# 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

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**Hawaiian Monk Seal Research Program (HMSRP)**

**Honolulu, Hawaii**

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## Executive Summary

The purpose of this Supplemental Environmental Assessment (SEA) is for the National Marine Fisheries Service (NMFS) to consider the potential environmental impacts of additional methods which were not included in the March, 2009 Programmatic Environmental Assessment (PEA) of activities to reduce Galapagos shark predation on pre-weaned pups at French Frigate Shoals (FFS).

The scope of the proposed research is using an additional fishing method to remove Galapagos sharks, which are preying on pre-weaned pups. The new fishing method would not increase the number of sharks taken, but may increase the chances of successfully removing up to 40 Galapagos sharks over a 2-year period, as analyzed in the PEA. The new method under consideration is a vertical 'surprise net' which is deployed remotely from when the desired target (in this case, Galapagos shark) is within the arc of the net. The activity would be conducted exclusively at FFS.

This analysis presents information on the anticipated effects to the physical environment resulting from the proposed activity, as well as potential effects to the biological environment, including marine mammals, sea turtles, Galapagos sharks, other fishes, seabirds, and corals. With mitigation measures in place to prevent seal and turtle entanglements, no significant impacts would occur.

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# 1 Purpose and Need

## *1.1 Background*

In March 2009, the Protected Species Division, Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS), Hawaiian Monk Seal Research Program (HMSRP) prepared a programmatic environmental assessment analyzing activities expanding its program for decreasing or eliminating shark predation on Hawaiian monk seal pre-weaned pups in the Northwestern Hawaiian Islands. A component of the action was on pup/Galapagos shark interactions within French Frigate Shoals. In response to the dire circumstances facing the Hawaiian monk seal population, the programmatic analysis presented a set of strategies to decrease or eliminate predation on pre-weaned pups, especially at Trig islet, the Gins, and other islets within the atoll.

As discussed at Section 1.10 of the PEA, the PEA anticipated preparation of supplementary NEPA analysis for any site or project specific actions that may be added to the program that were not specifically covered under the PEA or another analysis and that might have environmental impacts not previously considered. Since that PEA was prepared, HMSRP has identified a modified tangle net fishing gear that may be deployed in specific areas of French Frigate Shoals under identified conditions to more effectively target predatory Galapagos sharks. Although not identified and discussed in the PEA, the proposed use of the modified tangle net fishing method is consistent with the overall program parameters identified. As well, since the PEA was completed, nothing has substantially changed in the environment for any resource analyzed. Consequently, this supplemental EA is linked to and tiers from the PEA. This SEA incorporates by reference the PEA, while appropriately examining site, deployment, and equipment specific proposals consistent with the PEA. This SEA is prepared to provide a detailed analysis of site-specific impacts for the gear and deployment methodologies presented.

The overall program of which this action is a part has been evaluated in several Environmental Assessments in support of Monument permit applications and consultations per the Endangered Species Act. These are listed in Section 1.4 of the PEA, and incorporated by reference here.

In addition to the assessments listed in the PEA, the following assessment was conducted.

- **Environmental Assessment for Issuance of Two Conservation and Management Permits…for Conducting Shark Deterrent and Removal Activities in the Papahanaumokuakea Marine National Monument.**

NMFS received the following permits from the Monument for activities related to the shark predation program:

- **Shark deterrent deployment at FFS 2009, permit number PMNM-2009-002, which covered deployment of electromagnetic Shark Shields, magnets attached to foam floats, recordings of boat and outboard engine noise broadcast from underwater speakers, and a permanently anchored small boat.**
- **Shark deterrent deployment at FFS 2008, permit number PMNM-2008-045, which covered deployment of electromagnetic Shark Shields, magnets attached**

**to foam floats, recordings of boat and outboard engine noise broadcast from underwater speakers, and a permanently anchored small boat.**

- **Shark removal at FFS 2007, permit number PMNM-2007-025, which covered monitoring of shark activity and shark removal by various fishing methods, including hand line, harpooning, bottomset, and drumline.**

This SEA includes the following type of actions:

- **Use of a surprise net to catch Galapagos sharks near pupping beaches at Trig Island, FFS.**

## *1.2 Description of action*

The Protected Species Division, Pacific Islands Fisheries Science Center (PIFSC), National Marine Fisheries Service (NMFS, Hawaiian Monk Seal Research Program (HMSRP) proposes to add a fishing method using a 'surprise net' for catching Galapagos sharks to the existing suite of fishing and deterrent methods already being used to decrease or eliminate shark predation on pre-weaned Hawaiian monk seal pups. The action will not increase the total number of sharks to be removed under the existing PEA.

## *1.3 Need for Action*

The overall need for action to decrease shark predation on Hawaiian monk seal pups was stated in part 1.1 of the PEA, and remains unchanged for purposes of the immediate action. Part 1.1 of the PEA is incorporated by reference.

The specific need for this action is to achieve to achieve removal of predatory Galapagos sharks in an efficient manner while minimizing harm to marine resources. Fishing methods used through 2008 (all fishing was suspended in 2009) had low catch rates, were time intensive for limited staff, and did not necessarily catch the specific predatory individual immediately after its predatory behavior had occurred. The proposed tangle net fishing methodology was developed as a means to capture harbor and grey seals in Europe, animals that are notoriously wary of human presence and therefore extremely difficult to capture on shore for research. HMSRP anticipates that the method, as modified, will also be successful catching sharks swimming close to shore.

## *1.4 Goal and Objectives*

The overall goal of this component of the Hawaiian monk seal research program remains as stated in part 1.2 of the PEA, namely to reduce or eliminate losses of pre-weaned pups to shark predation in the NWHI. If reached, this goal will contribute to 1) reducing the rate of population decline and 2) increasing the potential for population recovery by raising the probability that more seals reach breeding age.

The primary objective to meet this goal is to:

Decrease total losses of pre-weaned pups to shark predation to 0 to 2 per year or 5% of the annual cohort, whichever is less. Shark incidents on pre-weaned pups average zero cases per year for other monk seal subpopulations in the NWHI, HMSRP believes that a maximum loss of 2 pups or 5% of the annual cohort, whichever is less, is reasonable given the expected asymptotic nature of extinguishing pup predation at FFS by Galapagos sharks.

The specific goal of the project is to successfully deploy the surprise net and capture Galapagos sharks observed preying on, or attempting to prey on Hawaiian monk seal pups.

## *1.5 Scope of Analysis*

### 1.5.1 Temporal Scope and Actions Included

This SEA provides the detailed descriptions of an additional method to remove Galapagos sharks, and evaluates potential effects of using the new method. This methodology may be used individually, or in various combinations with methods already in use, which have been described and evaluated the PEA. This methodology included in this SEA will not increase the number of sharks taken, evaluation of which was also included in the PEA.

The PEA has no termination date; and was intended to provide the basis for long-term continuation and potential expansion of existing mitigation and research activities, as well as to provide the foundation to evaluate the effectiveness of actions intended to maintain and improve survival of pre-weaned pups. Similarly, this SEA has no termination date and will remain current, as long as individual projects are conducted as described in Chapter 2 and the actual impacts associated with implementation remain within the range of impacts as identified in Chapter 3. Per NOAA policy, any Finding of No Significant Impact (FONSI) resulting from this SEA will be reviewed for consistency and appropriateness at least every 5 years.

### 1.5.2 Permit Requirements

Any action conducted within the land and waters of the Papahanaumokuakea Marine National Monument (Monument) must be conducted under a permit issued by the Monument. As an agency action, issuance of permits must comply with National Environmental Policy Act (NEPA) and other applicable laws. The intent of this SEA is to provide sufficient analysis of informed decision making by NMFS PIFSC, and to provide the foundation for any permits issued by the Monument. The Monument may use the SEA in whole or in part for NEPA compliance in issuing permits (40 CFR 1506.3).

This SEA will also document the analysis and process for compliance with NEPA for considering grants to Joint Institute for Marine and Atmospheric Research (JIMAR) to assist in conducting the work within this program.

Two species listed under the Endangered Species Act (endangered Hawaiian monk seals and threatened green turtles) occur in the action area, and consideration of the effects on these species is required according to Section 7(a)(2) of the Endangered Species Act (ESA) (16 U.S.C. 1536(a)(2)). The effects of human presence in the area to conduct all predation reduction activities were considered in a Biological Opinion issued by the NMFS Office of Protected Resources on June 30, 2009. The effects of existing fishing methods to reduce shark predation were considered in an informal consultation with the NMFS Pacific Islands Regional Office (PIRO) in May 2008. At that time, PIRO concurred with PIFSC that the activities may affect but were not likely to adversely affect the above listed species. For the proposed action of this SEA, PIFSC will seek PIRO concurrence on a similar determination. No action will occur prior to issuance of this concurrence (with mitigating measures as appropriate).

### 1.5.3 NEPA Compliance for Implementation of Actions within the Program

Any site-specific and/or project-specific actions that would be added to the program and not specifically covered under this SEA, the PEA, or other NEPA documents, and that would potentially have environmental considerations (adverse impacts) not evaluated in this SEA or the PEA, will need additional appropriate NEPA analysis via additional supplements (40 CFR 1502.9) or a new NEPA analysis.

Any site-specific or project-specific actions not covered in this SEA or another NEPA document and that would not have any additional environmental considerations can be addressed in the research project implementation plan and protocol for the specific project. Possible examples include computer modeling and data analysis.

A categorical exclusion memorandum per NAO216-6 Section 5.05(b) would not be appropriate for any short-term or long-term projects or activities not consistent with this SEA because NAO216-6 Section 5.05c states: "The preparation of an EA or EIS will be required for actions that would otherwise be excluded if they involve a geographic area with unique characteristics, are the subject of public controversy based on potential environmental consequences, have uncertain environmental impacts or unique or unknown risks, establish a precedent or decision in principle about future proposals, may result in cumulatively significant impacts, or may have any adverse effects upon endangered or threatened species or their habitats."

This program, as currently implemented and as proposed, has many activities conducted within the geographically unique Monument, both on land and in the near offshore area. In addition, some of the efforts are experimental in nature, but necessary to at least try to recover the reproductive potential of the Hawaiian monk seal subpopulations in the NWHI, with a variety of known and uncertain risks. The Hawaiian monk seal is highly endangered, with fewer than 1,200 individual animals remaining, and the population is continuing to decrease for reasons that are known, as well as speculated based on scientific evidence. Therefore, a categorical exclusion would not be appropriate for activities conducted within the current and/or proposed program.

### 1.5.4 Spatial Scope and Species Included

This SEA includes conducting research and management activities at French Frigate Shoals, Hawaii, which will be the only geographic area considered. More specifically, the activity will occur at Trig, Gin, and/or Little Gin Islands, FFS.

Species considered are the ESA listed Hawaiian monk seal (*Monachus schauinslandi*) and green turtle (*Chelonia mydas*), and the three incidental fish species most likely to be included in the net arc during deployment: Pacific threadfin (Hawaiian name moi) *Polydactylus sexfilis*; rudderfish (Hawaiian name nenue) *Kyphosus cinerescens*; and mountain bass (Hawaiian name aholehole), *Kuhlia sandvicensis*.

The primary target of the fishing activity, Galapagos shark (*Carcharhinus galapagensis*) was considered in the PEA, and the additional fishing method will not increase the number of Galapagos sharks taken. Therefore, Galapagos sharks will not be considered further in this SEA.

## *1.6 Scope of Decisions to be Made*

The Responsible Program Manager (RPM; the Director of the PIFSC) will use this SEA and associated PEA to make the following decisions:

1. Might the proposed action of using a surprise net to catch Galapagos sharks near the identified pupping beaches within FFS, as described, have significant impacts requiring analysis in an Environmental Impact Statement?

2. Should the PIFSC use a surprise net among the suite of fishing methods to minimize or eliminate Galapagos shark predation on pre-weaned Hawaiian monk seals in the NWHI in support of Endangered Species Act (ESA) recovery requirements?

This SEA and associated PEA will be used as the basis for PIFSC decisions regarding financial support of the program, as well as components of the program submitted by application for necessary permits from the Monument for the monk seal and shark work evaluated in this SEA. Galapagos sharks are not regulated under either the Marine Mammal Protection Act or ESA, but under the Monument permit. Therefore, this SEA, and associated PEA will provide documentation and analysis to support decisions the Monument must make regarding a permit requested by the program. This SEA and the 2009 PEA may be used, in whole or in part, by the Monument for their decision-making.

## *1.7 Consistency with Monument Mission and Necessary Findings for Permit Approval*

On December 4, 2000, President William Clinton established the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Reserve) by Executive Order 13178 (E.O.). Within this order, the Department of Commerce was tasked with managing the Reserve in accordance with a number of principles. The seventh principle included:

*The Reserve shall be managed to further restoration and remediation of degraded or injured Reserve resources.*

Later, in June 2006, President George W. Bush created the Northwestern Hawaiian Islands National Monument by Presidential Proclamation (proclamation) under authority granted the president by the Antiquities Act of 1906. Jurisdictional authority for managing the Monument is shared by the Secretary of Commerce, acting through NOAA, and the Secretary of Interior, acting through USFWS. This proclamation did not overturn Executive Order 13178. Also, per the Proclamation, actions taken within the Monument must be permitted by the Monument prior to implementation, based on the impacts evaluated by the action entity and consideration of ten findings identified in the proclamation.

This program meets these mandates (E.O. and proclamation) and their associated principles and findings because the Hawaiian monk seal population endemic to the Hawaiian Archipelago, including the NWHI, has decreased precipitously since the 1950s, and is currently decreasing at more than 4% per year. In support of these mandates, the Monument has helped seek funding to expand the study of Galapagos sharks and its associated ecosystem at FFS and has funded and permitted research on shark tagging conducted by HIMB. In addition, the Monument has provided direct support in FY08 and FY09, which included logistical support through ship time in the NWHI. The Monument has also provided advice over time to ensure that predation studies are consistent with the mandates. The Monument has committed to facilitating the processing and issuance of necessary permits for shark removal and deterrence to protect pre-weaned pups in a timely manner (R .Kosaki PIFSC Workshop II, *pers. comm. November 2008*). Furthermore, HMSRP will attempt to provide additional population data on the Galapagos sharks at FFS if an application for a permit

for expanded fishing effort is submitted in the future and permission is granted by the Monument (Section 2.2.2).

This SEA and associated PEA fulfills the NEPA requirements for any decision necessary to issue a permit from the Monument at any time regarding any NMFS application that includes actions evaluated within this SEA and the PEA.

## *1.8 Alternatives Not Considered in Detail*

All alternatives not considered in detail were described in Section 1.9 of the PEA, which is incorporated by reference. This SEA does not add any other alternatives not being considered.

# 2 Affected Environment and Alternatives

Nothing has substantially changed in the environment for any resource analyzed in the PEA since the PEA was completed. Therefore, the affected environment from the PEA is incorporated by reference here. Specifically, this chapter incorporates:

- **description of the affected environment;**
- **description of the PEA's No Action alternative;**
- **description of the SEA's proposed action alternative.**

## *2.1 Affected Environment*

### 2.1.1 French Frigate Shoals (FFS)

FFS was described in detail in Section 2.1.3. of the PEA, which is incorporated by reference. The action will occur at three specific sites within FFS, Trig Island, Gin Island, and Little Gin Island.

#### 2.1.1.1 Trig Island

Trig Island (Fig. 1) is located just inside the north reef of FFS, about 2.3 miles east of Tern Island. Trig is an unvegetated sand islet that varies somewhat in area and configuration seasonally according to sand movements within the atoll. As of late 2009, it was approximately 360 m long, and varied in width between ~20 m and ~50 m. Most of the island's immediate surroundings comprise a 30-40 m extent of sand or coral rubble bottom at a maximum depth of approximately 5 m. Farther out than 40 m the bottom drops to a depth of ~20 m, with live coral heads separated by sand channels. The exception is the northeast corner of the island, where deep water and live coral heads occur in close proximity to Trig. The island is used for basking and nesting by green turtles (*Chelonia mydas*), haulout and pupping by Hawaiian monk seals (*Monachus schauinslandi*), and nesting by up to three seabird species: black-footed albatross (*Phoebastrea nigripes*), masked booby (*Sula dactylatra*), and brown noddy (*Anous stolida*).

**Figure 1. Trig Island, French Frigate Shoals (white bar = 100m)**

#### 2.1.1.2 Gin Island

Gin Island is located along the inner, southwestern reef of FFS, approximately 10 miles southeast of Tern Island. The sand island measures approximately 150m x 100m, and has been unvegetated for several years. The area immediately surrounding the island varies from shallow sandy bottom, to coral rubble. The island is used for basking and nesting by green turtles (*Chelonia mydas*), haulout and pupping by Hawaiian monk seals (*Monachus schauinslandi*), and nesting by three seabird species: black-footed albatross (*Phoebastrea nigripes*), masked booby (*Sula dactylatra*), and brown noddy (*Anous stolida*).

#### 2.1.1.3 Little Gin Island

Little Gin Island is located along the inner, southwestern reef, approximately 10 miles southeast of Tern Island. The sand island is measures approximately 400 m x 75 m and is generally unvegetated, though occasional seedlings of *Boerhavia repens* and *Portulaca lutea* sprout, only to be generally overwashed seasonally. The area immediately surrounding the island varies from shallow sandy bottom, to coral rubble, with a deeper sandy bottom inlet on the west side. The island is used for basking and nesting by green turtles (*Chelonia mydas*), haulout and pupping by Hawaiian monk seals (*Monachus schauinslandi*), and nesting by up to three seabird species: black-footed albatross (*Phoebastrea nigripes*), masked booby (*Sula dactylatra*), and brown noddy (*Anous stolida*).

### 2.1.2 Critical Habitat

The action area includes Hawaiian monk seal critical habitat, the establishment and extent of which were described in Section 2.1.11 of the PEA, which is incorporated by reference. Actions authorized, funded, or carried out by federal agencies that may have an impact on critical habitat must be consulted upon in accordance with section 7 of the ESA, regardless of the presence of Hawaiian monk seals at the time of impacts. Impacts on these areas that may affect primary constituent elements such as prey availability must be considered when analyzing whether habitat may be adversely modified.

## *2.2 Description of Alternatives*

This SEA evaluates the impacts of the proposed action (Alternative 2, Current Program, Adding Surprise Net to Fishing Methods). The other alternative (Alternative 1, No Action, Continuation of Current Program including Expanded Bottomset Methods) will be briefly discussed here, but most of the information and evaluation regarding that alternative will be incorporated by reference from the PEA.

### 2.2.1 Alternative 1: Description of the Current Program including Shark Removal by Expanded Bottomset Method (No Action Alternative)

Description and evaluation of this alternative was delineated in section 2.2 of the PEA, which is incorporated by reference. This alternative includes methods of shark deterrence (2.2.1.2. and 2.2.1.3. of the PEA), limited shark fishing (2.2.1.4. of PEA), and expanded bottomset fishing (2.2.2.

of PEA). Under this alternative, existing methods to decrease Galapagos shark predation on monk seal pups would continue, as adapted and modified as necessary. Procedures would continue to include monitoring Galapagos shark activity and behavior, deploying devices to deter presence of Galapagos sharks, removing Galapagos sharks by various fishing techniques, and continually evaluating fishing techniques.

### 2.2.2 Alternative 2: Continue the Current Program, Adding Shark Removal using a Surprise Net (Proposed Action)

NMFS proposes to continue the actions described in the no action alternative with the addition of surprise net methodology for shark capture. Deployment methods will incorporate measures to mitigate against environmental effects, as stated below in 2.2.2.2 and 3.2.

#### 2.2.2.1 Description of Equipment

The surprise net to be used by PIFSC will be based upon a system developed by scientists at the Sea Mammal Research Unit (SMRU), Scottish Oceans Institute, University of Saint Andrews, Scotland (Figure 2). Faced with difficulties capturing animals in some situations and the desire to minimize disturbance, SMRU developed a radio-controlled net deployment apparatus. This technology was created to enable the subtle deployment of tangle-nets in front of animals in shallow nearshore areas, and is used to capture harbor seals and grey seals, which are very wary of human presence and readily flee into the water at human approach. The device is a barrier/tangle net which is compressed into a long, horizontal, submerged tube anchored along the bottom, and deployed in an arc enclosing a prescribed area of shoreline or nearshore waters. The bottom of the net is weighted, and the top of the net is a hose which can be inflated with air and which is attached to portable air cylinders. Inflation of the hose is controlled remotely via solenoid switches and valves between the cylinders and the hose. When the hose is inflated the top of the net rises quickly (and surprisingly…hence the moniker) from the bottom to the surface, trapping the desired animals between the arc of the net and the shore. The target animals will become tangled if they attempt to swim through the net, or if they remain untangled they can be captured by pulling the net in to shore.

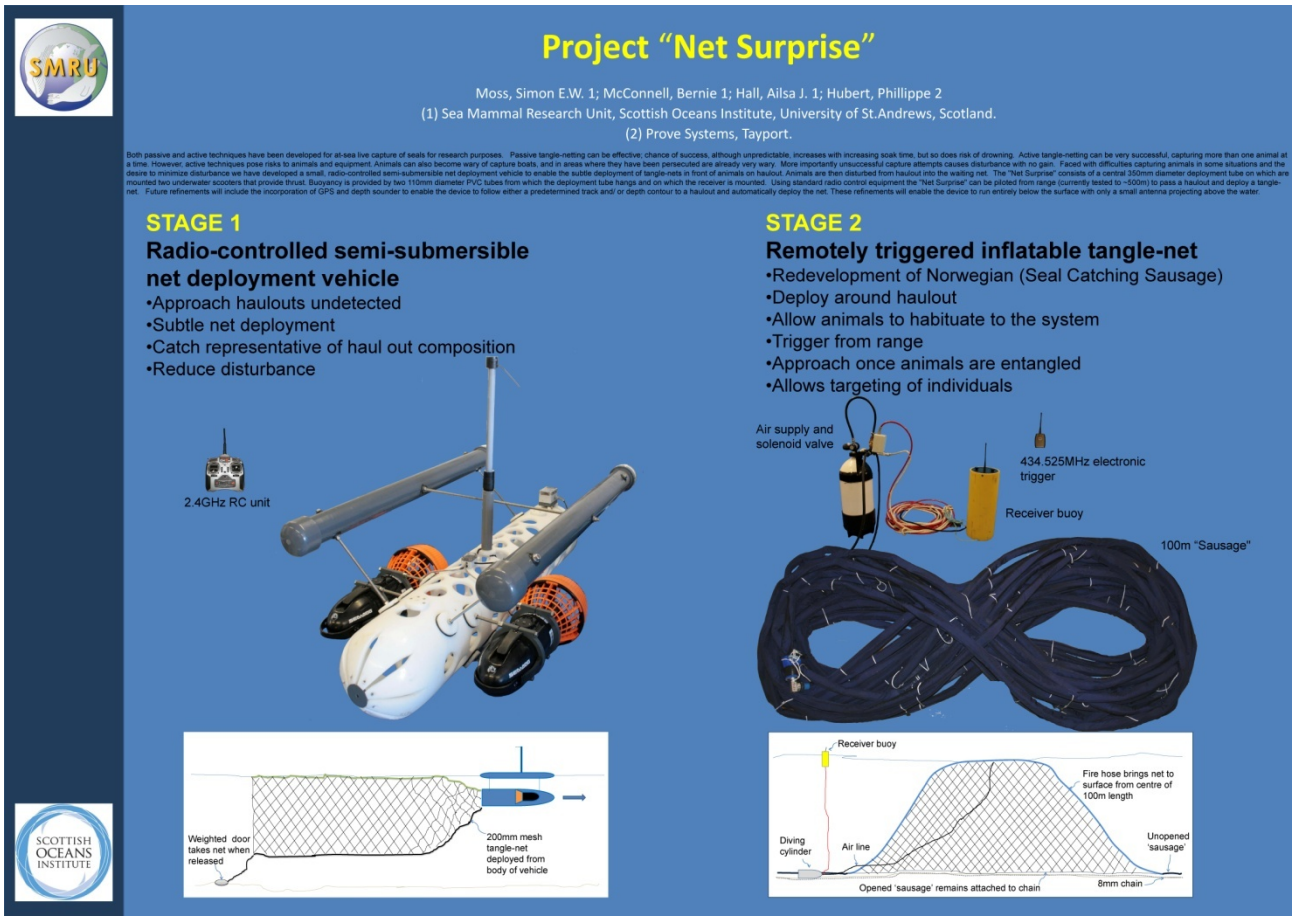


**Figure 2. Prototype Surprise Net (Stage 2 Only)**

The PIFSC version of the surprise net consists of a central 350mm diameter deployment canvas or heavy mesh tube containing the tangle net. The deployment tube is attached to a heavy (8mm) anchor chain of equal length to the tube, and the ends may be attached to Danforth anchors on the shore to increase stability. The tube is held together longitudinally by velcro. Each tube (and therefore each surprise net) is 30 m long (note, much shorter than the 100m depicted in Fig 2). The tangle net (folded within the tube) is constructed of nylon, multifilament fiber (4" diameter stretch mesh), suspended from a 2" diameter inflatable hose. Each end of the hose is attached to a diving cylinder (also encased in the deployment tube) via air line and a regulator and pressure relief valve. The diving cylinder supplies air to provide thrust and quick deployment of the tangle net. 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. The height of the net will be 5 m from bottom chain to surface float line. Precise location of the receiver is to be determined, either attached to a floating buoy or on the shore.

The PIFSC version will not include a remote-controlled deployment vehicle (Stage 1 in Fig. 2); the net will be deployed manually.

#### 2.2.2.2 Deployment methods

The deployment tube will be used 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 by hand or via small boat in a semi-circle configuration, arcing out approximately 5-10m from the shoreline, with each end on shore. Up to two tubes may be deployed at once. The duration of deployment at any one location will vary according to the amount and locations of observed predatory shark activity, but will not exceed 72 continuous hours. At times when no personnel are present at the deployment site, all valves will be shut to prevent accidental deployment. The tube will be removed from the water if inclement weather and accompanying higher currents and/or wave surge is forecast.

Specific sites of deployment will vary according to the location of mother/pup seal pairs, which will determine the vicinity in which predatory sharks are patrolling. At Trig Island, based on observed predatory events in past years, we anticipate most activity to be at the southeast area of the island (Fig. 3).

**Figure 1. Trig Island Showing Typical Surprise Net Deployment Site (Red Dots Inscribe 30m Arc of Net)**

Deployment at Gin Island will most likely be on the west or northwest side of the island. Deployment at Little Gin will likely occur on the west side of the island

All deployments will occur on sandy bottom or coral rubble bottom. No living coral will be within the arc of the net. If mother/pup pairs (and patrolling sharks) are adjacent to deep water or living

coral areas, we will deploy the net at the sandy/coral rubble area in closest proximity to the mother/pup pair. Because the height of the net will be 5 m all deployment will be in water no deeper than 5 m.

#### 2.2.2.3 Triggering Net and Shark Capture

The surprise net will be triggered by personnel on shore only when a Galapagos shark which has exhibited predatory behavior is within the arc of the net. Predatory behavior has been defined in Appendix 6 of the PEA, incorporated by reference here. Moreover, the net will not be triggered if any seals or turtles are within the arc of the net, either in the water or on shore. If the net surrounds a shark, or if the shark becomes entangled, the net will be pulled in to shore from the ends manually by field personnel. The shark will be euthanized with a 0.44 caliber bang stick. Post catch procedures will follow those described in 2.2.2.6. of the PEA, incorporated by reference here.

### 2.2.3 Native Hawaiian Practices and Participation

Hawaiian cultural protocols, based on practitioner input, will be included in all shark removal efforts. NMFS has conducted numerous group and individual meetings with Native Hawaiian cultural practitioners and advisors to incorporate appropriate actions into proposed shark fishing activities and to ensure that shark removal and disposal of remains are in keeping with Hawaiian cultural practices. Ongoing consultation with Hawaiian practitioners will advise fishing personnel on traditional fishing techniques, along with the feasibility for an on-site practitioner to conduct activities, including collection of shark parts for cultural use remains to be determined. If a Hawaiian practitioner is on site, his/her observational activities related to shark removal efforts and monk seal population assessment will be in accordance with the guidelines outlined in existing permits from NMFS and the Monument. NMFS has also added a native Hawaiian as a member of the Hawaiian Monk Seal Recovery Team to improve cultural components of all Hawaiian monk seal recovery efforts.

# 3 Evaluation of Environmental Consequences

The following impacts apply to the alternatives described in Chapter 2. The no action alternative is the current program as described and analyzed in the June, 2009 Environmental Assessment on the Effects of NOAA Fisheries Permitted Scientific Research and Enhancement Activities on the Endangered Hawaiian Monk Seal (Permit No. 10137) and further described in Chapter 2 of the PEA. The proposed action (Alternative 2) is expanding this program to include using a surprise net among the fishing methods.

## *3.1 Effects of Alternative 1 (No Action)*

The potential effects of the no action alternative, namely continuing the existing program of shark deterrence, shark fishing with existing methods, and expanded bottomset fishing, were described in detail in Section 3 of the PEA, which is incorporated by reference. The effects of the no action alternative may in fact be diminished by the proposed action, if the new fishing method proves more efficient in catching sharks than the existing methods.

## *3.2 Effects of Alternative 2 (Proposed Action)*

### 3.2.1 Potential for Disturbance to Sea Turtles and Monk Seals

The proposed action may result in disturbance to basking sea turtles and monk seals beyond that which would normally occur from existing research and enhancement activities. Commotion on beaches may occur during net retrieval and shark capture, and these activities are likely to be in proximity to mother/pup pairs. Such disturbances would be temporary, and would be documented on data forms identically to disturbances from other activities.

### 3.2.2 Potential for Entanglement of Sea Turtles and Monk Seals

Very little potential exists that sea turtles or monk seals will be inadvertently entangled by the surprise net. The surprise net will not be triggered if monk seals or sea turtles are on shore or in the water within the arc of the net. Seals and turtles in the water will be readily visible because of water clarity, so no potential entanglement risk exists from hidden or unseen seals or turtles. Some potential exists that seals or turtles will investigate the net once it is triggered, particularly if commotion ensues from a shark capture. Any such animals will be hazed away by field personnel.

The untriggered surprise net will not present any entanglement risk. The deployment tube containing the untriggered net will be thick and relatively inflexible, incapable of twisting into any potentially entangling loops. The area of deployment will be free of wave surge under normal conditions, and the net will be removed if inclement weather is forecast. Air cylinder valves will be closed at times when the net is unattended, preventing accidental deployment.

### 3.2.3 Potential for Bycatch of Other Fish

The three species of fish most frequently observed in shallow water over sandy bottom areas at FFS, and therefore with the highest likelihood of being within the arc of a triggered surprise net, are: Pacific threadfin (Hawaiian name moi) *Polydactylus sexfilis*; rudderfish (Hawaiian name nenue) *Kyphosus cinerescens*; and mountain bass (Hawaiian name aholehole), *Kuhlia sandvicensis*. Any fish caught by the net will be released by hand as soon as is practicable following capture of the

shark, or immediately if no shark is captured. Most fish caught will be released alive, though some injuries or deaths may result from capture. Some aholehole will be smaller than the 4" mesh size and will swim through the net.

### 3.2.4 Potential for Entanglement of Turtles or Monk Seals

If receivers are placed on buoyed lines (as opposed to onshore), the lines will include shielding with segments of PVC pipe or modification of the shape of the float buoy to add a rubber, tapered extension, a recent development to prevent cetacean and pinniped entanglement in float buoys. In the highly unlikely event of an entanglement or injury of a monk seal or green turtle would result in immediate cessation of fishing and a review of the methodology to determine any needed adaptations. No entanglement is expected based on known experience with other bottomset gear. The bottomset data includes the 1999 bottomset commercial fishing work conducted at the outer boundary of FFS. That fishery involved 840 hooks set along a bottomline, with no entanglements.

### 3.2.5 Potential Effects on Benthic Fauna

The triggered net will be retrieved by pulling it in to the beach from either end. During this process, the chain holding down the bottom of the net will drag through the sandy or coral rubble bottom. If the 30 m net were deployed in a perfectly semicircular arc from shore, each net retrieval would drag the chain through approximately 150 square meters of benthic habitat (sand or coral rubble). In practice, the arc of the net is likely to be a segment of a larger circle, which will incorporate less area of bottom. This action could result in injury or death to benthic organisms which are unable to avoid the chain. The most visible such organisms at FFS are sea cucumbers (*Holothuria sp.*). The footprint covered by the retrieval is very small relative to the entire habitat occupied by *Holothuria* within FFS, and the effect on these species will be negligible.

### 3.2.6 Potential Effects to Endangered Birds and Seabirds

No endangered birds populate FFS. Seabirds nesting in the affected environment are listed in 2.1 of this SEA. The proposed action may disturb some non-nesting birds on the beach in the vicinity of net retrieval. The proposed action will not affect any nesting seabirds, as all nests are further inland on the islands than the immediate shore.

### 3.2.7 Potential Effects to Coral Reefs/Benthic Habitat

The proposed action will affect the benthic habitat where the net is deployed. Retrieving the net, whether empty or having caught a shark will include dragging a chain, as described in 3.2.5. above. The net will be deployed only over sandy or coral rubble shallow bottom, habitat which is exposed to wave surge and therefore is dynamic and in fairly constant movement. The only potential effects to live coral would result if the undeployed net were to be shifted by storm surge or excessive currents. Each end of the undeployed net will be anchored firmly on shore, so the configuration of any shifting would be constrained by the fixed ends of the 30 m tube, on shore (i.e. very limited scope available for lateral shifting/dragging). The fixed shore anchors will also be sufficiently secure to prevent a Galapagos shark from dragging the net away from its location. In the unlikely event that the shore anchors were dragged by a captive shark, the possibility exists that the chain anchoring the bottom of the net could become fouled on living coral or a section of reef above the sandy bottom. The area of damage to living coral would be limited to the fouling site, as a Galapagos shark is not strong enough to drag a fouled, weighted, 30m net through a living coral

substrate. As stated in 2.2.2.2. above, we will minimize these potential effects by removing the deployment tube if inclement weather is imminent. Upon first deployment into a new area, we will closely monitor the deployment tube to ensure it is not moving under normal conditions.

### 3.2.8 Archaeological and Cultural Resources

The proposed action would not affect archaeological or cultural resources, which do not exist at FFS.

### 3.2.9 Potential to Spread Invasive Species

The proposed action would not create any additional movement to or from the action site. All potential to spread terrestrial invasive species was documented in 3.10 of the PEA, which is incorporated by reference. Because the surprise net will be tested on Oahu, the potential exists for transport of invasive marine species from the MHI to the NWHI. PIFSC will follow disinfectant protocols developed by the Monument for quarantine of diving gear transported into the Monument, as well as transported among different sites within the Monument. Specifically, between testing in the MHI and transport to FFS, the surprise net will be soaked in commercial grade ammonia, soaked in fresh water, and dried.

## *3.3 Cumulative Effects*

The cumulative effects and incremental impacts of HMSRP research and enhancement activities were addressed in 3.11 of the PEA, which is incorporated by reference. The addition of the surprise net method would not change the character of the research or enhancement activities considered in the PEA. However, the surprise nets have been included because they offer a potentially more effective means to remove those specific Galapagos sharks that show predatory behavior towards pre-weaned Hawaiian monk seals. Because surprise nets are deployed around specific targets, the indirect impacts to aquatic resources (e.g., non-predatory Galapagos sharks, turtles) will likely be reduced relative to methods discussed in the PEA. If the surprise nets prove to be a more effective means to reduce predation of pre-weaned Hawaiian monk seals, then there would likely be a small beneficial effect on their population. The use of surprise nets may result in increased adverse impacts to benthic organisms as the associated bottom chain is dragged during retrieval. The substrate within these areas is primarily less sensitive sand and coral rubble. These direct impacts would be short-term, localized to the near-shore area, and have a minimal impact on aquatic resources.

Overall, the proposed action will involve deployment of no more than two surprise nets at any one time. The surprise nets would temporarily impact an area up to approximately 150 square meters. Surprise net deployment would be limited to a 72 hours period. These activities would occur episodically over a two-year period. Surprise nets would be deployed at three sites: Trig, Gin, and Little Gin Islands. These three islands represent a small fraction of shallow water habitat within the 938-square-kilometer area of FFS.

FFS is located within the Northwestern Hawaiian Islands National Monument and is rarely visited by humans. Past activities in the area include limited amounts of fishing, infrequent tourism, and as a refueling stop for United States military planes during World War II. Because the atoll is open, it is susceptible to marine debris (e.g., derelict fishing gear, plastic bottles) that may wash onto or through area. Presently the area is subject to research and management activities by federal

resource agencies. Small-scale research and management activities will continue in FFS in the future.

The use of surprise nets during the HMSRP research and enhancement activities will have a less than significant impact on the environment because they will be used on a small scale, for a short duration, and infrequently over the two-year period. Cumulative impacts would be minimized and avoided because FFS is a federally protected area that restricts access.

# 4 List of Preparers

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Mr. Henderson is a Fishery Biologist with the Protected Species Division of PIFSC. He has been part of the Hawaiian monk seal research program for 28 years, and has extensive experience working with numerous Federal, State, and non-government agencies in matters related to permit requirements inherent to working with an endangered species in areas under several jurisdictions. He has conducted field assessments of seals in all NWHI locations, and has prepared previous environmental assessments compliant with the National Environmental Policy Act with the NMFS Office of Protected Resources.