

**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](mailto: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:** June 1, 2014 - May 31, 2015

**Proposed Method of Entry (Vessel/Plane):** one of the following: NOAA vessels- Oscar Elton Sette and NOAA vessel Hi'ialikai, chartered vessel Kahana, chartered vessel Searcher, chartered flight via FWS, Pacific Air Cargo

**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:** 130 days

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

a.) The proposed activity would...  
include the removal of predatory Galapagos sharks from French Frigate Shoals (FFS) at select monk seal pupping sites during 2014/15. These activities are a continuation of previously permitted activities conducted in 2010-2013. The proposed activity would support the recovery of the Papahānaumokuākea Marine National Monument's population of endangered Hawaiian monk seals by reducing the likelihood of shark predation on seal pups at FFS. 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. Monitoring of shark activity at FFS, to be conducted to inform shark removals, is included in another permit application (Co-Trustees Management permit for 2014) and is not described here.

b.) To accomplish this activity we would ....  
remove Galapagos sharks (tail length of 200cm or greater) caught within 700m of select pupping sites. Sharks would be caught by the following methods: 1) hand line, 2) hand-held harpoon, 3) drum-line, and/or 4) small 10-hook bottomset and 5) the "Net Surprise". Bait would include tuna

heads, shark tissue, or flesh collected from previously deceased monk seals. For all methods, hooked or netted sharks will be pulled into shore or along side a small boat, tail-roped and killed with a bangstick. Shark carcasses will be examined (gross necropsy), sampled for future scientific analyses (isotope, fatty acid, genetic analysis) and any suitable shark tissue used as bait. Thereafter, remains would be handled as deemed appropriate by designated Native Hawaiian community members. Currently, the plan is to return remains to the ocean outside of the atoll.

c.) This activity would help the Monument by ... working to reduce a significant source of monk seal mortality 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). In this application, we propose to 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 2008, 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 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 subsequent field season's findings (2009-2013) 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 removals 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 2009-2013 Activities

In 2009, there were 7 incidents of shark predation on pups, and as a result 5 pups died. This represented 14.7% (5 of 34 monk seal pups born) of the annual cohort (see Table 1a & b for a comparison of pup losses at FFS over the last 5 years). On Trig islet, Galapagos shark predatory activity was directly observed on 12 occasions; 12 additional sightings were recorded via a remote camera system temporarily installed on the islet. There was also one sighting of a Galapagos shark at Gin.

Also in 2009, we conducted research on possible shark deterrents, monk seal pup behavior and facilitated research on shark movement patterns. We compared shark presence and predatory behavior toward pups across two experimental treatments: 1) acoustic playback and a moored boat, and 2) continuous human presence, versus a control. We rotated treatments on a one-week basis at two pupping sites. We detected presence of large sharks with a remote camera system. Observations of shark activity at FFS decreased in successive seasons during intensive and systematic daytime monitoring in 2001 to 2003 yet mortality of monk seal pups was unchanged (NMFS 2004). This finding suggested that sharks preying on monk seal pups at FFS grew wary of daytime human activity in the area, preferring to hunt at night when humans were absent. Thus, we reasoned that a continuous human presence on pupping islets or the application of visual implements and acoustic playbacks that mimic human activity might repel sharks from the immediate area. The acoustic playbacks also had the potential function as a negative stimulus and to startle or repel sharks. However, sharks were present during 12 of 57 days of video examined, spread across all treatments. Shark presence at Trig did not differ significantly among treatments ( $R^2 = 0.05$ ,  $n = 57$ , Likelihood ratio  $\chi^2_{22} = 2.6$ ,  $p = 0.27$ ). (Gobush & Farry 2012).

For the pup behavioral study, we collected 132 hours of scan sampling observations (on a 15-minute interval, totaling 528 scans), primarily of mother-pup nocturnal activity (between 1800 to 1000 hours). 14% of the time (75 scans), pups was in the water; 84% of these water entries were into the wave wash. 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 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). This tagging research represents the greatest effort in terms of time devoted to sampling the shark population FFS to date (aside from commercial fishing in 1999). This research 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. (Dale et al. 2010).

In 2010, there were 9 incidents of shark predation on pups, and as a result 6 pups died. This represented 16.2% (6 of 37 pups born) of the annual cohort (Table 1a & b). 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 the removal of a Galapagos shark at Trig on 13 July 2010 (see description below).

Two shark fishers were hired to fulfill the objectives of the PNMM permit granted in June 2010. 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. At Trig Island, monitoring of sharks occurred via camping and video recording. The removal 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 (Table 3). One Galapagos shark was captured via the bottomset on the third day of fishing; the male shark (165cm total length) (see Table 2 for the number of Galapagos sharks caught and removed at FFS by HMSRP over the last 10 years). The shark 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. Bycatch was minimal and all non-target fishes caught were released alive (3 ulua, 1 whitetip shark and 3 tiger sharks). It is also noteworthy that tiger shark hooking at Trig occurred throughout the 34 days of fishing reported here and this tiger shark presence was not coincident with predation activity. Our direct observations, video recordings and low catch success at Trig in 2010 given near identical bottomset procedures as 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 (see also Dale et al. 2010).

The fishers also surveyed the waters around Trig and the Gins to document the micro-geography around these islets (depths, substrate and currents). Incidentally, the water depth 400 m from Trig Island was only 12-14 feet, not 25 feet as indicated by nautical charts. We discovered that the water depth was more adequate for bottomset fishing at approximately 700m from Trig; thus, we request this distance for fishing later in this application.

Also in 2010, we invited 3 members of the Native Hawaiian community on our cruise to drop off the fishers (5 July through 11 July). 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, led by the members of the Native Hawaiian Community.

In 2011, there were 6 incidents of shark predation on pups, and as a result 5 pups died. This represented 13.5% (5 of 37 pups) of the annual cohort (Table 1a & b). Staff camped for a total of 84 days, 51 days on Gin and 33 days on Trig. The focus of monitoring was at Gin during the first half of the season because more pups were born there than at Trig. Our staff sighted Galapagos sharks twice; a shark with no distinctive fin marks was observed attempting to attack a pup in the nearshore and a second individual with a "notched" fin was captured and removed (see below). The remote camera system was installed at Trig; however, it was non-functional despite several attempts at fixing it throughout the season. No Galapagos sharks were directly sighted at Trig in 2011.

Handlines were first deployed at Gin on 7 June, after a shark-inferred disappearance of a pup there, and continued until 12 July. Thereafter fishing occurred at Trig from 14 July to 29 July 2011. Staff used handlines for a total hook soak time of 680 hours (Table 3). A large female Galapagos (274 cm total length) was caught at Gin on 7 July 2011 with a handline (no boat used) and tuna bait set approximately 30m offshore on the northeast side of the islet (23°44'09.58, 166°09'55.33) (Table 2). This shark was not seen until it took the bait. Skin, jaw and specimens were taken and frozen; remains were used subsequently as bait. Non-target species caught and

released alive included 4 grey reef and 5 tiger sharks. Also 1 ulua spun line around itself and died. We added a swivel to the handline gear to prevent this occurrence from happening in the future.

In July (2011), the HMSRP coordinated with the Office of Hawaiian Affairs (OHA) to reach out to the Hawaiian community to build upon the relationships formed with cultural practitioners initiated in 2010. Our primary objective was to continue to promote an increased mutual understanding and respect between our Program and members of the community. We aimed to provide an opportunity for Hawaiian community members to accompany our staff on the monk seal camp pickup cruise to the NWHIs, spend time with our staff at FFS, and experience our seal and shark predation mitigation work first-hand. At recent cultural working group meetings, it was voiced that the community would benefit from this type of participation by a more senior representative of the community. Thus, OHA, along with Auntie Pua Kanahale of Hawaii Island, facilitated the selection of Mr. Leighton Tseu. He boarded the OES on July 30; we hosted him at FFS from August 1 until August 17; he returned to Honolulu on August 20. The Galapagos shark's skin and jaws were distributed to G. Umi Kai for cultural and educational purposes upon our return from FFS (September 2011).

In 2012, there were 5 incidents of shark predation on pups recorded (3 at Trig, 1 at East and 1 at Gin), and as a result 2 pups died (Table 1a & b). This represented 6.5% (2 of 31 pups) of the annual cohort that was observed at FFS by the end of the field season (2 August). Three additional pups disappeared between FFS's observation of them in May and NMFS arrival on 18 June. Information about these pups' disappearances was limited and thus, their cause of death was deemed 'unknown' but may have been shark-caused.

Staff camped at Trig for a total of 28 days between 27 and 28 June. Camping did not occur at the Gins because shark predation was not evident there until 17 July, when the last remaining pup there was nearly weaned. No Galapagos sharks were directly sighted in 2012. The remote camera system was installed at Trig and functional until it began malfunctioning on 12 July. Shark activity has not been observed on the limited footage viewed to date.

Handlines were first deployed at Trig on 27 June, the day after a pup disappeared, and continued until 28 July. Staff used handlines from shore for a total of 479 hook hours; however no Galapagos sharks were caught (Table 3). Bycatch included 6 tiger sharks and 2 white tip sharks; all were released alive and unharmed. Two additional large sharks took bait but were not hooked; their species was not identified.

NMFS translocated 10 pups at weaning from Trig, Gin, Round and Shark islets to Tern Island where predation risk is relatively low. Ten pups remain nursing, and thus, are still vulnerable to predation. The relatively short HMSRP field season this year means that the information on the mortality causes of 3 early-season pup losses is missing; likewise information on any late-season pup losses will be absent. So, though the impact of shark predation on pups this year may appear low; field effort to document such events was substantially less than other years.

In 2013, there were at least 35 pups born at FFS and at least 13 pups were observed with shark bites. Furthermore, at least 9 pups (26%) were either killed by sharks or disappeared (with shark attack being the likely cause). We were unable to fully assess the level and impact of shark predation this year due to the cessation of USFWS presence at FFS and the late deployment of the HMSRP field camps. During the “gap” between USFWS’ departure and NMFS’ arrival several pups were lost, and while shark predation is a likely cause we cannot say for certain so those disappearances are not counted. During the gap in human presence there was also probably a small number of pups that were born and lost. Despite these sources of uncertainty we can give an estimate on the level of shark predation at FFS in 2013 and it should be considered a minimum and it continues to be the greatest source of mortality for young pups.

Field teams spent a total of 20 days camping on Trig and the Gins for monitoring and fishing. The total soak time for bait was 194.5 hours. During this time 3 tiger sharks were captured as by-catch and released safely. No Galapagos sharks were caught. Seal flesh was not used as bait this season.

There were a total of 13 intra-atoll translocations (Tern 11, Shark Island 2) to reduce predation risk for recently weaned pups. Translocations to Shark Island were an attempt to keep weaned/abandoned pups with severe shark bites away from other translocated weaners on Tern.

Table 1a. The number of monk seal pup deaths and the number that died due to shark predation (confirmed and inferred kills) in the NWHI, listed by atoll, across the past 5 years. Total pup deaths per location by year in bold; pup deaths attributable to shark predation in parentheses.

Location	FFS	LAY	LISI	PHR	MDY	KUR
Year	FFS	LAY	LISI	PHR	MDY	KUR
2007	<b>7(6)</b>	<b>2(0)</b>	<b>0(0)</b>	<b>1(0)</b>	<b>3(0)</b>	<b>0(0)</b>
2008	<b>8(6)</b>	<b>2(0)</b>	<b>1(0)</b>	<b>0(0)</b>	<b>1(0)</b>	<b>2(0)</b>
2009	<b>7(5)</b>	<b>0(0)</b>	<b>1(0)</b>	<b>0(0)</b>	<b>0(0)</b>	<b>0(0)</b>
2010	<b>9(6)</b>	<b>3(0)</b>	<b>1(0)</b>	<b>2(0)</b>	<b>0(0)</b>	<b>1(0)</b>
2011	<b>9(5)</b>	<b>3(0)</b>	<b>1(0)</b>	<b>3(0)</b>	<b>2(0)</b>	<b>5(0)</b>
2012	<b>6(2)</b>	<b>0(0)</b>	<b>1(0)</b>	<b>0(0)</b>	<b>0(0)</b>	<b>1(0)</b>
2013	<b>11(9)</b>	<b>1(0)</b>	<b>1(0)</b>	<b>0(0)</b>	<b>0(0)</b>	<b>1(0)</b>

Table 1b. The number of monk seal pups impacted by sharks (injured, confirmed and inferred kills) in FFS, listed by islet during the past 5 years. Islets with no recorded shark incidents on pups across all 5 years are omitted.

Year	Location			
	Trig	Gins	Round	East
2007	5	3	1	0
2008	4	4	0	1
2009	5	1	0	1
2010	4	1	0	1

2011	3	3	0	0
2012	3	1	0	1
2013	5	3	0	1

Table 2. The number of sharks removed by NMFS to date and the number of pups impacted by shark predation at FFS between 1997 and 2011.

Year	Galapagos sharks removed*	Pups impacted by sharks
1997	0	27
1998	0	16
1999	0	28
2000	1	12
2001	5	17
2002	2	12
2003	2	14
2004	0	14
2005	2	13
2006	0	17
2007	0	9
2008	Not attempted**	9
2009	Not attempted**	7
2010	1	6
2011	1	6
2012	0	5
2013	0 (limited effort)	9 (deaths disappearances) 13 bites observed

\* All Galapagos sharks were removed from Trig with the exception of 1 from Gin in 2011.

\*\* Shark deterrent testing occurred in this year and shark removals were not attempted.

Table 3. NMFS shark removal effort in 2010-2013 at Trig and/or Gin islets, FFS.

Year	Galapagos caught	Hook hours	Days with hooks in water	Primary method(s)	Bycatch
2010	1	932.5	34	bottomset/drumline	3 tiger, 1 whitetip, 3 ulua
2011	1	680	50	handline	5 tiger, 4 grey reef, 1 ulua
2012	0	479	24	handline	6 tiger, 2 whitetip
2013	0	194.5	20	handline	3 tiger

## **Section A - Applicant Information**

### **1. Applicant**

Name (last, first, middle initial): Dr. Frank Parrish and Alecia VanAtta

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]

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-PRD

#### **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]

Shawn Farry, PIFSC Contractor; [REDACTED]  
Mark Sullivan, PIFSC Contractor; [REDACTED]  
Ben Cook, PIFSC Contractor  
TBA (2-3 staff)

All staff names will be provided prior to our 2014 field season after we have completed the hiring process.

**Section B: Project Information**

**5a. Project location(s):**

<input type="checkbox"/> Nihoa Island	<input type="checkbox"/> Land-based	<b>Ocean Based</b>	
<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			

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.

Shark monitoring activities pertinent to shark removal are being applied for separately (Co-Trustee's Management permit for 2014).

Concurrent to monitoring, we propose to remove Galapagos sharks (200cm total length or greater) within 700m of the shoreline of Trig, Gin, Little Gin and Round islets during the pupping season (approximately June 1 to September 30, 2014). 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).

Only Galapagos sharks (*Carcharhinus galapagensis*) will be removed because this is the only shark species we have positively identified pursuing, injuring or killing nursing pups from 1997 to present (prior to this time period, such observations were not recorded because predation levels were low). Tiger shark (*Galeocerdo cuvier*) predation of monk seals likely occurs at FFS; however, we have not definitively observed this shark species pursuing, attacking or killing nursing and newly weaned pups at FFS or elsewhere in the NWHIs. Because our aim is to manage the issue of shark predation on nursing and newly weaned pups, we choose to focus on the species that is definitively involved in the predation of these age classes.

We aim to remove a maximum of 18 Galapagos sharks during the monk seal pupping period in 2014 at FFS. This number of Galapagos sharks plus the 2 removed in 2010 and 2011 would fulfill the quota of 20 sharks that was recommended at a workshop on 2008 and permitted by the Monument in 2010-2013.

A range of methods will be used to capture these sharks because sharks are known to be unpredictable, individualistic predators that are often difficult to catch. Captured sharks will be humanely killed with a bang stick. A 700-meter distance from shore encompasses water depths of approximately 25 ft that allow replications of Meyer's methods and success (2009). 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.

We will perform a gross necropsy on sharks, including gut content inspection, morphometric measurements, and identification of sex and reproductive state. Samples will then be taken for shark ecologists (e.g. Carl Meyer, PhD, Jennifer Schultz, PhD, R. Dean Grubbs, PhD, Greg Skomal, PhD) for future 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).

Then, suitable shark tissue will be used bait for future removal attempts within the pupping season.

Thereafter, remains will be handled as deemed desirable and appropriate by Native Hawaiian community members, OHA and/or the MMB and as allowed under applicable Monument regulations. Current protocol is to return remains to the ocean outside of the atoll.

To complement nursing pup protection through shark removal, we will translocate pups as close to weaning as is possible. Weaned pup translocations will occur from high shark predation risk islets (e.g. Trig, Round, the Gins) to low risk islets (e.g. Tern) within FFS (to be permitted separately: Co-Trustee's Management permit for 2013).

The HMSRP proposes to use monk seal flesh that has been collected from recently deceased seals at FFS as bait for Galapagos sharks. This activity was approved in 2013 but was not implemented due to the fact that no freshly deceased animals were found during the short 2013 field 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 permits for this work in 2010 -2011, we consulted with and sought and received quality input from OHA, the NHCWG and other member of the Native Hawaiian community. We believe constructive feedback was offered to us during each consultation and we left with an improved understanding of the views of some representatives of the Native Hawaiian community on our proposed work. From these meetings, we also developed partnerships with Keoni Kuoha (2010) and Leighton Tseu (2011); both men accompanied us to FFS at different times during our field 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. It was a pleasure to work with the members of the Native Hawaiian community. We believe that these collaborations have deeply enriched the experience of our staff and fortifies our efforts to conserve the Hawaiian monk seal.

Since the Land Board hearing in May 2013, during which the proposed activity was most recently considered, we have continued efforts to communicate with, and be responsive to, stakeholders regarding this activity. Email updates have been sent to approximately 35 organizations and individuals that included a summary report of the 2013 field season and plans for the 2014 season. To date, none of these entities has expressed questions or concerns.

During the May 2013 hearing, the Board requested that we have further consultations with supporters of monk seal conservation, in particular consultations regarding the use of seal tissue with Native Hawaiians with whom we have been building productive relationships. In this regard, we have held one-on-one discussions with several Hawaiian individuals (cultural practitioners, partners, and/or advisors). During these discussions, we explained our planned use of seal tissue, discussed why we thought it was necessary, and acknowledged that this was a difficult activity to consider and undertake. Input we received during these one-on-one discussions ranged from full support and understanding to acceptance without expressed support. No one we have spoken with regarding the use of seal tissue has voiced opposition or indicated that the use of seal tissue as we have proposed would adversely affect their productive relationships with our program or otherwise diminish their support for monk seal conservation. The overarching sentiment we have heard has been that as long as the seals would be dead of a cause beyond our control (which would be the case), using their bodies to try to save a still living seal, while admittedly difficult to consider or undertake, would be a reasonable (or “pono”) effort in light of the endangered status of the monk seal population.

One recommendation that came out of the one-on-one discussions with our Native Hawaiian partners was that we consider cultural protocols regarding the use of seal tissue, and we intend to follow this recommendation. In part to address this recommendation and in part to continue our consultation with Native Hawaiians on this topic, we are considering bringing the proposed activity before the Archipelago-Wide Cultural Working Group, which is a newly formed group established as a joint initiative of the Hawaiian Islands Humpback Whale National Marine Sanctuary, the Monument, DLNR and OHA. Cultural protocols related to the use of marine species are part of the group’s scope of interest and we are in discussions with the group’s Chairperson regarding the group considering the proposed activity, including the use of seal tissue. If the group does consider the proposed activity, we anticipate a report and/or set of recommendations would be produced for our consideration and action, as well as for the MMB and Land Board. We look forward to continuing these and other efforts to

maintain communications and productive relationships with Hawaiian partners in monk seal conservation.

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 18 Galapagos sharks within 700m of four islets across FFS atoll during the main pupping season only. 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. A recent Galapagos shark abundance estimate at FFS Galapagos is in the hundreds or low thousands (Dale et al. 2011). The number of Galapagos sharks likely involved in predation of pups in the shallows (i.e. around the pupping islets) is estimated to be in the low tens based on sonic-tag data (C. Meyer pers comm.).

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.

b. How will the activity be conducted in a manner compatible with the management direction of this proclamation, considering the extent to which the conduct of the activity may diminish or enhance Monument cultural, natural and historic resources, qualities, and ecological integrity, any indirect, secondary, or cumulative effects of the activity, and the duration of such effects? The proposed activity would be conducted in a manner that will not only be compatible with the management direction of the Monument, but will enhance the ecological integrity of the Monument by helping to avoid the extinction of an endangered species. While this activity will be conducted on a very small spatial and temporal scale and it will directly adversely affect up to 18 Galapagos sharks, it may also have a long-term beneficial cumulative impact on the health of the monk seal population and biodiversity of the Monument.

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.

There is not a practicable alternative location to the proposed activity outside of the Monument because this threat to the recovery of the endangered Hawaiian monk seal has only been identified in the Monument. While a small portion of the monk seal population lives outside of the Monument, in the MHI, the species will not likely avoid extinction without a healthy population in the NWHI.

Losing a high number of pre-weaned and newly weaned pups to shark predation is a unique phenomenon at French Frigate Shoals only; therefore, we propose to manage this threat at this location only. We have taken this focused and targeted approach to maximize the limited federal resources and minimize adverse impacts to other Monument resources by conducting the shark removal activities at 3 of the 9 islets at FFS.

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) 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 removed, a higher number of pups should be expected to survive to be candidates for translocation and other enhancement activities 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 225 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 225 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.

Neither the HMSRP nor external experts 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.

Some of the staff that conducted this work in the 2011-2013 field seasons will return for the 2014 field season. In 2011-2013, they completed this work at FFS safely with no harm to seals or lethal shark bycatch (i.e. all tiger, whitetip and grey reef sharks captured were released alive), and in 2011 they removed one Galapagos shark with a handline in a safe and respectful manner. In 2010, they facilitated in gear prep, setting of bottomsets and shark necropsy and sampling. In 2009, they accompanied Meyer's shark tagging crew in FFS in capturing and handling sharks.

Also, we conducted a Risk Assessment on shark fishing with Carl Meyer, his students and Bill Putre of NOAA (March 2009). Each year, FFS staff contribute and participate in updating this Risk Assessment. This will be done in 2014 as well.

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.

We have received funding annually that is adequate to perform the activities. 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.

The proposed procedures (i.e. scope, timing, location, numbers, species of sharks to be removed) 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 - 2011 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 2011, there were only 2 sightings of Galapagos sharks; in 2012 and 2013 there were no sightings of Galapagos sharks. 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 Kahana, Sette and Hi'l'alakai have also been equipped with transceivers.

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 2010-2012. The 201-2012 permit applications 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:**

### **Shark Fishing/Removals**

1. Fishing personnel and location:

A crew of 3-4 staff experienced in safe and effective methods for shark fishing/removal will be tasked with shark monitoring and fishing 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 fish for a maximum of 18 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. Handlines were successful in 2011 and also in the past (between 2000 and 2005). Bottomsets with large hooks and bait were shown to be highly effective in 2009 across the atoll (i.e. Carl Meyer’s crew caught Galapagos sharks in the 2009 season) and in 2010 near Trig by HMSRP. 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.

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. The order in which the different methods will be applied will be at the discretion of the crew and will be highly dependent on a variety of environmental and biological factors. 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 proposed catch quota of 18 additional sharks. 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 and seal remains) and hook type (circle hook, size 18/0 to 20/0) as was approved for use in 2010-2013 (seal flesh only requested and approved in 2013). Fish bait will be brought from outside the Monument. Shark and seal flesh will be collected at FFS.

We will tend the gear to avoid bycatch mortality (non-target species will be dehooked and released). It is assumed that bycatch will be minimal and primarily shark species, based on Meyer's crew's experience in 2009 and our bycatch in 2010-2013. Fishing staff will avoid removal of 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. However, in Galapagos sharks, there is a very distinct ridge along the back between the first and second dorsal fins. Also, the maximum size of 20 grey reef sharks caught across the NWHI was 159 cm (total length) in a 2003 study and in 2011 at Trig and Gin by our staff (3 5-foot grey reefs were caught and released). So, based on the absence of the dorsal ridge and a threshold size requirement above 160cm for removal, we will ensure that we do not misidentify a shark that is actually a grey reef.

For handlines, a line will be baited from shore or small boat. 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 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. Meyer's bottomsets had 10 hooks; we propose to use this many or less on each set. The gear is designed for 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 ½ 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 tested the “Net Surprise” in 2010 and 2011 to ensure that it deploys as intended and can be pulled in quickly.

At this time it appears there will be adequate ship time and funding for a full field camp from early June to September 2014. The level of fishing activity will be based upon the budget that is allocated for monk seal research and recovery efforts.

### 3. Post-catch procedures:

When a shark is hooked, harpooned, darter 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 bangstick training and safety protocols (used in 2010 -2013). On March 19, 2009, the HMSRP conducted an Operational Risk Management (ORM) for shark fishing operations and produced a Risk Assessment. ORM 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. This ORM was updated in 2010 -2013 and will be reviewed and refined with the 2014 prior to their deployment.

Refresher training on use of the bang stick will occur boat side on inert material here in Oahu.

HMSRP will perform a shark necropsies 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.

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.

Thereafter, shark remains will be handled as deemed appropriate by members of the Native Hawaiian and the State of Hawaii Office of Hawaiian Affairs. Current guidance is that remains not used for bait be returned to the ocean outside of the atoll.

#### 4. Reporting:

The MMB will notified by NMFS when a shark has been removed. 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.

#### 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 18 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 2014 and the achievement of the ultimate goal is apparent within 1- 2 years thereafter. 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 2014 approximates 18 (which, in combination with the 2010 & 2011 catches, 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 and continued fishing effort is warranted and will be requested in future years.

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: Remains will be disposed of in a similar fashion as has been permitted from 2010-2013. Shark remains will taken at least .5 mi outside FFS atoll and returned to the ocean. This will be done in multiple deepwater locations. Information on all discharges (date, latitude, longitude etc.) will be recorded for reporting purposes.

**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:  
18/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, remains handled as deemed appropriate by members of the Native Hawaiian community and 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).

Sample analysis will be done to be cost-effective, unless otherwise requested by the Monument. Thus, the samples will not be sent to the scientists listed above until additional sharks (approaching the quota of 20 individuals) have been captured.

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

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

Shark necropsy and sample analysis 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:**

No fixed instrumentation.

Three to four freezers will be required at Tern for bait and sample storage. These will be either propane or solar (most likely propane though).

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

Report to the Monument: end of season report within 1 month of end of season, permit report by Dec 31, 2014.

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:**

Dale, J. J., A. M. Stankus, M. S. Burns, and C. G. Meyer. 2011. The Shark assemblage at French Frigate Shoals Atoll, Hawai'i: species composition, abundance and habitat use. *Plos One* 6:e16962.

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.

Gobush, K.S. and S.C. Farry. 2012. Nonlethal efforts to deter shark predation of Hawaiian monk seal pups. *Aquatic Conservation*. DOI:10.1002/aqc.2272.

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