appear to be the same species by morphology

can be different species genetically, and two individuals that appear to be different species by morphology may be the same species genetically. There are two potential explanations for this pattern: morphological species are not biologically realistic, or specimens are commonly misidentified across a wide array of researchers and locations. Voucher specimens are critical to distinguishing between these alternative explanations. Towards that end, the proposed sampling is limited to the absolute minimum number of lethally-sampled moray eels necessary for statistically supported inferences (Karl et al.,1992; Muss et al., 2001; Streelman et al., 2002). Our preliminary non-lethal sampling also allows us to estimate migration and population sizes in moray eels in the Papahanaumokuakea Marine National Monument so that we can propose sample sizes that are highly unlikely to impact local populations on a demographic scale. This ensures the ecological stability of reef systems in the Papahanaumokuakea Marine National Monument. Lastly, it is impossible to conserve or culturally respect ecological resources if one does not know what those resources are in terms of species units. The proposed work will identify species units in moray eels and the geographic scale over which management is biologically and ecologically relevant.

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?
As described above, this sampling scheme is designed to minimize the demographic and ecological impact of lethal sampling, as well as respect the cultural significance of this prized region. Effective population size estimates for the targeted species are between 500,000 and 2.5 million individuals. It is highly unlikely that the proposed sampling would have any negative impacts on moray eel populations or the ecosystems they inhabit. We have endeavored with great effort since 2006 to incorporate non-lethal sampling. We have demonstrated that lethal sampling is necessary and where possible, we have generated preliminary data to document that our proposed sampling scheme would be both statistically rigorous from a scientific standpoint and environmentally and culturally sensitive to these organisms and their ecosystem. The benefits to science, the informed management of Hawaii's natural resources, and our understanding of migration patterns and species boundaries justify the small level of lethal sampling proposed here.

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.
The Papahanaumokuakea Marine National Monument is the largest protected marine area on earth, giving global significance to estimates of gene flow within the Monument and among other reef systems in the Indo-Pacific. On a local scale, the vast stores of biological diversity protected by the Monument potentially serve as a means of replenishing the depleted coral reef fish populations in the main Hawaiian Islands. The ability to sample an entire chain of coral reef systems, the pristine nature of these populations, and the local and global significance of the Papahanaumokuakea Marine National Monument to coral reef conservation are impossible to recreate in alternative sampling schemes. This results in a necessity to conduct this research in the Monument. The alternative to lethal sampling is continued non-lethal sampling. We have employed this methodology in 2007 with excellent results in terms of sample sizes and minimal

bycatch. A single hinalea luahine (Thalassoma ballieui) was caught over the course of 15 deployments. It was a target species for the researchers on board and was non-lethally sampled and released. Thus, trapping ensures targeted sampling of moray eels and lobster. Unfortunately, given the strange species ambiguities with respect to morphology, voucher specimens are critical to ensuring that organisms are properly classified in the future. We considered taking a series of morphological measurements in the field and digital photographs, however, many of the species diagnostic measurements include vertebral counts and analyses of dental morphology. It would be prohibitively dangerous to the researcher to examine the dental morphology of a living moray eel. Thus, given the need for detailed morphological analyses that often require skeletal measures and with the safety of researchers in mind, limited lethal sampling is the only viable alternative.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?
The end value of this activity is two fold. First, the proposed sampling will definitively identify species units in moray eels. The identification of species units allows for detailed analyses of geographic variation within taxa for estimates of population sizes, connectivity, and migration among populations; critical information for managing a marine reserve. It is impossible to provide meaningful management, conservation, or monitoring information for species units that are not biologically realistic. Secondly, this study will provide samples and voucher specimens for a group of key predatory coral reef fishes. In addition to serving a key predatory role, moray eels have two other major ecologically important roles. They have the longest pelagic larval durations among coral reef fish (potentially conferring the greatest dispersal distance; Hourigan and Reese 1987) and they serve as a food resource for the endangered Hawaiian monk seal (Goodman-Lowe 1999). It should be noted that they make up only 5.6% of the monk seal diet, and are not a staple food resource, nor would our sampling be likely in any way to deplete monk seal food resources. Monitoring moray eel population genetic structure allows for estimates of gene flow among the Papahanaumokuakea Marine National Monument and depauperate main Hawaiian Island reefs as well as estimates of population sizes available as a prey resource for monk seals.

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.
The duration of this activity is set to include the projected durations of three cruises. Once sample sizes are reached all sampling of moray eels will cease. With respect to the duration of any single sampling activity, the proposed sampling is in addition to ongoing sampling of lobster and will not increase the duration of any of the sampling cruises or the soaking time of any of the traps. This means that whatever ecological impact researcher presence confers is already ongoing and unchanged by the proposed sampling. By accomplishing the objectives of multiple researchers simultaneously in a single trip we hope to minimize anthropogenic impact to the Papahanaumokuakea Marine National Monument.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
This research is in collaboration with and overseen by Dr. Brian Bowen of the Hawaii Institute of Marine Biology, who has over 20 years of experience in this field, including two major

expeditions to the NWHI. He is known to the MNM staff, DAR staff, and USFWS staff, and is clearly qualified to perform this research. Joshua Reece is a Ph.D. candidate researching moray eel phylogenetics and phylogeography for his dissertation research and has sampled moray eels lethally and non-lethally throughout the Indo-Pacific, including a 2007 expedition to the NWHI. He has been working with moray eels in the field for three years and is qualified to conduct the proposed research. To mitigate any potential impacts resulting from our conduct we have endeavored to make all of our sampling (with the exception of sampling the pier at Midway) originate from collections that are already ongoing, ensuring that we maximize the benefits of biological collections while minimizing the impact to ecological and culturally sensitive areas.

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.
There are sufficient financial resources in the NWHIMNM-HIMB partnership to conduct and complete the research outlined herein. The partnership is supplemented by two grants from the National Science Foundation to Brian Bowen and collaborators. This work is also funded by grants to Joshua Reece from the PADI Foundation and the National Geographic Society.

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.
This project has two main goals, 1) to resolve ambiguities between morphologically-defined species and genetically-defined species, and 2) to provide estimates of migration, connectivity, and population sizes for moray eel species. Molecular genetic studies using multiple loci are essential to the first goal, and the most feasible and widely used means of estimating the second goal. Molecular genetic studies of fish are widely used to identify patterns of migration, connectivity among populations, and to estimate population sizes (e.g. Bowen et al., 2001; Planes and Fauvelot, 2002; Bowen et al., 2006; Rocha et al., 2007). The graduate researcher Joshua Reece has published four papers using molecular genetics to identify these patterns, and the collaborator Brian Bowen has authored over 70 peer-reviewed publications using molecular genetics to estimate population patterns. Our methods do not extend any of the current sampling within the Papahanaumokuakea Marine National Monument, and thus minimize ecological and cultural impacts.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?
The NOAA vessel Hi'ialakai is properly outfitted with the OLE approved transceiver and complies with requirements of Presidential Proclamation 8031.

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

8. Procedures/Methods:

The moray eel species listed below will be collected by trapping in the plastic F-plus eel traps used for sampling lobster. Traps will be deployed in the evening (approximately 4 pm) and retrieved the following morning (about 8:00-9:00 am) to minimize any unnecessary stress to the organism. Any moray eels captured will be immediately placed into an iced cooler. Humanely euthanizing moray eels could be done by injection, however, this procedure exposes the researcher to an extended handling time and the potential for injury from an eel bite. Instead, the eels will be placed into an iced cooler where their metabolism will quickly slow and cease. Based on our experience, moray eels can breathe or at least persist out of water for over two hours. However, on ice their metabolism ceases after approximately thirty minutes, resulting in a humane euthanasia prior to asphyxiation.

Laboratory methods for molecular DNA analyses are standard and include DNA isolation, PCR of two mitochondrial (cytochrome b and cytochrome oxidase) and three nuclear genes (rhodopsin, RAG-1, and RAG-2), and automated sequencing. DNA aliquots will be made available to other researchers for future studies.

DNA sequences will be analyzed to create a multilocus Bayesian phylogenetic reconstruction in the program MrBayes (Huelsenbeck & Ronquist, 2001) that defines species by their genetic patterns. Species thus defined will be compared to traditional morphologically-defined species to identify any dissimilarity and identify potentially misleading morphological features. Within each species we will summarize genetic variation using standard diversity indices with an analysis of molecular variance (AMOVA) in the program Arlequin v.3.11 (Excoffier et al., 2005). We will provide estimates of directional gene flow among populations and effective population sizes in the program Lamarc v.2.1 (Kuhner, 2006).

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:
Snowflake moray
Zebra moray
Yellowmargin moray
Steindachner's moray
Whitemargin moray
Whitemouth moray
Undulated moray
Stout moray

Giant moray
Dragon moray
Banded moray

Scientific name:
Echidna nebulosa
Gymnomuraena zebra
Gymnothorax steindachneri
Gymnothorax albimarginatus
Gymnothorax meleagris
Gymnothorax undulatus
Gymnothorax eurostus
Gymnothorax javanicus
Enchelycore pardalis
Gymnothorax rueppellii

& size of specimens:
15 organisms all sizes all species, all locations

Collection location:
Nihoa, Necker, French Frigate Shoals, Gardner, Maro, Laysan, Lisianski, Pearl and Hermes, Midway, Kure.

☒ Whole Organism ☐ Partial Organism

9b. What will be done with the specimens after the project has ended?
All specimens will be curated at the Bishop Museum so that they can serve as a natural resource for scientific study by other researchers throughout Hawaii and abroad.

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

• General site/location for collections:

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

• Is there an outfall? ☐ Yes ☐ No

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

• Will organisms be released?

10. If applicable, how will the collected samples or specimens be transported out of the Monument?
Samples will be frozen in the on-board cold room and transported upon return to Oahu to on-site storage at HIMB until they can be curated and moved to the Bishop Museum for permanent addition to their Ichthyology collection.

11. Describe collaborative activities to share samples, reduce duplicative sampling, or duplicative research:
This research makes advantage of collaboration by emphasizing work on a species that is already caught as bycatch during approved research activities. The only novel aspect with regard to sampling that is proposed here is the pier-based sampling at Midway Island. Thus, there is no duplicative sampling and we maximize the collection of valuable scientific data with minimal impact on the environment. The samples collected during this study will provide molecular genetic information and full specimens for morphological and dietary studies. All molecular genetic information will be made available to researchers globally through posting on GenBank, and DNA aliquots will be made available for other researchers. Whole specimens will be permanently curated at the Bishop Museum for future study.

12a. List all specialized gear and materials to be used in this activity:
The only additional gear utilized in this study is an iced-cooler for euthanizing moray eels. The means of capture, plastic F-plus traps, are already utilized for sampling lobster populations. All traps and materials are cleansed in a modified bleach solution to guard against translocation of microbes among sites.

12b. List all Hazardous Materials you propose to take to and use within the Monument:
None.

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

14. Provide a time line for sample analysis, data analysis, write-up and publication of information:
We expect to publish preliminary results from this sampling within one year of the close of sampling, or by Fall 2009.

15. List all Applicants' publications directly related to the proposed project:
Please see attached CVs.

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 Jah Reece Date Jan 31, 2008

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