

**MARINE MAMMAL COMMISSION
4340 EAST-WEST HIGHWAY, ROOM 905
BETHESDA, MD 20814**

19 December 2007

Randall Kosaki, Ph.D.
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National Ocean Service
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Dear Dr. Kosaki:

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, has reviewed the 6 November 2007 *Federal Register* notice requesting comments on the development of a natural resources science plan for the Papahānaumokuākea Marine National Monument. The plan will be structured using five overarching themes: (1) ecological processes and connectivity, (2) biodiversity and habitats, (3) human impacts, (4) indicators and monitoring of ecosystem change, and (5) modeling and forecasting of ecosystem change. The following recommendations and comments are intended to assist Monument staff as they work on developing the plan.

RECOMMENDATIONS

The Marine Mammal Commission recommends that the natural resources science plan for the Papahānaumokuākea Marine National Monument place high priority on research projects that support the National Marine Fisheries Service's Hawaiian monk seal recovery program. In this regard, the science plan should include the following:

- studies to help understand the ecology of Hawaiian monk seals within Northwestern Hawaiian Islands (NWHI) ecosystems;
- expanded research to determine fine-scale movements and foraging patterns of Galapagos sharks and other top predators at French Frigate Shoals;
- identification of the need to continue studies of marine debris accumulation rates in atoll lagoons near monk seal haul-out sites; and
- assessment of remote technology to detect floating debris that could be removed before it reaches important wildlife habitats within the Monument.

The Marine Mammal Commission also recommends that the science plan include:

- research on spinner dolphin populations using the atolls in the NWHI, including their abundance, demography, movements, habitat-use patterns, and foraging behavior;
- initiation of year-round passive acoustic sampling and periodic visual surveys to determine the abundance and trend of humpback whales using the NWHI and to collect identification photos and biopsy samples to evaluate their relationships with other groups of humpback whales;
- long-term monitoring research on the oceanic and atmospheric conditions of the NWHI and their ecosystems; and

- provisions for holding periodic meetings for scientists, managers, and other people working on or interested in science projects conducted in the Monument.

RATIONALE

Hawaiian Monk Seals

The lands and waters of the NWHI lying within the boundaries of the Monument are principal habitat for 90 percent of all remaining Hawaiian monk seals. Despite considerable effort by the National Marine Fisheries Service and other agencies, monk seal numbers in the NWHI have been in a near-continuous state of decline since at least the 1950s when the first counts were made. Given current trends and population demography, the population will fall below 1,000 individuals in the next few years. To guide efforts to reverse the decline, the Service recently updated the Hawaiian Monk Seal Recovery Plan. The most pressing recovery needs identified in the plan are (1) improving survival rates for juvenile female monk seals; (2) reducing shark predation, particularly on pups and juvenile seals at French Frigate Shoals; and (3) preventing and mitigating the entanglement of seals in marine debris, including derelict trawl nets and other fishing debris.

The Hawaiian monk seal is a major component of NWHI ecosystems and an endangered species whose recovery is a matter of international significance. This sentinel species occupies a high trophic level, as its health and status reflect the health and status of the ecosystems themselves. Efforts to address threats to monk seals will, in most instances, equate with efforts to address threats to the ecosystems they occupy; conversely, effective conservation of monk seals will promote effective conservation of the critical habitats on which the species relies. The National Marine Fisheries Service alone does not have sufficient resources to carry out all the research and management actions needed to guide recovery efforts for the Hawaiian monk seal. Support for key research projects by managers of the Monument will be essential for returning the species to an optimal population level. Such support is entirely consistent with the purposes of the Monument. Therefore, the Marine Mammal Commission recommends that the natural resources science plan identify as a high priority the need to support research projects that complement the Hawaiian monk seal recovery program being conducted by the National Marine Fisheries Service. Key areas of support are described below.

Ecology of Hawaiian Monk Seals: As a top predator, Hawaiian monk seals likely play a substantial role in structuring NWHI ecosystems through trophic and behavioral interactions. The decline in their abundance has undoubtedly diminished their ecological role in those small island- and atoll-based ecosystems. For example, increased abundance of sharks and jacks in the NWHI could be due, at least in part, to the reduction in monk seal numbers.

Inadequate nutrition appears to be one of the factors preventing monk seal recovery. Juvenile seals particularly do not seem to be finding adequate food. Monk seals forage in coral reefs, deepwater coral beds, sand flats, and talus slopes. Feeding success is dependent on the condition of the habitat, the available populations of prey, and the activities of their competitors (e.g., sharks and

jacks). As stewards of the Monument, the National Ocean Service will need to understand the ecology of these ecosystems to monitor and maintain them. For that reason, the Marine Mammal Commission recommends that the science research plan include support for ecological studies of monk seals within NWHI ecosystems. Those studies would best fit under the plan's ecological processes and connectivity theme.

Shark Predation: In the late 1990s predation by Galapagos sharks caused an abrupt increase in Hawaiian monk seal pup mortality at French Frigate Shoals. In response, National Marine Fisheries Service field teams began to identify and remove sharks that were patrolling pupping beaches, working on the hypothesis that such predation was a learned behavior involving a few individual sharks. Since then, shark predation has declined from peak levels, but it continues to be a significant source of mortality at that site. Recent efforts to remove Galapagos sharks at pupping beaches have been unsuccessful because the sharks have learned to avoid people. To date, studies to confirm the operating hypothesis and guide efforts to remove sharks preying on monk seals have been limited and inconclusive. In 2005 the Hawaii Institute of Marine Biology, supported by the National Ocean Service, began a broad-scale study of top predators in the Hawaiian Archipelago. As part of that study, about 60 Galapagos sharks and a number of giant trevally in the NWHI were tagged with sonic tags. Receivers to detect the tags were placed at the major NWHI atolls and in the main Hawaiian Islands. Results of that study suggest that each atoll is home to relatively discrete populations of Galapagos sharks and giant trevally.

An expansion of this study could provide a more detailed understanding of the fine-scale movements and foraging patterns of sharks and other top predators at French Frigate Shoals. Such a study could improve prospects for catching individual sharks preying on monk seal pups. The study, as we envision it, would require more intensive tagging and placement of sonic receivers and might cost as much as \$250,000 to \$300,000 a year for five years. If conducted, such a study might explain how the small isolated ecosystems of the NWHI are able to support such large populations of top predators. For all these reasons, the Marine Mammal Commission recommends that the Monument's natural resources science plan call for expanded research to determine fine-scale movements and foraging patterns of Galapagos sharks and other top predators at French Frigate Shoals. This project also might best fit under the science plan's ecological processes and connectivity theme.

Marine Debris: Since the early 1980s National Marine Fisheries Service monk seal field teams have disentangled more than 200 seals caught in marine debris. The vast majority of those seals have been juveniles entangled in webbing from derelict trawl nets on beaches in the NWHI. An unknown number of seals are also entangled at sea. To reduce entanglement risks, monk seal field teams remove hazardous debris from atoll beaches, which also entangles and kills other marine life. Since 1996 teams of divers under the direction of the National Oceanic and Atmospheric Administration also have removed submerged debris from atoll lagoons. Additional funding from Congress during 2000 to 2005 allowed removal of more than 400 tons of net debris from atoll lagoons. Follow-up studies suggest accumulation rates are high, and entanglement rates of monk seals also have remained relatively high. In 2006 and 2007 funding and removal effort declined.

A recent study indicates that both the amounts of debris and monk seal entanglement rates increase in El Niño years when the North Pacific subtropical convergence zone moves close to the NWHI. Remote sensing technology is being considered for locating concentrations of drifting debris and intercepting it before it reaches the NWHI. To better assess such mitigation strategies, the Marine Mammal Commission recommends that the Monument's natural resources science plan (1) identify the need to continue studies of marine debris accumulation rates in atoll lagoons near monk seal haul-out sites, and (2) include assessment of remote technology to detect floating debris that could be removed before it reaches important wildlife habitats within the Monument. These studies might best fit under the science plan's human impact theme.

Spinner Dolphins

Local populations of spinner dolphins use several NWHI atoll lagoons as daytime resting habitat. Their abundance and trends, distribution, movements, and behavior patterns are poorly known. In general, they are not subject to extensive human disturbance, but study of them may provide information needed to understand human impacts on spinner dolphins in the main Hawaiian Islands. Midway Atoll is an exception, and spinner dolphins there may be subject to impacts from recreational visitors to the atoll. To detect and analyze effects of human activity both within and outside Monument boundaries, the Marine Mammal Commission recommends that the Monument's science plan include research of spinner populations using the atolls in the NWHI, including their abundance, demography, movements, habitat-use patterns, and foraging behavior. This research might best fit under the science plan's ecological processes and connectivity theme or the human impact theme.

Humpback Whales

Recent research has shown that humpback whales are using waters in the NWHI during the winter calving and breeding periods. Such use had not been previously reported, and this finding may reflect a reoccupation of former calving habitat. To document this possible reoccupation and to assess its implications for the species' recovery, the Marine Mammal Commission recommends that the Monument's science plan include initiation of passive acoustic monitoring using autonomous recorders capable of year-round sampling, augmented by periodic visual surveys, to determine the abundance and trend of humpback whales using the NWHI. During visual surveys, researchers should collect identification photos and biopsy samples to evaluate relationships among whales using NWHI waters and other groups of humpback whales. This research might best fit under the science plan's ecological processes and connectivity theme.

Oceanic and Atmospheric Studies

The oceanic and atmospheric properties of the Central and North Pacific play an important role in determining the ecology of NWHI ecosystems. Over the past several decades, studies of oceanic and atmospheric conditions have expanded our understanding of the role of physical and chemical processes and their effects on the many populations supported by these ecosystems. The evidence suggests that these processes are highly variable, and understanding that variability should provide useful information for managing the Monument and its ecosystems. For these reasons, we

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believe that the science plan should include long-term oceanic and atmospheric monitoring stations to provide insights into the factors that determine the abiotic character of NWHI ecosystems and habitat. Therefore, the Marine Mammal Commission recommends that the science plan include long-term monitoring research on the oceanic and atmospheric conditions of the NWHI and their ecosystems. Such monitoring fits under the ecological processes and connectivity theme, as well as under the indicators and monitoring of ecosystem change theme.

Information Sharing

The National Ocean Service and its partners will most likely be conducting a broad array of physical, biological, and ecological research within the Monument. The multidisciplinary nature of these studies offers an exciting prospect for the sharing of findings and development of cooperative research strategies. Investigators studying different aspects of the ecosystem will have varying perspectives, ideas, and interpretations regarding the structure of the region and the forces that shape it. As a result, periodic meetings to summarize research and management activities, results, and plans in a relatively informal setting could offer an effective means of encouraging collaboration, sharing information that might not otherwise be available in a timely fashion, and broadening perspectives regarding the implications and significance of research findings.

The annual two-day gathering of the North Atlantic Right Whale Consortium is an excellent example of such a meeting. At that meeting, scientists and managers involved in right whale research and conservation present brief summaries of recent activities, research results, and plans related to North Atlantic right whales. Costs for the meeting are relatively low and largely covered by a minimal registration fee. In our view, such an annual forum could be a valuable mechanism for sharing information on research and management developments related to the Monument. The Marine Mammal Commission therefore recommends that the Monument's science plan include provisions for holding periodic meetings for scientists, managers, and other people working on or interested in science projects conducted in the Monument.

If you have any questions regarding these comments or recommendations, please call.

Sincerely,



Timothy J. Ragen, Ph.D.
Executive Director

Cc: Dan Polhemus, Hawaii DAR
Sam Pooley, NMFS PIFSC
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