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

May 10, 2013

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, 2013 and May 31, 2014.

The proposed activities are a continuation of work previously permitted and conducted in the Monument, over the last year. Activities proposed that differ from last year, but previously permitted prior to the establishment of the Monument, include the use of salvaged Hawaiian monk seal tissue as bait for this proposed activity.

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-2013-001.

Applicants aim to remove a maximum of 18 sharks between June 1, 2013 and May 31, 2014 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. Fishing efforts will focus on capturing Galapagos sharks displaying the unique predatory behavior of killing Hawaiian monk seal pups.

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 Galapagos 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 applicants propose to use tuna heads, salvaged Hawaiian monk seal tissue (e.g., from seals that had previously died), and other bait previously approved for use in the Monument. Previously permitted fishing expeditions have shown there is a higher catch per unit of effort for Galapagos sharks when Hawaiian monk seal tissue was used as bait at FFS (NMFS Proposal to the MMB re: 2013 Parrish/Van Atta permit, Item F-3c).

Fishing will only occur during daylight hours and if Galapagos sharks exhibiting predatory behavior are nearby. Soak time for salvage Hawaiian monk seal tissue will be limited to two hours.

The activities proposed by the applicants 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 March 13, 2013, 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 what capacity will the Cultural Working Group (CWG) be consulted in the treatment/use/disposal of shark remains?

The applicants stated that at this time there is no plan to consult with the PMNM CWG regarding the shark removal project. In 2012, the applicants were specifically requested to not bring this issue back to the CWG and have proceeded with that understanding. In conversations with Keola Lindsey (OHA and CWG liaison), the applicants have indicated a willingness to engage the CWG should they wish a briefing, dialog, or provide input, etc. The applicants welcome the opportunity to discuss options regarding the treatment, use, and disposal of shark remains.

2. Do researchers plan on incorporating Native Hawaiian protocols into their collection methods?

The applicants stated that, as described in the permit application, they have tried to work closely with the CWG and other practitioners to incorporate Native Hawaiian protocols as appropriate. The applicants have incorporated previous guidance that remains may only be collected and used if appropriate Hawaiian protocols are conducted. Again, the applicants welcome the opportunity to discuss options regarding any aspect of this project.

3. What is the purpose of shipping shark samples to researchers?

The applicants explain that, despite the fact that Galapagos sharks are a widespread tropical species and considered to be relatively abundant, there is still a lot that remains unknown about their biology and ecology. For instance, their population status is considered data deficient and

descriptions of life history traits, gestation, reproductive periodicity, diet etc. are unknown or poorly understood for any population. Carl Meyers' work on Galapagos shark movement in Hawaii is an exception. Sharing samples will maximize the gain for science and increase our knowledge of the species.

4. Why is genetic testing analysis necessary for this activity?

The applicants explain that, as stated in response to question 3, there is much to learn about Galapagos sharks. Studies of global phylogeny and population genetics are needed. By collecting and analyzing or archiving tissue samples we can ensure that we can learn as much as we can about the species. Information on Galapagos shark genetics was identified as a data "need" by shark experts during the 2008 Shark Predation on Hawaiian Monk Seal II workshop. The collection of genetic information and its analysis is also consistent with the Monument Management Plan: Marine Conservation Science Action Plan. Specifically, MCS-1.5 states "Measure connectivity and genetic diversity of key species to enhance management decisions".

5. Who will be the owner of any genetic information?

The applicants state that the Monument's policy is as follows: The permittee retains ownership of any data (including, but not limited to, any photographic or video material), derivative analyses, or other work product, or other copyrightable works, but the Federal Government and the State of Hawaii retain a lifetime, non-exclusive, worldwide, royalty-free license to use the same for government purposes, including copying and dissemination, and making derivative works. Consistent with the developing Monument Materials Transfer Permit, the information is generally shared openly on an online genetic database (Genbank; http://www.ncbi.nlm.nih.gov/genbank/) for free and open use by researchers.

6. Will the proposed samples be shared or exchanged with other research projects outside of Hawaii and why?

The applicants state that samples would be likely sent to and analyzed by colleagues at Woods Hole Oceanographic Institute and Dalhousie University. Samples may also be shared with other shark ecologists upon request. Please see the response to question 3 regarding why. If there are groups in Hawaii that are interested in the samples they could be shared with them after working with the MMB for necessary permissions.

7. Will any of the genetic information be licensed for future product development?

The applicants are not clear what is meant in this question by product development. Genetic information will be used for scientific research of Galapagos shark populations only, and will not be licensed for any commercial product development.

8. Will a cultural practitioner be present with the applicant and their team?

The applicants value the relationships they have formed with cultural practitioners in the past and looks forward to strengthening these relationships in the future to promote an increased

mutual understanding and respect. Please see page 8 of the application for additional information regarding the history of these relationships. The opportunity for a cultural practitioner to travel with the team will be made available when possible, although, sometimes, logistical constraints may prevent this from happening. The applicant currently has no funds to support additional individuals. The applicant has a history of incorporating Hawaiian cultural practitioners or representatives when we can financially support their participation. However, should another MMB Agency wish to support a participant for this project we should be able to accommodate them. Due to the impacts of the December 2012 microburst storm at FFS, extremely limited facilities are available on Tern Island and the field team will have to tent camp.

9. Is there another more sustainable approach to manage this interaction?

The applicants reply, no. Currently, the Hawaiian monk seal population is at a point of critical decline and the sustainability of the species is in question. The sustainability of the Galapagos shark population is stable and not in question.

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). However, despite the applicant's efforts to move pups to safer islets, staff are not present at all times on all islets, and thus are not able to locate every pup for forced weaning.

The applicants have 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 most viable 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. 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.

10. What type of cultural protocol would be conducted to honor these sharks before, during, and after eradication?

The applicants state that at this time, no cultural protocols would be conducted before, during, or after shark removal. The applicants continue to welcome discussions regarding cultural practices that could be practiced as part of the predatory Galapagos shark removal activities. As described in question 5, the applicants want to promote an increased mutual understanding and respect with cultural practitioners. Per previous guidance from the MMB, any cultural protocols would depend on the presence of a cultural practitioner, and for this season there is

currently no plan for one to participate in the applicants' camps. While none of the applicant's staff are Hawaiian cultural practitioners themselves, the staff members are dedicated conservation scientists with an abiding respect for nature and they act with the appropriate level of solemnity and professionalism for this activity. No one enjoys the activity of removing sharks and they endeavor to do so in the most humane and respectful way they can. These are universal values not solely Hawaiian or Western.

11. Besides scientific research, how would the sharks be used? Will they be eaten also? How will they be returned back to the 'āina or kai if at all?

The applicants state that any sharks that are removed are not eaten, although they may be used for bait (as authorized in previous years). All other remains are returned to the sea approximately 0.5 miles outside the reef (See page 24 of permit application).

12. How can this activity be done differently?

The applicants state that for more than a decade, the applicant has attempted, explored, researched, and discussed every available measure to protect pups without killing sharks. The applicants have a statutory mandate to recover endangered species. Given the critical status of the Hawaiian monk seal population and the rapidly declining population of monk seals at FFS, the applicant has to act and removing a known predator of monk seal pups is necessary. This decision has not been arrived at lightly, and the applicants welcome the opportunity for a productive dialogue that would focus on new ideas to the recovery of this species. A detailed description of the project's history is included in the permit application and more information can be found in Dr. Gobush's NOAA Technical Memorandum NMFS-PIFSC-21, dated July 2010, and titled Shark Predation on Hawaiian Monk Seals: Workshop II & Post-Workshop Developments, November 5-6, 2008.

http://www.pifsc.noaa.gov/library/pubs/tech/NOAA_Tech_Memo_PIFSC_21.pdf

The applicants further explain the only other modification other than changing bait (see next question) would be to fish through the night, further away from the islands, or even outside the reef. All of these modifications would be less discriminate and likely end up catching many Galapagos sharks that do NOT prey on monk seals, as well as other species. The applicants prefer to continue with the more conservative fishing methods requested in this permit that increase the likelihood of catching the sharks that are preying on monk seals.

13. Are there any other tools or methods that could be used/incorporated that could help support the activity's efficiency and success?

The applicants have decided, per MMB discussion on April 3, 2013, to request an amendment to our permit that will allow the use of additional bait types, including salvaged monk seal tissue. The use of salvaged monk seal tissue as bait has been proven effective in the past. However, we fully expect and have always stated that the catch per unit effort of fishing would always be low (for reasons outlined in the previously cited workshop report).

14. Permit Group Question: Other information and background (page 5) the applicant summarizes PIFSC-HMSRP activities at French Frigate Shoals (FFS) from 2009 - 2012. As part of this summary please respond to the following question: Based on prior years results from shark removal efforts at FFS, is there a recovery benefit to the monk seal population at FFS from conducting removal activities?

The applicants responded with, this is a reasonable and appropriate question and we concur that the benchmark for undertaking an activity of this nature within the Monument is relatively high. The applicant feels strongly that although it is difficult to verify a direct, quantitative link between historic shark removals and monk seal population status (as measured by pup survival), the available evidence is sufficient to warrant our continued investment in this activity. Further, the applicants believe that there is no evidence to suggest that this activity has compromised the status or welfare of any other Monument resources, including the Galapagos shark population. The basis of their rationale is articulated in detail in the permit application, but the applicants will summarize their thinking here.

The applicants explain that there is difficulty in establishing a direct causal link between historic shark removals and pup survival arises because shark fishing has not occurred in isolation, but rather as one component of a suite of activities intended to improve pup survival at vulnerable sites. These activities include human presence (including intensive observations, overnight camping, and regular visits for other population assessment tasks), pup translocation, shark harassment, shark deterrents (2008-2009), and shark fishing (with or without successful removals). In aggregate, these activities have achieved a substantial reduction in predation mortality as compared to when predation was first detected as a major factor in pup mortality (see Tables 1-2 in permit application). Overall the number of incidents per year (attacks and kills) has decreased from a high of 28 in 1999 (30% of the cohort) to 5-6 incidents the last 2 years (16% of the cohort in each year). During this period, 14 Galapagos sharks have been removed and the applicants believe that these removals have been instrumental in reducing the number of active, persistent predators on monk seal pups and have thereby reduced the overall predation pressure. Despite this reduction, the level of predation remains unacceptably high and the applicants believe that it can only be reduced to acceptable levels by further reductions in the number of active predators.

Since the inception of the removal program in 2000, the applicants have maintained that the predators were drawn from a relatively small pool of sharks. While that conclusion was initially based on direct observations, the results of Dr. Carl Meyer's sonic tag study are consistent with and substantiate our working premise that the number of active predators is in the low tens (permit application item 7a). If it is assumed minimal or no recruitment into the pool of seal-predating sharks, the 14 Galapagos sharks that have been removed could represent a sizable proportion of the overall pool of predators. Had those 14 sharks not been removed, the active pool of predators would then be considerably higher (perhaps double) its current estimated size. While the applicants acknowledge that it is tenuous to speculate about how many more pups might have been lost had those sharks remained in the population, if the number of additional losses were correlated with the proportional increase in the pool of predators, it would represent a considerable increase in the number of pup mortalities.

The applicants explain they are also concerned about their capacity to respond quickly and efficiently to a possible escalation in shark predation, should that occur. Historically, both the frequency of shark observations (sharks patrolling in near-shore waters) and the number of predation incidents occurring each year has been largely erratic and unpredictable. The removal permit, along with the requisite personnel and gear, is required to ensure that their ability to respond immediately to a spike in predation incidents is not compromised.

In summary, the applicants believe that the level of shark predation on monk seal pups at FFS would likely be considerably higher had the historic shark removals not taken place. The removal of an additional 18 sharks, as requested in this permit application, is likely to further enhance pup survival rates at FFS and will result in no functional harm to any biological populations or physical resources within the Monument. Failure to undertake this recovery action would be inconsistent with the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) mandates, as well as recommendations provided in the Hawaiian Monk Seal Recovery Plan.

Resultant of Monument Management Board (MMB) member discussion, a revised application and proposal was submitted by the applicant to use salvaged Hawaiian monk seal tissue as bait to conduct this activity. The following questions are the result of MMB agency review pertaining to this specific addendum:

1. Is it possible to obtain seal blubber/flesh from other sources of non-endangered seals if use of this particular species causes concerns?

The applicants responded that it is not practicable to use tissue from a different, non-endangered, species of seal. First, all marine mammals are regulated under the Marine Mammal Protection Act, and any use of marine mammal parts would require a new authorization from the NMFS Office of Protected Resources. Obtaining such an authorization would take months, if not years. The applicants are only authorized to use salvaged Hawaiian monk seal tissue. Second, even if such an authorization was granted (and that is a remote possibility) the costs and logistics of obtaining fresh tissue from a different seal species and transporting the fresh tissue to FFS would be prohibitive. However, these concerns are secondary to the very real health and disease concerns that would be raised by bringing in seal tissues that do not occur naturally in Hawaii and exposing them to the Monument ecosystem. Such tissue could be harbor pathogens that could harm monk seals or other native Hawaiian species. It is unlikely that importing seal tissue would even satisfy the Monument's quarantine policy.

2. If the flesh of dead monk seals are allowed to be used as bait, it may possibly cause changes in the foraging activities of the sharks in the area. Once monk seal flesh and blood is being used to bait the sharks, and the non-Galapagos sharks are released, will the predation on monk seals possibly increase as a result of this?

The applicants state that it is possible, but NMFS doesn't consider it likely. Freshly dead monk seals – many bleeding from wounds or tissue degradation – are, and have been, a regular occurrence in the NWHI for a very long time. Thus, sharks across the archipelago have been exposed to monk seal flesh and blood. Despite this exposure we have no scientific evidence that

shark predation has increased above background levels except Galapagos sharks at FFS. A good example is the wounded and bleeding seals that are moved from Trig and the Gins to Tern Island. Despite their compromised condition we rarely see shark predation at Tern Island and certainly have not seen an escalation. However, the NMFS still intends to use the bait conservatively: monk seal bait would be retrieved after use and not used as "chum", monk seal pups would be closely monitored, and predation rates would be monitored for any changes or if species other than Galapagos sharks undertake this shallow water/beaching-style of monk seal predation.

3. Is there evidence that the use of monk seal flesh doesn't lead to the spread of undesirable behaviors in Galapagos sharks? If not, then the use of monk seal flesh could actually exacerbate the issue.

The applicants state, please see response to question 2.

4. How much bait will be used? Is bait already collected and frozen or will it be collected fresh/opportunistically? From the 2011 agency review, Carl Meyer recommended a minimum of 5.5 lbs of monk seal flesh per hook, will this be the guide?

The applicant explains the amount of bait that would be used (i.e., the total amount over the course the season) will depend on the availability of salvaged monk seal tissue available, which will be collected opportunistically. The applicants have learned, from past fishing activities and extensive consultation with Dr. Meyer, that the size of the bait is the most important characteristic, not the weight. In particular, a properly sized piece of bait will reduce or prevent depredation, minimize by-catch, and target the desired species and size class of shark. To that end we shifted to using tuna heads of a particularly size etc. The applicants will apply the same process to monk seal tissue so that the pieces used are large enough to catch only larger predators.

5. Will it be used in all locations and times that fishing will occur? How will you decide how/when to use seal meat?

The applicant states, yes, this type of bait will be used at all of the fishing locations at FFS, as requested in the permit. The applicants will likely start slowly with its use because seal deaths are unpredictable and the amount of salvaged tissue bait will be uncertain. This will also allow their staff to carefully observe for any unexpected changes during shark removal activities.

6. If we know about the potential that more sharks will develop this behavior, will additional effort be made to track potential changes (e.g. support continued tracking studies)?

The applicants' staff will continue to monitor by-catch, pup loss, and other factors that might indicate changes in shark behavior, and additional studies may be considered if appropriate. However, there are no current plans for additional tracking studies.

7. What will be done with non-target catch, if, by admission in the permit application the use of this bait will likely result in more catch of non-target animals?

The applicant explains that, as stated in the permit application, by-catch will be released as it always has been.

8. Why was the use of monk seal flesh as bait not included in the original proposal?
The applicants should have included this in the original application, but has added it to ensure its proposed action is completed. The applicants have brought up the issue of using salvaged monk seal tissue many times in the past, but unfortunately the issue was not met with an objective assessment and was ultimately dropped. However, during the April 3, 2013 briefing to the MMB, the applicant received encouragement from MMB members to every tool available to improve the chances of success, and the permit was amended immediately. Given the dramatic decline of monk seal pup survival in the NWHI and the documented long-term threat of shark predation at FFS, the applicants are obligated to make every effort to enhance the survival of this endangered species.

9. What are the added costs, time and logistical challenges, if any, of using monk seal flesh as bait as opposed to that of the original permit application?

The applicant states that the short-term changes to cost, time, and logistics are negligible. Over the long-term, using a wider variety of tools and increasing their catch rate should ultimately save money by removing the small group of Galapagos sharks that have this unique predatory behavior of killing monk seal pups at FFS. But more importantly, it will save seals, which is the applicants' core mission.

10. How does the applicant plan to inform the public of the monk seal flesh as bait request as required by the Monument Permit Application Unified Public Notification Policy?

The applicants responded that the Unified Public Notification Policy (posted at http://www.papahanaumokuakea.gov/permit/pdf/upn_permitapps.pdf) does not specify that amendments made to a permit application must be posted. In addition, the policy states that "proposed activities that respond to urgencies, meet a high management priority, and are exigent in either opportunity or need for execution shall be considered separately." Monk seals are already giving birth, and those pups will be vulnerable to shark predation, necessitating the applicants to prepare and implement this action immediately.

The applicant explains further, in 2011, when use of salvaged monk seal tissue was proposed for use as bait as part of the Parrish/Van Atta permit application, no public comments were received through the Unified Notification System (see DLNR submittal to the Land Board, April 21 2011). Nor were any comments received through the System on the permit application in 2012 (when salvaged monk seal tissue was not requested as bait). Finally, the public will have the opportunity to comment on the activity through the State of Hawaii DLNR's Land Board process. As the Unified Notification Policy notes, all Land Board submittals are posted 7 days prior to a hearing. The public may also attend a Land Board meeting and comment upon a submittal.

Therefore, the applicants believe that adequate opportunities have been made available for public comment.

11. What has NMFS done to consult with Native Hawaiian's that consider the monk seal as their 'aumakua?

The applicants have worked with ONMS to update and refine the Environmental Assessment (EA) for the permit application. The most recent update was in 2012 and included additional discussion of the issues of 'aumakua and Native Hawaiian beliefs and traditions. The EA is publically available and was used in support of previous permits. As stated in our response to comments, the applicants remain open to ideas of how to improve their outreach with any community and welcome any constructive offered.

12. Due to the cultural and community concerns expressed in the 2011 Land Board submittal, how has NMFS addressed these concerns in this additional activity request?

The applicants respond that no cultural or community concerns were articulated in the 2011 Land Board Submittal.

13. Baiting is used by many fishermen (Hawaiians and many others) to reinforce behaviors. It's not just about catching something, but it's about supporting a behavior in that which you want to catch so that you are more likely to catch them in the future. This appears to be diametrically opposed to the goals of this permit application—where the seal-eating behavior is undesirable—but it's being reinforced by the use of seal flesh for bait. Please comment.

The applicants state that the Galapagos sharks that take the bait will be removed, so the behavior will not be reinforced.

14. The managers and scientists that are working to protect the monk seal have a huge messaging problem within Hawaiian and other local communities; the use of monk seal flesh will certainly exacerbate that problem. Some will see it as a disconnect between wanting to save a species and being willing to disrespect that species in the process—for those with this perspective, the ends do not justify the means. If someone is demanding that others respect the monk seal, but their behaviors are not respectful of the monk seal, then they lose standing to demand respect for monk seals. Please comment.

The applicants respond, they emphasize that their mandates under the ESA and MMPA require us to use all necessary and appropriate means, based on the best scientific information available, to ensure the survival and recovery endangered species. We are always happy to hear ideas of how to improve our outreach with any community and welcome any constructive advice offered.

15. Please address the concern that some Native Hawaiians may object to the use of monk seal flesh on the grounds that the monk seal is an 'aumakua for their family and the use of

monk seal flesh is disrespectful and crosses the boundaries of propriety (disturbs the peace of the deceased monk seal).

The applicants appreciate that the use of salvaged monk seal tissue for shark removal activities may raise cultural sensitivities and other public concerns. As stated in our response to question 11, the applicants (and our partners) continue to reach out to the public share our rationale and to address articulated concerns.

The following were agency comments related to the review of salvage Hawaiian monk seal tissue:

1. We request that NMFS continues to evaluate CPUE and by-catch rate per bait type in order to evaluate the efficacy of these aspects of the methodology.

2. It is a legal use of the seal flesh as long as the flesh was properly salvaged under an ESA MMPA permit.

3. Seal blubber or flesh is used in other places as a bait around the world when researchers are targeting sharks that feed on seals (searched on the web and found references in Africa, Canada, and Iceland).

4. It is a tool a partner is coming forward with who is a subject matter expert in the field.

5. It is not the role of the MMB to evaluate the efficiency of an action proposed by a partner.

6. If use of that seal flesh from a pup that is already dead can be used to conserve another pup and enhance recruitment into the population, then it is quite probably a high priority conservation use.

7. If the use of monk seal flesh as bait increases predation, the effort to reduce predatory behavior will have failed again and instead possibly increase the amount of attacks on the Hawaiian monk seal.

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:

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 10137-7.
- 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 2012. 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.
- The Department has made an exemption determination for this permit in accordance chapter 343, HRS, and Chapter 11-200, HAR. See Attachment ("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, NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION, NATIONAL MARINE FISHERIES SERVICE (NMFS), FOR ACCESS TO STATE WATERS TO CONDUCT SHARK REMOVAL ACTIVITIES UNDER PERMIT PMNM-2013-017."

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, PMNM-2011-007, and PMNM-2012-013 in 2010, 2011, and 2012, 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, as in 2012, the majority of MMB agencies support the proposed activity as originally submitted 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 for activities included in the original proposal, with conditions similar to those stipulated in the 2012 permit for this activity. The specific condition concerning the issue of using monk seal as bait would not be included. The MMB further recognizes that concerns remain regarding these efforts to selectively remove sharks in relation to Native Hawaiian cultural impacts and correlation of the outcomes to endangered species recovery.

In regards to the additional request to use monk seal tissue as shark bait, consensus was even more difficult to achieve with one agency opposed, one abstaining, one requesting a deferral and four in support. The MMB regrets that it could not reach consensus on either the original or revised applications, as this has been and continues to be the preferred means of developing permit recommendations.

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 Van Atta 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, 2013- May 31, 2014
Proposed Method of Entry (Vessel/Plane): one of the following: NOAA vessels- Oscar Elton Sette and NOAA vessel Hi'ialikai, chartered vessel Kahana, chartered vessel Searcher, chartered flight via FWS, Pacific Air Cargo

Proposed Locations: French Frigate Shoals

Estimated number of individuals (including Applicant) to be covered under this permit: 10
Estimated number of days in the Monument: 130 days

Description of proposed activities: (complete these sentences):

a.) The proposed activity would…
include the removal of predatory Galapagos sharks from French Frigate Shoals (FFS) at select monk seal pupping sites during 2013. These activities are a continuation of previously permitted activities conducted in 2010-2012. 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 2013) 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 (2009-2012) 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 2009-2012 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 2012).

For the pup behavioral study, we collected 132 hours of scan sampling observations (on a 15-minute interval, totaling 528 scans), primarily of mother-pup nocturnal activity (between 1800 to 1000 hours). 14% of the time (75 scans), pups was in the water; 84% of these water entries were

into the wave wash. While in the water (wave wash or farther), pups were with their mothers 100% of the time and on 97.3% of those occasions/scans they were within 1 meter of her (for 2.7% of the occasions/scans they were within 2 meters of her). The maximum distance a seal pup ventured into the water was 50 meters from shore at Gin (1 occasion/scan) and 20 meters from shore at Trig (3 occasions/scans). These findings support the idea that seal pups enter the water infrequently at night and primarily do so to thermoregulate in the company of their mothers rather than to swim far into the ocean alone.

HMSRP logistically and financially supported a Galapagos and tiger shark tagging study conducted by Carl Meyer, PhD. of HIMB. Across the pupping season (May-August), 189 bottomsets were made; totaling 1570 hooks and 6850 soak hours. These bottomsets used large tuna heads and shark tissue as bait. Bycatch was minimal and limited to elasmobranch species. In total 68 Galapagos and 40 tiger sharks were tagged with sonic tags; additional individuals were tagged with spaghetti tags. Four Galapagos sharks were tagged near islets with monk seal pups (5.9% of the sampled population captured in a stratified fishing scheme that attempted to evenly fish across shallow and deep lagoonal areas and deep areas outside the breaking reef at FFS). This tagging research represents the greatest effort in terms of time devoted to sampling the shark population FFS to date (aside from commercial fishing in 1999). This research suggest that 1) using a small bottomset is a very effective way of capturing sharks and avoiding bycatch; 2) very few sharks utilize the shallow waters around the pupping sites. (Dale et al. 2010).

In 2010, there were 9 incidents of shark predation on pups, and as a result 6 pups died. This represented 16.2% (6 of 37 pups born) of the annual cohort (Table 1a & b). On Trig islet, Galapagos shark predatory activity was observed on 2 occasions during onsite monitoring by staff and/or recorded with the remote video camera. To increase the chance of observing sharks, staff camped on Trig as much as was feasible; however shark sightings remained rare, especially after the removal of a Galapagos shark at Trig on 13 July 2010 (see description below).

Two shark fishers were hired to fulfill the objectives of the PNMM permit granted in June 2010. Beginning on 10 July, the shark fishers focused their efforts at Trig because this was the islet with the greatest number of nursing pups to protect for the entire season. At Trig Island, monitoring of sharks occurred via camping and video recording. The removal effort initially focused on off-shore activities. Bottomsets and drumlines were deployed according to the permit's provisions with staff observing from island ready to alert the fishers (who were in their small boat monitoring the off-shore gear) of any near-shore shark activity. No near-shore Galapagos shark activity or shark incidents at Trig were observed between July 9 and August 23, 2010.

Thirty-four days of fishing occurred at Trig with 413 bottomset hook hours and 519.5 drumline hook hours (Table 3). One Galapagos shark was captured via the bottomset on the third day of fishing; the male shark (165cm total length) (see Table 2 for the number of Galapagos sharks 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 (5 July through 11 July). The vessel's course was based on the suggestions by the members of the Native Hawaiian community, which included timed arrival at select islands. The course included a visit to Ka'ula rock to perform the Mano i'a Harvest Ceremony at approximately noontime on July 6, with the ship stationed off a cave on the northwest side of the rock. Hawaiian greetings were chanted from the vessel during two morning circumnavigations around Nihoa Island, as well as at Mokumanamana during the night as the ship passed by en route to Tern Island, FFS. The stay at Tern Island, FFS was extended by a few hours beyond the scheduled drop-off of supplies and personnel to perform a second Manu i'a Harvest Ceremony. Our shark staff, monk seal staff, as well as the Refuge manager and other Fish & Wildlife staff participated in the ceremony, led by the members of the Native Hawaiian Community.

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

Handlines were first deployed at Gin on 7 June, after a shark-inferred disappearance of a pup there, and continued until 12 July. Thereafter fishing occurred at Trig from 14 July to 29 July 2011. Staff used handlines for a total hook soak time of 680 hours (Table 3). A large female Galapagos (274 cm total length) was removed 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 Galapagos shark's skin and jaws were distributed to G. Umi Kai for cultural and educational purposes upon our return from FFS (September 2011).

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

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

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

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

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)
2012	6(2)	0(0)	1(0)	0(0)	0(0)	1(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
2012	3	1	0	1

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

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

* All Galapagos sharks were removed from Trig with the exception of 1 from Gin in 2011.
** Shark deterrent testing occurred in this year and shark removals were not attempted.

Table 3. NMFS shark removal effort in 2010-2012 at Trig and/or Gin islets, FFS.

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

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]
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 2013).

Concurrent to monitoring, we propose to remove Galapagos sharks (200cm total length or greater) within 700m of the shoreline of Trig, Gin, Little Gin and Round islets during the pupping season (approximately June 1 to September 30, 2013). 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 2013 at FFS. This number of Galapagos sharks plus the 2 removed in 2010 and 2011 would fulfill the quota of 20 sharks that was recommended at a workshop on 2008 and permitted by the Monument in 2010-2012.

A range of methods will be used to capture these sharks because sharks are known to be unpredictable, individualistic predators that are often difficult to catch. Captured sharks will be humanely killed with a bang stick. A 700-meter distance from shore encompasses water depths of approximately 25 ft that allow replications of Meyer's methods and success (2009). Meyer's methods require setting gear over a sandy bottom. Our ground-truthing in 2010 of substrate maps and areal photos of the area indicates that this ideal sandy bottom type is located within the requested 700m distance.

We will perform a gross necropsy on sharks, including gut content inspection, morphometric measurements, and identification of sex and reproductive state.
Samples will then be taken for shark ecologists (e.g. Carl Meyer, PhD, Jennifer Schultz, PhD, R. Dean Grubbs, PhD, Greg Skomal, PhD) for future scientific analyses (e.g. gut content and tissue analysis, vertebrae isotope analysis, fatty acid analysis, genetic analysis of the shark itself and its

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

Thereafter, remains will be handled as deemed desirable and appropriate by Native Hawaiian community members, OHA and/or the MMB and as allowed under applicable Monument regulations.

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

7. Answer the Findings below by providing information that you believe will assist the Co-Trustees in determining how your proposed activities are compatible with the conservation and management of the natural, historic, and cultural resources of the Monument:

The Findings are as follows:

a. How can the activity be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument?
The activity can be conducted with adequate safeguards for the cultural, natural and historic resources and ecological integrity of the Monument.

Prior to obtaining permits for this work in 2010 -2011, we consulted with and sought and received quality input from OHA, the NHCWG and other member of the Native Hawaiian community. We believe constructive feedback was offered to us during each consultation and we left with an improved understanding of the views of some representatives of the Native Hawaiian community on our proposed work. From these meetings, we also developed partnerships with Keoni Kuoha (2010) and Leighton Tseu (2011); both men accompanied us to FFS at different times during our field work. In 2010, a range of practices and prayers were made that included our staff on a custom-design cruise course from O'ahu to FFS. It was a pleasure to work with the members of the Native Hawaiian community. We believe that these collaborations have deeply enriched the experience of our staff and fortifies our efforts to conserve the Hawaiian monk seal. 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. 2011). The number of Galapagos sharks likely involved in predation of pups in the shallows (i.e. around the pupping islets) is estimated to be in the low tens based on sonic-tag data (C. Meyer pers comm.).

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

To safeguard the ecological integrity of the Monument, we propose to limit the scope of our removal actions as described above and also to avoid by-catch of any other wildlife to the greatest degree possible. Possible adverse effects on the coral reef ecosystem at FFS from shark removals were investigated using the EcoSim model (Parrish, unpublished data; NMFS, in preparation). Results from that work indicated that the removal of 20 sharks had a nearly imperceptible effect on the dynamics of the FFS ecosystem. Expert opinion at our shark predation workshops supported these modeled results.

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

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

c. Is there a practicable alternative to conducting the activity within the Monument? If not, explain why your activities must be conducted in the Monument.

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

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

d. How does the end value of the activity outweigh its adverse impacts on Monument cultural, natural and historic resources, qualities, and ecological integrity?
The potential positive outcomes from enhanced monk seal recovery outweigh the adverse impacts associated with the loss up to 20 Galapagos sharks (combined) because we believe that these actions will ensure the co-existence atoll-wide of the 2 species into the future.

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

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

We do not believe that other, secondary, impacts are likely to result from the removal because Galapagos sharks and other apex predators are relatively abundant compared to monk seals (see discussion above on abundance).

e. Explain how the duration of the activity is no longer than necessary to achieve its stated purpose.
The activity is scheduled to coincide with the primary pupping season.

f. Provide information demonstrating that you are qualified to conduct and complete the activity and mitigate any potential impacts resulting from its conduct.
Some of the staff that conducted this work in 2011 and 2012 will return for the 2013 field season (S. Farry and M. Sullivan). In 2011 and 2012, they executed this work at FFS safely with no harm to seals or lethal shark bycatch (i.e. all tiger, whitetip and grey reef sharks captured were released alive), and in 2011 they captured and removed one Galapagos shark with a handline in a safe and respectful manner. In 2010, they facilitated in gear prep, setting of bottomsets and shark 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 removed one Galapagos shark and caught and released other shark bycatch. We aim to hire comparably skilled staff for the 2013 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 2010-2012.

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 removed) are appropriate to reach a goal of conserving wildlife (Hawaiian monk seals) and reducing the threat (shark predation) on a Monument resource (Hawaiian monk seals) based on the best-available knowledge about shark abundance, shark movement, shark predation, predation mitigation, seal behavior, seal movement, fishing catch rates and fishing success rates (given location) at FFS. Please see Gobush (2010) for a comprehensive description of this knowledge.

Adverse impacts to Monument cultural, natural, historic resources and ecological integrity are minimized as described in the discussion above.

Based on the experiences and success of past shark-capturing crews at FFS, shark ecologists and fishing gear-makers, having a variety of fishing methods at our 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 2012 there were no sightings of Galapagos sharks. In sum, the crew needs to be able to respond to the situation and the unpredictable and individualistic nature of sharks if they are going to have a chance at being successful.

i. Has your vessel has been outfitted with a mobile transceiver unit approved by OLE and complies with the requirements of Presidential Proclamation 8031?
The Kahana, Sette and Hi'l'alakai have also been equipped with 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 2010-2012. The 201-2012 permit applications evolved from previous projects, which underwent extensive review in-house, by members of the Hawaiian Monk Seal Recovery Team, the USFWS, and the State of Hawaii. The purpose, scope, methods and protocol of this application mirror and/or build upon the activities, insights and experiences of these previous projects.

8. Procedures/Methods:

Shark Fishing/Removals
1. Fishing personnel and location:

A crew of 3-4 staff experienced in safe and effective methods for shark fishing/removal will be tasked with shark monitoring and removing 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 2010-2012. 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 2010-2012. Fishing staff will avoid removing 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 removing, we will ensure that we do not misidentify and take a shark that is actually a grey reef.

For handlines, a line will be baited from shore or small boat. A hand-held harpoon will be used from shore or small boat when a shark is observed. A barbed shaft, on the end of the harpoon pole will 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. The buoy line length will be contingent on target set depth (45-75 feet depending on depth of deployment allowed). Gangions will consist of a stainless steel lobster trap clip (snaps onto mainline loops) with 2m of 1/2 inch polypropylene, a large swivel, 2m of 7/19 strand stainless steel aircraft cable (bite leader) to a 20/0 Mustad circle hook. Sets will be made from a small boat, and with short soak times of a maximum of 3 hours (in the daytime only).

The drumline will be of either of the following 2 designs. It may consist of a large buoy, with a chain trace attached to it and single baited hook, shackled to the other end of the chain trace. A baited hook will be suspended approximately 10 feet above the sea floor. A groundline will be shackled to the drum with a swivel, attached to a Danforth or CQR anchor and anchored to the bottom substrate. A scope of 3-4 times the water depth will be used. Alternatively, it may consist of 20ft of ½ in. polypropylene substituting for a chain trace, connected to the same branchline type used for the bottomsets described above. The opposite end of this mainline will be shackled to a float-line buoy that serves as the 'drum'. A chain will be run through this buoy

with the other end shackled to an 8' yellow marker line. The other end of the yellow line will then be shackled to a large red buoy with the connected float line (same used for bottomsets). The drumline set-up is a modification of what was used in 2010 so that the single baited hook rests on the bottom and does not suspend in the water column. This is preferred because we are targeting a species that spends most of its time on the bottom feeding on demersal fishes. With this design, the drum-buoy functions as a 'bobber' that will sink or move when an animal is hooked.

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

We intend to set the deployment tube in discrete areas of the nearshore habitat in islet sectors where sharks have been observed to patrol or pursue pups. The tube will be laid in a semi-circle configuration, arcing out approximately 5-10m from the shoreline. The tube will be weighted to the seafloor bottom by clipping it to a heavy anchor chain (8mm) of equal length to the tube; the terminal ends may also be attached to anchors on the beach to add stability. The net is only released upon trigger; it will not be released if large non-target animals (i.e. seals, turtles, birds, non-target shark species, large ulua) are in the water in the semi-circle area outlined by the tube or within 2m of the area outside of the tube or on the beachside opening. Multiple "Net Surprises" may be used to create a double-barrier design, creating two concentric arcs when deployed, in order to facilitate capturing a fast-moving shark. Multiple "Net Surprises" may be set adjacent to each other in the nearshore areas in order to facilitate capturing a fast-moving shark. In this case, only one "Net Surprise" would be deployed per capture event (each "Net Surprise" has its own dedicated radio-trigger). For example, at the beginning of the day, two "Net Surprises" would be laid at sector 2E of Trig islet, each arcing out 10m. If Galapagos sharks are observed patrolling and pursuing a pup in the area outlined by the first "Net Surprise" but circling out into the area of the second net, only the second net would be deployed. Once the net is released and a shark is tangled, the net will be pulled onto the beach and the shark euthanized. The "Net Surprise" will be in 100% attendance once set. HMSRP 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 2011-2012 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 more clear.

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 -2012). 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 -2012 and will be reviewed and refined with the 2013 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 removed 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 (if requested), 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 2013 and the achievement of the ultimate goal is apparent within 1- 2 years thereafter. We expect a lag time in any measurable increase in pup survivorship from shark removal because it is likely to take an entire season to catch the number of sharks requested given the low CPUE in the shallow lagoon.

If the number of sharks removed in 2013 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. 2011. The Shark assemblage at French Frigate Shoals Atoll, Hawai'i: species composition, abundance and habitat use. Plos One 6:e16962.

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

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

Harting, A., G. Antonelis, B. Becker, S.M. Canja, D. Luers, and A. Dietrich. In Prep. Galapagos Sharks and Hawaiian Monk Seals: A Conservation Conundrum. Marine Mammal Science.

Hawn, D. 2000. Galapagos shark (Carcharhinus galapagensis) removal and shark sighting observations at Trig Island, French Frigate Shoals during the 2000 Hawaiian monk seal field

season. Prepared for National Marine Fisheries Service, Southwest Fisheries Science Center, Honolulu Laboratory. Contract Order 40JJNF000208. 25 pp.

Hayes, S. 2002. Galapagos shark predation of monk seal pups at Trig Island, FFS 2001. Unpublished report. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI. 22 pp.

NMFS, 2002. Environmental assessment for the proposed experimental shark removal to enhance preweaned monk seal pup survival at Trig Island, French Frigate Shoals, Hawaiian Islands National Wildlife Refuge. Prepared under contract for U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Honolulu, HI. 46 pp.

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

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

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

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

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

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

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

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.

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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.

Fred H. Parr 1/29/13

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

With knowledge of the penalties for false or incomplete statements, as provided by 18 U.S.C. 1001, and for perjury, as provided by 18 U.S.C. 1621, I hereby certify to the best of my abilities under penalty of perjury of that the information I have provided on this application form is true and correct. I agree that the Co-Trustees may post this application in its entirety on the Internet. I understand that the Co-Trustees will consider deleting all information that I have identified as "confidential" prior to posting the application.

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Revision as of 4/18
1 of 2

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 2010-2012. Fish bait will be brought from outside the Monument.

; salvaged monk seal tissue will also be used as bait, in accordance w/ MMPA & ESA permit #10137

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 2010-2012. Fishing staff will avoid removing 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 removing, we will ensure that we do not misidentify and take a shark that is actually a grey reef.

For handlines, a line will be baited from shore or small boat. A hand-held harpoon will be used from shore or small boat when a shark is observed. A barbed shaft, on the end of the harpoon pole will 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. The buoy line length will be contingent on target set depth (45-75 feet depending on depth of deployment allowed). Gangions will consist of a stainless steel lobster trap clip (snaps onto mainline loops) with 2m of 1/2 inch polypropylene, a large swivel, 2m of 7/19 strand stainless steel aircraft cable (bite leader) to a 20/0 Mustad circle hook. Sets will be made from a small boat, and with short soak times of a maximum of 3 hours (in the daytime only).

The drumline will be of either of the following 2 designs. It may consist of a large buoy, with a chain trace attached to it and single baited hook, shackled to the other end of the chain trace. A baited hook will be suspended approximately 10 feet above the sea floor. A groundline will be shackled to the drum with a swivel, attached to a Danforth or CQR anchor and anchored to the bottom substrate. A scope of 3-4 times the water depth will be used. Alternatively, it may consist of 20ft of ½ in. polypropylene substituting for a chain trace, connected to the same branchline type used for the bottomsets described above. The opposite end of this mainline will be shackled to a float-line buoy that serves as the 'drum'. A chain will be run through this buoy

Revision of 4/17
2. of 2.

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.

Fred H. Parr — Signature — Date 1/29/13

*With revision – Fred A Parr — Date 4/17/13

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

NMFS Proposal to the MMB re: 2013 Parrish/Van Atta permit

NMFS Proposal:
In light of our discussions at the 4/3 MMB briefing, NMFS requests the MMB:

a) Endorse the 2013 Parrish/Van Atta permit
b) Approve an amendment that will allow the use of other bait types, including but not limited to: tuna heads, salvaged Hawaiian monk seal tissue (e.g., from seal that had previously died), and other bait types previous approved for use in the Monument, for the purposes of capturing Galapagos sharks displaying the unique predatory behavior of killing monk seal pups.

Rationale:
NMFS believes that, given current options, the only practicable means to increase catch per unit effort (CPUE) for Galapagos sharks and save monk seal pups from shark attack is to expand the types of bait used, and include the option of using salvaged monk seal tissue as bait. This is based on data from 2001-2006 shark removal activities at FFS, when the CPUE using handlines with salvaged monk seal bait was higher than when using handlines with fish bait. This strategy was also recommended through consultation with other wildlife managers engaged in predator control activities.

- 2001-2006: 3 catches out of 15 attempts, or a 20% success rate (using salvaged monk seal bait)
- 2010-2012: 2 Galapagos sharks were caught during 2091.5 hook hours of fishing (using frozen tuna heads), 0.001 CPUE.

Compliance:

- Use of salvaged monk seal tissue as bait for predatory shark removal activities in order to enhance seal survival is authorized per the ESA and MMPA under NMFS permit No. 10137-07 dated July 11, 2012.

Fishing Method:

- Fishing methods will not change from those described in the 2013 permit application.

The following protocols are in place to mitigate by-catch mortality and safety risks.

- Fishing will only occur after a known or inferred shark injury/disappearance or if G. sharks observed demonstrating predatory behaviors in near-shore waters.
- Fishing will only occur during daylight hours, no lines will be left in the water overnight.
- All lines will be continuously monitored.
- Bottomset and drumline hooks and bait will be checked every 2 hours.

The following additional protocols are specific to using salvaged monk seal tissue:

- Soak times for salvaged monk seal bait will not exceed 2 hours with at least 1 hour between successive fishing attempts.
- Trends in by-catch will be monitored to determine if by-catch rates increase with the use of seal tissue as bait.

Process

- NMFS is preparing a Supplemental Information Report for NEPA compliance.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Pacific Islands Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, Hawaii 96814-4700
(808) 944-2200 · Fax: (808) 973-2941

April 22, 2013

MEMORANDUM FOR: Maria Carnavale
Chair, PMNM MMB

FROM: Midori Akamine
NMFS PMNM MMB Representative

SUBJECT: Parrish/Van Atta 2013 PMNM Permit

The Hawaiian monk seal is an endangered species, with a population of 1,100 – 1,200 individuals. The National Marine Fisheries Service (NMFS) has authority and responsibility under the Endangered Species Act (ESA) and Marine Mammal Protection Act (MMPA) to implement the 2007 Hawaiian Monk Seal Recovery Plan and the recommendations of the Hawaiian monk seal recovery team, which includes members from Federal and State Agencies (including those represented on the Papahānaumokuākea Marine National Monument (PMNM) Monument Management Board, or MMB). To that end, NMFS currently possesses a valid permit under the ESA and MMPA to use salvaged monk seal tissue as bait (collected post-necropsy from deceased animals) in its Hawaiian monk seal research enhancement activities.

The NMFS is addressing a wide range of threats to monk seals throughout the Hawaiian Archipelago. In the PMNM, the key threats to the survival of the species are falling birth rates combined with poor survival of juvenile Hawaiian monk seals to reproductive age. The primary source of pup mortality at French Frigate Shoals (FFS; once home to the largest monk seal subpopulation) is the unique predatory behavior of a small number of Galapagos sharks (G. sharks), which target nursing and newly weaned pups. Since 1997, NMFS has engaged in a variety of actions to address this threat, including pre-weaning and translocating pups, predator deterrents, and targeted fishing activities to remove problem G. sharks.

Despite the suite of activities implemented by NMFS, the monk seal population in the NWHI, and particularly at FFS, has continued to decline. Pup predation by G. sharks therefore has an escalating impact on the remaining population. Removing the sharks exhibiting this behavior from the environment is the most effective means of preventing predation. The best available scientific information is that the use of salvaged monk seal tissue as bait likely will result in higher G. shark catch rates, with a corresponding reduction in the mortality of monk seal pups.

The use of salvaged monk seal tissue to improve the efficiency of fishing activities and increase the catch per unit effort (CPUE) of G. sharks and save monk seal pups from shark attack was discussed

during an MMB informational briefing in April 2013. NMFS shared data from 2001-2006 shark removal activities at FFS, when the CPUE using handlines with salvaged monk seal tissue bait was higher than when using handlines with fish bait.[1] The historically higher CPUE and evidence that the use of seal tissue does not pose any additional threat to seals or the environment justify its use for this recovery action. NMFS also noted that in similar predator control activities, it is a widely accepted practice for wildlife managers to employ as bait the predator's target species.

Subsequent to the April 2013 meeting, NMFS revised its permit application to include the use of salvaged monk seal tissue as bait. Given the desperate conservation status of this endangered species, it is imperative that NMFS act decisively to halt and reverse declining survival rates. NMFS appreciates that the use of salvaged monk seal tissue for shark removal activities may raise cultural sensitivities and other public concerns. We emphasize that our mandates under the ESA and MMPA require us to use all necessary and appropriate means, based on the best scientific information available, to ensure the survival and recovery endangered species. The best available information supports the use of salvaged monk seal tissue for these shark removal activities.

We are happy to work with the public and our resource agency partners to address articulated concerns. Given the increasing gravity of the situation at FFS (increased shark-induced pup mortality combined with fewer seal births) and NMFS' responsibility to recover the Hawaiian monk seal population, it is essential that the NMFS utilize all available options and all of the "tools in the toolbox." As above, use of salvaged monk seal tissue as bait has already been approved by the NMFS Office of Protected Resources under the MMPA and ESA with permit number 10137-07. **NMFS therefore requests that the MMB support its request to amend NMFS PMNM permit 2013-017 (endorsed by the MMB April 18, 2013) to include the use of salvaged monk seal tissue as bait.**

[1] From 2001-2006 NMFS recorded 3 catches of G. sharks out of 15 attempts, or a 20% success rate using salvaged monk seal bait. From 2010-2012: 2 Galapagos sharks were caught during 2091.5 hook hours of fishing (using frozen tuna heads), or a CPUE of 0.001.

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—field camp leader
Mark Sullivan—assist in field setup
3 TBN—2 field assistants, 1 volunteer

2. Specific Site Location(s): (Attach copies of specific collection locations):

French Frigate Shoals is an approximately 27 km-long crescent-shaped atoll that protects a 727 sq.-km shallow lagoon that is from 2 to 10 km wide. Numerous sand islets dot the lagoon area of French Frigate Shoals. Waves and currents constantly change the size and shape of these sandy islets. The majority of shark predation on nursing and weaned monk seal pups has occurred at Trig Island and therefore near shore waters around this island would be the primary implementaion site. However, dependent upon Galapagos shark activity, additional sites including Gin Island and Little Gin Island may be selected for deployment of proposed shark deterrent activities.

Trig Island – 1.1 acres in September 2004
Lat: 23 degrees 52' 17.59
Long: 166 degrees 14' 34.17

Gin Island – 2.1 acres in September 2004
Lat: 23 degrees 44' 03.88
Long: 166 degrees 09' 56.40

Little Gin Island - 2.3 acres in September 2004
Lat: 23 degrees 43' 43.64
Long: 166 degrees 09' 49.63

3. Other permits (list and attach documentation of all other related Federal or State permits): No additional permit in place for shark fishing. Permit 10137-07 issued by NMFS Office of Protected Species to take Hawaiian monk seals for Scientific Research and Enhancement Activities is in effect and can be provided. PMNM-2013-001 authorizes shark monitoring at FFS.

University of Hawaii IACUC Protocol 11-1120-3 is in place covering shark removal.

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): Approximately $200K will be allocated from federal funds provided to the Protected Species Division for FY13 to support field research in the NWHI. Shark monitoring and removal is part of this overall effort.

5. Time frame:
Activity start: July 3, 2013
Activity completion: September 30, 2013

Dates actively inside the Monument:
From: July 4, 2013
To: September 29, 2013

Describe any limiting factors in declaring specific dates of the proposed activity at the time of application:

Cruise dates are reasonably certain and would be affected only by last minute mechanical problems which might occur on the R/V *O. E. Sette*.

Personnel schedule in the Monument:

Shawn Farry will enter the Monument July 4, 2013 and will disembark at FFS on July 5, 2013. He will depart FFS on September 13, 2013, and will leave the Monument from Midway on September 19, 2013.

Mark Sullivan will enter the Monument July 4, 2013 and will disembark at FFS on July 5, 2013. He will leave FFS on July 18, 2013 and will exit the monument on July 19, 2013.

The 3 TBN will enter the Monument on July 4, 2013 and will disembark at FFS on July 5, 2013. They will depart FFS on September 28, 2013, and will exit the monument on

September 29, 2013. There is some uncertainty in departure of at least 1 TBN who, if selected, would have to depart FFS on September 11, 2013, and exit the Monument from Midway on September 19, 2013.

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:

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

☒ Vessel
☐ Aircraft

Provide Vessel and Aircraft information: R/V *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): Will be provided prior to departure in early July, 2013.

☐ 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:
Vessel owner:
Captain's name:
IMO#:
Vessel ID#:
Flag:
Vessel type:
Call sign:
Embarkation port:
Last port vessel will have been at prior to this embarkation:
Length:
Gross tonnage:
Total ballast water capacity volume (m3):

Total number of ballast water tanks on ship:
Total fuel capacity:
Total number of fuel tanks on ship:
Marine Sanitation Device:
Type:

Explain in detail how you will comply with the regulations regarding discharge in the Monument. Describe in detail. If applicable, attach schematics of the vessel's discharge and treatment systems:

Other fuel/hazardous materials to be carried on board and amounts:

Provide proof of a National Oceanic and Atmospheric Administration (NOAA) Office of Law Enforcement-approved Vessel Monitoring System (VMS). Provide the name and contact information of the contractor responsible for installing the VMS system. Also describe VMS unit name and type:

VMS Email:
Inmarsat ID#:

* Individuals MUST ENSURE that a type-approved VMS unit is installed and that its automatic position reports are being properly received by the NOAA OLE system prior to the issuance of a permit. To make sure your VMS is properly configured for the NOAA OLE system, please contact NOAA OLE at (808) 203-2503 or (808) 203-2500.

* PERMITS WILL NOT BE ISSUED TO INDIVIDUALS ENTERING THE MONUMENT VIA VESSEL UNTIL NOAA OLE HAS CONTACTED THE MONUMENT PERMIT COORDINATOR WITH A 'POSITIVE CHECK' READING.

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:

"Montauk" 17' Boston Whaler with a 75hp Honda outboard engine.
"Alert" 17' Boston Whaler with a 60hp Yamaha outboard engine

Additional Information for Land Based Operations

11. Proposed movement of personnel, gear, materials, and, if applicable, samples: Movement within the monument will be accomplished using tenders of the Hawaiian Monk Seal Research Program, which will be transported to FFS aboard the R/V *O.E. Sette* at the start of this activity.

12. Room and board requirements on island: None. NMFS/PSD personnel will establish a tent base camp at Tern Island, and will also have temporary camps at Trig Island to monitor and/or remove sharks.

13. Work space needs: Sufficient footprint on Tern Island to park two 20' whalers, on trailers. Space for 3 chest freezers.

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

ESTHER KIA'AINA
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
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

May 10, 2013

TO: Division of Aquatic Resources File

THROUGH: William J. Aila Jr., Chairperson

FROM: William Tam
Water Deputy and Acting Administrator, Division of Aquatic Resources

SUBJECT:

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-2013-017.

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-2013-017

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, 2013 through May 31, 2014.

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 (MMP) Environmental Assessment (EA). This EA analyses the MMP covered 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 March 13, 2013 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 to 2012, under permits PMNM-2007-025, PMNM-2010-014, PMNM-2011-007, and PMNM-2012-013; which had no deleterious effects on Monument resources. Possible adverse effects 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, and associated monitoring activities, are covered under the Manager's permit PMNM-2013-001. 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 no. PMNM-2012-050). Meyer's permit is effective through August 24, 2013 and depending on logistics, could be conducted in the area throughout the summer season. In the past, Meyer has spent less than seven days a season at FFS. Jacob Asher, 2013 permit pending BLNR's approval no. PMNM-2013-018, proposes to conduct videographic surveys of predators and coral reef fish at FFS during August 2013. 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.

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