

**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:** James E. Maragos

**Affiliation:** Pacific Reefs National Wildlife Refuge complex, U.S. Fish and Wildlife Service

**Permit Category:** Research

**Proposed Activity Dates:** July-December 2010

**Proposed Method of Entry (Vessel/Plane):** Plane access to Midway and ship access elsewhere

**Proposed Locations:**

**Estimated number of individuals (including Applicant) to be covered under this permit:**  
one

**Estimated number of days in the Monument:** 30

**Description of proposed activities:** (complete these sentences):

a.) The proposed activity would...

1. Collect coral samples for connectivity analyses with nearby archipelagos (see Toonen application)
2. Collect rare Hawaiian corals for public education display at the Waikiki Aquarium, Honolulu and the Hilo PMNM center (see Rossiter application)
3. Collect rare and undescribed corals from mesophotic zone reefs in the Monument (see Kosaki application)
4. Collect undescribed corals to assess molecular and morphological relationship to closest species, describe new species, and publish an updated guide book on the corals of the Hawaiian Archipelago (this application)

b.) To accomplish this activity we would ....

Participate as the coral expert in upcoming expeditions to fulfill the goals summarized above including:

1. In situ scuba and technical diving surveys of corals to determine which fulfill the above categories and photograph selected corals;
2. collect small slivers (< 1cm<sup>2</sup> each) of new or rare corals for molecular analyses to be accomplished by the Toonen-Bowen Laboratory of HIMB;

3. collect type specimens of corals suspected of being species new to science;
4. conduct taxonomic analyses of specimens including consultation with other coral taxonomic specialists;
5. Publish scientific papers on the findings;
6. and prepare a guidebook of Hawaiian corals for publication.

c.) This activity would help the Monument by ...

1. Identifying new coral species in the Monument
2. Determining whether such species are restricted and rare enough to be recommended for threatened and endangered status, critical habitat designation, and recovery planning, as appropriate
3. Help assess the geological age of the Monument estimated through molecular analyses of corals, and
4. Promote public education and support for the unique corals of the Monument via publications and assisting in the collection of live corals for public display at aquariums in Hilo and Waikiki

**Other information or background:**

## **Section A - Applicant Information**

### **1. Applicant**

Name (last, first, middle initial): James E. Maragos, Ph. D.

Title: Coral Reef Biologist, U.S. Fish and Wildlife Service

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

Applicant would serve as Principal field Investigator only for Activity 4 of part a) focused on taxonomic analysis, and publication of species new to science, and coral guidebook publications. Otherwise he would serve the role as coral specialist for the collection of corals for the other Principal Field Investigators identified in the applications submitted by Kosaki, Rossiter, and Toonen. The Monument is attempting to limit the numbers and species of corals collected in the Monument by designating experts able to identify targeted corals in the field that are worthy of collection and avoid collection and loss of corals not targeted by the other investigators. This waste and loss is avoided by having experts properly identify corals in situ before they are collected.

#### **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):**

Employee of U.S. Fish and Wildlife Service,  
Graduate faculty member of the University of Hawaii,  
Research Associate, Bernice Pauahi Bishop Museum, and  
Member of the Coral Specialist Group , Species Survival Commission, IUCN

**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):**

No others are included in this applications. However, I will be collaborating with scientists and field staff mentioned in the Toonen, Rossiter, and Kosaki applications.

**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 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 checked="" 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 checked="" 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 type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input checked="" type="checkbox"/> Midway Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input checked="" type="checkbox"/> Kure Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input checked="" 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:  
 Raita Bank, if possible

**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:***

### **BACKGROUND**

In 1968 when I first began my study of Hawaii corals there were no other faculty , students, or other scientists studying corals. Moreover, there were no guidebooks, computers, GPS, and digital photography, and scuba still relied on double-hose regulators. In 1970, I was asked to prepare a guide book on the corals of Hawaii based upon diving and examination of early type specimens of species described by Vaughan, (1907) which still remains one of the most comprehensive works on Hawaiian corals. My coral guide was published in the Reef and Shore Fauna of Hawaii in 1977, and involved hundreds of dives between 0-60 m and constant consultation with the world's leading coral taxonomist, John Wells of Cornell University between 1970 and 1980. Even though several Pacific guidebooks have been published since that time, there were no new species described from Hawaii although more than a hundred were described from the coral triangle and Australia alone. In Veron's first widely published guidebook in 1986, he still recorded only a single endemic coral from Hawaii. After significant consultation with him over the next 15 years, he increased the level of coral endemism in Hawaii to 13 species in his 2000 treatise, Corals of the World.

Earlier surveys of corals in the NWHI were published by James Dana (1846), and later Vaughan (1907) compiled all subsequent records and reported a few corals at Laysan. Tom Dana (1971) conducted dive surveys at Kure recording more than 20 species there, and Grigg and Dollar (1980) surveyed all of the NWHI compiling a total of 29 species, including three species of Acropora (Grigg et al. 1981). Thus, when the first of the detailed "RAMP" surveys were conducted (NOWRAMP 2000-2), it came to our great surprise to find double the number of coral species reported earlier in the NWHI and comparable to what have been reported in the Main Hawaiian Islands despite substantially more survey effort in the latter (Maragos et al. 2004). Although Fenner's guide book on Hawaiian corals (2005) covers NWHI species, there were no new records reported. During the 2006 RAMP surveys, the applicant reported three additional Acropora at Pearl and Hermes, Lisianski and French Frigate Shoals and another potential new species of Montipora was reported at Kure by Bernardo Vargas. However, we were not allowed to collect the corals. Later in 2006 during the Census of Marine Life expedition to French Frigate Shoals, the applicant served as the stony coral specialist on the team but was not allowed to collect corals, although everyone else on the team was allowed to collect invertebrates. The COML expedition had a different focus, to search for new species rather estimate their abundance, distribution etc. I was to photograph more than a dozen presumably undescribed species just at FFS (Maragos et al. 2008). Despite repeated attempts, the applicant still has not been permitted to collect, analyze and describe these or any other species.

The cumulative findings of previous coral surveys in the NWHI reveal that the number of total and presumably endemic coral species has been grossly estimated, and it is very likely there are many more of these species. The now 40% of coral endemism in the NWHI is the highest in the world for any tropical archipelago, and this number could increase substantially with additional collections at the other atolls and mesophotic zones in NWHI. These preliminary findings suggest an ancient age for the archipelago greatly transcending the age any of the current islands and also substantial geographic isolation over geological time.

## NEED

The main concern at this stage, as global climate change increases its impact on coral reefs, is the undocumented loss of dozens of undescribed and unknown coral species in the Monument. Even though the verdict is still out for ocean acidification, there is no question about sea level rise leading to greater wave energy and exposure to reefs, and loss of low islands. Also alien species may also get a foothold in the islands and smother corals, such as is happening in Kaneohe Bay where alien red algae are now growing over one of Hawaii's rarest corals, *Montipora dilatata*. Already documented are several episodes of coral bleaching at the distal end of the NWHI, and the potential loss of Midway as a functional atoll where reef erosion is appearing to exceed reef accretion (Don Potts, pers. comm.).

Unless these corals are identified to species, they cannot be afforded protective status as threatened and endangered species nor can other measures such as critical habitat and recovery planning be authorized and funded. At least the Waikiki Aquarium is well suited and experienced in coral propagation and could help save species that might otherwise go extinct. Moreover, molecular analyses of the corals aside from documenting connectivity, can also help to determine whether species of the same morphology have different molecular characteristics and whether morphologically different have very similar genetic structure. Clearly, substantially more exploration is needed through the Monument both in shallow and deep water habitats. Hence all four of the applications involving collections of corals can assist one another in determining which coral species are at risk, which are not, and taking measures to protect those rare species via propagation and education.

In October 2009, the Center for Biological Diversity filed a petition with the NMFS to list 83 coral species as endangered. Although NMFS agreed favorably, it has only one year to respond to the petition. The CBD petition includes four Hawaiian endemic species and five other species common in Hawaii but with two very rare outside of Hawaii. The suite of coral studies being proposed in the Monument will help to address some of the species listed in the petition but also identify other "new" species in the Monument that also warrant protection.

## SCOPE

The scope of species to be covered in this application are listed in the table below. All these species would subject to morphological and molecular analyses including comparison to nearest species. As noted earlier, none of the species in the list have been collected in the NWHI. The table includes the targeted (those that may prove to be "new") and closest morphological species in the NWHI. Molecular testing of both pairs of species would help to confirm their differences or similarities as well as connectivity. The list below covers species known or previously observed in the Monument. Obviously this list does not include potentially new species to be discovered during explorations in mesophotic and shallow water habitats. Collection of samples for any new rare species would include both molecular samples and type specimens for analysis and eventual accession in museums. The total number of molecular samples per species per island would be 3. In addition the total number of types for suspected new species would be 2, with one stored at the Bishop Museum and the other at the National Museum (Smithsonian)

TARGET SPECIES	NEAREST SPECIES	DATA SOURCE
Acropora sp1 (prostrate)	Acropora cerealis	Maragos et al. 2008
Acropora paniculata	Acropora cytherea	CBD 2009
Acropora sp28 cf. retusa	A. humils, A. gemmifera	Mar. et al. 2008, CBD 2009
Acropora sp29 (table)	Acropora cytherea	Maragos et al. 2008
Acropora sp30 cf. palmerae	Acropora cytherea	Maragos et al. 2008
Acropora sp26 cf. loripes	none	Maragos et al. 2008
Montipora flabellata	Montipora dilatata	Mar. et al. 2008, CBD 2008
Montipora patula	Montipora verrilli	CBD 2009
Montipora sp4 cf. incrassata	none	Mar. et al. 2004, 2008
Montipora dilatata	Montipora sp3 cf. turgescens	Mar. et al. 2004, 2008
	Montipora sp6 cf. dilatata	Mar. et al. 2004, 2008
Montipora sp7 (foliaceous)	Montipora patula	Maragos et al. 2008
Montipora sp2 (ridges)	none	Maragos et al. 2008
Montipora sp5 (branching)	none	Maragos et al. 2008
Montipora sp14 (nodular, Vargas)	none	Maragos et al. 2008
Montipora sp24 (irregular)	none	Maragos et al. 2008
Leptoseris incrustans	L. scabra, L. sp22 cf. incrustans	CBD 2009
Leptoseris sp17 (scabra)	Leptoseris scabra	Maragos et al. 2008
Cyphastrea ocellina	Cyphastrea agassizi	CBD 2009
Pocillopora sp10 cf. laysanensis	none	Mar. et al. 2004, 2008
Pocillopora molokensis	Pocillopora meandrina	Maragos et al. 2004
Pocillopora sp32 cf. verrucosa	Pocillopora meandrina	Maragos et al. 2008
Pocillopora sp11 cf. capitata	Pocillopora eydouxi	Maragos et al. 2004
Porites sp23 (arthritic fingers)	Porites compressa	Maragos et al. 2008
Porites sp21 cf. lobata	Porites lobata	Mar. et al. 2004, 2008
Porites sp16 cf. lutea	Porites evermanni	Maragos et al. 2008
Porites sp27 (columns)	Porites pukoensis	Maragos et al. 2004, 2008
Porites sp13 cf. solida	Porites solida	Maragos et al. 2004
Psammocora stellata	none	CBD 2009

**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?

The applicant plans to meet with cultural experts to determine kapus and other conditions for culturally important species. Methods of collections would be minimized to collect molecular samples of only 1 cm<sup>2</sup> each and only three such samples per species per island. Only a maximum of two types would be collected for "new" species, the absolute minimum needed for description and access by other coral specialists at the museums. Once collected and placed in vials with ethanol, the fragments would be dead and incapable to spreading disease.

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? The level of the collections is very low and all targeted corals are colonial with specialized abilities to repair themselves quickly. The size of the molecular fragments are so small that the corals would recover completely and quickly, based on extensive personal experience. The collection of the two whole type specimens for each new species is a loss that would be more than compensated by future efforts to protect or restore the species they represent. Without a name, the coral species does not officially "exist", and programs to insure its continued existence cannot be developed or implemented.

A major responsibility of the leadership of any National Monument with a natural component, including PMNM, is to identify the species within them and to assess their status. Without knowing this fundamental information, the Monument cannot protect these species or mitigate the adverse impacts to them. In a sense each species "social security number" is its name. Without a name the species not exist and management cannot take directed actions to protect it.

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 is no alternative. The activity must be accomplished in the Monument because there is no record of these species occurring outside the Monument, except the few endemics proposed by CBD for endangered status. Since NMFS agreed to take action to examine these species, eventually corrective actions may be needed if established at endangered or threatened species. However, the CBD species also occur outside the Monument and corrective measures if any could also be handled outside the Monument, if reasonable and appropriate.

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?

Without first consulting cultural experts, it is not possible to assess the direct cultural effects of these actions. However, if the analyses of the corals merit them enhanced status or protection, the short turn cultural loss, if any, would be outweighed by its greater protected status and monitoring. Even so I don't believe at this stage that there will be any cultural effects, but I do look forward to consultations with cultural experts for substantiation.

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

The reality is that each expedition should yield samples of some of the targeted species, but would not likely find all of them. Hence there will likely be the need to conduct more searches depending on the outcome of the molecular and morphological analyses. This phased approach is best because it is impossible to devote enough time during each cruise to find all the targeted species. However, the analyses themselves may yield results that show that many of the targeted species are new to science, or conversely, are not new to science. On the basis of the outcome of the analyses, management may either want to accelerate or reduce future exploration and

collections. However, without doubt there will be additional new target species identified especially in areas that have not been surveyed at shallow habitats, but also at mesophotic depths. Until there is a pattern of diminishing returns it is likely that explorations, collections, and analyses will be not only an ongoing research activity, but an important management responsibility.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.

As noted beforehand I am among the first of modern-day coral taxonomists who has embraced improvements in underwater surveys, computers, photography, and GPS, and working with colleagues with expertise in laboratory techniques in promoting the identification and protection of corals and reefs worldwide. I have made more than 6,000 dives in more than a hundred islands, atolls and reefs over the past 42 years. Within a few months I'll be releasing an important multivariate biogeographic assessment of the distribution of coral of more than 500 species of corals at 71 central Pacific Islands and at more than 2,250 individual sites. This publication will review all the abundance and distribution of all encountered species and assess which CBD species and non CBD species are rare and favoring more protection, but also flagging other CBD species that may be common and not warranting protective status.

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.

I am presently employed at the U.S. Fish and Wildlife Service which will cover my salary and expenses for participating in this effort. I rely on my colleagues in the other three related applications to assist in gaining access to the targeted sites, and to collaborate and share in the analyses. Once the molecular samples are collected, they will preserve indefinitely until they analyzed. I will rely on a publisher to finance the guide book on Hawaiian corals, and believe there will be sufficient interest in this endeavor.

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.

The work I am proposing is both an essential management and research responsibility of the Monument. I'm a scientist within the management regime of the Monument and have the full support of my agency, the leading agency for the protection of fish and wildlife, to conduct this essential work.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?

I will be relying on one of the NOAA vessels to serve as the support platform for accomplishing the field work. It is my understanding that the NOAA vessels comply with this requirement.

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

My academic, public, conservation, and publication record speak for themselves.

## **8. Procedures/Methods:**

Laboratory molecular analyses would be accomplished by the Toonen Bowen (ToBo) Laboratory at the Hawaiian Institute of Marine Biology.

Diving procedures will be based on a dive safety plan developed by the dive team and approved by the dive safety officers in charge of the diving

Field research methods will use the following sequence:

- 1) searching and evaluating possible corals for collection,
- 2) once a desired target is detected, photographs with a scale bar in view will be taken with a digital camera at varying distances and angles,
- 3) the coral's species will be recorded on a data sheet and assigned a number corresponding to the preprinted number of the Ziploc bag into which the coral fragment will be placed,
- 4) then using a piton and hammer, I'll select a portion of the coral colony where removal of a small sample can be obtained with minimal impact to the coral and proceed to dislodge and bag the sample,
- 5) The opening of the bag with them be zipped tight to avoid contamination with other corals and placed in a mesh bag,
- 6) upon completion of the dive, all samples will be examined to insure their integrity and disposition,
- 7) as soon as the dive skiff returns to the ship and gear offloaded, the samples will be processed inside the "wet lab". For the rest of the samples to remain alive, they will be given to the Rositter team for aeration and further life support,
- 8) all Ziploc bags with samples will be taken out of the mesh bag and separated on the counter to avoid contamination,
- 9) A bone cutter will be used to cut a piece of each coral fragment (<1cm<sup>2</sup>) that fits inside a pre-labeled 3 ml vial (corresponding to the number on the Ziploc bag) and completely immersed in ethanol for preservation,
- 10) the bone cutter, wooden chopping board, my hands and other potentially contaminated gear will be washed between each sampling
- 11) at the end of processing, all excess waste and used Ziploc bags will be disposed in an appropriate wet lab container and all tools thoroughly washed and dried
- 12) all data collected during each dive will then be logged in on data sheets including date, site number, time, tag number, depth, habitat, photo numbers, and notes,
- 13) At this point the vials will be saved and stored for eventual transfer to the ToBo lab. This same procedure would be used for collections of connectivity samples for the Toonen team, and mesophotic samples for the Kosaki team.
  
- 14) Type specimens to serve as the reference for new species will also have a small fragment removed for molecular analysis, with the rest of the colony immersed in sodium hypochlorite solution (ordinary diluted "bleach") for cleaning and disinfection. After the types are rinsed in

fresh water and dried, they will be photographed, labeled and stored, each within its own Ziploc bag to avoid mixing labels with other 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:  
stony corals

Scientific name:  
see list on page 9. All corals will be scleractinians or stony corals.

# & size of specimens:  
1 cm<sup>2</sup> each for molecular samples, and up to 100 cm<sup>2</sup> for the much fewer number of type specimens

Collection location:  
at each of the dive sites chosen each day by the field investigators and chief scientist

Whole Organism  Partial Organism

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

type specimens will be stored indefinitely at the Bishop Museum and Smithsonian Institution, one each for every new species estimated at about 20 species and 40 type specimens

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

Only samples to be provided to the Waikiki Aquarium and Hilo Center, which will be kept alive in accordance with procedures in the Rossiter application. Otherwise the larger number of coral samples will be dead but preserved for molecular analyses.

• General site/location for collections:  
shallow and mesophotic habitats to be determined by the team of field investigators and chief scientist

• Is it an open or closed system?  Open  Closed  
applies only for specimens to be kept alive for the aquariums.

• Is there an outfall?  Yes  No

- Will these organisms be housed with other organisms? If so, what are the other organisms?  
no

- Will organisms be released?  
no

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

Live samples for the Rossiter team will be transported alive to the two aquaria in Waikiki and Hilo. The rest of the samples will be dead and either given to the ToBo Lab for further analyses or retained by the applicant for future morphological analyses, after which they would be given to the two Museums

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

all samples would be shared among the four applicants, as necessary

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

Hammer, piton (like a cold chisel but including a hole or loop that can be tied to the hammer to avoid loss), Ziploc bags, ethanol, vials, underwater slates and underwater paper and pencils, ruler for scale, digital cameras in housings, 5 gallon buckets to store all samples, chopping board to fashion samples to be placed in the vials, and pipettes to transfer alcohol to the vials

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

ethanol (flammable) to be kept in a secured box or drawer on the ship

**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:**

nine months

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

Maragos, J.E. 1972. A study of the ecology of Hawaiian reef corals. PhD. Dissertation, University of Hawaii, Honolulu. 292 pp

Maragos, J.E., 1977. Order Scleractinia: Stony Corals. In: Reef and Shore Fauna of Hawaii Section 1: Protozoa through Ctenophora. B.P. Bishop Museum Special Publication 64(1): 158-241, D. Devaney and L. Eldredge (eds.). Bernice P. Bishop Museum, Honolulu.

Maragos J.E., and P.L. Jokiel 1986. Reef corals of Johnston Atoll: One of the world's most isolated reefs. Coral Reefs 4:141-150.

Grigg, R.W. and J.E. Maragos, 1974. Recolonization of hermatypic corals on submerged lava flows in Hawaii. *Ecology* 55(2): 387-395

Maragos, J.E. 1995. Revised checklist of extant shallow-water stony coral species from Hawaii (Cnidaria: Anthozoa: Scleractinia). *Bishop Mus. Occ. Pap.* 42: 54-55.

Maragos, J.E., 1998. Marine Ecosystems, In: *Atlas of Hawaii*, J. Juvik and S. Juvik, (eds). University of Hawaii Press. Honolulu. Pp 111-120.

Holthus, P.F., J.E. Maragos, and C.W. Evans, 1989. Coral reef recovery subsequent to the fresh water kill of 1965 in Kaneohe Bay, Oahu, Hawaii. *Pacific Science* 43(2):122-130.

Maragos, J.E. 2000. Hawaiian Islands (U.S.A.). Chap. 105, in: *Seas at the Millennium: an Environmental Evaluation*, C.R.C. Shepard (ed). Pergamon Press-Elsevier Science, Oxford, pp 791-812.

Gulko, D., J. Maragos, A. Friedlander, C. Hunter, and R. Brainard. 2000. Status of coral reefs in the Hawaiian Archipelago. In: *Status of Coral Reefs of the World*, C. Wilkinson (ed). Australian Institute of Marine Science, Cape Ferguson, Queensland, Australia, pp 219-238.

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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.

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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

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- 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