State of Hawaii
DEPARTMENT OF LAND AND NATURAL RESOURCES
Division of Aquatic Resources
Honolulu, Hawaii 96813

March 23, 2012

Board of Land
and Natural Resources
Honolulu, Hawaii

Request for Authorization and Approval to Issue a Papahānaumokuākea Marine National Monument Conservation and Management Permit to Frank Parrish and Alecia Van Atta, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, for Access to State Waters to Conduct Shark Removal Activities

The Division of Aquatic Resources (DAR) hereby submits a request for your authorization and approval for issuance of a Papahānaumokuākea Marine National Monument conservation and management permit to applicants Frank Parrish, Chief of Protected Species Division, and Alecia Van Atta, Assistant Regional Administrator for Protected Resources, of the National Oceanic and Atmospheric Administration (NOAA), National Marine Fisheries Service, pursuant to § 187A-6, Hawaii Revised Statutes (HRS), chapter13-60.5, Hawaii Administrative Rules (HAR), and all other applicable laws and regulations.

The conservation and management permit, as described below, would allow entry and management activities to occur in Papahānaumokuākea Marine National Monument (Monument), including the NWHI State Marine Refuge and the waters (0-3 nautical miles) surrounding the following site:

- French Frigate Shoals

The activities covered under this permit would occur between June 1, 2012 and May 31, 2012.

The proposed activities are largely a continuation of work previously permitted and conducted in the Monument. Activities proposed that differ from last year, but previously permitted, are the drum line and bottomset fishing gear types including vessel based fishing. The applicant has also requested to extend the activity from the previously permitted 400 m distance from shore limit to the 700 meter distance from shore or to achieve approximate 25 ft depth contour boundary.

INTENDED ACTIVITIES

The applicants propose to conduct management activities for the conservation of Hawaiian monk seals, include the removal of predatory sharks at selected pupping sites. The proposed activities would support the recovery of Papahānaumokuākea Marine National Monument's endangered Hawaiian monk seals by reducing the likelihood of shark predation on seal pups at French

Frigate Shoals (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. Increased survival of pups is necessary for the species' recovery. Monitoring of shark activity at FFS, to be conducted to inform shark removals, is included within the Co-Trustee Conservation and Management permit, PMNM-2012-001.

Applicants aim to remove a maximum of 18 sharks between June 1, 2012 and May 31, 2013 within a 700-meter distance from shore and depths of approximately 25 feet. This depth is required for the efficiency of the bottomset and drum-line gear methods proposed. Shark removals would be limited to Galapagos sharks (Carcharhinus galapagensis), as they are the only shark species that staff of the Hawaiian Monk Seal Research Program (HMSRP) has positively identified pursuing, injuring or killing pups during observations over the last 10 years.

The applicants propose to remove Galapagos sharks (tail length of 200cm or greater) within 700m of selected 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".

For all methods, hooked or netted sharks would be brought into shore, or alongside a small boat, tail roped and humanely killed with a bangstick. Shark carcasses would then be examined (gross necropsy), sampled for future scientific analysis (isotope, fatty acid, genetic analysis) and any suitable shark tissue used as bait or diposed of at deepwater locations (0.5 miles beyond the break reef from Tern Island).

The activities proposed by the applicant directly support the Monument Management Plan's priority management need 3.2 - Conserving Wildlife and Habitats through activity TES 1.6 – Reduce shark predation on monk seals. In addition, 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.

The activities described above may require the following regulated activities to occur in State waters:

- ☒ Removing, moving, taking, harvesting, possessing, injuring, disturbing, or damaging any living or nonliving Monument resource
- ☒ Anchoring a vessel
- ☒ Discharging or depositing any material or matter into the Monument
- ☒ Possessing fishing gear except when stowed and not available for immediate use during passage without interruption through the Monument
- ☒ Attracting any living Monument resource

REVIEW PROCESS

The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and

Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since January 5, 2012, giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Comments received from the scientific community are summarized as follows:

Scientific reviews support the acceptance of this application.

The following questions were raised:

1. In light of recommendations from the Native Hawaiian Cultural Working Group in regards to leaving the shark carcass in PMNM, what would be the applicant's method of carcass disposal?
We would request the direction of OHA, Native Hawaiian cultural practioners and/or other community members.

The applicant responded that the remains could be disposed at multiple deepwater locations outside of the atoll (latitude/longitude of the location will be recorded and avoided for addition disposals in the same year) at a distance of 0.5 mile from the FFS atoll's breaking reef. Disposal could occur safely at this distance from the atoll and current and water depths are adequate. This is what occurred with shark remains other than the skin and jaws retained for cultural purposes, and the tissue that was used as bait from the Galapagos shark culled in 2011.

2. Since there have only been 2 sharks removed since 2010, what is the criteria for success? How effective are these techniques?

The applicant states that as per p22 of the application: 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. The applicant would consider the activity to have been successful if the proximate goals are achieved in 2012 and the ultimate goal is apparently met within 1- 2 years thereafter. In terms of success, the applicant defines success in the short-term as safely executing the mission to monitor and remove up to 18 adult Galapagos sharks near pupping sites and translocate weaned pups to safe islets. Per annum, this may translate to less than 18 sharks culled because CPUE has proven to be exceedingly low near the islets. In the long-term, success is defined by the applicant as first, achieving the proximate goal and then after an expected lag time (e.g. 1-2 years), meeting the ultimate goal. If a decrease in pup mortality becomes apparent and equal to background levels (1-2 pup deaths to predation per year), prior to the removal of 18 additional Galapagos sharks, then shark removals would temporarily be halted while monitoring continued.

3. Would shark deterrent activities be conducted under this permit, if approved?

No. The applicant has states that there are no plans to conduct deterrent testing in 2012.

4. Why are the applicants not proposing to conduct shark removal activities at East Island, FFS when there is documented take of monk seal pups there?

The applicant states that there is no plan to conduct removal activities at East because 1) the incidence of shark predation on nursing pups at East is historically low, much lower than at Trig, Gins and Round; and 2) tiger sharks and green turtles are particularly active at East. The applicant further explains that these factors would make shark monitoring and fishing while not impacting other wildlife especially challenging here.

5. If permitted personnel observe a tiger shark pursuing a monk seal, what would be the applicant's proposed course of action?

NMFS states that if any field staff observed a tiger shark pursing a nursing pup, they would likely monitor and record the event via photographs and video. The applicant further states that have not observed tiger sharks to patrol and attack nursing or newly weaned pups in the shallows for the duration of our monitoring (1997 to 2011), this would be a rare and unexpected event.

6. If shark removal may not be resolving the loss of monk seal pups, what additional measures are being taken to (1) improve monk seal pup survivorship or (2) improve fishing methods/procedures?

The applicant responds to the 2 points in questions as follows;
1) NMFS routinely undertakes several actions to promote weaned pup and juvenile seal survival (e.g. translocation, deworming, disentanglements) at the NWHI breeding sites. Also, when male seal aggression towards pups and weaners occurs (e.g. Kure in 2011), NMFS intervenes and hazes the males and medically treats injured pups. However, at all breeding sites, expect FFS, nursing pup survival is high (>90%) and it is not typically necessary for NMFS to act to improve survival for this age class. At FFS, the only threat to nursing pup survival that has occurred year after year since 1997 is shark predation (impacting many pups) and possibly inclement weather issues (impacting few pups). NMFS has attempted to mitigate predation via deterrent testing, shark hazing and shark removal; NMFS translocates pups at weaning to safer islets in the atoll (e.g. Tern). It is very important to understand that if pups can be saved from shark predation until after they fully wean, NMFS has and will translocate these pups away from the atypical shark predation areas (Trig, Round,and the Gins) to safer islets in the atoll (e.g. Tern). The central objective of the shark predation mitigation activities described in the permit application is to help keep the pups alive until translocation is possible (i.e., until after the pups no longer need to be
with their mothers to nurse.) Monk seal juvenile survivorship (from 1 years old and onward) at FFS is improving for the first time in over a decade, according to population assessment estimates of the last 3 years. This development makes mitigating shark predation prior to weaning/near weaning even more impactful for the population because there is a greater chance that a larger number of weaned seals might survive to maturity.

2) To continually refine and improve our attempts at fishing for Galapagos sharks, NMFS has 1) discussed and incorporated the fishing lessons learned from the past at FFS (i.e. fishing attempts

and successes between 2000-2007), 2) consulted with experienced shark researchers (e.g. held 2 workshops and consulted with C. Meyer and his crew), 3) created and tested new techniques in 2010-2011, 4) increased effort (in terms of hook hours) and geographic scope between 2010 and 2011, and 5) improved the basic understanding of the fishing environment (i.e. bathymetry, etc) around the pupping islets. In addition, there will be continuity in crew between 2011 and 2012 that has not occurred in the recent years; this may improve efficiency and effectiveness in 2012.

Comments received from the Native Hawaiian community are summarized as follows:

The Papahanaumokuakea Native Hawaiian Cultural Working Group requested not to be consulted again, until further notice, on applications pertaining to these proposed activities. After a full discussion about the possibility of targeted sharks being killed under such a permit, however, the group came to consensus that if this permit were granted and any sharks were killed under the permit, they wanted all of the remains left in Papahanaumokuakea, unless there were Hawaiian protocols.

Comments received from the public are summarized as follows:

No comments were received from the public on this application.

Additional reviews and permit history:

An external review of this application and the proposed activities therein was completed by Dr. Carl G. Meyer, Assistant Researcher, Hawaii Institute of Marine Biology, University of Hawaii. Dr. Meyer has an extensive, over 15 years, research background which most recently includes a focus on top predator movements and diet within PMNM, in particular at FFS. See Attachment ("Review of PMNM 2012□2013 Conservation and Management Permit Application").

Are there other relevant/necessary permits or environmental reviews that have or will be issued with regard to this project? (e.g., MMPA, ESA, EA) Yes ☒ No ☐
If so, please list or explain:

- NMFS ESA/MMPA Research and Enhancement Permit 10137-04.
- 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 NWHI. Pacific Islands Fisheries Science Center, Protected Species Division, Hawaiian Monk Seal Research Program.
- NMFS 2010. Supplemental 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. Pacific Islands Fisheries Science Center, Protected Species Division, Hawaiian Monk Seal Research Program.
- NMFS and ONMS in prep. Issuance of a Conservation and Management Permit to the National Marine Fisheries Service Pacific Islands Fisheries Science Center Protected Species Division and Pacific Islands Regional Office Protected Resources Division For Conducting Hawaiian Monk Seal Conservation and Management Activities in Papahānaumokuākea Marine National Monument.

EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT CONSERVATION AND MANAGEMENT PERMIT TO FRANK PARRISH AND MS. ALICIA VAN ATTA, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, NATIONAL MARINE FISHERIES SERVICE (NMFS), FOR ACCESS TO STATE WATERS TO CONDUCT SHARK REMOVAL ACTIVITIES UNDER PERMIT PMNM-2012-013.")

Has Applicant been granted a permit from the State in the past? Yes ☒ No ☐
If so, please summarize past permits:

- The applicant was granted permit PMNM-2007-053 in 2007 for unrelated work and permits PMNM-2010-014 and PMNM-2011-007 in 2010 and 2011 respectively for similar work.
- George, "Bud", Antonelis was granted permit PMNM-2007-025 in 2007 for activities similar to those being proposed by the current applicants.

Have there been any a) violations: Yes ☐ No ☒
b) Late/incomplete post-activity reports: Yes ☐ No ☒

Are there any other relevant concerns from previous permits? Yes ☐ No ☒

STAFF OPINION

DAR staff is of the opinion that Applicants have properly demonstrated valid justifications for their application and should be allowed to enter the NWHI State waters and to conduct the activities therein as specified in the application with the following special instructions and conditions, which are in addition to the Papahānaumokuākea Marine National Monument Conservation and Management Permit General Conditions, and include the special condition which addresses field reporting that the BLNR imposed in 2011 for this activity (See Recommendation section, #3f.). All suggested special conditions have been vetted through the legal counsel of the Co-Trustee agencies (see Recommendation section).

MONUMENT MANAGEMENT BOARD OPINION

Although not in unanimous agreement, the majority of MMB agencies support the proposed activity in recognition of the dire status of Hawaiian monk seals, and the limited range of recovery options available to address this situation. The agencies in support therefore recommend issuance of a permit, with conditions similar to those stipulated in the 2011 permit for this activity, which now includes vessel-based fishing. The MMB further recognizes that concerns remain regarding these efforts to selectively remove sharks, in relation to Native Hawaiian cultural impacts, effective implementation of the proposed activities, and correlation of the outcomes to endangered species recovery, as indicated by the scientific reviews.

RECOMMENDATION:

Based on the attached proposed declaration of exemption prepared by the department after consultation with and advice of those having jurisdiction and expertise for the proposed actions under the contract:

1. That the Board declare that the actions which are anticipated to be undertaken under this permit will have little or no significant effect on the environment and is therefore exempt from the preparation of an environmental assessment.

2. Upon the finding and adoption of the department's analysis by the Board, that the Board delegate and authorize the Chairperson to sign the declaration of exemption for purposes of recordkeeping requirements of chapter 343, HRS, and chapter 11-200, HAR.

3. That the Board authorize and approve a Conservation and Management Permit, to Frank Parrish and Alecia VanAtta with the following special conditions:

   a. This permit is not to be used for nor does it authorize the sale of collected organisms. Under this permit, the authorized activities must be for noncommercial purposes not involving the use or sale of any organism, by-products, or materials collected within the Monument for obtaining patent or intellectual property rights.

   b. The permittee may not convey, transfer, or distribute, in any fashion (including, but not limited to, selling, trading, giving, or loaning) any coral, live rock, or organism collected under this permit without the express written permission of the Co-Trustees.

   c. To prevent introduction of disease or the unintended transport of live organisms, the permittee must comply with the disease and transport protocols attached to this permit.

   d. Tenders and small vessels must be equipped with engines that meet EPA emissions requirements.

   e. Refueling of tenders and all small vessels must be done at the support ships and outside the confines of lagoons or near-shore waters in the State NWHI Marine Refuge.

   f. Permittee is required to provide in writing to the Monument Management Board (MMB), a field report after any lethal catch, to include species, size, and GPS coordinates of capture location within a week of capture date, unless unforeseen field communications inhibit this time frame to be met.

Respectfully submitted,

Administrator

APPROVED FOR SUBMITTAL

WILLIAM J. AILA JR.
Chairperson

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: June 1, 2012- May 31, 2013
Proposed Method of Entry (Vessel/Plane): primarily chartered vessel Kahana, in addition possibly the following: NOAA vessels- Oscar Elton Sette and NOAA vessel Hi'ialikai, chartered vessel Searcher, chartered flight via FWS

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 2012. These activities are a continuation of previously permitted activities that removed a total of 2 Galapagos sharks between 2010 and 2011. 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 2012) 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) small10-hook bottomset and 5) the "Net Surprise". 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 approriate by designated Native Hawaiian community members.

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). 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 (2009-2011) 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 2009-2011 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 ($R2 = 0.05$, $n = 57$, Likelihood ratio $\chi 22 = 2.6$, $p = 0.27$). (Gobush & Farry, in prep).

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 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. 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 culled 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 (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, 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 born) 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.

Staff fished with handlines for a total hook soak time of 680 hours. Fishing commenced at Gin on June 7 after a shark-inferred disappearance of a pup there and continued until July 12. Thereafter fishing occurred at Trig from 14 July to 29 July 2011. A large female Galapagos (274 cm total length) was culled 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 practioners

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 pick up 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 Kanahele 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 culled Galapagos shark's skin and jaws were distributed to G. Umi Kai for cultural and educational purposes upon our return from FFS (September 2011).

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					
Year	FFS	LAY	LISI	PHR	MDY	KUR
2007	7(6)	2(0)	0(0)	1(0)	3(0)	0(0)
2008	8(6)	2(0)	1(0)	0(0)	1(0)	2(0)
2009	7(5)	0(0)	1(0)	0(0)	0(0)	0(0)
2010	9(6)	3(0)	1(0)	2(0)	0(0)	1(0)
2011	9(5)	3(0)	1(0)	3(0)	2(0)	5(0)

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.

	Location			
Year	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

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

* 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.

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]

Phone: [redacted]

Fax: [redacted]

Email: [redacted]

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

3. Affiliation (institution/agency/organization directly related to the proposed project):
NOAA-NMFS-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]
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 (1-2 staff)

Section B: Project Information

5a. Project location(s):

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

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

Location Description:

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 2012).

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 May 1 to September 30, 2012). 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 2012 at FFS. This number of Galapagos sharks plus the 2 removed in the last two years would fulfill the quota of 20 sharks that was recommended at a workshop on 2008 and permitted by the Monument in 2010 and 2011.

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 culled 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.

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 2012).

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 and 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. We will continue to welcome and greatly appreciate input from the Native Hawaiian community.

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. 2010). 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. However, in the unlikely event that fishing activities revealed any items of potential maritime historical value fishing activities would be halted in that area, a GPS location of the spot would be taken, and a report of the location and description of findings would be reported to the PMNM MMB upon return to camp. The area would be avoided during future fishing efforts. Prior to dropping any fishing gear, the field team will scan the bottom of the fishing site to look for any signs of historic resources.

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; Parrish et al. 2011). Results from that work indicated that the removal of 20 Galapagos sharks had a nearly imperceptible effect on the dynamics of the FFS ecosystem. Expert opinion at our shark predation workshops supported these modeled results. However, the total size of the Galapagos shark population at FFS was

underestimated in the model when it was run in 2005 because data about sharks in the region was limited. Since then, and of paramount importance, Meyer's research directly on Galapagos sharks at FFS estimated the size of Galapagos shark population to be in the low thousands and that 20 individuals would represent a very small fraction of this larger total (Dale etal. 2010). Both Parrish and Meyer's research suggest that the removal of 20 Galapagos sharks would not impact the Galapagos shark population dynamics nor the foodweb dynamics of the ecosystem, given the large number of apex predators overall at FFS (i.e. tiger sharks, Galapagos sharks, ulua and monk seals).

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 culled, a higher number of pups should be 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, thus the activity will attempt to protect the greatest number of nursing pups at FFS possible. Tentative dates that are highly subject to change based on numerous internal Programmatic factors are arrival on June 5 and departure on July 26, 2012, yielding 52 days on site. Pups are likely to be born before our arrival and after our departure, so in truth the duration of our activity would benefit from being increased past 52 days; however, all things considered, this is not likely to occur for our Program.

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 2011 will return for the 2012 field season (S. Farry and M. Sullivan). In 2011, they successfully captured and culled one Galapagos shark with a handline in a safe and respectful manner; they also caught a few tiger and grey reef sharks as bycatch that were released alive. In 2010, they facilitated in gear prep, setting of bottomsets and shark necrospy and sampling. In 2009, they accompanied Meyer's shark tagging crew in FFS in capturing and handling sharks.

In 2010, 2 staff with shark handling experience were contracted to primarily make bottmsets around Trig. They captured and culled one Galapagos shark and caught and released other shark bycatch. We aim to hire comparably skilled staff for the 2012 season (1-2 staff) to complement our returning experienced staff (S. Farry and M. Sullivan).

Also, we conducted a Risk Assessment on shark fishing with Carl Meyer, his students and Bill Putre of NOAA (March 2009). S. Farry and M. Sullivan contributed to this RA and the updating of it in 2010 and 2011.

Operations will be based on two funding scenarios:

Low Funding: Only shore-based fishing will occur as in 2011. The two field leaders from 2011 that oversaw the fishing activities and training would be in place for the 2012 field season.

High Funding: Both shore-based and boat-based fishing will occur. The additional boat-based fishing would be undertaken by personnel with experience specific to boat-based fishing using the techniques described in this application.

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 (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 disposable 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 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, Searcher and Hi'l'alakai have also been equipped with tranceivers.

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 and partially in 2011. The 2010 and 2011 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 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 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 remains) and hook type (circle hook, size 18/0 to 20/0) as the Meyer's project and what we used in 2010 and 2011. Fish bait will be brought from outside the Monument.

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 and 2011. 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. 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 culling, we will ensure that we do not misidentify and cull a shark that is actually a grey reef. Our requested size requirement for Galapagos shark removal is actually 200cm or greater, which generously exceeds the 160cm threshold size required to avoid mistaken removal of grey reefs. The 200cm size limit is based on information from C. Meyer's work on movement behavior of tagged Galapagos sharks at FFS.

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 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 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 (this constitutes placing a material on the submerged lands and is indicated in section 5b of this application). The buoy line length will be contingent on target set depth, for example setting at 25 ft depth will require 75ft of buoyline on each side (a scope of 1:3). The buoyline exceeds the depth 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 typically spends most of its time on the bottom feeding on demersal fishes (i.e. when not in the wavewash or at water depths of 1-3m attempting to or attacking monk seal pups). 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. A maximum of two "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" to ensure that it deploys as intended and can be pulled in quickly. Such a tests were done in 2010 & 2011.

It should be noted that budget the budget for NOAA Hawaiian Monk Seal Program is uncertain at this time due to the continuing resolution. The level of fishing activity will be based upon the budget that is allocated for monk seal research and recovery efforts. Based on projections of the minimum budget, we expect to at least replicate fishing activities undertaken in 2011 which included used of the surprise net and all shoreline fishing activities. If enough funding is received we will hire personnel that have expertise for the boat based fishing activies as well. We will coordinate with the PMNM MMB and permit coordinators as the budget scenario becomes clearer. To reiterate from above, operations will be based on two funding scenarios:

Low Funding: Only shore-based fishing will occur as in 2011. The two field leaders from 2011 that oversaw the fishing activities and training would be in place for the 2012 field season.

High Funding: Both shore-based and boat-based fishing will occur. The additional boat-based fishing would be undertaken by personnel with experience specific to boat-based fishing using the techniques described in this application.

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-roped and euthanized with a .44 caliber bang stick. HMSRP has established bangstick training and safety protocols (used in 2010 & 2011). 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 and 2011 and will be reviewed and refined with the 2012 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 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.

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. If deemed appropriate, we request that suitable shark tissue be used as bait for subsequent removal efforts within the field season.

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 2012 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 2012 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.

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: If it is requested that any remaining shark tissue be disposed of in the Monument, we suggest that remains be disposed at multiple deepwater locations outside of the atoll (latitude/longitude of the location will be recorded and avoided for addition disposals in the same

year). We suggest a distance of 0.5 mile from the FFS atoll's breaking reef because disposal can occur safely at this distance from the atoll and current and water depths 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:
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. To date, we have these set of samples from 2 Galapagos sharks (1 in 2010 and 1 in 2011).

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 dmso, 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 catridges 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: 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:

Dale, J. J., A. M. Stankus, M. S. Burns, and C. G. Meyer. 2010. 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. In prep. Efforts to deter shark predation of Hawaiian monk seal pups.

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. 2010. 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.

Parrish, F. A., E. Howell, B. Antonelis, S. Iverson, C. Littnan, J. D. Parrish, and J. Polovina. 2011. Estimating the carrying capacity of French Frigate Shoals for the endangered Hawaiian monk seal using Ecopath with Ecosim. Marine Mammal Science DOI: 10.1111/j.1748-7692.2011.00502.x.

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.

Signature Date

SEND ONE SIGNED APPLICATION VIA MAIL TO THE MONUMENT OFFICE BELOW:

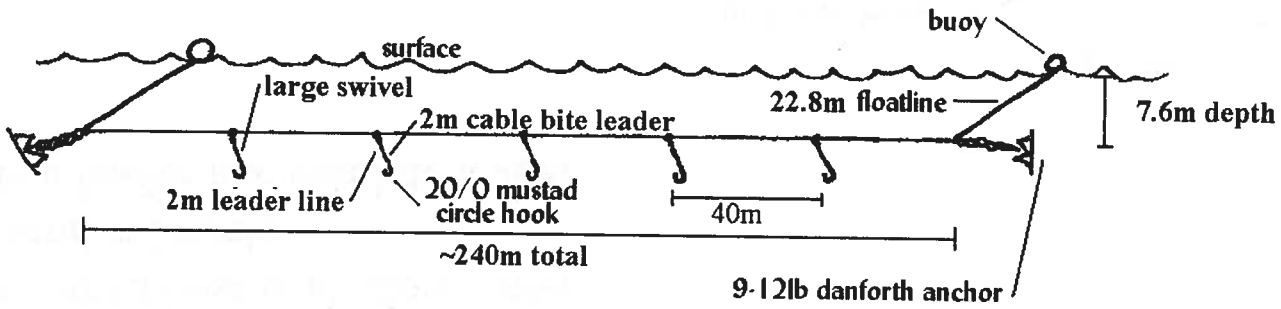
Papahānaumokuākea Marine National Monument Permit Coordinator
6600 Kalaniana'ole Hwy. # 300
Honolulu, HI 96825
FAX: (808) 397-2662

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

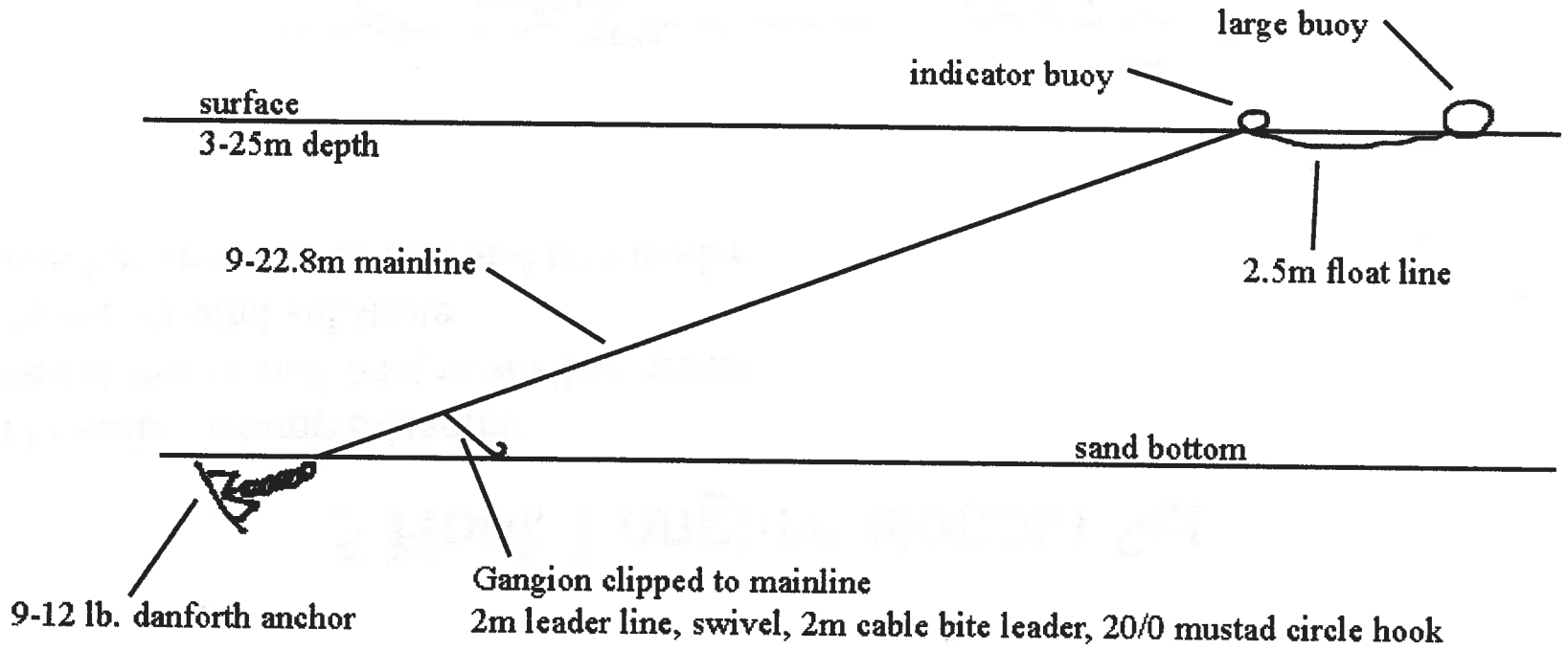
5 Hook Longline Bottom Set

Not to scale - example diagram
To be set from small boat in shallow water
To be set on sand substrate
Swivel between leader line and bite leader



Drumline Set

Not to scale - example diagram
To be set from small boat in shallow water
To be set on sand substrate
Swivel between leader line and bite leader

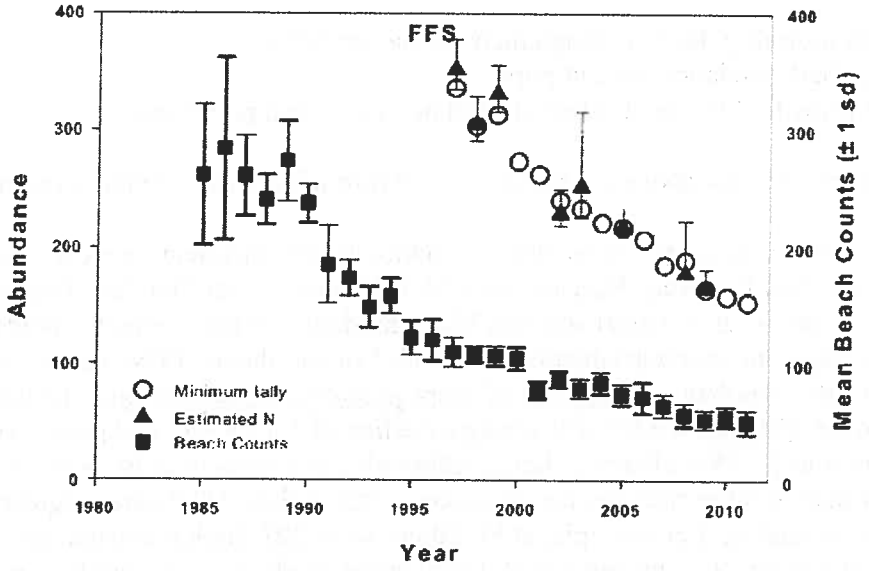


Response to MMB Request for Additional Information on the Revised 2011 Parrish/Van Atta Permit Application

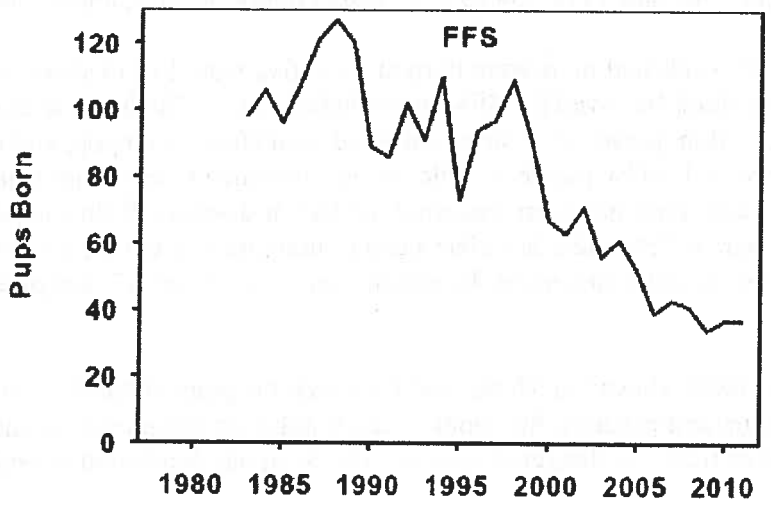
Introduction

There are only about 1,100 Hawaiian monk seals left in existence. The population is heading towards extinction as a result of numerous threats across its range, and is listed as Endangered under the U.S. Endangered Species Act (ESA). The ESA requires all federal agencies, including the National Marine Fisheries Service(NMFS), the National Ocean Service, and the U.S. Fish and Wildlife Service to carry out programs for the conservation of the Hawaiian monk seal.

Estimates of non-pup abundance and mean non-pup beach counts at French Frigate Shoals



Pup production at French Frigate Shoals



In the Papahanaumokuakea Marine National Monument (PMNM), the key threat to the survival of the species is falling birth rates combined with poor survival of juvenile Hawaiian monk seals to reproductive age. Many of these young animals have failed to thrive, and only one of every 5 lives to reach maturity. The age structure of the population is unfavorable for future population growth.

This decline will continue and the conservation challenge will intensify unless scientists and managers, working together, develop the means to improve juvenile survival. Improving juvenile survival is one of four key activities highlighted in the updated Recovery Plan for the Hawaiian monk seal, published by NOAA in 2007. The four activities are:

1. Improving juvenile survival through direct intervention such as providing captive care and feeding
2. Mitigating mortality due to entanglement in marine debris
3. Reducing shark predation on seal pups
4. Ensuring growth of the small Main Hawaiian Islands seal population

Items 1, 2, and 4 from the list above are being pursued through a series of other programs/applications.

Recognizing the extreme threat posed by shark predation to the Hawaiian monk seal population, both the Hawaiian Monk Seal Recovery Plan and the PMNM Management Plan list "Reduce Shark Predation on Monk Seals" as a critical activity. Shark predation of pre-weaned and newly weaned pups contributes to a unique and extreme situation at French Frigate Shoals (FFS), which was once the largest segment of the population. This level of shark predation stands out from the trends observed at other sites within the PMNM. We are still seeing a decline of 5-11 monk seal pups a year from shark predation alone (about 12-25% of each cohort). Although some pup mortality is to be expected, this rate is far greater than at other sites and across recent history (since 1980 when regular monitoring began) and is unsustainable. For example, at FFS there were 207 shark incidents (bite wounds, disappearances categorized as shark-related and confirmed shark kills) on pups (pre-weaned and newly weaned) from 1997 to 2010. This means that 24.2% of the 854 pups born at FFS were involved in shark incidents from 1997 to 2010.This level of shark predation at FFS is extremely high compared to shark predation at other breeding sites over the same time period. For instance, wounds and disappearance attributable to sharks at Laysan Island and Lisianski Island over the same period were much lower - 10 of 520, (1.9%,) and 13 of 334 (3.9%), respectively (NMFS, unpublished data).

Last field season, of the 37 monk seal pups were born at FFS, five were lost to shark predation and a sixth pup was injured by a shark but lived (NMFS, unpublished data). The lethal attacks on pups were evidenced by direct observation, presence of shark-inflicted wounds on each pup, and the disappearance of an otherwise healthy pup that could not be attributed to any other cause (i.e. severe weather, male seal aggression, poor nutrition, maternal neglect or disease). With such small numbers of pups being born each year at FFS, there is a clear need to dramatically cut the proportion of each monk seal cohort that is lost to shark predation. Increasing survival of just 1-2 seal pups is a significant portion of that goal.

Over the last decade, the NMFS Hawaiian Monk Seal Research Program (HMSRP), in coordination with the PMNM co-management partners, has employed a number of techniques to mitigate the effects of shark predation on this critically endangered species. The team has conducted intensive monitoring

and standardized observation and data collection to quantify the threat posed by shark predation and to determine which species of shark is preying upon monk seal pups. The team also conducts translocation of weaned pups to safer islets within FFS. However, the danger to pre-weaned and newly weaned pups from shark predation cannot be addressed by data collection nor by translocation alone, since pups cannot be removed from their mothers before weaning. [Translocation of mother-pup pairs is not feasible due dangers to the health and welfare of mothers and pups, as well as the extreme cost and risk involved in the care of pups should they be abandoned].

To further address the threat of shark predation, the HMSRP has, under previous year PMNM permits, employed techniques to protect the pre-weaned and newly weaned pups including harassment of sharks, deployment of devices to deter predation, and removal of predatory sharks.

This year's permit application is very similar to permits issued in 2010 and 2011. It seeks to gain re-authorization of efforts that have been employed by the HMSRP to protect pre-weaned and newly weaned pups. This request is for removal of 18 adult Galapagos sharks from islets at FFS. Last year we were permitted to remove 19 sharks (but ultimately only 1 shark was lethally removed).

History of efforts to mitigate shark predation on pre-weaned and newly-weaned pups at FFS

As part of the overall strategy to increase pup survival, HMSRP has worked on trying to mitigate Galapagos shark predation of pups at FFS for over 10 years. This work, and the work of Dr. Carl Meyer, University of Hawaii's Hawaii Institute of Marine Biology, has provided a great deal of information about the issue at FFS: the extent of predation temporally and spatially, the segment of the monk seal population affected by shark predation and the frequency of these effects, the shark species involved, the fraction of the greater shark population that is involved, seal behavior (mother and pup), the uniqueness of this predation at FFS as compared to other PMNM sites, and the impact of this pup mortality on recruitment and persistence of the FFS seal population. Results confirm that shark predation has a negative and significant impact on the persistence of the monk seal population at FFS. Further results from shark movement tracking research between 2009 and 2011 from the HIMB research indicates that it is a small portion of the overall Galapagos shark population (approximately 7%) frequents the monk seal pupping sites during the annual breeding season.

In 2012, the FFS monk seal population assessment team will once again be undertaking extensive observations and camping to document shark activity and accomplish timely and effective pup mortality mitigation activities. Should the permit to attempt shark removal be approved, the main impact to the field team would be to allow personnel already on scene to intervene rather than just observe when a shark is preying on a monk seal pup. It would not impact their ability to accomplish their population assessment tasks.

From the initial inception of the shark predation mitigation activity, the removal of sharks was always intended to be one of a suite of methods aimed at increasing the survival of Hawaiian monk seal pups within the PMNM. A separate Monument permit for other pup survival enhancement measures is currently active and we intend to request renewal this permit in future years.

The objective of the shark mitigation permit application is to physically prevent Galapagos sharks and pups from coming in contact with each other. One method used to ensure the physical separation of these two species is the translocation of monk seal pups to safer islets as soon as is physiologically

possible (after weaning). The HMSRP has demonstrated that harassing Galapagos sharks and using activities and devices aimed to deter Galapagos shark predation is ineffective across multiple trials in multiple years. For Galapagos sharks, the only method to keep a shark away from pups once it has entered the near-shore area proximal to the pups is to capture it and remove it. No other options exist. A failure to keep the two species separate allows predation to occur and amounts to standing by as the entire monk seal subpopulation is substantially impacted.

Given that harassment and use of deterrents aimed at stopping Galapagos shark predation on pre-weaned and newly-weaned Hawaiian monk seals has proven ineffective, the only viable method remaining to protect these vulnerable pups (as they are not eligible for translocation until after weaning) is to remove sharks that exhibit predatory behavior in the vicinity of the FFS pupping sites.

Small-scale operations to remove Galapagos sharks were initiated in 2000 and continued each year thereafter until 2007. A total of 12 Galapagos sharks were removed from 2000 to 2006, all using shore-based methods (harpooning and fishing with handlines in shallow waters primarily near Trig). Drumlines were used in 2007 but yielded no catch (NMFS, unpublished).

The boat-based bottomset is an excellent tool for catching sharks at FFS, as demonstrated by other researchers there. Bottomsets were permitted and used near pupping islets (up to a distance of approximately 1000m from shore) by HIMB in 2009 yielding 7 Galapagos sharks and in 2010 by NMFS yielding one Galapagos shark (for approximately half of the breeding season only, 400m from shore). Shore-based fishing has also proven to be an effective method for NMFS for removal of target sharks. Between 2000 and 2011, shore-based methods were permitted and used in 7 different years with a yield of 13 Galapagos sharks caught.

However, both nearshore and shore-based methods are subject to the low CPUE that is characteristic of the shallows of FFS. Shore-based fishing likely requires sharks to be more brazen (which is a highly variable behavior) than deeper water methods because it requires that the animals be in extremely shallow water, which is not the species preferred habitat. Thus, overall catch rates may be lower if shore-based methods alone are used than if bottomset and drum line gear types were used in addition.

Other efforts to enhance survival of Hawaiian monk seal pups and juveniles in the PMNM

A number of methods have been undertaken to enhance the survival of Hawaiian monk seal pups and juveniles in the PMNM.

These efforts include:

- Annual evaluation of the six primary populations in the Northwestern Hawaiian Islands. Researchers establish temporary field camps and assess Hawaiian monk seal abundance, age and sex composition, survival, reproduction, feeding habits, entanglement rates in marine debris, and other factors that may limit population growth.
- Translocation of weaned pups from locations with low survival rates at FFS to other sites in the atoll where the pups have a higher probability of survival.
- Removal or harassment of aggressive male monk seals causing mortality of adult females and juveniles of both sexes.
- Characterization of important monk seal foraging habitat and prey species.
- Investigation of health and disease factors that may be limiting population growth.

- Removal of entangling marine debris from beaches and coral reefs and disentangling monk seals and other wildlife.
- Understanding low juvenile and pup survival.
- Deworming juvenile seals to mitigate food limitation stresses
- Captive care and rehabilitation of sick, injured, or undernourished seals

Our field staff is asked to complete a number of different activities as part of their mission at FFS. For example, in 2009, a four-person team performed all seal monitoring work, performed a systematic controlled shark-deterrent study, translocated newly weaned pups as FFS, attached sonic tags to weaners, performed all work related to a larger translocation program of FFS weaners to Nihoa, performed a pup night behavior study which involved camping on Trig for more than 30 nights and the Gins for 7 nights, installed a temporary remote camera system for the first time, and conducted a shark monitoring program. They successfully completed all their planned objectives.

Summary

The Hawaiian monk seal is a critically endangered species, and NMFS and its federal agency partners are bound by federal law to promote the recovery of the Hawaiian monk seal. As part of the suite of mitigation measures aimed at improving juvenile survival of the Hawaiian monk seal, permission for access to PMNM is being requested to enhance survival of Hawaiian monk seal pre-weaned and newly-weaned pups by removing predatory Galapagos sharks from French Frigate Shoals. Given the status of the Hawaiian monk seal, even one pup saved from predation by Galapagos sharks is considered a success.

Receiving a permit for access to PMNM to conduct this activity will allow NMFS to intervene if aggressive, predatory behavior by Galapagos sharks is exhibited toward these particularly vulnerable pre-weaned and newly weaned monk seal pups. Not receiving a permit for access to PMNM to conduct this activity will mean requiring NMFS field staff to simply stand by and record data and video as monk seal pups are killed by predatory Galapagos sharks. NMFS has selected the most appropriate and safest gear types to ensure that the effort will be most likely to target only the Galapagos sharks observed to exhibit predatory behavior, and has carefully selected an expanded set of field staff with the necessary experience to conduct this activity safely. The staff is being trained in additional field protocols and hazard mitigation techniques to minimize the chances of injury to personnel during the conduct of this activity.

Supplemental Information: Comparison of fishing techniques in the 2012 Parrish/Van Atta permit application and permits from 2010 and 2011

Given the status of the Hawaiian monk seal as a critically Endangered Species, even one pup saved from predation by Galapagos sharks is considered a success. Giving our field staff the tools they need to act (instead of standing by to observe mortalities) is crucial to that success.

The 2012 permit application includes 5 fishing methods that were all permitted for use by NMFS for this work in 2010:

- Simple handline from the boat or shore.
- Harpoon.

- Stealth tangle net ("Surprise Net) that is deployed by hand (simply by turning on the air flow from a diving tank). This stealth net rests in a chain-weighted tube on the seafloor. It is approximately 100 m in length and will be set in an arc from shore with its ends on the beach; once air flow is turned on, the net deploys in approximately 10 seconds.
- Longline bottomset line with up to 5 hooks attached laterally to the bottom line, with the bottom line secured to the anchors at either end, marked with floats.
- Single hook attached to a drumline (a floating, anchored drum).

In 2011, only the first 3 listed methods were used because of the reduced number of NMFS staff at FFS.

All 5 techniques are viable, proven methods for removal of sharks at FFS. Together, they will allow NMFS to flexibly respond to the predation situation on the ground as it unfolds during the 2012 monk seal breeding season. If sharks behave brazenly as they have during some years over the last decade, then the shore-based methods will allow us to specifically target the most aggressive predatory sharks. If sharks behave with more stealth but are active as evidenced by pup wounding or shark-inferred disappearance, then the deeper water nearshore fishing methods should prove most useful.

Bait will be tuna and shark remains. Two staff will work together to conduct the removal activities and 2 staff will be on call (via small boat). If shark activity is obvious and brazen, all four staff may participate in removal activities at the same time. When a shark is caught it will be brought to shore or along the side of the small boat and secured (e.g. tail-roped), its species identified and its body measured. Only Galapagos sharks with a minimum fork length of 200 cm will be euthanized. Other species or smaller Galapagos sharks will be photographed, dehooked and released. Euthanasia will occur with a bangstick. To follow the manufacturer's recommendations, the bangstick must be fired in at least a few inches of water; thus the hooked, harpooned or netted shark may secured in the wavewash area. The handline or harpoon tether will be anchored as necessary; drumlines and bottomsets will be actively monitored at all times. Euthanized Galapagos sharks will be sampled and remains discarded at a deep water location as described in the permit application (e.g. 0.5 miles beyond the break reef from Tern). This method of disposing of the remains is being proposed in response to a recent request of the PMNM cultural working group that all shark remains be left in Monument waters

An adjustment in the maximum distance from shore that the bottomsets and drumlines may be set is the only change NMFS is requesting in this permit application compared to those of 2010 and 2011. In the 2010, NMFS was permitted to make bottomsets up to 400m from Trig. This year we are requesting a maximum of 700m from Trig in order to be able to set the gear in a water depth of 25ft. This change in the distance from shore is being requested to allow for the bottomset gear to be deployed in depths (approximately 25m) in which the gear works most effectively and safely. The most recently available nautical charts had indicated incorrectly that water depth was 25ft at 400m; thus, our original proposal requested the 400m distance only. Bathymetric data collected by NMFS staff in 2010 around Trig showed that water depth is actually between 12-14ft at 400m from shore and approximately 25ft starting at 700m from shore. Adjusting the fishing zone in this manner will simply allow us to more optimally use the bottomset design of shark ecologists that were recently successful in fishing for Galapagos sharks at FFS (C.Meyer, HIMB in 2009).

It cannot be emphasized enough that shark behavior (aggressiveness and level of activity) from season to season is extremely variable. In any given year it is uncertain what shark activity pattern will be displayed (Dale et al. 2011) and what fishing technique will prove successful. Some years there are

regular sightings of Galapagos sharks pursuing monk seal pups in the shallows, while in other years observers have noted only a few sightings of dorsal fins just offshore. Having the full range of fishing options as described in the application will help ensure that the effort required to fish, and the risks of fishing for sharks will likely result in the protection of the most monk seal pups as possible despite the low expected CPUE in the shallows of the atoll.

Supplemental Information: A Summary of the Impacts of Intervention Activities on the Abundance of Hawaiian Monk Seals[1]

The following is summaries of an analysis being undertaken by NMFS PIFSC to identify the impacts the numerous enhancement activities being undertaken by NMFS have on the monk seal population. This exercise illustrates that the shark project is a component of a larger and more complex suite of recovery activities that are having a demonstrable affect on monk seal population numbers and reproductive capacity.

Introduction

The PIFSC monk seal research program conducts fieldwork in the main Hawaiian

Islands and the Northwestern Hawaiian Islands primarily to monitor the number of monk seals in the population, to track their survival and productivity, and to understand their behavior in a variety of situations. Another benefit of this field work is to allow field staff to directly intervene in cases where risks to monk seals are observed. This report summarizes results from a preliminary analysis to characterize the potential benefits accrued from direct interventions to resolve monk seal survival risks. This analysis is not exhaustive due to data and interpretive limitations, but it develops a characterization of the benefits associated with these past and ongoing fieldwork activities. This is valuable to NMFS because it helps us gauge the contribution of our past efforts to the welfare of the HMS population and may also help us assess how to best focus future work.

The analysis was intended to be as scientifically robust as possible, but there are a number of data limitations and caveats that influence the proper interpretation of the results. The analysis only includes *direct* interventions – that is, those handling interventions that are undertaken to address an immediate survival risk to a particular seal or seals. In contrast, *indirect* interventions that are undertaken to ameliorate potential or dispersed risks (such as removing marine debris, regulating fisheries, controlling access, removing aggressive males or predatory sharks) are not assessed.

Summary of Analysis

The research program identified a number of handling events types that could result in increasing the survival of a seal (e.g. disentangling seals from nets, dehooking, or reuniting mothers and pups). Other types of events such as handling for research purposes were not included. Each handling event was also assigned a numerical severity code to indicate the relative risk (from low risk to near certain mortality) posed by the threat being mitigated by the intervention. The severity codes were defined in the following way:

0 No or negative survival benefit

[1] This is a summary of NOAA PIFSC is described in a paper in draft for publication

1 Possibly improved chance of survival

2 Probably improved chance of survival

3 Seal would have almost certainly died without action, increased chance of survival

This analysis focused primarily on those interventions that addressed high risk situations (categories "2" or "3").

Results

The following is only a summary of some of the results of this analysis. There were a total of 737 survival-enhancing interventions involving 576 individual seals (some seals were involved in more than one incident). These interventions included 614 handling interventions that addressed risks of Severity 2 or greater.. Considering only these high risk interventions, there were 486 permanently identified seals whose status could be monitored throughout their lifespan. Of these handled seals, there are 124 seals currently surviving, including 69 females. Throughout the lifespan of the handled seals (including those still alive as well as those no longer in the population), there were 198 known births, with 56 of those descendents still alive including 25 females. Extending the analysis one additional generation, there were 2 known births born to 2nd generation females, with 1 of those still alive. Combining all 3 generations gives 686 total seals (486+198+2), with 181 (124+56+1) still alive including 94 females.

Because the mother of many of the pups born in the population remains unknown, the preceding results likely underestimate the actual number of seals descended from handled seals. Applying a correction factor to the known pup production[2], we estimate that there are approximately 256 seals currently in the population which were involved or were descended from handled seals (all severities). If only interventions of severity 2 or greater are considered, this value becomes 204 seals.

Interpretation

Approximately 23% of the current population of 1,125 seals (2011 Stock Assessment report) consists of seals handled to resolve survival risks or their descendants (256/1125= 0.23). For Severity 2 or greater interventions, approximately 18% of the current population (204/1125 = 0.1813) belongs to a lineage of seals that probably or certainly would not be in the population without intervention.

In concert, the presence of HMSRP field staff, their handling interventions, and the reports generated from a thirty-year presence in the NWHI, has provided an important safety buffer (at least 18%) for the population. This is particularly important during a period of stress for the NWHI population and may prove critical to the species in terms of their ability to weather the current storm of declining numbers and low juvenile survival throughout much of their breeding range in the NWHI.

[2] The derivation of this correction factor is described in a paper in draft for publication.

Review of PMNM 2012-2013 Conservation and Management Permit Application

Applicants: Frank Parrish, PhD and Alecia Van Atta, NOAA-NMFS-PIFSC/PIRO

Reviewer: Carl Meyer, UH-HIMB

Summary

This 2012 Conservation and Management application seeks to continue shark culling efforts permitted in 2010 & 2011 in an effort to reduce shark predation on pre-weaned monk seal pups at FFS atoll. Proposed activities for 2012 are very similar to those conducted in 2010, with an expanded fishing area aimed at increasing the catch of Galapagos sharks (only one very small Galapagos shark was captured in 2010, one large individual in 2011).

In my opinion, the proposed amendments will result in negligible additional impact beyond those of activities permitted in 2010 & 2011.

The PWG had some specific questions about the proposed methods for shark fishing & culling in 2012. I answer these briefly below but also provide additional, more detailed background information in subsequent sections.

1. *Will the expansion of the fished area to include habitat with 700 m of Trig, Round and Gin Islands result in capture of Galapagos sharks not involved in pup predation?*

Our empirical data clearly show the probability of capturing Galapagos sharks which never visit seal pupping sites generally increases with increasing distance from pupping sites. However, 700 m is still within close proximity to seal pupping sites, and our data suggest sharks captured within this zone are likely to at least be repeat visitors to shallow habitats around pupping sites (see fishing section below for further details).

2. *Will the expansion of the fished area to include habitat with 700 m of Trig, Round and Gin Islands attract sharks from deeper areas of the lagoon to the areas around the seal pupping islands?*

Although it is possible that sharks present in deeper lagoonal areas will follow the scent trail from baited hooks and swim into shallow habitats, we had extremely low catch rates of sharks in habitats within 700 m of Trig, Tern, East & Gins (we did not fish close to Round Island), and those few sharks captured and tagged within 700m of pupping sites did subsequently visit shallow habitats within a few meters of those islands.

Synopsis of acoustically-tagged Galapagos shark detections in shallows at Trig & Gins 2009-2011

At FFS in summer 2009 we captured and surgically implanted 68 Galapagos sharks with acoustic transmitters. Beginning in May 2009 we deployed 12 receivers specifically to monitor shallow habitats around Trig (10 receivers – Figure 1) and Gins (2 receivers), where Galapagos sharks have been sighted preying on, or harassing, monk seal pups. These receivers are stationed within 5-70 m of the sandy shore of each island, and blocked from listening out into deeper areas of the lagoon by ribbon reefs and coral heads surrounding each island. Thus sharks detected on any of these 12 receivers were swimming over shallow habitats where seal pup predation has been observed or suspected. Additional single receivers were stationed close to Trig, Round Island and Gins, but had

an acoustic view of deeper lagoonal habitats (i.e. sharks detected on these units were may have been swimming several hundred meters away from pupping sites) and are excluded from this summary.

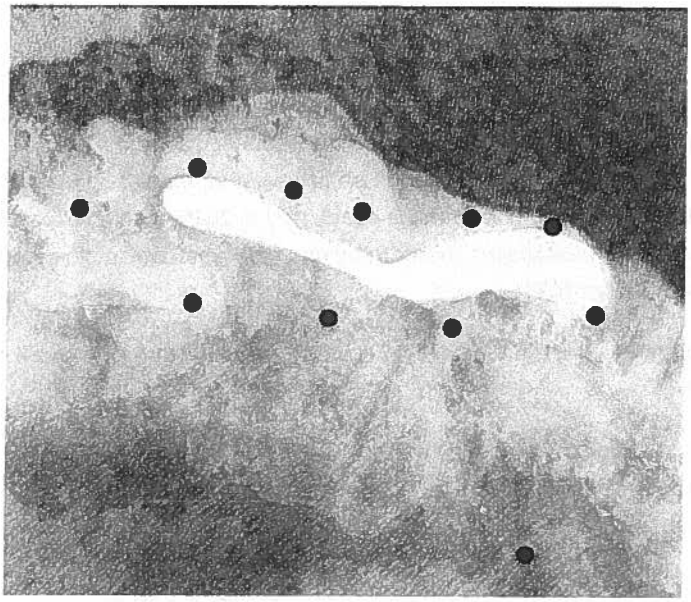


Figure 1. Acoustic receiver locations (red points) around Trig Island

Acoustic receivers deployed at FFS in 2009 were recovered in May 2010 and again in September 2011, providing up to 29 months of continuous monitoring data from the shallow habitats around both seal pupping sites. During this period, 13 (19.1%) Galapagos sharks (the species thought to be primarily responsible for sea pup predation) were detected in the shallows surrounding Trig and Big Gin islands. <u>This includes 4 'new' Galapagos sharks which had not been detected during our initial 12 months of monitoring (May 2009-May 2010).</u>

Combining the proportion of transmitter-equipped Galapagos sharks detected in the shallows around Trig & Gins from 2009-2011 (N=13, 19.1% of 68 total) with our mark-recapture population size estimate for Galapagos sharks at FFS (668 individuals; Dale et al. 2011), provides an estimate of 127 Galapagos sharks utilizing shallow habitats around Trig & Gins during the period May 2009-September 2011. However only a subset (7) of these individuals displayed behavior consistent with actual observations of sharks involved in pup predation (i.e. repeat visits to shallow habitats during seal pupping season, detected on multiple days for extended periods of up to several hours). Other Galapagos sharks were only detected around Trig or Gins in winter, or just passed through these areas on one solitary occasion.

A revised calculation incorporating only 7 Galapagos sharks displaying pupping site visitation patterns similar to those observed during pup predation events, together with our FFS population size estimate of 668 individuals, yields an estimate of 69 potential pup predators over a 29 month period.

Our two major conclusions are;

1. The number of Galapagos sharks at FFS which are active seal pup predators in any given season is probably in the tens (i.e. less than 100).

2. The "occasional" visits to habitats around seal pupping sites by other Galapagos sharks could represent a natural mechanism of ongoing recruitment to pup predation behavior. If any of these occasional visitors captures prey (not necessarily a seal pup) during a visit to shallow habitats around seal pupping sites, then they may be more inclined to return (i.e. there will be positive reinforcement to return to this habitat), increasing their probability of encountering seal pups in future.

Where did scientific fishing occur in 2009 and where were Galapagos sharks detected at Trig & Gins between May 2009 and September 2011 originally captured?

Fishing: We divided our fishing effort among three broad habitat zones (1. Shallow habitats adjacent to seal pupping sites, 2. Deeper lagoonal areas, 3. Outside the barrier reef). The specific locations of each shark line set are illustrated below (Figure 2). We set shark lines in shallow habitats adjacent to seal pupping sites on 38 occasions, totalling 1,859 hook hours. Half of this effort (19 sets) was focused around Trig Island (see Figure 2B). Galapagos shark catch rates were 3-5 times lower in the shallow habitats around seal pupping sites than in the deep lagoon or outside the barrier reef.

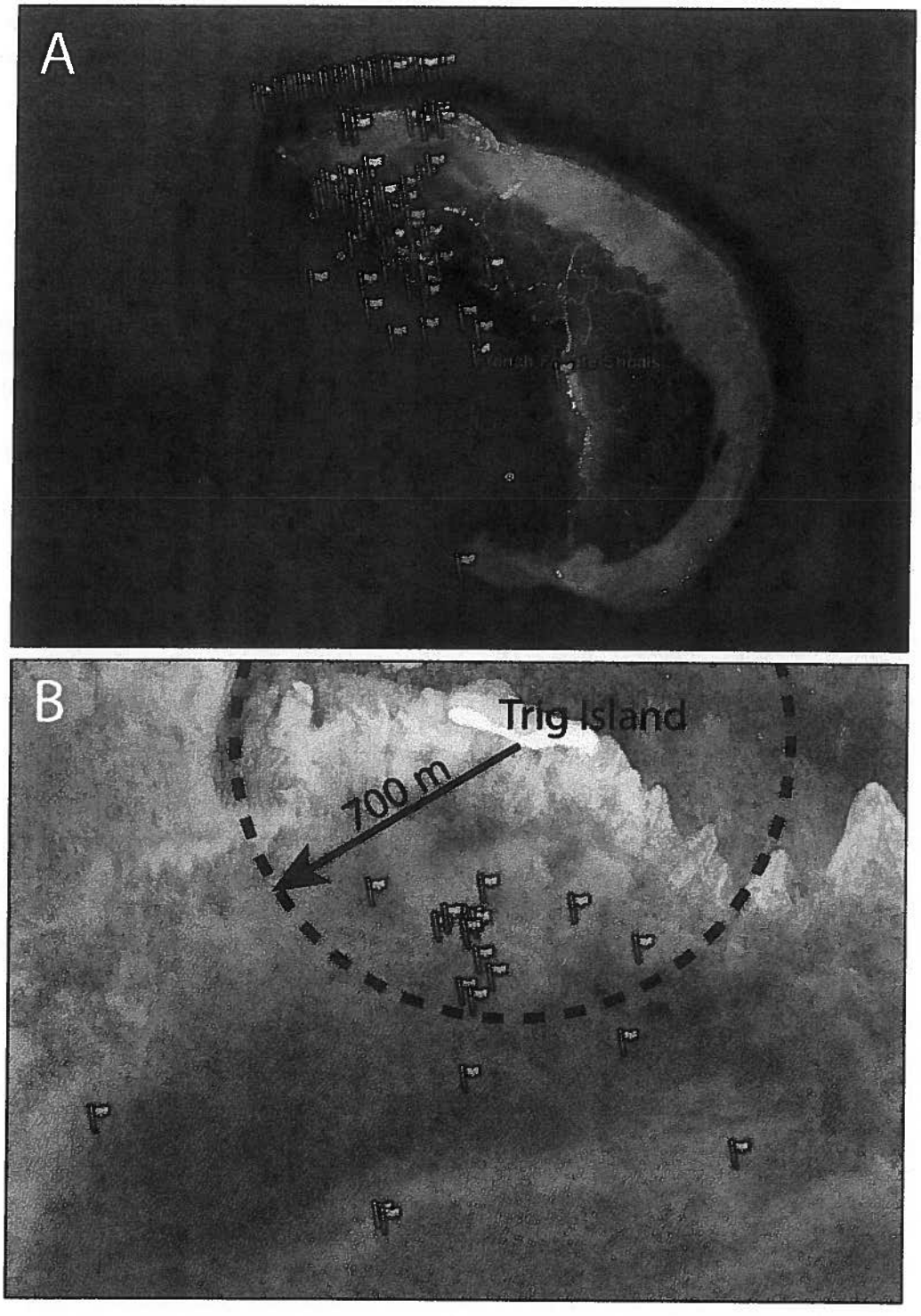


Figure 2. A: Overview of all 2009 shark line sets (yellow flags) at FFS. B: Closeup view of shark line sets (yellow flags) in shallow habitats adjacent to Trig. Dashed red line indicates a 700m radius from Trig Island shore line.

Shark capture locations: Of 13 Galapagos sharks detected in shallows at Trig or Gins, 2 were captured close (~550 m) to those islands (1 shark at each location), 1 was captured in shallow lagoonal habitat south of Tern Island, 8 were captured in deeper areas of the lagoon 6.5 to 13.7 km from the pupping sites, and 2 individuals were captured outside the barrier reef north of Shark & Tern Islands (Figures 3 & 4).

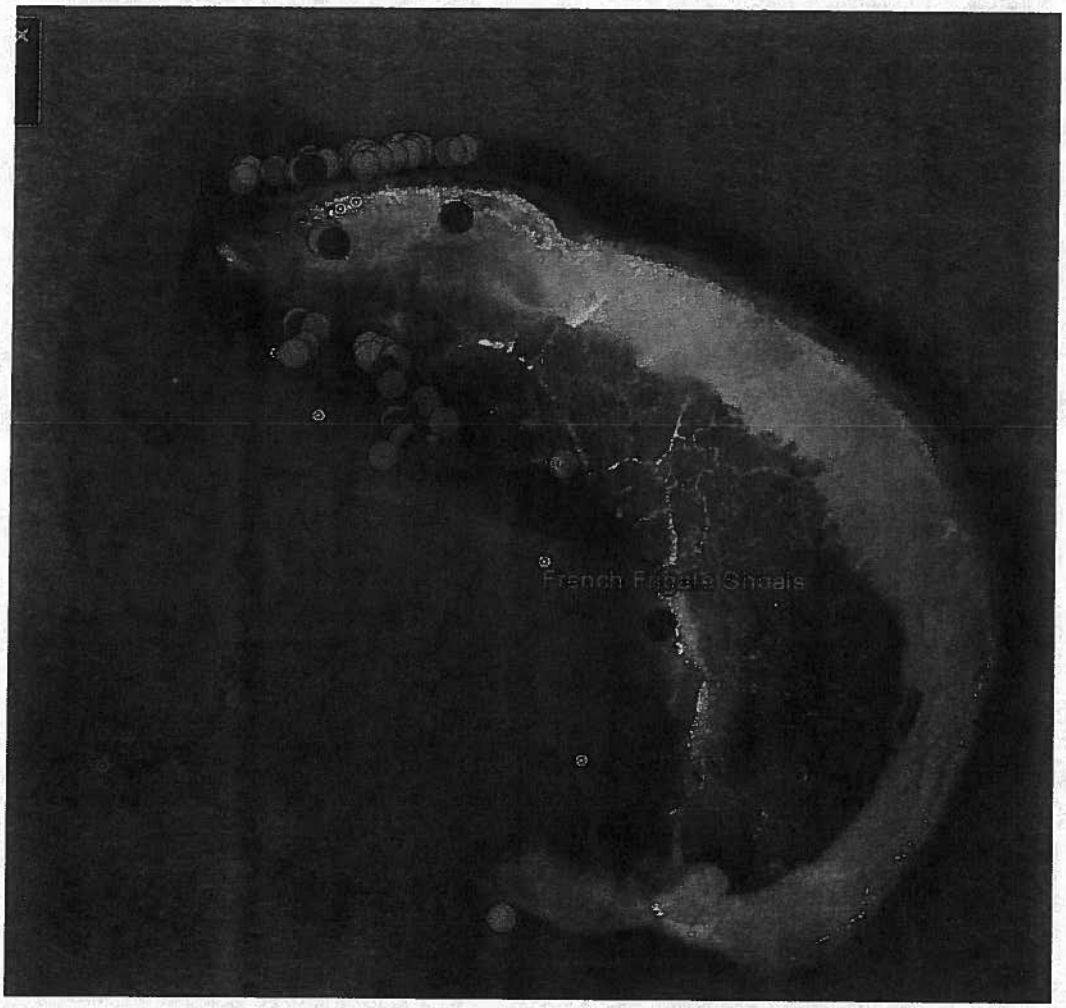


Figure 3 – Galapagos shark capture locations at FFS during summer 2009. Red points indicate capture locations of Galapagos sharks detected in shallow habitats around Trig and Gins. Grey points indicate capture locations of Galapagos sharks never detected in shallow habitats around Trig & Gins.

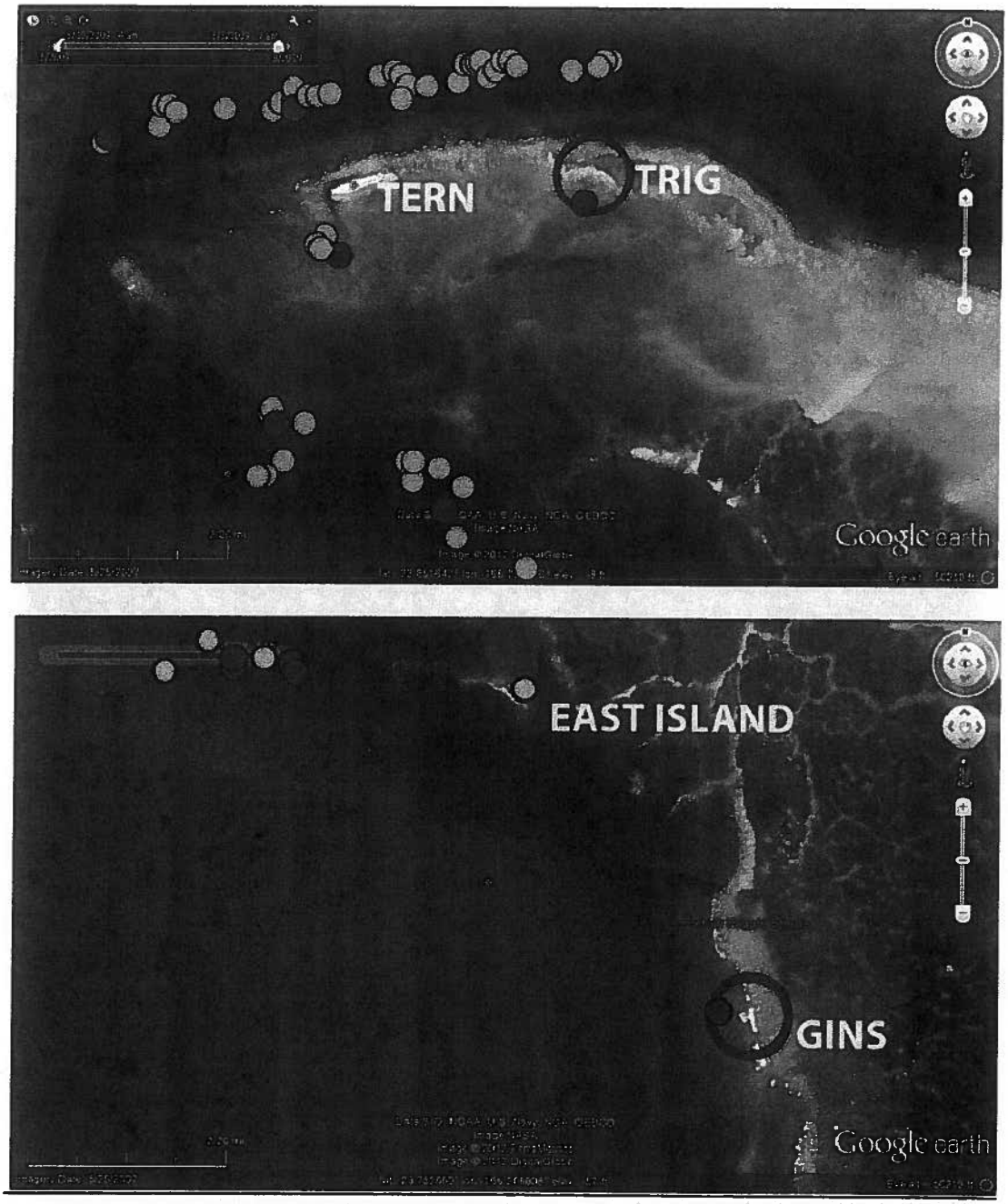


Figure 4. Detail of Galapagos shark capture locations around Trig/Tern (top panel) and Gins/East (bottom panel). Red points indicate capture locations of Galapagos sharks detected in shallow habitats around Trig and Gins. Grey points indicate capture locations of Galapagos sharks never detected in shallow habitats around Trig & Gins. Red circles indicate 700m radius around Trig & Gin Islands.

References cited

Dale JJ, Stankus AM, Burns MS, Meyer CG. 2011. The Shark Assemblage at French Frigate Shoals Atoll, Hawai'i: Species Composition, Abundance and Habitat Use. ***PLoS ONE*** 6(2): e16962. doi:10.1371/journal.pone.0016962

Papahānaumokuākea Marine National Monument
Compliance Information Sheet

1. Updated list of personnel to be covered by permit. List all personnel names and their roles here (e.g. John Doe, Diver; Jane Doe, Field Technician, Jerry Doe, Medical Assistant): Shawn Farry, lead field staff, Mark Sullivan, co-leader, 2 assistants TBD

2. Specific Site Location(s): (Attach copies of specific collection locations): French Frigate Shoals (Tern, Trig, Round and Gins islets)

3. Other permits (list and attach documentation of all other related Federal or State permits): MMPA/ESA Permit # 10137-06 and IACUC # 1348 (it was submitted for review on 3/7/12)

3a. For each of the permits listed, identify any permit violations or any permit that was suspended, amended, modified or revoked for cause. Explain the circumstances surrounding the violation or permit suspension, amendment, modification or revocation. none

4. Funding sources (Attach copies of your budget, specific to proposed activities under this permit and include funding sources. See instructions for more information): NOAA-NMFS-PIFSC-PSD-HMSRP programmatic funds

5. Time frame:
Activity start: June 1, 2012, exact date to be determined upon NOAA vessel OES schedule
Activity completion: August 2012, exact date to be determined upon NOAA vessel OES schedule
Dates actively inside the Monument: same as above

Describe any limiting factors in declaring specific dates of the proposed activity at the time of application: OES vessel schedule has not been finalized yet.

Personnel schedule in the Monument: TBD

Please see Co-Trustees'/ Manager's permit compliance form please for answers to questions 6- 10.

6. Indicate (with attached documentation) what insurance policies, bonding coverage, and/or financial resources are in place to pay for or reimburse the Monument trustees for the necessary search and rescue, evacuation, and/or removal of any or all persons covered by the permit from the Monument:
All four staff are RCUH JIMAR staff.

7. Check the appropriate box to indicate how personnel will enter the Monument:

☒ Vessel
☐ Aircraft

Provide Vessel and Aircraft information: OES NOAA vessel Oscar Elton Sette

8. The certifications/inspections (below) must be completed prior to departure for vessels (and associated tenders) entering the Monument. Fill in scheduled date (attach documentation):

☐ Rodent free, Date:
☐ Tender vessel, Date:
☐ Ballast water, Date:
☐ Gear/equipment, Date:
☐ Hull inspection, Date:

9. Vessel information (NOTE: if you are traveling aboard a National Oceanic and Atmospheric Administration vessel, skip this question):
Vessel name: OES Oscar Elton Sette

10. Tender information:

On what workboats (tenders) will personnel, gear and materials be transported within the Monument? List the number of tenders/skiffs aboard and specific types of motors:
Staff will use two 17 foot skiffs while at FFS (Boston whalers, 4-stroke outboard engines Honda 70 and Yamaha 50)

Additional Information for Land Based Operations

All staff for this permit will be also on the Co-Trustees'/ Manager's permit for regular seal recovery work duties, thus their transport, gear, housing etc. are all covered within that permit as well. Nothing new is needed under this permit (i.e. there is no additional staff or staff needs beyond the other permit); however, shark samples would be additional.

11. Proposed movement of personnel, gear, materials, and, if applicable, samples: Personnel will be transported via the OES. Gear is already housed at Tern Island, FFS. Samples will return via the OES to Honolulu to be stored at Kewalo Research Facility

12. Room and board requirements on island: housing at Tern via the seal recovery work via the Manager's permit

13. Work space needs: computer use, space for 3 propane freezers at Tern

DID YOU INCLUDE THESE?

- ☐ Map(s) or GPS point(s) of Project Location(s), if applicable
- ☐ Funding Proposal(s)
- ☐ Funding and Award Documentation, if already received
- ☐ Documentation of Insurance, if already received
- ☐ Documentation of Inspections
- ☐ Documentation of all required Federal and State Permits or applications for permits

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

GUY KAULUKUKUI
FIRST DEPUTY

WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF AQUATIC RESOURCES
1151 PUNCHBOWL STREET, ROOM 330
HONOLULU, HAWAII 96813

March 23, 2012

TO: Division of Aquatic Resources File

THROUGH: William J. Aila Jr., Chairperson

FROM: Guy Kaulukukui
First Deputy and Acting Administrator, Division of Aquatic Resources

DECLARATION OF EXEMPTION FROM THE PREPARATION OF AN ENVIRONMENTAL ASSESSMENT UNDER THE AUTHORITY OF CHAPTER 343, HRS AND CHAPTER 11-200 HAR, FOR PAPAHĀNAUMOKUĀKEA MARINE NATIONAL MONUMENT CONSERVATION AND MANAGEMENT PERMIT TO FRANK PARRISH AND ALECIA VAN ATTA, NOAA FISHERIES, PACIFIC ISLANDS FISHERIES SCIENCE CENTER, FOR ACCESS TO STATE WATERS TO CONDUCT SHARK REMOVAL ACTIVITIES UNDER PERMIT PMNM-2011-013.

The following permitted activities are found to be exempted from preparation of an environmental assessment under the authority of Chapter 343, HRS and Chapter 11-200, HAR:

Project Title:
Papahānaumokuākea Marine National Monument Conservation and Management Permit to Frank Parrish and Alecia Van Atta, NOAA Fisheries, Pacific Islands Fisheries Science Center, for Access to State Waters to Conduct Shark Removal Activities

Permit Number: PMNM-2012-013

Project Description:
The conservation and management permit, as described below, would allow entry and activities to occur in Papahānaumokuākea Marine National Monument (Monument), including the NWHI State waters from June 1, 2012 through May 31, 2013.

This is an effort to conduct management activities for the conservation of Hawaiian monk seals, including the removal of predatory sharks from these areas. The activities would support the recovery of the endangered Hawaiian monk seal by reducing the likelihood of shark predation on seal pups at French Frigate Shoals.

The activities are in direct support of the Monument Management Plan's priority management needs 3.2 – Conserving Wildlife and Habitats, through action plan 3.2.1 – Threatened and Endangered Species. This action plan states that "site specific mitigation plans and methods should be developed and implemented" (PMNM MMP Vol 1, p.163). This action plan includes

an activity to reduce shark predation on monk seals. Monitoring shark activity and removing sharks are also both listed in the Hawaiian Monk Seal Recovery Plan (NMFS 2007) as necessary activities, critical to the species' recovery.

In addition, activities to support threatened and endangered species in the NWHI are addressed in the Monument Management Plan Environmental Assessment. This EA which in turn analyses the MMP covers field activities "to monitor predation of sharks on Hawaiian monk seals and its effects and develop and implement methods to deter predation" (PMNM MMP Vol 2, p.173). The EA states that "these activities could have a beneficial effect on the endangered monk seal by decreasing population loss".

Consulted Parties:
The permit application was sent out for review and comment to the following scientific and cultural entities: Hawaii Division of Aquatic Resources, Hawaii Division of Forestry and Wildlife, Papahānaumokuākea Marine National Monument (NOAA/NOS), NOAA Pacific Islands Regional Office (NOAA-PIRO), United States Fish and Wildlife Service Hawaiian and Pacific Islands National Wildlife Refuge Complex Office, and the Office of Hawaiian Affairs (OHA). In addition, the permit application has been posted on the Monument Web site since January 5, 2012 giving the public an opportunity to comment. The application was posted within 40 days of its receipt, in accordance with the Monument's Public Notification Policy.

Exemption Determination:
After reviewing HAR § 11-200-8, including the criteria used to determine significance under HAR § 11-200-12, DLNR has concluded that the activities under this permit would have minimal or no significant effect on the environment and that issuance of the permit is categorically exempt from the requirement to prepare an environmental assessment based on the following analysis:

1. All activities associated with this permit, including monitoring and removal of sharks, have been evaluated as a single action. As a preliminary matter, multiple or phased actions, such as when a group of actions are part of a larger undertaking, or when an individual project is precedent to or represents a commitment to a larger project, must be grouped together and evaluated as a single action. HAR § 11-200-7. This permit may involve an activity that is precedent to a later planned activity, i.e. the continued removal of sharks next year if 18 are not removed this year, or removal of 20 sharks in total over a multi-year period since the project's inception. Subsequent activities will depend largely on the results achieved under this permit.

2. The Exemption Class for Experimental Management with no Serious or Major Environmental Disturbance Appears to Apply. Chapter 343, HRS, and § 11-200-8, HAR, provide for a list of classes of actions exempt from environmental assessment requirements. HAR §11-200-8.A.5. exempts the class of actions which involve "basic data collection, research, experimental management, and resource evaluation activities which do not result in a serious or major disturbance to an environmental resource." This exemption class has been interpreted to include "wildlife management actions including predator control", such as those being proposed.

The proposed removal activities here appear to fall squarely under the exemption class #5, exempt item #5 as described under the Division of Forestry and Wildlife exemption list published on June 12, 2008. As discussed below, no significant disturbance to any

environmental resource is anticipated in the monitoring and removal of a limited number of sharks. Thus, so long as the below considerations are met, an exemption class should include the action now contemplated.

3. Cumulative Impacts of Actions in the Same Place and Impacts with Respect to the Potentially Particularly Sensitive Environment Will Not be Significant. Even where a categorical exemption appears to include a proposed action, the action cannot be declared exempt if "the cumulative impact of planned successive actions in the same place, over time, is significant, or when an action that is normally insignificant in its impact on the environment may be significant in a particularly sensitive environment." HAR § 11-200-8.B. To gauge whether a significant impact or effect is probable, an exempting agency must consider every phase of a proposed action, any expected primary and secondary consequences, the long-term and short-term effects of the action, the overall and cumulative effect of the action, and the sum effects of an action on the quality of the environment. HAR § 11-200-12. Examples of actions which commonly have a significant effect on the environment are listed under HAR § 11-200-12.

This project will continue shark removal activities that were undertaken in 2007 and 2010 under permits PMNM-2007-025 and PMNM-2010-014, which had no deleterious effects on Monument resources. Possible adverse affects on the coral reef ecosystem at French Frigate Shoals (FFS) from shark removals were investigated using the EcoSim model (Parrish, NMFS). Results from that work indicated that the removal of 20 sharks had a nearly imperceptible effect on the dynamics of the FFS ecosystem. With that in mind, significant cumulative impacts are not anticipated as a result of this activity, and numerous safeguards further ensure that the potentially sensitive environment of the project area will not be significantly affected. All activities will be conducted in a manner compatible with the management direction of the Monument Proclamation in that the activities do not diminish monument resources, qualities, and ecological integrity, or have any indirect, secondary, cultural, or cumulative effects. The joint permit review process did not reveal any anticipated indirect or cumulative impacts that would occur as a result of these activities.

These activities would be conducted from the seasonal monk seal field camp based on FFS. The operation of the field camp, as well as associated monitoring activities, are covered under the Manager's permit PMNM-2011-001. Interactions with sharks at FFS are also anticipated, for the purpose of shark tagging, by Carl Meyer (2011 permit no. PMNM-2011-018, 2012 permit application in prep). Meyer's work will be conducted from the NOAA Ship HI'IALAKAI at various times throughout the season, and it is anticipated that Meyer will spend less than 7 days total working at FFS. In addition, there are no other known proposed projects would be undertaken with respect to sharks at FFS. Therefore, the culmination of these permits is not anticipated to have significant cumulative impacts.

Since no significant cumulative impacts or significant impacts with respect to any particularly sensitive aspect of the project area are anticipated, the categorical exemptions identified above should remain applicable.

4. Overall Impacts will Probably be Minimal and Insignificant Any foreseeable impacts from the proposed activity will probably be minimal, and further mitigated by general and specific conditions attached to the permit. Specifically, all conservation and management activities covered by this permit will be carried out with strict safeguards for the natural, historic, and

cultural resources of the Monument as required by Presidential Proclamation 8031, other applicable law and agency policies and standard operating procedures.

Conclusion. Upon consideration of the permit to be approved by the Board of Land and Natural Resources, the potential effects of the above listed project as provided by Chapter 343, HRS and Chapter 11-200 HAR, have been determined to be of probable minimal or no significant effect on the environment and exempt from the preparation of an environmental assessment.

William J. Aila Jr.
Board of Land and Natural Resources

Date