

**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:** Kathleen Gobush

**Affiliation:** National Marine Fisheries Service, Pacific Islands Fisheries Science Center

**Permit Category:** Research

**Proposed Activity Dates:** June 1, 2009- September 30, 2009

**Proposed Method of Entry (Vessel/Plane):** OES

**Proposed Locations:** French Frigate Shoals

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

7

**Estimated number of days in the Monument:** 120 days

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

a.) The proposed activity would...  
include monitoring of shark activity at select pupping sites and the removal of predatory Galapagos sharks from these areas.

b.) To accomplish this activity we would ....  
monitor shark presence around pupping sites by observation from the ground, an observation tower, and/or patrolling near shore waters from a small boat. Galapagos sharks observed in predatory behavior would then be caught by: 1) hand line fishing from the shoreline or a small boat 2) hand-held spear gun or hand-held harpoon 3) using a variation of bottom long line gear modified for fishing sharks 4) drum-line technique and/or 5) trolling with a lure. For all methods, disposing of hooked sharks would occur with a bang stick.

c.) This activity would help the Monument by ...  
mitigating shark predation on nursing pups at FFS, a significant cause of death to this crucial age class, thus improving the likelihood of recovery of this important subpopulation of monk seals. Effects from the removal of a limited number of Galapagos sharks will be ephemeral and are not

likely to have a serious impact on the greater Galapagos shark population at French Frigate Shoals or on the coral reef ecosystem (see Section 7a below).

**Other information or background:**

Studies conducted over the last 10 years have shown that shark predation has been a significant factor contributing to nursing pup mortality at FFS, particularly at Trig and more recently at Gin Islands. This predation on nursing pups is believed to involve a small number of site-specific Galapagos sharks (*Carcharhinus galapagensis*), as indicated by research initiated in 1997-1998. In 1998, a number of individually identified Galapagos sharks patrolled Trig Island repeatedly within the same season, and exhibited distinct predatory behavior. In 2000-2004, Galapagos sharks remained the only species identified attempting to prey on nursing pups in shallow water, <2 m in depth, at Trig Island. Observational studies, bite radii, and teeth spacing of shark injuries to nursing pups also indicate that the preponderance of pup wounds were inflicted by Galapagos sharks. Although Galapagos sharks have been previously reported to prey on pinnipeds, (Compagno 1984), they most commonly forage on fish and cephalopods (Compagno 1984, Wetherbee et al. 1996). However, this opportunistic predator may have adopted the intense pup-predating behavior as routine, in response to unusually high numbers of pup carcasses associated with adult male seal aggression at Trig in 1997-8, when coincident sharp peaks in both activities were evident. Subsequent management actions have adequately controlled male seal aggression, whereas high predation rates have remained a constant threat over the last decade. A decrease in annual cohort size apparently due to an aging seal population exacerbates the impact of this shark induced-mortality.

The decision to focus removal efforts specifically on Galapagos sharks is consistent with our experience as they are the only shark species we have identified to charge, injure and kill pre-weaned pups over the last decade (this includes 3436 hours of observation at FFS). Thus, we currently have no data to substantiate the involvement of other likely predators, namely Tiger sharks (*Galeocerdo cuvier*). Accordingly, we do not feel it is prudent at this time to attempt to manage the interactions of other shark species with pre-weaned pups. However, given the catholic diet of tiger sharks, we recognize that their involvement cannot be categorically excluded and should be investigated. NMFS is currently collaborating with HIMB shark ecologists to address this issue.

Direct observation or confirmation of a shark kill is often rare due to crepuscular/nocturnal predation and wariness to humans. Therefore, many of the pup mortalities attributed to shark predation must be inferred from circumstantial evidence. We apply conservative criteria when inferring a shark-induced mortality to these disappearances. The disappearance of a healthy pup (greater than a week old), which is not coincident with inclement weather/seas or aggressive male seal behavior, and whose mother is typically searching and vocalizing is considered to be a shark-induced death. Furthermore, an intensive behavioral study in 1988 on 30 mother-pup pairs at FFS demonstrated that only pups less than a week old died due to high seas/ wave wash (Boness 1990). Intense predation on nursing pups was initially observed at Trig and neighboring Whaleskate Island in 1997-99, when 18-28 mortalities occurred annually. These losses equated to 38-69% of pups born at those sites, clearly an unsustainable rate of loss. Since then, 15-37% of the annual cohort is consistently believed to be lost to sharks before weaning, based on our

conservative criteria. An increase in human activity during the pupping season or a decrease in sharks involved in the activity may have led to the observed drop in predation. However current levels, albeit less than the late 1990's peak, cannot be absorbed by the shrinking monk seal population and recovery expected. Forty-one pups were born in 2008 at FFS, greatly reduced from the 109 born in 1997 when shark predation was first considered a significant issue. Of the 41 pups born in 2008, 8 were lost to shark predation (20%) and 3 disappeared after the regular field season (cause of death unknown, shark-related loss not ruled out) resulting in only 28 pups surviving to weaning, the lowest on record.

At this time, likely avenues for reducing predation include limiting predation opportunities by removing prey (pup translocation), deterring predation using artificial devices or harassment, and/or removing predators. HMSRP has pursued all three fronts over the last decade but has had limited success in permanently curbing predation of nursing pups below 20%, suggesting that an increased effort in all three areas is needed to make progress. Recommendations received by shark and seal experts and numerous stakeholders in attendance at two recent workshops devoted to this issue (January 8-9 and November 5-6, 2008) support this notion.

We seek to conduct shark removals in conjunction with other likely alternatives (deterrent deployment and weaned pup translocation), not in place of them. The most likely alternative is to deploy deterrents at select pupping sights where it is geographically feasible. However, reliance on deterrents alone in 2008 was met with limited success. Beginning in 2001, we attempt to translocate pups at weaning from sites with historically high shark observations and incidents; this option is not possible during the nursing period. Therefore, we would like to again deploy deterrents (proposal submitted under a separate permit) and translocate weaned pups, complimenting this activity with the option to remove Galapagos sharks that we observe near pupping sites.

Other alternatives include: doing nothing, applying deterrents alone, moving mother and pup pairs, and installing barriers to shark or seal movement. However, all of these alternatives have serious shortcomings and many are not feasible for 2009 based on limited knowledge to date of their impacts on the ecosystem.

To do nothing has been deemed imprudent by a panel of experts attending two Workshops convened to discuss this issue. The Recovery Plan, as created by the HMS Recovery team, mandates mitigation of shark predation as a high priority. To be consistent with our program's mission and the Monument's mission, it is important that we make all attempts to positively influence the recovery of the HMS with respect to all sources of mortality, including shark predation. No one method alone has proven effective; therefore we seek to apply both nonlethal and lethal means of mitigation at this time.

A 'deterrent alone' approach is insufficient because thus far our designs have not proven to conclusively alter the presence of patrolling Galapagos sharks around pupping sites or to influence their predation success atoll-wide. The success of a suite of deterrents deployed in 2008 was equivocal. The total number of confirmed and inferred shark-related mortalities did not decrease as compared to the previous year when no deterrents were applied (2007) because of

low efficacy and/or displacement of predatory activity to sites where deterrents were absent. As we continue to test and attempt to improve deterrent efficacy and feasibility, an additional method for protecting pups is needed.

Moving mothers and pups to 'safer' islands (e.g. from Trig to East or Tern) is not preferable because it will increase seal density at the receiving island possibly making it more attractive to sharks. Recent analysis has shown that seal density and shark predation are positively related (from 2000-2006 data): when the number of mother-pup pairs on Trig surpassed a threshold of 14, shark predation was observed to be more frequent. Furthermore, it is unknown if relocated mothers will continue to parent. A care facility for abandoned pups is also a prerequisite for such management activity. In sum, though we intend to further investigate moving mother-pup pairs, it is not yet an option for our program.

Creating barriers, such as fencing or penning to either keep sharks away from near shore areas or keep mothers and pups within near shore areas has the potential to negatively influence the normal movement patterns of both pregnant female seals and basking or nesting green turtles. Furthermore, constructing barriers around all pupping sites may not be geographically feasible due to currents and wave surge. The design, materials and maintenance of such structures requires thoughtful investigation and testing rendering it unfeasible at this time.

## **Section A - Applicant Information**

### **1. Applicant**

Name (last, first, middle initial): Gobush, Kathleen S.

Title: Research Ecologist

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

Shawn Farry

#### **2. Mailing address (street/P.O. box, city, state, country, zip):**

Monk Seal Research Program

[REDACTED]

Phone: [REDACTED]

Fax: [REDACTED]

Email: [REDACTED]

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

#### **3. Affiliation (institution/agency/organization directly related to the proposed project):**

NOAA, NMFS

Pacific Islands Fisheries Science Center (PIFSC)

Protected Species Division (PSD)

#### **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):**

Shawn Farry, PIFSC Contractor; [REDACTED]

Mark Sullivan, PIFSC Contractor; [REDACTED]

TBA



**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 checked="" type="checkbox"/> Land-based	<input checked="" type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Gardner Pinnacles	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Maro Reef			
<input type="checkbox"/> Laysan Island	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Lisianski Island, Neva Shoal	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Pearl and Hermes Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Midway Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Kure Atoll	<input type="checkbox"/> Land-based	<input type="checkbox"/> Shallow water	<input type="checkbox"/> Deep water
<input type="checkbox"/> Other			

**Ocean Based**

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

Location Description:

Vicinity of Trig and Gin Islands and/or other islets within FFS where predatory Galapagos shark activity is detected

**5b. Check all applicable regulated activities proposed to be conducted in the Monument:**

- Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource
- Drilling into, dredging, or otherwise altering the submerged lands other than by anchoring a vessel; or constructing, placing, or abandoning any structure, material, or other matter on the submerged lands
- Anchoring a vessel
- Deserting a vessel aground, at anchor, or adrift
- Discharging or depositing any material or matter into the Monument
- Touching coral, living or dead
- Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
- Attracting any living Monument resource
- Sustenance fishing (Federal waters only, outside of Special Preservation Areas, Ecological Reserves and Special Management Areas)
- Subsistence fishing (State waters only)
- Swimming, snorkeling, or closed or open circuit SCUBA diving within any Special Preservation Area or Midway Atoll Special Management Area

**6 Purpose/Need/Scope *State purpose of proposed activities:***

In an effort to safeguard this endangered species that is endemic to the Hawaiian Islands, we propose to limit the number of pup-preying Galapagos sharks by lethally removing those observed to be in the vicinity of monk seal pupping sites. The Papahānaumokuākea National Monument is home to approximately 94% of the entire population of Hawaiian monk seals (Carretta et al. 2006). The most populous monk seal subpopulation and the one suffering the severest decline is at French Frigate Shoals. In contrast, Galapagos sharks are a wide-ranging, globally abundant species. Near shore pup-preying behavior is believed to be unusual for this species, thus we intend to detect and remove few individuals. Deterrent deployment and translocation of weaned pups will be conducted concurrently with removals in order to decrease the attractiveness of pupping sites. To date, such activities alone have not adequately prevented predation, thus, suggesting the need for removals. Past removal efforts have been met with limited success, thus suggesting the need to implement numerous methods of removal in order to accomplish this objective.

**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 activity can be conducted with adequate safeguards for the resources and ecological integrity of the Monument as exemplified by Protected Species Division and the Hawaiian Monk Seal Research Program's longstanding record in conducting research and managing protected species while facilitating the mission of the Monument. The HMSRP has assessed monk seal subpopulations in the NWHI annually since 1982. HMSRP has been monitoring shark predation on pups since 1997 and has conducted shark removals since 2000 (total of 12 Galapagos sharks removed from 2000-2006). Through these investigations, HMSRP has acquired shark removal experience while also demonstrating sensitivity to all other Monument resources and procedures. We seek to improve on this experience this year through direct training with shark ecologists in shark fishing and handling techniques in O'ahu. Possible adverse effects on the coral reef ecosystem at FFS from shark removals were investigated using the EcoSim model (Parrish unpublished data 2005). Results from that work indicated that the removal of 20 sharks (the initial number permitted in the 2002 EA prepared to address possible effects of shark removals) had a nearly imperceptible effect on the dynamics of the ecosystem. Expert opinion at our shark predation workshops supported these modeled results.

To safeguard the cultural resources of the Monument, HMSRP staff will attend a Hawaiian Cultural Briefing each year before entering the Monument waters. This education instills the awareness of the natural, cultural, and historical values the Monument holds. Also, the NOAA vessels have informative cultural literature provided by the Office of Hawaiian Affairs (OHA)

and the Monument for personnel seeking further knowledge or who may not be able to attend the briefings.

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? Shark removals will 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 resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects. The Hawaiian monk seal is integral to the Monument's biodiversity and trophic structuring. Accordingly, activities that contribute to the monk seals recovery are compatible with the objectives set forth in the Proclamation. Effects from the removal of a limited number of the abundant Galapagos shark will be ephemeral and are not likely to have a serious impact on ecosystem functioning. In contrast, failure to mitigate for the high predation rate will have a major influence on the likelihood of monk seal recovery at FFS.

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. In terms of alternative locations, there are no practicable alternatives to conducting shark removals in the Monument. This proposed activity can only occur within the Monument because we seek to mitigate this specific source of mortality for this specific subpopulation of monk seals in order to facilitate its population growth and recovery.

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 positive outcomes from enhanced monk seal recovery potential outweigh any adverse impacts associated with the loss of a limited number of Galapagos sharks. The declining monk seal population at FFS is at crisis-levels and projected to continually worsen given the low survivorship of females to weaning and beyond; activities that manage and mitigate this decline are currently necessary if preservation of the species at this atoll into the future is a goal. We do not believe that other, secondary, impacts are likely to result from the removal because Galapagos sharks and other apex predators are relatively abundant compared to monk seals (see also section 7a above).

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose. The activity is scheduled to coincide with the primary pupping season, but will not commence until and unless shark predation becomes evident. Historically, predation has commenced in June and continued through the beginning of August. The extended duration (through September), is a contingency in case shark predation persists later than usual, and also takes advantage of planned NOAA cruise schedules for transport of personnel.

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

The HMSRP at PIFSC has conducted field assessments of monk seals in the NWHI annually since 1982, and is recognized as being central to Hawaiian monk seal research. HMSRP has been engaged in shark monitoring and shark removals at FFS since 1998 and 2000, respectively. HMSRP has individuals on-staff with experience and advanced expertise in shark fishing methods, gear selection, and relevant technology to minimize the risk of by-catch or other adverse effects from the proposed operation. We seek to improve on this experience this year through direct training with shark ecologists in shark fishing and handling techniques in O'ahu. We also have consulted with stakeholders on the issue at two recent workshops (January 8-9, 2008 and November 5-6, 2008), and will continue to consult, with other individuals, both in the scientific and private communities, having expertise in shark fishing methods. These consultations will continue to include Native Hawaiian cultural practitioners familiar with traditional fishing methods

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. The HMSRP has annually received funding adequate to perform the activity, and anticipates that 2009 funding levels will continue to suffice. If additional funds are required to mitigate any unexpected impact, resources would be available from PIFSC or NMFS Office of Protected Resources.

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.

Removing a limited number of Galapagos sharks to mitigate this source of seal mortality likely facilitates the maintenance of biodiversity at this atoll overall. Maintaining biodiversity is essential to the ecological and cultural integrity of the Monument and the Hawaiian monk seal, as an endangered genus, holds a prominent place among this biodiversity. Monk seals are at risk of going extinct at FFS, in part driven by some number of Galapagos sharks that prey on pups. It is regrettable to consider removing a limited number of sharks permanently; as an apex predator and biodiversity component they are also a valuable part of the system. However, the removal of a high percentage of pre-weaned pups by shark predation year after year is unsustainable.. On balance, the loss of 15 Galapagos sharks in order to reduce the loss of approximately 20% of the monk seal annual cohort are appropriate to retain the greatest diversity of the Monument's wildlife resources into the future. Our removal methods have been designed to have a minimal impact on the physical environment and the other species that utilize it . The gear we propose to use, timing and location of fishing and the total number of sharks we propose to remove allow for minimal bycatch and minimal shark taken to achieve our objective of protecting the maximum number of pups. Furthermore, given our objectives, our methods aim to be as culturally cognizant and sensitive as possible; please see reference to Native Hawaiian Practices and Participation in our methods section below.

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 R/V Oscar Elton Sette has been so equipped.

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 a permit for the activity inappropriate. This project is a renewal of a previous project which underwent extensive review in-house, by members of the Monk Seal Recovery Team, by the USFWS, and, in 2006, by the State of Hawaii.

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

This project encompasses two main components: shark monitoring and shark removals.

### **A. Shark Monitoring**

Observation via systematic surveys from a tower, the ground, patrolling small boats and/or remote cameras will be the primary methods of monitoring shark presence and movement patterns at two main pupping sites with historically high shark incidence. As described in the previous permit applications, the tower is a 9-foot structure made of scaffolding that will be erected on Trig, located approximately 40 meters from the south end of the island. The geography and land mass of other pupping sites prohibits observation tower installation because of the relatively large footprint and little available land mass; therefore, surveys will be conducted from the ground or small patrolling boat at these sites. The installation of a remote camera recording system(s) will allow shark observation during days and times when HMSRP staff are not present. We will also be observing shark activity via remote cameras, pending consideration of this method under the manager's permit. Such recordings will be viewed on a regular basis (at least every 2-3 days, if not during the time of recording) from a receiver on Tern Island.

For all surveys, shark sighting/attack data, including identifying characteristics and behaviors, will be recorded on a standardized data form. Worksheets used in 2001-2003 tower observation and an International Shark Attack File questionnaire created by the Elasmobranch Society form the basis of this standardized data form.

### **B. Shark Fishing/Removals**

#### **1. Fishing personnel:**

A crew of 2-3 staff experienced in safe and effective methods for shark fishing/removal will be tasked with conducting boat surveys and fishing/removing Galapagos sharks that they encounter in the vicinity of pupping sites (location depending on conditions required for fishing technique used, see descriptions below). Boat surveys will occur during daylight hours at select times/days around each main pupping site on a regular basis throughout the field season. Additionally, if

campers sight a shark from shore of a pupping site (ground or tower) they will alert the fishing crew, who will commence fishing at that time. If the fishing crew deems a removal personally unsafe or unfeasible, they will attempt to harass the shark away from shore by throwing coral and/or herding the shark into deeper water.

2. Location:

Shark fishing and removals will be conducted primarily at those locations previously identified or suspected of having the greatest likelihood of catching predatory Galapagos sharks. Probable sites include: reef channels surrounding Trig Island; channels between Tern and Trig Island; and nearshore waters surrounding Round Island. Similar sites may be identified in the vicinity of the Gins or other less frequently used pupping sites.

3. Shark monitoring during fishing operations:

When the fishing crew is surveying, all shark activity will be recorded using a standardized data form, which includes the notation of shark response to all attempts to fish, harass or herd.

4. Gear and Fishing Method:

In attempting to remove predatory sharks, our ability to observe active predators near the pupping sites is limited by their wariness to humans. This wariness has been paramount in reducing the efficacy of traditional fishing methods conducted from shore. Although 12 sharks were removed historically by hook-and-line fishing or harpoon (2000-2006), our fishing effort (number of hook hours) was low (ranged from 10-30 hours) and efficiency (removals per effort hours) progressively deteriorated throughout that period. Therefore, we seek the maximum number of options to safely and humanely remove a limited number of Galapagos sharks, including a fishing option that allows us attendance/viewing from a distance.

Historically, sighting Galapagos sharks is rare; in recent years, the maximum number of Galapagos sharks observed together during one predatory bout has been four individuals. Furthermore, HIMB researchers have estimated the CPU of Galapagos sharks within the atoll to be an order of magnitude lower than in deeper water outside of the atoll (0.15 CPU within the atoll). Together, these findings suggest a low density of Galapagos sharks within the atoll. Thus, if we employ more than one fishing method at a time, we expect that the total number of removals will be low. However, we plan to monitor the total number of baited hooks deployed across methods simultaneously in order to remain within initial catch quotas, minimize bycatch and minimize accumulated shark attractant in order to balance the desire to catch a limited number of sharks and maintain a safe environment for other wildlife.

Also, historically, Galapagos sharks have demonstrated a wariness to humans and possibly their boats; for example, we take advantage of this wariness in our deterrent protocol by having staff camp at pupping sites and deploy deterrents that function as human "proxies", such as a moored boat. Therefore, in addition to the traditional hook and line technique, we propose to use a modified 5-hook bottomset, drumline and/or trolling with a lure. These fishing methods are very

similar to those intended for use for shark-tagging operations by HIMB at FFS this year. Additionally, a spear gun or harpoon gun will be used at necessary to catch sharks from the shoreline if observed close to land (as has occurred in the past) for euthanasia.

For the hook and line technique, a line will be baited (with shark, tuna, mackerel) from shore or from a small boat in water in the approximate area where a Galapagos shark has approached the pupping site. Once a shark has been targeted for removal, the line will be baited. Bait soak time will be limited to one hour following the last sighting of a targeted shark to reduce the possibility of attracting additional sharks to the area. Currents will be noted, and the bait will be placed in an area that will avoid excessive risk of scent emanating from the bait to attract other sharks or put seals at additional risk. We will tend the gear to ensure that only Galapagos sharks are taken hooked. No personnel will enter the water during culling activities. Bycatch will likely be zero because the baited hook is observed at all times and removed from the water if a non-target species approaches it.

As an alternative to hooking, a spear gun or hand-held harpoon may be used from shore or small boat when a shark is observed to be very close to the shoreline, as has occurred in the past. A barbed shaft, shot from a spear gun or delivered by hand, will be attached to wire cable and connecting line that will be used to retrieve sharks to the beach for euthanasia. Alternatively, a small caliber (.223) charged harpoon gun with a detachable barbed harpoon head tethered to a line may be used to capture and then haul the shark to the beach for euthanasia.

The trolling method involves trailing a parachute line, that has a bungie cord, chain trace and/or wire leader and artificial lure attached from a small boat driving at slow speeds of approximately 5-7 knots per hour. It is expected that the most likely bycatch is ulua (*Caranx ignobilis*), though the species is not typically known to be attracted to artificial lures. If non-target fish are captured by trolling, they will be immediately released and if by-catch becomes more than occasional then trolling will cease in that area. Trolling will not occur in areas where seals are observed to be swimming.

The bottomset method described here represents our best assessment of the most appropriate technology for catching Galapagos sharks while allowing for humans to be remote from, but in visual contact with, the gear. This method may be refined or modified pending input and recommendations from other individuals. Any significant modifications (other than minor gear adjustments) will be submitted for approval prior to implementation. A weighted long line about 100 feet long will be placed on the seabed where there are openings in the reef adjacent to Trig or Gin Islands <60 ft in depth. The bottom gear used for this project will be a heavier gauge than pelagic gear, and will consist of a heavy monofilament mainline with lighter weight monofilament ganglions attached about 10 feet apart. A flexible 1/16" wire rope will be used as a short leader above each heavy gauge hook (the largest commercially available circle hooks) when fishing for sharks. The weighted monofilament long line will consist of up to 5 hooks baited with small tunas or mackerel. Because we will cease activity for evaluation after 5 sharks are caught (see item 10. below), no more than 5 hooks will be deployed at any time. Moreover, the number of hooks will be reduced as sharks are caught, to ensure we do not inadvertently catch more than we are authorized. If a monofilament bottom line proves to cause problems

with, e.g. drifting into coral structured areas, causing chafing or wear on the line or damage to coral, we may switch the bottom line from monofilament to another material, such as polypropylene, bloodline (a thin braided line made of synthetic line, commonly used in bottom fishing), or tarred OPI nylon mainline to alleviate the problem. The bottomset will be in 100% attendance at all times (in view of the fishing crew).

The gear will be deployed and retrieved by hand from a small boat, and with short soak times of a maximum of 3 hours (in the daytime only) and will be checked when hooking is evident by observation of the attached marker device. The marker device will consist of a buoy with a flag to designate each end of the gear and will be connected to the monofilament mainline using a ½” diameter polypropylene buoy line. A brummel hook or similar type snap-on hook will be used to connect the buoy to each terminal end of the gear and then anchored to the seabed with a mushroom type anchor or other anchoring device depending on the type of seafloor substrate. We plan to deploy and anchor on sand or coral rubble bottom, avoiding live coral areas. Measures to prevent seal and turtle entanglement in the buoy line will include shielding of the buoy line with segments of PVC pipe, or modification of the shape of the float buoy to add a rubber, tapered extension, a recent development to prevent cetacean and pinniped entanglement in float buoys. Any entanglement or injury of a monk seal or sea turtle by the equipment will result in immediate cessation of fishing, pending review of methodology.

Another optional method of fishing will be single hooks/rigs utilizing a ‘drum line’. A drum line uses an air or foam-filled drum, or large buoy, with a chain trace attached to it and single baited circle hook, size 14/0 to 20/0, shackled to the other end of the chain trace. The hook is suspended approximately 10 feet above the sea floor. A ground line is also shackled to the drum with a swivel and then attached to a Danforth or CQR anchor and anchored to the bottom substrate. A scope of 3-4 times the water depth will be used. Precautions to prevent entanglement will be identical to those described above for the bottom set method, i.e. either stiff plastic tubing or segments of PVC covering the polypropylene buoy line, or a funnel/trombone shaped modification to base of the float. The total number of rigs used will not exceed either the combined balance of five (across all methods deployed at a single time) or the number of sharks remaining on the permit, whichever is fewer. The locations of sets will be primarily in the sandy channels in the vicinity of Trig Island, although sets in other sand bottom locations may also occur where shark predation is evident, such as Round Island or the Gins. This method may be used in addition to the bottom set method described above.

#### 5. Post-catch procedures:

When a shark is hooked, it will be brought to shore or side of the small boat and euthanized with a .44 caliber bang stick. Fishing gear will be pulled and not redeployed until after necropsy is complete. The carcass will be taken to Tern Island for necropsy, which will be conducted in a location where blood and other remains will not enter the water. The necropsy and shark disposal protocol will be conducted under the advice of the Hawaiian practitioner (on site or by prior consultation) to ensure sensitivity to native Hawaiian cultural practices. Teeth and ventral (belly) skin will be retained from each carcass for cultural use if requested in advance. After all samples and data have been collected, shark carcasses will be discarded at the closest deep water location outside French Frigate Shoals.

6. Native Hawaiian Practices and Participation:

Hawaiian cultural protocols, based on extensive practitioner input, will be included in all shark removal efforts. NMFS has conducted numerous group and individual meetings with Native Hawaiian cultural practitioners and advisers to incorporate appropriate actions into proposed activities and to ensure that shark removal and disposal of the remains are in keeping with Hawaiian cultural practices. Ongoing consultation with Hawaiian practitioners will advise fishing personnel on traditional fishing techniques, along with the feasibility for an on-site practitioner to conduct activities, including the collection of shark parts for cultural use (remains to be determined).

7. Capture effort and post-removal reports:

As agreed upon by FWS and NMFS (August 18, 2001), information concerning the removal of each shark will include environmental conditions at the time of removal, criteria used to determine the shark targeted for removal, identifying tags and physical features of the shark removed, history of previous shark sightings, removal methodology, and method of euthanasia. Information collected from each shark carcass will include morphometric measurements, genetic samples, stomach contents, vertebrae and reproductive status. Tissue samples from sharks will be analyzed to quantify compounds of potential concern at acceptable detection limits to include total metals, polychlorinated biphenyls, organochlorine pesticides, percent lipid and moisture, and fatty acid analysis and vertebrae analysis for possible detection of monk seal consumption. Teeth and ventral (belly) skin will be retained and made available for cultural purposes.

8. Shark activity summaries:

Throughout the season, periodic shark activity updates will be submitted for agency review that summarize the data recorded on the standardized shark sighting/attack data forms, with the addition of:

- Number of pups born and currently present at each islet
- Date and location of shark related pup injuries, deaths and disappearances
- Date, time and method of removal for each shark collected
- Biological data collected from all sharks removed
- Any other information pertinent to the ongoing evaluation of this project

9. Number of sharks:

This application requests lethal take of up to 15 Galapagos sharks. Additional removals may be requested if continued mitigation is considered necessary. Galapagos sharks will be removed in increments of five using the techniques described above. After the removal of the fifth Galapagos shark, a field report of research activities and removal efforts will be provided to a joint USFWS/NMFS review panel to determine if the culling activity should cease. The review panel will be given up to two days to review the information and make a determination. The decision to continue removing sharks will be based on an evaluation of the possible impacts to other wildlife (e.g., turtles), compliance with the terms of the permit, and the report of activities supplied by field personnel.

10. Non-target species: Any species other than Galapagos sharks which are caught as part of this project will be released immediately. These may include tiger sharks, reef sharks, or other top predators such as ulua. We anticipate that by catch will be minimal, as the hooks should be too large to catch small reef sharks or ulua, and will be small enough to be bent (straightened) by large tiger sharks. Moreover, circle hooks which will be used are less prone to accidentally snag non-target animals. Nonetheless, USFWS Refuge personnel will be immediately notified if any non-targeted species die during fishing. Fishing will be terminated if excessive by catch becomes a problem.

11. Evaluation: The goal of the project is a reduction in shark-related pup mortality at French Frigate Shoals. We will consider the activity to have been successful if such pup mortality drops from 2008 levels, or if known predatory sharks are removed from the system.

**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:  
Galapagos shark

Scientific name:  
Carcharhinus galapagensis

# & size of specimens:  
15/ adult

Collection location:  
French Frigate Shoals, inside the atoll, near pupping islets

Whole Organism  Partial Organism

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

Necropsy conducted, samples retained, tissues/teeth provide to cultural practioners if requested

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

• General site/location for collections:  
inside the FFS atoll at pupping sites

• 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?  
No

• Will organisms be released?  
No

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

Deep freeze on OES

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

This work is part of a collaborative effort with HIMB to understand and mitigate shark predation on monk seal pups; shark presence/ movement/ attack data and shark necropsy and tissue samples will be shared with HIMB shark ecologists as requested.

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

Fishing and dispatching gear: 9/16 x 600 'blue steel poly line, 100' long line type tarred cotton line, gaffs, meter caliper, leads, gloves , crimpers , cutters , hooks, knives, bolt cutter , buoys w/ anchor rode and anchor ., chain traces, danforth anchors, SS wire, 3/0 interlock snap swivel, 100 yd coil #18 bloodline, assorted mustad hooks (10/0 - 20/0), bangstick, ammunition (44 magnum cartridges Remington), hand-held harpoon gun, hand-held spear gun, trolling line, artificial lure

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

As listed on the Manager's permit: chemicals related to necropsy and tissue preservation (formalin, DMSO and/or ethyl alcohol for genetics and fatty acid analysis), also bangstick ammunition (.44 caliber magnum cartridges)

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

none

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

Data analysis and write up: Decemeber 1, 2009

Fatty acid and vertebrae analysis: TBD- will be sent out for analysis

Necropsies- immediately upon death

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

NMFS. 2008. Shark Predation on Hawaiian Monk Seals: Minutes of the Workshop Sponsored by the Pacific Island Fisheries Science Center and the Pacific Islands Regional Office. Prep. By Harting Biological Consulting, Bozeman, Montana for U.S. Department of Commerce, Pacific Islands Fisheries Science Center, Honolulu, HI. 66 pp.

Harting, A., G. Antonelis, B. Becker, S.M. Canja, D. Luers, and A. Dietrich. In Prep. Galapagos Sharks and Hawaiian Monk Seals: A Conservation Conundrum. Pacific Islands Fisheries Science Center, Honolulu, HI

Hawn, D. 2000. Galapagos shark (*Carcharhinus galapagensis*) removal and shark sighting observations at Trig Island, French Frigate Shoals during the 2000 Hawaiian monk seal field season. Prep. for Natl. Marine Fish. Serv, SW Fish. Sci. Center, Honolulu Laboratory. Contract Order 40JJNF000208. 25 pp.

Hayes, S. 2002. Galapagos shark predation of monk seal pups at Trig Island, FFS 2001. Unpublished report Prep. by U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Honolulu, HI. 22 pp.

NMFS, 2002. Environmental assessment for the proposed experimental shark removal to enhance preweaned monk seal pup survival at Trig Island, French Frigate Shoals, Hawaiian Islands National Wildlife Refuge. Prep. by U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Honolulu, HI. 46 pp.

NMFS. 2003. Shark predation at Trig Island, 2002. Prep. by U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Honolulu, HI. 38 pp.

NMFS 2004. Shark predation at French Frigate Shoals, 2003. Prep. by U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Pacific Islands Fisheries Science Center, Honolulu, HI. 56 pp.

NMFS 2005. Shark Predation at French Frigate Shoals, 2004. Prep. by U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Pacific Islands Fisheries Science Center, Honolulu, HI. 36 pp.

Peschon, J.D. 2002. 2002 Trig Island shark project report. Prep. under contract for U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Honolulu, HI.

Peschon, J., D. Luers, B. Becker, and M. Niemeyer. 2003. 2003 French Frigate Shoals shark predation project report. Prep. under contract for U.S. Dep. Of Commerce, Natl. Oceanic and Atmos. Admin, Natl. Marine Fish. Service, Honolulu, HI.

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

**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