

**Papahānaumokuākea Marine National Monument**  
CONSERVATION AND MANAGEMENT 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:** Frank Parrish, PhD and Alecia Van Atta

**Affiliation:** NOAA-NMFS-PIFSC/PIRO

**Permit Category:** Conservation and Management

**Proposed Activity Dates:** Renewal permit application to conduct same work as in 2010 for April 10, 2011- September 30, 2011

**Proposed Method of Entry (Vessel/Plane):** NOAA vessels- Oscar Elton Sette (April deployment), and possibly NOAA vessel Hi'ialikai, chartered vessel Kahana, chartered vessel Searcher, chartered flight via FWS, Air Pacific cargo (for August or September pick up and possibly resupply)

**Proposed Locations:** French Frigate Shoals

**Estimated number of individuals (including Applicant) to be covered under this permit:** 10

**Estimated number of days in the Monument:** 173 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 sharks from these areas. The proposed activity would support the recovery of the Papahānaumokuākea Marine National Monument's endangered Hawaiian monk seals by reducing the likelihood of shark predation on seal pups at French Frigate Shoals. This activity, when combined with other conservation efforts, would help address the problem of low juvenile seal survival, a factor identified as one of the main causes of Hawaiian monk seal population decline in the Monument.

b.) To accomplish this activity we would ....  
Monitor shark presence around pupping sites by observation from the ground, an observation tower, remote cameras and/or patrolling near shore waters from a small boat (remote camera installation is permitted separately). Sharks observed in patrolling or predatory behavior would then be caught by the following methods approved for use this applicant at this location in the past (e.g. 2009): 1) hand line, 2) hand-held harpoon, 3) drum-line, and/or 4) small 5-hook

bottomset that was used by C. Meyer at FFS in 2009 and 5) the "Net Surprise". For all methods, hooked or netted sharks will be pulled into shore or along side a small boat, tail-rope and killed with a bang stick. Shark carcasses will be examined and desired remains retained to fulfill Native Hawaiian practices and to conduct scientific analyses; thereafter, remains will be retained for bait or disposed of at deepwater locations outside of the atoll.

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

Conducting activities identified in the Papahānaumokuākea Marine National Monument Management Plan (December 2008, hereinafter referred to as MMP) Priority Management Needs: 3.2 Conserving Wildlife (Hawaiian monk seals), and 3.3 Reducing Threats (predation) to Monument Resources (Hawaiian monk seals), as well as the Co-Trustee's Conservation & Management Activity: Natural Resource Protection, as listed in section 6.3 of that Monument permit application.

The Co-Trustees, including NOAA, aim to accomplish natural resource protection by conducting "...management actions to promote the conservation of Monument resources which includes activities necessary to carry out protection of species, such as carrying out existing recovery plans" to fulfill our obligations under the Endangered Species Act (MMP page 11). The activity of removing Monument wildlife (aggressive male monk seals) that threatens a Monument natural resource (monk seal pups) is listed in that permit application. However, the activity of removing sharks is not, thus, the origination of this permit application.

In this application, we propose to monitor shark activity and remove sharks as a means of managing the threat of shark predation and thereby protecting Hawaiian monk seal pups, and thereby increasing the chances these pups will grow to adults and reproduce. Increased survival of pups is necessary to the species recovery. Monitoring shark activity and removing sharks are both listed in the Hawaiian Monk Seal Recovery Plan (NMFS 2007) as necessary activities, critical to the species' recovery.

**Other information or background:**

A comprehensive 100-page Technical Memorandum titled "Shark Predation on Hawaiian Monk Seals II" details the lengthy history of shark predation of monk seal pups at French Frigate Shoals, predation mitigation and research activities undertaken to date, as well as a summary of the proceedings of a workshop conducted in November 2008 with various stakeholders (including the Monument, USFWS, State of Hawaii DLNR and leading shark experts) (Gobush 2010). This memorandum serves as a reference of the information, background and best-available science to date on the issue. To avoid an overly lengthy Conservation & Management application here, the Executive Summary of the memorandum is included below. A summary of the 2009 and 2010 field season's findings follows.

EXECUTIVE SUMMARY

The technical memorandum is divided into three sections. Section 1 summarizes the proceedings of the second workshop on Shark Predation on Hawaiian Monk Seals sponsored by the Hawaiian

Monk Seal Research Program (HMSRP) of the Pacific Island Fisheries Science Center (PIFSC) and also the Pacific Islands Regional Office (PIRO) of the National Marine Fisheries Service (NMFS). Section 2 reviews knowledge to date about shark predation on pre-weaned and newly weaned monk seals pups (*Monachus schauinslandi*) and NMFS' mitigation attempts at French Frigate Shoals (FFS) and elsewhere in the Northwestern Hawaiian Islands (NWHI), and provides a more comprehensive picture of the issues than time-permitted at the workshop. Section 3 summarizes HMSRP's premises about the nature of shark predation based on peer-reviewed science, inferences, expert opinions and field experience. HMSRP's positions on controversial aspects of the issue are stated and a number of appendices are included that detail plans to be executed in 2009 and mitigation ideas for the future.

## Workshop II

Workshop II was held on November 5-6, 2008 in Honolulu, Hawaii. Representatives from the NMFS-PIFSC, NMFS-PIRO, Papahānaumokuākea Marine National Monument (the Monument), US Fish and Wildlife Service (USFWS), State of Hawaii Department Land and Natural Resources (DLNR), Marine Mammal Commission (MMC), and Hawaiian Monk Seal Recovery Team participated. The primary goal of this workshop was to exchange ideas and opinions from different management and scientific perspectives about the predation problem and suggest a logical course of action. Presentations describing the endangered status of the Hawaiian monk seal, the shark predation problem at FFS, and the first workshop on the issue set the stage for the second workshop's discussions. Hawaiian Institute of Marine Biology (HIMB) scientists reviewed past shark research in FFS, reported the results of their 2008 research efforts, and presented their research plan for 2009 aimed at gathering fine-scale movement data on sharks. HMSRP described 2008 mitigations activities and mitigation strategies for the future. The 2008 mitigation strategy focused solely on the application of a suite of deterrents and devices around Trig Island and translocation of weaned pups to "safe" islets, although lethal removal of select sharks had also received support at the Workshop I.

Outcomes of Workshop II included an evaluation of past research efforts, development of definitive statements about the predation problem agreed upon by all workshop participants, identification of knowledge gaps, and a prioritized list of suggested actions for upcoming field seasons. Workshop participants encouraged improved deterrent design, improved and informed removal of sharks displaying predatory behavior, and a need for analyses on past data and the collection of additional data on seal and shark behavior. Ideas, such as the use of barriers to keep sharks away from near shore areas and sonic tagging pups, were discussed and their development recommended.

## Knowledge to Date About the Shark Predation at FFS and its Mitigation

The genus *Monachus* is in crisis; with just two extant representative species, the Hawaiian monk seal offers the best chance of its persistence. However the Hawaiian monk seal population itself is heading towards extinction. Numerous threats afflict the species across its range. Shark predation on pre-weaned and newly weaned pups contributes to a unique and extreme situation at FFS that peaked in 1997-1999 and stands out from the trends observed at other sites in the

NWHI. Since then, predation has declined to 6-11 pups a year, an unsustainable rate due to falling birth rates. Galapagos sharks (*Carcharhinus galapagensis*) and tiger sharks (*Galeocerdo cuvier*) both potentially feed on marine mammals; however, HMSRP has only observed Galapagos sharks attacking and killing pups in near shore water. Mitigation activities by HMSRP conducted over the last decade include harassment of sharks, intensive observation, translocation of weaned pups, deployment of devices to deter predation and shark removal (see 2009 findings at the end of this Executive Summary below).

### HMSRP Premises, Positions and Post-workshop Developments

HMSRP has developed premises about the identity and number of sharks likely involved, shark wariness to human activity, and opinions about shark culling based on peer-reviewed science, inference, expert opinion and ample experience with the situation at FFS. Post-workshop, HMSRP systematically compared all mitigation actions proposed, detailing the potential benefits and drawbacks based on its premises, positions, Workshop recommendations and stakeholders' perspectives. A 2009 field plan was created that included: 1) logistical and financial support for HIMB shark scientists to conduct shark tagging studies at FFS, 2) the systematic application and comparison of 3 treatments (human presence, deterrents and a control) at 2 pupping sites, 3) the design and installation of a custom-made remote surveillance camera system on 1 pupping site, and 4) additional behavioral monitoring of sharks and seals.

### Summary of 2009 Findings

In 2009, 34 monk seal pups were born, 20 weaned and 8 were lost to shark predation at FFS (NMFS, unpublished data). On Trig islet, Galapagos shark predatory activity was observed on 13 occasions during 28 camping days; additional attacks were recorded via remote camera. Shark predatory activity at Trig resulted in 6 incidents: 5 confirmed attacks on 5 pups (as evidenced by direct observation and presence of 1-6 shark-inflicted wounds on each pup), and 1 shark-induced mortality of a pup (i.e. the otherwise healthy pup's suspicious disappearance met our conservative criteria for shark-inferred mortality, see Appendix C of Technical Memorandum).

The incidence of shark predation was compared across three experimental treatments capitalizing on an apparent wariness of sharks experienced in the past. Treatments included 24-hour human presence, visual and auditory devices aimed to deter shark activity, and a control (no humans, no deterrents) at two pupping sites. Through the systematic application of these treatments, no significant difference in shark incidents existed across treatments (Trig only- Pearson's Chi square 3.5,  $p=0.17$ , 94 days; Trig & Gin- Pearson's Chi square 2.5,  $p=0.28$ , 140 days). The pattern of shark incidents appeared to be independent of device/deterrent placement at Trig. For example, a 36-day period with no shark incidents occurred in 2008 with the maximal deterrent effort and a 41-day period with no shark incidents occurred in 2009 with alternating deterrent effort. The number of pups attacked at Trig Island differed little when compared over the 3 years. In 2007, a year with no devices, 5 (27.8%) pups were attacked. In 2008, a year with devices for most of the season (until they failed to operate), 4 (25%) pups were attacked. In 2009, a year with devices for part of season (i.e. devices were deployed during the 'device

treatment', totaling 28 days), 6 (31.3%) pups were attacked. Sharks were sighted on 10 of 35 days during the human presence treatment at Trig and Gin islets, demonstrating that sharks' wariness to humans is variable, unpredictable, possibly individualistic and unreliable at these locations. The hypothesis that a lower percentage of pups born will succumb to shark predation when devices/deterrents are deployed compared to previous years was not supported. The hypothesis that fewer shark incidents will occur when humans are present or devices are deployed versus control periods was also not supported.

A pup behavioral study was conducted in 2009; 132 hours of scan sampling observations (on a 15-minute interval, totaling 528 scans) were recorded, primarily of mother-pup nocturnal activity (between 1800 to 1000 hours). A preliminary review of the data indicates that 14% of the time (75 occasions/scans), pups was in the water; 84% of these water entries were into the wave wash, the area where the water laps the shore. While in the water (wave wash or farther), pups were with their mothers 100% of the time and on 97.3% of those occasions/scans they were within 1 meter of her (for 2.7% of the occasions/scans they were within 2 meters of her). The maximum distance a seal pup ventured into the water was 50 meters from shore at Gin (1 occasion/scan) and 20 meters from shore at Trig (3 occasions/scans). These findings support the idea that seal pups enter the water infrequently at night and primarily do so to thermoregulate in the company of their mothers rather than to swim far into the ocean alone.

HMSRP logistically and financially supported a Galapagos and tiger shark tagging study conducted by Carl Meyer, PhD. of HIMB. Across the pupping season (May-August), 189 5 to 10-hook bottomsets were made; totaling 1570 hooks and 6850 soak hours. These bottomsets used large tuna heads and shark tissue as bait. Bycatch was minimal and limited to elasmobranch species. In total 68 Galapagos and 40 tiger sharks were tagged with sonic tags; additional individuals were tagged with spaghetti tags. Four Galapagos sharks were tagged near islets with monk seal pups (5.9% of the sampled population captured in a stratified fishing scheme that attempted to evenly fish across shallow and deep lagoonal areas and deep areas outside the breaking reef at FFS). HMSRP's human observations and video recordings and Meyer's tagging success support the hypothesis that a small subset of Galapagos sharks is primarily responsible for the predation of pups.

This tagging research represents the greatest effort in terms of time devoted to and catch success of sampling the shark population FFS to date (aside from commercial fishing in 1999). None of these tagged Galapagos sharks were present at Trig island during the video recordings of Galapagos shark attacks on pups or during the night the one pup disappeared that was inferred to be shark-caused at this location in 2009. Together these findings suggest that 1) using a small bottomset is a very effective way of capturing sharks and avoiding bycatch; 2) very few sharks utilize the shallow waters around the pupping sites; 3) catching sharks that are likely to prey on pups requires nearshore fishing (i.e. setting gear closer to the islets than what Carl Meyer's crew accomplished). However, it should be noted that a minimum depth and sandy substrate conditions are required to employ the 5-10 bottomset fishing method.

Summary of 2010 Activities

In 2010, 36 monk seal pups were born, 17 weaned and successfully survived and 8 were lost to shark predation at FFS (2 pups died from other causes or are still nursing as of August 23, 2010) (NMFS, unpublished data). On Trig islet, Galapagos shark predatory activity was observed on 2 occasions during onsite monitoring by staff and/or recorded with the remote video camera. To increase the chance of observing sharks, staff camped on Trig as much as was feasible; however shark sightings remained rare, especially after an incident on 7/9/2010 (the last incident at Trig) and the removal of a Galapagos shark at Trig on 7/13/10 (see description below). Shark predatory activity at Trig resulted in 4 incidents between 6/10/10 and 7/9/10: 3 confirmed lethal attacks on pups (as evidenced by direct observation and presence of shark-inflicted wounds on each pup), and 1 shark-induced mortality of a pup (i.e. the otherwise healthy pup's suspicious disappearance met our conservative criteria for shark-inferred mortality, see Appendix C of Technical Memorandum. In this case, an 8-foot Galapagos shark was observed swimming in the area near the searching mother seal). At the Gins, 4 pups also met the same criteria for shark-induced mortality between the dates of 7/2/10 and 8/10/10.

Two shark fishers were hired to fulfill the objectives of the PNMM permit granted in June 2010. These two staff and 3 invited members of the Native Hawaiian community deployed on a chartered vessel, the Kahana, bound for FFS; the cruise dates were from July 5 through July 11, 2010. The vessel's course was based on the suggestions by the members of the Native Hawaiian community, which included timed arrival at select islands. The course included a visit to Ka'ula rock to perform the Mano i'a Harvest Ceremony at approximately noontime on July 6, with the ship stationed off a cave on the northwest side of the rock. Hawaiian greetings were chanted from the vessel during two morning circumnavigations around Nihoa Island, as well as at Mokumanamana during the night as the ship passed by en route to Tern Island, FFS. The stay at Tern Island, FFS was extended by a few hours beyond the scheduled drop-off of supplies and personnel to perform a second Manu i'a Harvest Ceremony. Our shark staff, monk seal staff, as well as the Refuge manager and other Fish & Wildlife staff participated in the ceremony, lead by the members of the Native Hawaiian Community.

Beginning on 10 July, the shark fishers focused their efforts at Trig because this was the islet with the greatest number of nursing pups to protect for the entire season. The fishers also surveyed the waters around the Gins to document the micro-geography around these islets (depths, substrate and currents) in the event that fishing might occur there in the future.

At Trig Island, monitoring of sharks occurred via camping and video recording. The fishing effort initially focused on off-shore activities. Bottomsets and drumlines were deployed according to the permit's provisions with staff observing from island ready to alert the fishers (who were in their small boat monitoring the off-shore gear) of any near-shore shark activity. No near-shore Galapagos shark activity or shark incidents at Trig were observed between July 9 and August 23, 2010. Thirty-four days of fishing occurred at Trig with 413 bottomset hook hours and 519.5 drumline hook hours (as of 8/23/2010). One Galapagos shark was captured via the bottomset on the third day of fishing; the male shark (165cm total length) was euthanized with a bang stick, sampled (muscle, liver, stomach contents, skin clipping) and skin and teeth retained and preserved for Native Hawaiian community members. Remaining tissue was used as bait for subsequent fishing efforts.

Within the first few days of fishing activities, the shark fishers ground-truthed the depth and substrate condition of a 400 meter zone around Trig via global positioning device to ensure that bottomsets were made within in the specified zone of the permit. Because the micro-geography was not well known at the Gins relative to Trig, extra effort went toward documenting depths, currents qualities and substrate type around these two islets also. It was learned that water depth 400 m from Trig Island was only 12-14 feet, not 25 feet as indicated by nautical charts which had been the basis for developing the 2010 permit application. Bycatch was minimal and all non-target fishes caught were released alive (3 ulua, 1 whitetip shark and 3 tiger sharks). In addition, 2 tiger sharks took bait, bent the hooks and escaped, and therefore were not considered true bycatch. No monk seals or turtles showed interest in gear or bait. HMSRP's human observations, video recordings and low catch success at Trig given near identical bottomset procedures as Carl Meyer used in 2009 provide continued support for the long-standing hypothesis that a small subset of Galapagos sharks is primarily responsible for the predation of pups. It is also noteworthy that tiger shark hooking at Trig occurred throughout the 34 days of fishing reported here (5 incidents) and this tiger shark presence was not coincident with predation activity.

**Section A - Applicant Information**

**1. Applicant**

Name (last, first, middle initial): Parrish, Frank and Alecia Van Atta

Title: Chief of Protected Species Division, Pacific Islands Fisheries Science Center, NMFS, NOAA and Assistant Regional Administrator, Protected Resources Division, Pacific Islands Regional Office, NMFS, NOAA

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

Shawn Farry

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

NOAA-Hawaiian Monk Seal Research Program

[REDACTED]

[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):**

NOAA-NMFS-PIFSC-PSD and NOAA-NMFS-PIRO

**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):**

Charles Littnan, PhD, HMSRP Director, [REDACTED]

Jason Baker, PhD, Marine Biologist, [REDACTED]

Kathleen Gobush, PhD, Research Ecologist; [REDACTED]  
Jeff Walters, Monk Seal Recovery Coordinator; [REDACTED]  
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, Round and Gin islets

**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 purpose of the proposed activity is to support the recovery of the Monument's endangered Hawaiian monk seals by reducing the likelihood of shark predation on seal pups at French Frigate Shoals. This activity, when combined with other conservation efforts, would help address the problem of low juvenile seal survival, a factor identified as one of the main causes of Hawaiian monk seal population decline in the Monument.

To achieve the purpose stated above, we propose to monitor shark activity via human and/or remote camera observation at Trig, Gin, Little Gin and Round islets when Hawaiian monk seal pups are present to determine when predatory activity commences and what species of sharks are involved (remote camera installation is permitted separately).

We also propose to remove sharks observed to be pursuing, injuring or killing pups or are observed to be patrolling within 700m of the shoreline of Trig, Gin, Little Gin and Round islets during the pupping season. The purpose of these actions is to mitigate predation of Hawaiian monk seal pups. These actions are recommended in the species' Recovery Plan to mitigate predation and are deemed necessary for the recovery of the FFS monk seal subpopulation (NMFS 2007).

A range of methods will be used to capture these sharks since sharks are known to be unpredictable, individualistic predators that are often difficult to catch. A 700-meter distance from shore encompasses water depths of approximately 25 ft that allow replications of Meyer's methods and success. Meyer's methods require setting gear over a sandy bottom. Our ground-truthing in 2010 of substrate maps and areal photos of the area indicates that this ideal sandy bottom type is located within the requested 700m distance.

Captured sharks will be humanely killed with a bang stick. We request that Native Hawaiian community members be present to oversee and/or participate in these actions as deemed desirable and appropriate by the Office of Hawaiian Affairs and suggest a replication of the practices that occurred on the deployment cruise in 2010 at the least.

We aim to limit shark removals to Galapagos sharks (*Carcharhinus galapagensis*), based on HMSRP's observations over the last 10 years. This is the only shark species HMSRP has positively identified pursuing, injuring or killing pups from 1997 to present (prior to this time period, such observations were not recorded because predation levels were exceedingly low). However, USFWS recommended that removals not be limited to species but limited by behavior (i.e. any shark in active predation) in their memorandum dated April 17, 2009.

We aim to remove a maximum of 19 sharks between May 1 and September 30, 2011 to fulfill the quota of 20 sharks that was permitted in 2010. Translocation of weaned pups within French Frigate Shoals from high shark predation risk islets will be conducted under a separate permit.

HMSRP will perform a necropsy on culled sharks, including gut content inspection, morphometric measurements, and identification of sex and reproductive state. The deceased shark remains will be retained for Native Hawaiian cultural uses or practices as deemed desirable

and appropriate by the Office of Hawaiian Affairs and as allowed under applicable Monument regulations. These desired remains will be removed from the carcass after the necropsy and stored frozen. Thereafter, any remains will be retained for shark ecologists (e.g. Carl Meyer, PhD, Jennifer Schultz, PhD, R. Dean Grubbs, PhD, Greg Skomal, PhD) for scientific analyses (e.g. gut content and tissue analysis, vertebrae isotope analysis, fatty acid analysis, genetic analysis of the shark itself and its gut contents). Remains applicable to these tests will be removed from the carcass after the necropsy and stored frozen. Any remaining shark tissue will be disposed at multiple deepwater locations outside of the atoll or stored frozen and used for bait for future removal attempts that season.

**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 cultural, natural and historic resources and ecological integrity of the Monument. Prior to obtaining the permit for this work and to receive quality input, HMSRP consulted with Office of Hawaiian Affairs Monument Management representative, Heidi Guth, on several occasions and presented our preliminary plans at a Native Hawaiian Cultural Working Group in a meeting held in March 2010. We believe constructive feedback was offered to us at this meeting and we left with an improved understanding of the views of some representatives of the Native Hawaiian community on our proposed work. An outcome of this meeting was a suggestion to partner with a Native Hawaiian community representative, Keoni Kuoha, in order to include Native Hawaiian practices in our work going forward.

Thus, to safeguard the cultural resources, we included a Native Hawaiian practitioners on a deployment cruise to initiate the same work in 2010. A range of practices and prayers were made that included our staff on a custom-design cruise course from O'ahu to FFS. We request that similar activities occur in 2011 and we also plan to invite these or other practitioners to observe and/or participate in the shark removals, as well as

retain remains of shark carcasses for the Native Hawaiian community as they deem desirable and that is logistically feasible. It was a pleasure to work with the members of the Native Hawaiian community in 2010 as described here. We believe that this collaboration has deeply enriched the experience of our staff and fortifies our efforts to conserve the Hawaiian monk seal.

We will continue to welcome and greatly appreciate input from the Native Hawaiian community at any time. NMFS has recently obtained the services of a contractor to plan and conduct liaison activities between NMFS and Native Hawaiian leaders and practitioners in support of Hawaiian monk seal recovery. We believe this will help further enhance integration of Native Hawaiian practices and protocols with our research and recovery efforts, including the activities proposed in this permit application. This enhanced integration will include further consultations with Native Hawaiian leaders and practitioners regarding cultural protocols and fishing procedures associated with this application. We also look forward to our staff attending a Hawaiian cultural briefing and reviewing cultural literature provided by OHA prior to any activities being conducted.

The overall objective of this Conservation & Management permit application is to fulfill needs of the Monument: to conserve wildlife (Hawaiian monk seals) and to reduce threats (shark predation) to Monument resources (Hawaiian monk seals). To further safeguard natural resources, we propose to limit the scope of our removal actions to 19 sharks observed to be patrolling, pursuing, injuring or killing pups within 700m of Trig, Gin, Little Gin and Round islets during the main pupping season only (May 1-September 30, 2010). We would like to limit the species culled to Galapagos sharks, but would respect the wishes of USFWS on the matter. With respect to Galapagos sharks, the removal of a combined total of 20 individuals from the FFS represents a small percentage of the atoll's population (actual percentage depends on which abundance estimate is used). Carl Meyer abundance estimate puts the FFS Galapagos shark population in the hundreds or low thousands.

Historic resources under the NHPA would not be affected or potentially affected by our proposed actions.

To safeguard the ecological integrity of the Monument, we propose to limit the scope of our removal actions as described above and also to avoid by-catch of any other wildlife to the greatest degree possible. Possible adverse effects on the coral reef ecosystem at FFS from shark removals were investigated using the EcoSim model (Parrish, unpublished data; NMFS, in preparation). Results from that work indicated that the removal of 20 sharks had a nearly imperceptible effect on the dynamics of the FFS ecosystem. Expert opinion at our shark predation workshops supported these modeled results (NMFS, in preparation). With respect to bycatch, across a total of 894.5 hook hours, 3 ulua, 1 reef shark and 2 tiger sharks were caught and all released live. No monk seals or turtles showed interest in our gear or bait.

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 monitoring and removals will be conducted in a manner compatible with the management direction of this proclamation. As stated previously, the objective of these activities is to conserve wildlife and reduce a threat to a Monument natural resource (Monument management needs 3.2. and 3.3). Also, these activities would facilitate the Monument's mandate to maintain biodiversity.

The extinction of the Hawaiian monk seal at FFS would adversely affect the Monument's biodiversity and trophic structuring at this location. A failure to mitigate the significant threat of shark predation may advance the potential for extinction and prevent recovery. Other methods executed in an attempt to reduce this threat have failed; it is believed that the activities proposed here will reduce the threat.

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 could 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. Losing a high number of pre-weaned and newly weaned pups to shark predation is by and large a unique phenomenon at French Frigate Shoals only; therefore, we propose to manage this threat at this location only.

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 potential positive outcomes from enhanced monk seal recovery outweigh the adverse impacts associated with the loss up to 20 Galapagos sharks (combined for 2010 and the 19 we propose for 2011) because we believe that these actions will ensure the co-existence atoll-wide of the 2 species into the future.

If predation is not mitigated, the monk seal population may decline to a level that is unable to overcome demographic or environmental stochasticity. If a total of 20 Galapagos sharks are culled, a higher number of pups are expected to survive to be candidates for translocation and/or survive on their own to adulthood than would be the case if predation were not mitigated.

Increasing the number of juvenile seals reaching adulthood augments the population numbers in the short-term and if they are female, its reproductive potential in the long run. At least 198 pups have been maimed and/or have died in their first months of life due to shark predation since the initial upsurge in FFS shark predation (starting in 1997). This is a minimum estimate based on highly conservative criteria established by HMSRP to determine cause of death (see Appendix C of the Technical memorandum). To give some context, 198 individual monk seals were identified at FFS in 2009 and the total estimated number of pups born in the six main NWHI subpopulations in 2009 was 118 individuals. If over the last decade, these 198 FFS pups had successfully weaned, a percentage would have likely been later killed by sharks, starved or become entangled in their first year of life. However, even if 20 female pups had survived, the status of the FFS population would currently be more favorable. Each breeding female is extremely valuable to the population at current population levels and birth rates.

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 discussion above on abundance).

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.

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

Experienced shark fishers/researchers were contracted in 2010. They conducted the activities outlined in the 2010 permit and gained familiarity with the geography of FFS, as well as the monk seals, the shark community and other wildlife. These same or comparably skilled staff will carry out the work proposed for 2011.

In 2009, HMSRP conducted a Risk Assessment on shark fishing with Carl Meyer, his students and Bill Putre of NOAA (March 2009). During the 2009 field season, HMSRP accompanied Carl Meyer's shark tagging crew in FFS to learn shark capturing and handling techniques. In addition, the shark fishers deployed in 2010 were instructed in this Risk Assessment and participated in firearms safety class (though the bang stick is not considered a true firearm) by KOA Services Inc.

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. If additional funds were required to mitigate any unexpected impact, resources would be available from NMFS PIR 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.

The proposed removal methods and gear were all approved previously for past permit applications (including 2010).

The proposed procedures (i.e. scope, timing, location, numbers, species of sharks to be culled) are appropriate to reach a goal of conserving wildlife (Hawaiian monk seals) and reducing the threat (shark predation) on a Monument resource (Hawaiian monk seals) based on the best-available knowledge about shark abundance, shark movement, shark predation, predation mitigation, seal behavior, seal movement, fishing catch rates and fishing success rates (given location) at FFS. Please see Gobush (2010) for a comprehensive description of this knowledge. Adverse impacts to Monument cultural, natural, historic resources and ecological integrity are minimized as described in the discussion above.

Based on the experiences and success of past shark-capturing crews at FFS, shark ecologists and fishing gear-makers, having a variety of fishing methods at our disposal is advisable. The fishing crew will not know ahead of time which method will work best. Based on hours of observation from the tower in 2001-2003 and also video recording in 2009 - 2010 at Trig islet, Galapagos sharks come into the wavewash and attack pups, circling out away from shore into deeper water for about ~20 minutes and often reappearing in the wavewash for another try at a pup, at varying times of day and of the season, in varying numbers and at varying frequencies. These sharks also appear to respond to human activity in various ways (i.e. wary versus not

wary). For example, in 2009, attacks were most frequent in early morning hours, often for up to an hour, by Galapagos sharks that did not appear to be affected by the presence of human campers onshore. In 2010, once a Galapagos shark was captured and euthanized at Trig islet, no sightings of Galapagos shark or attacks on pups occurred for the rest of the season at this islet. In sum, the crew needs to be able to respond to the situation and the unpredictable and individualistic nature of sharks if they are going to have a chance at being successful.

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 Conservation & Management permit renewal application is a replication of the permitted activities in 2010. The 2010 permit application evolved from previous projects, which underwent extensive review in-house, by members of the Hawaiian Monk Seal Recovery Team, the USFWS, and the State of Hawaii. The purpose, scope, methods and protocol of this application mirror and/or build upon the activities, insights and experiences of these previous projects.

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

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

### **A. Shark Monitoring**

Observation from the ground by overnight campers, a tower, patrolling small boats and remote cameras will be the primary methods of monitoring shark presence and movement patterns at the pupping sites (Trig, Gin, Little Gin and Round islets).

Ground observation will occur by staff on island. For Trig and Gin islets, staff will have the option of overnight camping, as was done in 2010, in order to observe early morning or late evening shark activity. The footprint of the camp will be minimal for 1-2 people to basically sleep, cook camp food and have safety equipment by their side. Camping occurred in 2010 with no adverse reaction by monk seals or green sea turtles were observed. The 2010 permit limited camping to 7 consecutive days. We request lifting this cap on consecutive days, as longer camping periods may be desired and the greatest potential for wildlife disturbance is likely during camp set up. Lifting the 7-day cap would reduce the number of times camp would have to be set up and broken down.

The tower is a 12-foot structure made of scaffolding that may be erected on Trig, located approximately 40 meters from the south end of the island to improve visibility as needed. It was approved in 2010.

The installation of a remote camera recording systems on islets will allow shark observation during days and times when HMSRP staff are not present; their installation a part of another permit application. One was successfully installed on Trig in 2009 and 2010. Footage can be viewed nearly real-time from Tern and also reviewed on a daily or weekly basis as needed to help understand the shark predation patterns at that islet as the 2010 season unfolds.

For all observations, shark sighting/attack data, including identifying characteristics and behaviors, will be recorded on a standardized data form that was used in the 2009 -2010 field seasons.

## B. Shark Fishing/Removals

### 1. Fishing personnel and location:

A crew of 2-3 staff experienced in safe and effective methods for shark fishing/removal will be tasked with shark monitoring and culling Galapagos sharks that they encounter within 700m of shore of Trig, Gin, Little Gin and Round islets. As such, capturing sharks will only occur in what is considered the shallow lagoon inside the atoll in close proximity to islets with the highest rate of shark predation. Handlines, harpoon, and the "Net Surprise" will be used in shallow water, from shore or close to shore; bottomsets and drumlines will be used in deeper water, over sandy substrate at distances farther from shore (up to 700m away). Ability to set the gear as far out as 700m from shore will help ensure that it performs as designed by Meyer in 2009. Shallow depth, coral and snags make setting the bottomset at closer distances a challenge. We learned this first-hand in 2010 because water depth was only 12-14 feet at 400m off the south side of Trig (the side of Trig I. in which a Galapagos shark was sighted patrolling near-shore), whereas the Meyer 2009 bottomset design is for greater water depths (approximately 25 feet).

### 2. Fishing Methods:

Five different methods will serve as a "toolbox" of options to safely cull a maximum of 19 Galapagos sharks: handline, harpoon, bottomset, drumline and the surprise net. Each method has its advantages and drawbacks. The potential for shark wariness to humans in combination with extremely low CPUE near pupping sites indicates that such a "toolbox" is needed to successfully capture sharks at the numbers and in the areas we desire.

Handlines and harpoons have the advantage of being very specific; bottomsets with large hooks and bait were shown to be highly effective in 2009 across the atoll (i.e. Carl Meyer's crew caught 78 Galapagos sharks in the 2009 season), and drumlines and the "Net Surprise" hold promise.

Bottomsets and drumlines are, by design, restricted by habitat characteristics, otherwise lines can get tangled, etc. Thus, bottomsets and drumlines are not recommended to be effective in very

shallow depths. Bathymetry and currents are islet-sector specific; therefore, the distance from shore to achieve a feasible depth and appropriate substrate (sandy bottom) is also islet-sector specific; a zone of 700m around each islet will provide for this. A 700m distance is an increase in distance from what was permitted in 2010 (400m). In 2009, an approximate zone of fishing of 400m from shore (at Trig) was proposed and granted based on the understanding that this distance encompassed 25-foot depth, comparable to Carl Meyer's bottomset design. We request this correction in distance based on the finding that the maximum depth at 400m is only 14 feet, not 25 feet. This was discovered via ground-truthing nautical chart depths with a Global positioning device. The maximum depth of only 14 feet means bait is close to the surface and this could contribute to shark detection of above-water gear and staff and contribute to wariness. The possible advantage of laying bait by bottomset is thus neutralized if the baited hooks are too close to the rest of the gear and the staff monitoring the gear.

Unfortunately, no one method is guaranteed to be successful given the unpredictability and individualistic nature of sharks. However, together, all the methods provide the greatest chance of success. If we employ more than one method at a time, we still expect that the total number of removals will be low based on the low CPUE in the shallow lagoon. We will monitor the total number of baited hooks deployed across methods in order to remain within the catch quota of a combined total 20 sharks for 2010-2011, minimize bycatch and minimize accumulated bait. It is assumed that bycatch will be minimal and restricted to shark species, based on Meyer's crew's experience in 2009 with 6850 soak hours. Soak times will be limited to 1-3 hours (identical to Meyer's project). We will use the same bait type (large tuna heads and shark remains) and hook type (circle hook, size 18/0 to 20/0) as the Meyer's project, with the option of also using monk seal flesh from dead animals (after necropsy procedures and other sampling) as was done in 2005. Fish bait will be brought from outside the Monument. Remains of caught Galapagos shark may also be used as bait, as well as any dead bycatch. We will tend the gear to bycatch mortality (non-target species will be dehooked and released). Fishing staff will avoid culling non-target sharks through their proper identification. The only shark species that is likely to be confused with the Galapagos shark is the grey reef shark. The maximum size of 20 grey reef sharks caught across the NWHI was 159 cm (total length) in a 2003 study. Thus if a minimum size requirement for euthanizing is set above this figure, this confusion can be avoided (see Post-Catch Procedures below). The minimum total length permitted in 2010 was 160 cm, we suggest the same limit for 2011.

For handlines, a line will be baited (same bait as described above) from shore or from a small boat in the approximate area where a Galapagos shark has been observed. A hand-held harpoon will be used from shore or small boat when a shark is observed. A barbed shaft, on the end of the harpoon pole will be delivered by hand and the tip will be attached to wire cable and connecting line that will be used to retrieve the shark. For these methods, captured sharks will be hauled out on to the beach or to the side of the boat and tail-roped for euthanasia.

Bottomsets will be made to the specifications identical to those used in the Meyer's project permitted in the Monument to catch sharks in 2009, but may be adjusted to include 5-10 hooks. The gear is designed for clean bottoms only (i.e. sandy substrate with no potential for snagging). Approximately 200- 350m long ½ inch polypropylene mainline with overhand loops at regular

intervals (40-60m) for gangion (branch line with hook) attachment will be used. Each end of the mainline will have a buoy line consisting of 1/2-inch polypropylene with a cleat at the top and a Danforth anchor (9-12 lb) at the bottom. The buoy line length will be contingent on target set depth (45-75 feet depending on depth of deployment allowed). Gangions will consist of a stainless steel lobster trap clip (snaps onto mainline loops) with 2m of 1/2 inch polypropylene, a large swivel, 2m of 7/19 strand stainless steel aircraft cable (bite leader) to a 20/0 Mustad circle hook. Sets will be made from a small boat, and with short soak times of a maximum of 3 hours (in the daytime only).

The drumline will be of either of the following 2 designs. It may consist of a large buoy, with a chain trace attached to it and single baited hook, shackled to the other end of the chain trace. A baited hook will be suspended approximately 10 feet above the sea floor. A groundline will be shackled to the drum with a swivel, 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. Alternatively, it may consist of 20ft of 1/2 in. polypropylene substituting for a chain trace, connected to the same branchline type used for the bottomsets described above. The opposite end of this mainline will be shackled to a float-line buoy that serves as the ‘drum’. A chain will be run through this buoy with the other end shackled to an 8’ yellow marker line. The other end of the yellow line will then be shackled to a large red buoy with the connected float line (same used for bottomsets). The drumline set-up is a modification of what was used in 2010 so that the single baited hook rests on the bottom and does not suspend in the water column. This is preferred because we are targeting a species that spends most of its time on the bottom feeding on demersal fishes. With this design, the drum-buoy functions as a ‘bobber’ that will sink or move when an animal is hooked.

The “Net Surprise” may be used to capture Galapagos sharks in nearshore, shallow areas. This apparatus is modeled on a design created by the Sea Mammal Research Unit, St. Andrews, UK, for catching seals in shallow nearshore areas. The “Net Surprise” consists of a central 350mm diameter deployment tube (similar to a fire hose) containing a tangle-net (nylon, large mesh, approximately 4 inches) inside of it and an underwater mounted diving cylinder (with a regulator and 10 bar pressure release valve) and airline at each terminal end. The diving cylinder and airline supply air to provide thrust and quick deployment of the tangle-net. Buoyed receivers with small antennae are connected to the diving cylinders via solenoid valves, and can be remotely triggered from the beach using standard radio equipment.

We intend to set the deployment tube in discrete areas of the nearshore habitat in islet sectors where sharks have been observed to patrol or pursue pups. The tube will be laid in a semi-circle configuration, arcing out approximately 5-10m from the shoreline. The tube will be weighted to the seafloor bottom by clipping it to a heavy anchor chain (8mm) of equal length to the tube; the terminal ends may also be attached to anchors on the beach to add stability. The net is only released upon trigger; it will not be released if large non-target animals (i.e. seals, turtles, birds, non-target shark species, large ulua) are in the water in the semi-circle area outlined by the tube or within 2m of the area outside of the tube or on the beachside opening. Multiple “Net Surprises” may be used to create a double-barrier design, creating two concentric arcs when deployed, in order to facilitate capturing a fast-moving shark. Multiple “Net Surprises” may be

set adjacent to each other in the nearshore areas in order to facilitate capturing a fast-moving shark. In this case, only one “Net Surprise” would be deployed per capture event (each “Net Surprise” has its own dedicated radio-trigger). For example, at the beginning of the day, two “Net Surprises” would be laid at sector 2E of Trig islet, each arcing out 10m. If Galapagos sharks are observed patrolling and pursuing a pup in the area outlined by the first “Net Surprise” but circling out into the area of the second net, only the second net would be deployed. Once the net is released and a shark is tangled, the net will be pulled onto the beach and the shark euthanized. The “Net Surprise” will be in 100% attendance once set. HMSRP will thoroughly test the “Net Surprise” in Oahu in 2011 before using it at FFS in 2011 to ensure that it deploys as intended and can be pulled in quickly. Such a test was done in 2010.

### 3. Post-catch procedures:

When a shark is hooked, harpooned, darted or netted it will be brought to shore or side of the small boat and tail-rope and euthanized with a .44 caliber bang stick. HMSRP has established bang stick safety protocols (used in 2010). Also, in 2010 shark fishers underwent firearms training through Koa Services Inc. This course or similar training could be repeated for any hire new to the project in 2011. HMSRP conducted an Operational Risk Management (ORM) on March 19, 2009 lead by Chad Yoshinga and Kathleen Gobush on the shark fishing operations. Operational Risk Management is a continual process which includes risk assessment, risk decision making, and implementation of risk controls, which results in acceptance, mitigation, or avoidance of risk. It is standard for HMSRP to conduct ORM and risk assessment for projects that may involve risks such as this shark predation mitigation work. The product was a Risk Assessment that will be updated to include the 2010 experience and provided to any staff hired for this project in 2011. Refresher training on use of the bang stick will occur boat side on inert material here in Oahu.

A minimum size requirement for euthanizing a Galapagos shark can be set to ensure that only large adults capable of feeding on monk seal pups are culled. We suggest 160cm forklength based observations in the field in 2010 and results of Meyer’s project in 2009 (made available to us in July 2010).

HMSRP will perform a necropsy on culled sharks on site (Tern island), including gut content inspection, morphometric measurements, and identification of sex and reproductive state. Procedures will mirror those done on monk seals, using the same kits, modified as necessary based on instructions in the Elasmobranch Husbandry Manual (editors M. Smith, D. Warmolts, D. Toney & R. Hueter). The main focus of shark necropsies will be to determine pregnancy and gut contents provide remains for Native Hawaiian cultural practices and take samples for scientific analysis.

Desired shark remains (i.e. teeth, belly skin) will be retained for Native Hawaiian cultural uses or practices as deemed desirable and appropriate by the State of Hawaii Office of Hawaiian Affairs. These desired remains will be removed from the carcass after the necropsy and stored as appropriate. Samples of muscle, liver, vertebrae for fatty acid and isotope/ diet analysis will be removed from the carcass after the necropsy and stored frozen. Vertebrae samples will likely be sent to Woods Hole Oceanographic Institute to be processed by Greg Skomal’s lab for isotope

analysis. Fatty acid profiles will likely be analyzed for data on prey recently consumed, likely Sara Iverson's laboratory at Dalhousie University. Stomach contents will be screened for monk seal DNA by geneticist Jennifer Schultz, PhD and provided to shark ecologists upon request.

Any remaining shark tissue will be disposed of at multiple deepwater locations outside of the atoll (latitude/longitude of the location will be recorded and avoided for additional disposals in the same year) or stored frozen and used for bait for future removal attempts that season. We suggest a distance of 0.5 mile from the FFS atoll's breaking reef. The 2010 permit required disposal at least 3 miles from the atoll. We request permission to dispose at 0.5 miles due to safety concerns of traveling 3 miles from the atoll in a small boat. Water depths and current 0.5 miles from the atoll are adequate.

#### 4. Reporting:

A report that summarizes data concerning the removal of each shark will be submitted to the Monument one month after the expiration of this permit. This report will include environmental conditions at the time of removal, behavior or sightings of the individual prior to capture, identifying tags and physical features of the individual, location of the removal, method of removal, and method of euthanasia. Data about the carcass will also be included: morphometric measurements, gut contents, gender, reproductive status and the status of all remains (offered to the Native Hawaiian community, samples taken, use as bait or disposal and disposal location).

#### 5. Evaluation:

The ultimate goal of the proposed conservation and management activity is to reduce the threat of shark predation to pre-weaned and newly weaned monk seal pups at FFS. The proximate goals are to monitor shark activity and remove up to 19 additional Galapagos sharks within 700m of shore of Trig, Round, Gin and Little Gin islets. We will consider the activity to have been successful if the proximate goals are achieved in 2011 and the achievement of the ultimate goal is apparent within 1- 2 years. We expect a lag time in any measurable increase in pup survivorship from shark removal because it is likely to take an entire season to catch the number of sharks requested given the low CPUE in the shallow lagoon.

If the number of sharks removed in 2011 approximates 19 (which, in combination with the 2010 catch, approximates that recommended by Workshop participants), and no improvement in the proportion of pre-weaned and newly weaned pups lost to sharks (confirmed and inferred mortalities) is detectable within 1-2 years, then the idea of any additional shark removals will require careful consideration. If shark removal does not approximate these recommendations then such an improvement in survivorship from this source of mortality is not expected to be substantial.

Additional descriptions of:

Anchoring a vessel: small boats will be anchored at FFS according to standard practices included in the monk seal field camp permitted activities. This includes anchoring only in sandy

substrate and taking steps to avoid damaging of hard substrates (especially coral) with the anchor or chain.

Discharge: Any remaining shark tissue will be disposed of at multiple deepwater locations outside of the atoll (latitude/longitude of the location will be recorded and avoided for additional disposals in the same year) or stored frozen and used for bait for future removal attempts that season. We suggest a distance of 0.5 mile from the FFS atoll's breaking reef. The 2010 permit required disposal at least 3 miles from the atoll. We request permission to dispose at 0.5 miles due to safety concerns of traveling 3 miles from the atoll in a small boat. Water depths and current 0.5 miles from the atoll are adequate.

**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:

19/adult

Collection location:

French Frigate Shoals, inside the atoll, near pupping sites

Whole Organism  Partial Organism

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

Necropsy conducted, samples retained, tissues/teeth provided to Native Hawaiian cultural practitioners as desired by OHA.

Samples will be sent to :

Woods Hole Oceanographic Institute/ diet analysis through isotope screening  
(vertebrae) (Greg Skomal)

Dalhousie University/ diet analysis through fatty acid profiles (liver) (Sarah Iverson)  
NOAA toxicologist (Marie Yasmine Bottein)/ Ciguatera and mercury level testing  
(muscle and liver)

NMFS geneticist/ genotyping (DNA from fin clip) (Jenny Schultz)

NMFS geneticist/ prey identification (DNA from stomach contents, if available) (Jenny  
Schultz).

With regard to the distribution of tissues/teeth, we will coordinate with Kehau Watson,  
the contract liason with PIRO for Native Hawaiian community collaboration, as was  
done in 2010.

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

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

• Is it an open or closed system?  Open  Closed  
n/a

• Is there an outfall?  Yes  No  
n/a

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

• Will organisms be released?  
no

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

Biological samples collected from Galapagos sharks will be stored as appropriate (i.e. in vials with dms0, in liquid nitrogen, dry etc.). All samples will be transported out of the

Monument aboard the R/V Oscar Elton Sette, M/V Kahana, M/V Searcher or aboard aircraft.

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

Shark necropsy and tissue samples will be offered to HIMB and other shark ecologists.

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

Polypropylene mainline, buoy lines, gangions, bite leaders, lobstertrap clips, swivels, gaffs, meter caliper, leads, gloves, crimpers, cutters, hooks, knives, bolt cutter, buoys with anchor rode and anchor, chain traces, danforth anchors, SS wire, 3/0 interlock snap swivel, mustad circle hooks (18/0 - 20/0), bangstick, ammunition (44 magnum cartridges Remington), hand-held harpoon, nylon material netting with low stretch and good rot resistance (4 inch), Velcro, nylon cord, stainless steel clips, 20 bar working pressure fire hose, pvc, pressure relief valve, Stainless steel elbow, T-piece and hose fittings, airline, solenoid valves, regulators and 10bar pressure relief valve, diving cylinders, waterproof housing buoys with waterproof connector and multicore cable, receivers and programmable trigger, bait cooler, bait (large tuna heads), camping gear, night-vision scope. Bottomsets will be made by Pacific Ocean Producers to be identical to that used in the Meyer's project only adjusted for minimum of 5 hooks and up to 10 hooks (Meyer used ten hooks), and the possibility of an increased interval of 60m between branchlines, which would result in an increased groundline length of approximately 350m. A bottomset with a wider reach may prove beneficial in catching Galapagos sharks.

**13. 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).

15 ml vials with 20% DMSO, count 20

10% buffered formalin, 500ml

ethanol, 0.5 gallons

bangstick ammunition (.44 caliber magnum cartridges), 2 boxes of 20 cartridges

Propane for freezers (tanks 60#), 28

Propane for camp stove (canisters 2#), 10

Non-ethanol gasoline (drums, 55 gallon), 6

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

none

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

Report to the Monument: October 30, 2011

Necropsies focused on the gross anatomy immediately upon death

Preliminary gut content analysis- immediately upon death

Fatty acid, genetic (including genetic analysis of gut contents) and vertebrae analysis:

TBD- will be sent out for analysis

**16. List all Applicant's publications directly related to the proposed project:**

Gobush, K.S. 2010. Shark predation on Hawaiian monk seals: Workshop II & post-workshop developments, November 5-6, 2008. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TM-NMFS-PIFSC-21, 43 p. + Appendices.

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. Marine Mammal Science.

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. Prepared for National Marine Fisheries Service, Southwest Fisheries Science 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. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries 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. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI. 46 pp.

NMFS. 2003. Shark predation at Trig Island, 2002. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI. 38 pp.

NMFS 2004. Shark predation at French Frigate Shoals, 2003. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI. 56 pp.

NMFS 2005. Shark Predation at French Frigate Shoals, 2004. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI. 36 pp.

NMFS. 2007. Recovery plan for the Hawaiian monk seal (*Monachus schauinslandi*) 165 p. U.S. Department of Commerce, National Oceanic and Atmospheric Agency, Silver Spring, Maryland.  
NMFS. 2009. Programmatic environmental assessment of the program for decreasing or eliminating predation of pre-weaned Hawaiian monk seal pups by Galapagos sharks in the Northwestern Hawaiian Islands. 76 p. U.S. Department of Commerce, National Oceanic and Atmospheric Agency, Honolulu, Hawaii.

NMFS. In Prep. 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.

Peschon, J.D. 2002. 2002 Trig Island shark project report. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI.

Peschon, J., D. Luers, B. Becker, and M. Niemeyer. 2003. 2003 French Frigate Shoals shark predation project report. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries 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