

## Hawaiian Monk Seal (*Monachus schauinslandi*)

The Hawaiian monk seal is one of the world's most endangered seals. Numbering about 1,400 animals, it occurs only in the Hawaiian Archipelago. Most monk seals live in six major colonies (French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, the Midway Islands, and Kure Atoll) in the remote, largely uninhabited atolls of the Northwestern Hawaiian Islands (Fig. 21). The dearth of historical records or accounts of monk seals in the main Hawaiian Islands suggests that they have been rare in that area throughout the islands' human history. However, over the past decade, both monk seal sightings and births have increased significantly in the main Hawaiian Islands, raising the possibility that the area could become a more important part of the species' range and enhance future recovery prospects.

In the 1800s monk seals in the Northwestern Hawaiian Islands were killed by sealers, shipwrecked sailors, and other visitors, resulting in a major decline in their abundance. Although some uncertain level of recovery likely occurred by the mid-1900s, human activities on several of the atolls, particularly the Midway Islands, probably limited that recovery. Between the mid-1950s (when the first monk seal counts were made) and the early 1980s, their numbers declined by nearly 50 percent. This was the result of steep declines at all but the easternmost colony (i.e., French Frigate Shoals), where seal numbers had increased steadily. Human activity associated with a naval air station on the Midway Islands and a Coast Guard LORAN station on Kure Atoll is thought to have been a significant factor in the declines at the westernmost atolls.

In the early 1980s efforts to protect and manage monk seals improved, and by the mid-1980s seal counts at all of the colonies west of French

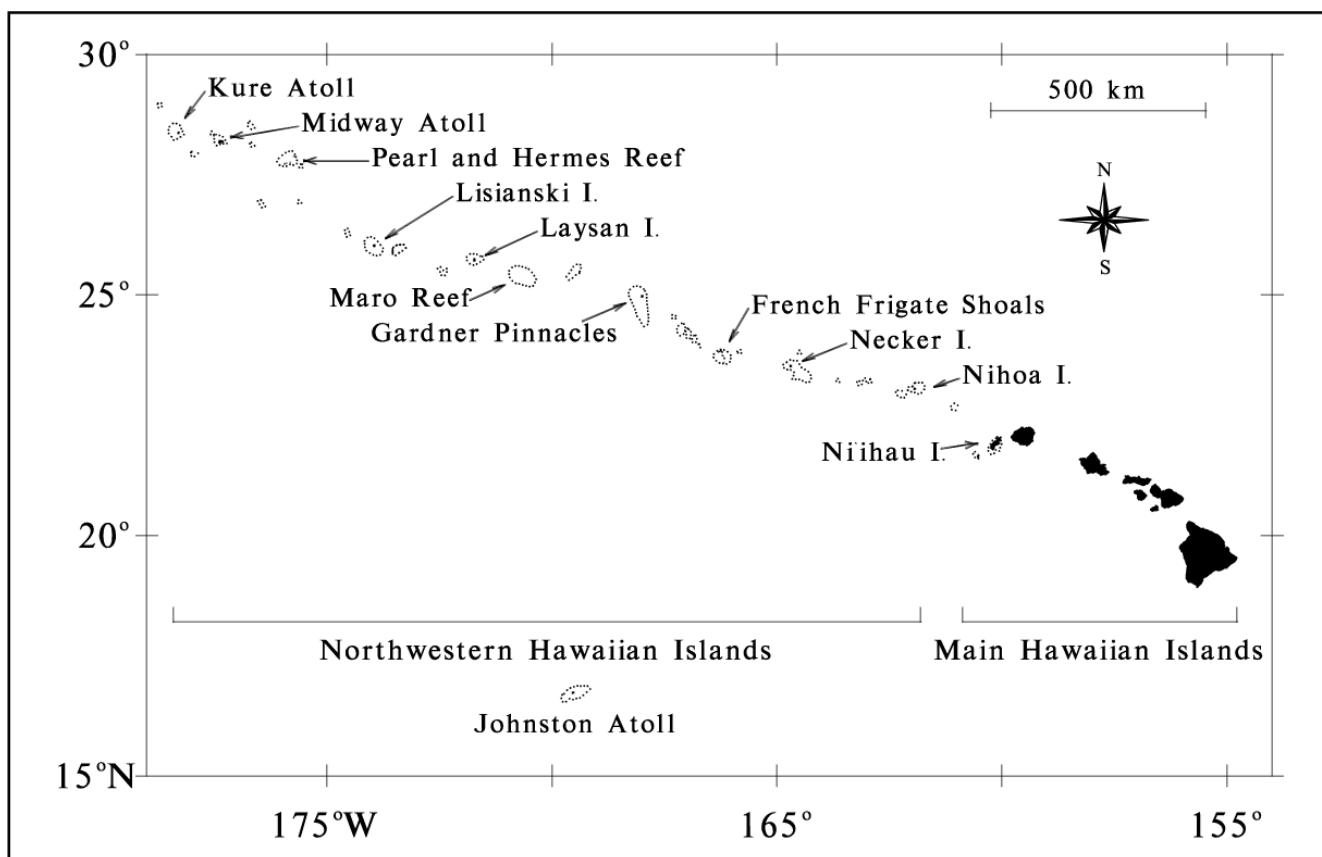


Figure 21. The Hawaiian Archipelago. The Northwestern Hawaiian Islands contain all major breeding colonies of Hawaiian monk seals.

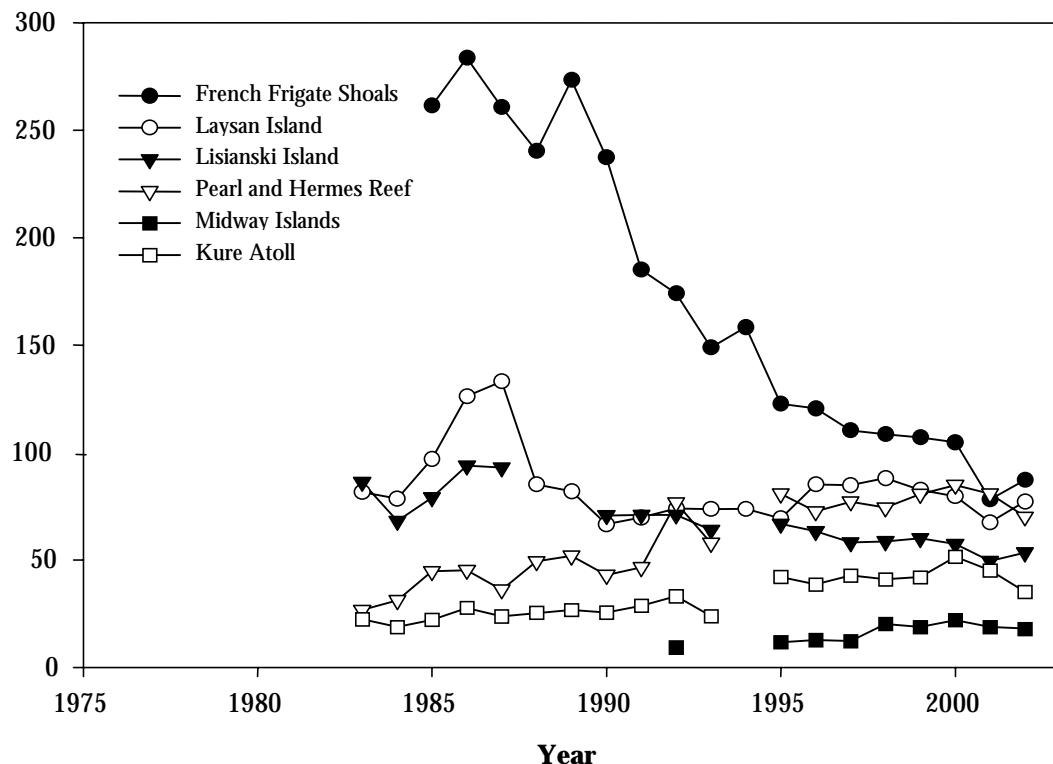


Figure 22. Mean beach counts of Hawaiian monk seals at major breeding colonies, 1982–2002. (Source: National Marine Fisheries Service, unpublished data; data for 2002 are preliminary.)

Frigate Shoals began to increase slowly (Fig. 22). However, in the late 1980s the colony at French Frigate Shoals, by then nearly three times the size of the second-largest colony, began a steep decline. This caused the total monk seal abundance to decrease even further through the early 1990s, even though all other colonies remained relatively stable or increased slowly. At French Frigate Shoals, the occurrence of underweight pups, very low juvenile survival, and comparatively small adult females strongly indicated that limited availability of prey for young seals and breeding females was the cause of the decline. Since the mid-1990s total population size has remained relatively stable. During this period, the decrease at French Frigate Shoals has slowed to a level roughly equal to the increases at the westernmost atolls. Because very few females born at French Frigate Shoals have survived to maturity over the past decade and juvenile survival rates have remained low, the number of breeding-age seals is beginning to decline, and both pup production and population size at that colony are expected to decline for at least several more years.

The small, isolated nature of islets and reef systems in the Northwestern Hawaiian Islands makes monk seals and other marine species in the area particularly vulnerable to human impacts and

natural environmental change. It appears that trends in the size of monk seal colonies have been affected by combinations of factors that differ from colony to colony. The factors thought to have been most important include human disturbance of hauled-out seals, entanglement in marine debris (particularly derelict trawl nets and line from fishing gear), prey removal by commercial fisheries, changes in prey abundance due to shifts in regional climate and current patterns, naturally occurring biotoxins (e.g., ciguatera), shark predation, and aggressive behavior by some adult male monk seals toward pups, juveniles, and adult females.

As discussed in past annual reports, the Marine Mammal Commission held a review of the Hawaiian monk seal recovery program in 1995. Since then, several developments have occurred that could significantly affect the success of efforts to conserve and protect Hawaiian monk seals. Among other things—

- the National Marine Fisheries Service has significantly increased funding and staff support for research and recovery work in the Northwestern Hawaiian Islands;
- all federal waters within 50 nmi of major monk seal breeding colonies (except the Midway Islands) were designated in December 2000 as the North-

western Hawaiian Islands Coral Reef Ecosystem Reserve and are now being considered for national marine sanctuary status;

- new regulations for commercial fisheries in the Northwestern Hawaiian Islands have been developed and continue to be subject to scrutiny;
- the Navy closed its air station on the Midway Islands and transferred ownership of the atoll and surrounding waters to the Fish and Wildlife Service for use as a national wildlife refuge;
- efforts have been made to establish an ecotourism program at the Midway Islands;
- steps have been taken to improve information on monk seal foraging behavior;
- years of planning to replace a seawall at Tern Island in French Frigate Shoals have nearly reached the construction phase;
- the increasing occurrence of monk seals on beaches in the main Hawaiian Islands has raised new management challenges; and
- the National Marine Fisheries Service restructured its Hawaiian Monk Seal Recovery Team to update the Hawaiian Monk Seal Recovery Plan.

In light of these developments, the Commission convened a panel on 15–17 April 2002 in Honolulu, Hawaii, to reexamine Hawaiian monk seal recovery needs. The panel included seven marine mammal scientists and managers with experience in Hawaiian monk seals and marine mammal conservation. During the program review, representatives of the National Marine Fisheries Service (the lead federal agency responsible for monk seal recovery work) and other involved federal and state agencies and groups reviewed recent and planned activities related to monk seals. The panel summarized its findings and recommendations in a report to the Commission in August (see Appendix B, Marine Mammal Commission 2002). After considering its findings, the Commission transmitted the report and its recommendations on 10 September 2002 to the National Marine Fisheries Service, the Fish and Wildlife Service, the National Ocean Service, the Coast Guard, and the Hawaii Division of Aquatic Resources. Results of that review and other actions by the Commission and involved agencies undertaken in 2002 are described below. As of the end of 2002 most of the agencies had not yet replied to the Commission's letters.

## **Population Assessment**

The Honolulu Laboratory of the National Marine Fisheries Service is responsible for assessing the status of monk seals in the Northwestern Hawaiian Islands and the main Hawaiian Islands. During the Commission's April program review, laboratory scientists described the current program.

In the Northwestern Hawaiian Islands, field crews annually visit each of the species' six major breeding colonies for various lengths of time between late winter and late summer to gather data on the status of the colony and undertake various management activities (e.g., disentangling seals, removing debris from beaches, moving weaned pups away from areas of high shark predation or aggressive male seals, removing individual sharks patrolling pupping beaches, and translocating aggressive male seals). Gathered data are analyzed and integrated into an evolving population model on a colony-by-colony basis to help evaluate their status and management needs. The personnel and logistics costs of working in such remote areas make the field program the most expensive element of the laboratory's monk seal recovery work (about \$1.2 million of its \$2 million 2002 monk seal program). Future plans call for continuing the assessment and recovery work, optimizing program results by adjusting deployment schedules and data collection priorities, assessing the use of satellite imaging to count seals on beaches, and developing photo-identification techniques to better track life history trends.

The review panel was impressed by the laboratory's field program. Funding support for the program has doubled since the Commission's 1995 program review, the fieldwork is well organized, and the data collected on this species over the past years now constitute perhaps the best long-term dataset for any seal species worldwide. The panel recommended that the laboratory continue its annual population assessment at all six breeding colonies. To optimize field work, the panel recommended that data collection focus on determining mortality causes at each colony—particularly Lisianski and Laysan Islands where the colonies have not been increasing and recently may have begun a downward trend. The panel also recommended that greater effort be made to tag and

monitor monk seals in the main Hawaiian Islands and that the laboratory contract or hire an additional scientist to help process and analyze data in a more timely manner. It also recommended that the population model be expanded to include data on monk seals in the main Hawaiian Islands and be used routinely to assess possible risks and benefits of management options.

The Commission concurred with the panel's findings. In its 10 September letter to the National Marine Fisheries Service, the Commission commended the Service for substantially increasing the laboratory's funding for monk seal recovery since 1995, and it recommended that additional funding be provided to hire one more staff member to process and analyze the data, and to expand monk seal monitoring in the main Hawaiian Islands.

In 2002 the Service continued its field research and mitigation work at all major breeding sites. At year's end preliminary results indicated that for the second year in a row, juvenile survival rates were low at all breeding sites. In the past, low juvenile survival had been a problem principally at Laysan and Lisianski Islands, and particularly at French Frigate Shoals. However, the total number of births in the Northwestern Hawaiian Islands increased slightly from 178 in 2001 to 196 in 2002. Also for the second year in a row, mean beach counts declined at the westernmost colonies (i.e., Kure, the Midway Islands, Pearl and Hermes Reef). Those declines reverse an overall trend of slow, steady increases at Pearl and Hermes Reef and Kure Atoll and a rapid increase at the Midway Islands since the early 1990s.

**Hawaiian Monk Seal Foraging Ecology—** Information on monk seal foraging areas, prey preferences, and prey availability is essential to understand the effects of commercial fisheries and other factors on the carrying capacity of atoll ecosystems that support monk seal colonies, particularly the colony at French Frigate Shoals. In the early 1990s the Honolulu Laboratory relied primarily on scat analyses for such information. It has since developed and tested several new techniques, including satellite tracking to locate feeding areas, time-depth recorders to determine foraging depths, video cameras mounted on individual animals ("crittercams") to film at-sea foraging behavior and habitat preferences, fatty acid analyses to identify the composition of monk seal diets from blubber samples, and assessments of reef fish populations.

Although these studies have vastly improved information, fundamental uncertainties about foraging patterns remain because these may differ by age and sex. Also until very recently, most work has avoided targeting juveniles and adult females whose diminished survival rates and poor condition appear most responsible for the declines at French Frigate Shoals. Work on these age and sex groups had been avoided because of concern over the possible effects of instrumenting and sampling the animals. However, reductions in the size of instrumentation and statistical analyses indicating that such research on adult males has not compromised their survival suggest that it may be safe to apply these techniques to juveniles and adult female seals. In 2001 the laboratory held a monk seal foraging research workshop to help plan future work. It advised the panel that for the 2002 field season, the laboratory planned to suspend most foraging fieldwork (except for crittercam studies) to analyze the backlog of foraging data already collected and plan future work based on those results. It also plans to continue to fund analyses of fatty acids from several hundred seal and prey samples already collected.

The panel supported the laboratory's decision to curtail fieldwork pending the ongoing data analyses and recommended that fatty acid analyses be completed as soon as possible. It also suggested that further crittercam work on adult male seals was unnecessary. To plan future work, the panel recommended that, by the 2004 field season at the latest, the laboratory develop a peer-reviewed foraging plan that sets forth specific hypotheses to be tested. It recommended focusing on the effect of prey availability on the condition and survival of weaned pups, juveniles, and adult females, particularly at French Frigate Shoals. It also urged that long-term studies be undertaken on individual seals to determine whether and how prey preferences and foraging patterns change as animals mature.

In its 10 September letter to the Service, the Commission concurred with the panel's foraging research recommendations. To assure that future studies are as cost-effective as possible, the Commission recommended that the Honolulu Laboratory develop a detailed foraging plan that identifies (1) the specific hypotheses to be tested, (2) the sample sizes by age, sex, and location for each of the various foraging study approaches (e.g., crittercam, satellite tracking, time-depth recorders,

fatty acid studies, etc.), (3) the rationale for the identified sampling regimes, and (4) how the various research components would be integrated.

**Interactions with Commercial Fisheries—**

Hawaiian monk seals feed on a variety of prey, including small reef fishes, octopuses, lobsters, and other crustaceans. Many of these species are targeted or caught incidentally in lobster traps. Because of the sharp decline in monk seal numbers at French Frigate Shoals since the early 1990s, the Commission has repeatedly recommended to the National Marine Fisheries Service and the Western Pacific Regional Fishery Management Council that (1) research be undertaken to improve understanding of possible effects of the lobster fishery on monk seal prey availability, and (2) pending results of that research, a precautionary approach be followed to reduce fishing in areas where prey removal could adversely affect a colony. Although the Service provided research funding, the precautionary management recommendations were not adopted. Instead the Service maintained that information on monk seal foraging was not sufficient to conclusively document effects of the fishery on monk seals.

By the late 1990s lobster stocks at banks where monk seals from French Frigate Shoals feed were severely overfished. The Hawaiian Monk Seal Recovery Team, also concerned about effects of lobster fishing on the declining colony at French Frigate Shoals, recommended in 1999 that the fishery be closed for three years to allow the lobster stocks to recover. Early in 2000 Earthjustice, a public interest law firm, sued the Service for failing to properly manage the fishery and prevent impacts to monk seals. By that time the French Frigate Shoals colony had declined to about one-third the size it had been in the late 1980s. Concerned about the status of the lobster stocks, but without reference to the fishery's possible effect on monk seal prey availability, the Service subsequently closed the region's lobster fishery for the 2000 fishing season.

In December 2000 President Clinton signed Executive Order 13178 designating federal waters within 50 nmi of the Northwestern Hawaiian Islands as the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (see below). The order imposed a cap on the number of commercial fishing permits and set harvests at levels authorized during the previous year. Because a catch limit on

lobsters was in place through December 1999, and no lobster fishing occurred during the year prior to the order, it was unclear whether or at what level lobster fishing might be resumed under terms of the order. The Service has kept the fishery closed since the order was signed, but has also initiated studies to resolve questions about the status of the region's lobster stocks. The Western Pacific Regional Fisheries Management Council has questioned the legality of the Executive Order's fishery-related provisions and indicated its interest in reopening the lobster fishery.

**Fishery Management of State Waters—**

Most waters within 3 miles of emergent land in the Northwestern Hawaiian Islands are under jurisdiction of the State of Hawaii (some are within the boundaries of two National Wildlife Refuges managed by the Fish and Wildlife Service — the Midway Islands National Wildlife Refuge and the Hawaiian Islands National Wildlife Refuge). In the past, the state has not imposed permit or regulatory restrictions on commercial fishing in its waters and has instead relied on management measures adopted by the Service at the recommendation of the Western Pacific Regional Fisheries Management Council. As noted in past annual reports, the Commission wrote to the Hawaii Department of Land and Natural Resources in May 1999, urging it to adopt measures to preclude lobster fishing in state waters pending results of ongoing monk seal foraging research.

In December 2001 the Department's Division of Aquatic Resources announced a proposed rule to designate state waters in the Northwestern Hawaiian Islands as a fishery management area to ensure sustainable use of the area's living resources. Under the measure, a permit would be required to enter and remove living marine resources from state waters in the Northwestern Hawaiian Islands. On 30 January 2002 the Commission wrote to the Division, noting that the rule would provide a needed mechanism to manage fishing vessels and other vessels in state waters in the Northwestern Hawaiian Islands. It commended the Division for its attention to the area's marine resource protection needs.

Noting its concern about the lobster fishery, the area's vulnerability to human impacts and exploitation, and the need to coordinate federal and state management actions in the area, the Commission recommended that the Division clarify and

expand the section of the proposed rule setting forth the goals of the management area. Specifically, it recommended adding language noting that a precautionary management approach would be used when deciding whether to issue permits and that management decisions would seek to complement those in the adjacent reserve and national wildlife refuges. To mitigate impacts caused by the accidental grounding of fishing vessels and other craft, which have occurred several times in recent years, the Commission also recommended that the rule require permittees to have insurance adequate to cover the costs of removing their vessel and associated debris, should they founder on area reefs.

Many others commenting on the proposed rule expressed similar concerns, and after consideration, the Division determined that further changes were needed to clarify management goals for the area. Late in 2002 a revised proposal was being transmitted to the Governor for approval before its release for a second round of public comment.

**Panel Review**—At the Commission's April 2002 program review, the panel was advised that at least six commercial fisheries have been proposed, authorized, or previously operated in the Northwestern Hawaiian Islands: a longline fishery for swordfish and other pelagic species, a lobster trap fishery, a hook-and-line fishery for bottomfish, a longline shark fishery, a precious coral fishery, and a fishery for reef-associated species. Few cases of hooked seals or other direct interactions with commercial fisheries have been reported in the Northwestern Hawaiian Islands since the early 1990s when steps were taken to prohibit pelagic longline fishing within 50 nmi of the Northwestern Hawaiian Islands. Since designation of the coral reef ecosystem reserve in December 2000, only one commercial fishery, the bottomfish fishery, has been authorized to fish in the Northwestern Hawaiian Islands.

As discussed below, the National Oceanic and Atmospheric Administration's National Ocean Service is considering action to convert the reserve to a national marine sanctuary. A Service official advised the panel that the Western Pacific Regional Fisheries Management Council would be responsible for recommending fishery management measures for the sanctuary and that, notwithstanding Executive Order restrictions in place for the reserve, it was possible that proposals to convert the

reserve to a sanctuary could include measures to allow lobster fishing and possibly other fisheries.

The panel found that the Service and the Council had been responsive to direct interactions between monk seals and commercial fisheries, but also concluded that commercial fisheries may have contributed to the decline of prey species, particularly lobsters and octopuses, eaten by monk seals. It therefore recommended that the Service limit future fishing (including lobster fishing) within 50 nmi of the Northwestern Hawaiian Islands to that which is consistent with fishery restrictions set forth in Executive Orders for the reserve, and that the Council incorporate all of those measures into its fishery management recommendations for the national marine sanctuary proposal. The panel also recommended that the Hawaii Division of Aquatic Resources implement a management program for the proposed fishery management area in state waters that is consistent with fishery management provisions for the established reserve.

The Commission concurred with the panel's findings and recommendations. In its 10 September letters to the National Marine Fisheries Service and the National Ocean Service, the Commission recommended that all fishery management measures set forth in the Executive Orders be incorporated into any proposal for making the reserve a national marine sanctuary. In its 10 September letter to the Hawaii Division of Aquatic Resources, the Commission noted that the panel's recommendations relative to the proposed Northwestern Hawaiian Islands' fishery management area were consistent with the Commission's 30 January letter to the Division and it again urged that the Division adopt a management program that complements the management of marine species within the reserve.

## **Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve**

As noted above, on 4 December 2000 President Clinton signed Executive Order 13178 establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Its purpose is to "ensure the comprehensive, strong, and lasting protection of the coral reef ecosystem and related marine resources and species of the Northwestern Hawaiian Islands." The reserve includes all submerged lands and waters (except those within the Midway Islands National Wildlife Refuge) from the

3-mile limit of state jurisdiction out to a distance of 50 nmi along the center axis of the island chain. The National Ocean Service was assigned management responsibility under provisions of the National Marine Sanctuary Act and directed to pursue steps to designate the area as a national marine sanctuary consistent with provisions established for the reserve. The order also directed that a reserve advisory council be established, made up of members representing state and federal agencies (including the Marine Mammal Commission) and nongovernmental stakeholders, to provide advice on reserve research and management matters.

The order placed a cap on the number of permits and harvest levels for commercial fisheries. It also called for designating marine preservation areas within which all fishing (except for the hook-and-line bottomfish fishery in some areas) was to be prohibited; limiting harvests of other living and nonliving resources; prohibiting oil and gas development; limiting discharges of materials; and preventing anchoring directly on coral reefs. After an opportunity for public comment, a second Executive Order (No. 13196) was signed on 8 January 2001 finalizing many of these restrictions. During 2001 the National Ocean Service provided staff and funding to begin administering the reserve and started a process for possible conversion of the reserve to a marine sanctuary.

#### **Conversion to National Marine Sanctuary**

**Status**—Executive Order 13178 directed that steps be taken “to initiate the process to designate the Reserve as a national marine sanctuary (in order to) supplement or complement the existing Reserve.” The National Ocean Service began a scoping process early in 2002 to solicit public comments and advice on issues to be addressed in a proposal to convert the reserve to sanctuary status. By letter of 23 May 2002 the Commission responded to the Service’s request.

In its letter, the Commission noted that it had written more than a dozen letters between 1991 and 1999 to the National Marine Fisheries Service and the Western Pacific Regional Fishery Management Council recommending precautionary management measures to protect monk seals from the effects of lobster fishing. Those recommendations were rejected by the Service and the Council on grounds that information was insufficient to determine the importance of lobsters in the monk seal diet. In this regard, the Commission noted

that Executive Order 13178 directs that “the Reserve shall be managed using available science and applying a precautionary approach with resource protection favored when there is a lack of information regarding any activity, to the extent not contrary to law.” It also directs that action to designate a sanctuary supplement or complement reserve measures. Noting that past management of commercial fishing had not always embraced a precautionary approach, the Commission observed that the directive to apply a precautionary management approach was particularly important and needed, and it recommended that this approach, as well as other management provisions set forth for the reserve in the Executive Order, be included explicitly in any proposal to designate the area as a national marine sanctuary.

The Commission also recommended that, during the process of considering sanctuary status, (1) agreements be developed to include nearshore waters under jurisdiction of the state and the Fish and Wildlife Service within the sanctuary boundaries, (2) sanctuary resources be used to help meet logistical needs of researchers and natural resources managers with other federal and state agencies working in the Northwestern Hawaiian Islands, (3) a research and monitoring plan be developed, (4) cooperative agreements be established with other agencies involved in managing and protecting the region’s living marine resources, and (5) cooperative measures be developed to ensure that the numbers, distribution, and activities of researchers and visitors to the Northwestern Hawaiian Islands do not adversely affect monk seals or other protected wildlife.

**Draft Reserve Operations Plan**—To guide management pending a decision on sanctuary designation, the reserve and sanctuary staff prepared and requested comments on a draft reserve operations plan. On 17 May 2002 the Commission, in consultation with its Committee of Scientific Advisors, commented on the draft plan. The Commission noted that the draft plan did not clearly or prominently identify the purpose of the reserve as set forth in the Executive Order or its directive that the reserve be administered using a precautionary management approach. The Commission therefore recommended that the National Ocean Service revise the draft plan to explicitly set forth the fundamental principles contained in Executive Order 13178.

The Commission also noted that the description of Hawaiian monk seals did not reflect the species' endangered status or identify any of the major threats, such as entanglement in marine debris, commercial fishing, and human disturbance, potentially affecting its recovery. The Commission therefore recommended that the draft plan be expanded to provide such information, specify what actions would be taken to foster monk seal recovery, and identify possible authorized activities (e.g., certain research, recreational, or commercial fishing activities) that could adversely affect monk seals and the steps that would be taken to avoid such impacts. As a related matter, a section of the draft on developing permit procedures did not appear to reflect that task's importance, and the Commission therefore recommended that it be revised to identify the development of permit regulations as a top priority.

The Commission also recommended that the draft plan be revised to identify the need for developing a comprehensive research and monitoring plan and for describing the reserve's role in evaluating and assisting regional research and monitoring activities.

**Panel Review**—During the Commission's April 2002 monk seal program review, a representative of the National Ocean Service advised the panel of efforts to implement the reserve and to begin considering its designation as a national marine sanctuary. In addition to points noted above, the panel was advised that a 36-foot research vessel was being constructed for the reserve and that a 225-foot research vessel also would be available periodically, the reserve had helped fund work to remove derelict net debris from Northwestern Hawaiian Islands reefs, and plans were being developed to construct a reserve interpretative center for the public.

The panel concluded that designation of the reserve was a constructive step that has increased protection for monk seals and other species in the Northwestern Hawaiian Islands. It recommended that the precautionary approach and fishery management measures in the Executive Orders be incorporated into any proposal to convert the reserve into a sanctuary. It also recommended that reserve managers establish an interagency task force or coordinating committee involving the National Marine Fisheries Service, the Fish and Wildlife

Service, the Hawaii Department of Land and Natural Resources, and the Coast Guard to coordinate research and management activities in the region. The panel also recommended that a portion of the reserve's funding and vessel support be used to help provide logistical support for research and management activities carried out by other agencies involved in regional resource conservation.

The Commission concurred with the panel's recommendations on the reserve. In its 10 September letter to the National Ocean Service, the Commission noted that implementation of the reserve offers an unprecedented opportunity to further conservation goals and underscored the importance of communication and coordination with other agencies and groups. The Commission recommended that the National Ocean Service implement the panel's reserve-related recommendations.

As of the end of 2002 the National Ocean Service had not yet advised the Commission as to what steps were being taken to address its recommendations concerning the reserve. A representative of the Commission has participated in all meetings of the reserve advisory council and at the end of the year, the National Ocean Service was revising the draft reserve operations plan and reviewing comments on converting the reserve into a national marine sanctuary.

## **Entanglement in Marine Debris**

Entanglement in marine debris constitutes a significant hazard for Hawaiian monk seals. Although many types of debris pose entanglement threats, most serious entanglements have involved derelict trawl nets and fishing line that drift into the Northwestern Hawaiian Islands from unknown locations around the North Pacific Ocean. Based on studies in the mid-1990s it appears likely that thousands and perhaps tens of thousands of derelict nets and net fragments have become lodged in reefs throughout the island chain. Derelict netting and line also entangles and kills sea turtles and other marine species and abrasives, breaks, smoothers, and otherwise damages fragile coral formations.

Most seal entanglements involve juvenile animals, perhaps because of their greater curiosity and smaller size. Seals are often able to free themselves with little or no injury, but those that cannot free themselves quickly are likely to die or sustain serious injuries. Although few entangled seals have

been found dead, the potential for significant impacts is high, given the amount of derelict net debris around monk seal colonies.

Since 1982 field teams deployed by the Honolulu Laboratory to monitor monk seal colonies have routinely disentangled seals whenever necessary and possible. They also routinely removed hazardous debris from island beaches. The number of observed entanglements averaged more than 15 per year in the late 1990s and reached a record high of 25 in 1999. In 2000 observed entanglements decreased abruptly to five, one of lowest totals since records were first kept in 1982. In 2001 eight seals were seen entangled. Because field seasons at most colonies typically last a few weeks to a several months, more entanglements undoubtedly occur than are reported.

Since 1996 teams of divers have been sent to the Northwestern Hawaiian Islands to remove derelict nets and lines from reefs and also ships to pick up debris gathered from beaches by monk seal field crews. This effort, which involves many co-operating agencies and groups, was initially funded primarily by the Honolulu Laboratory's monk seal recovery program and the National Fish and Wildlife Foundation, with contributions of labor and

equipment from many sources. In 2001 support was significantly increased to more than \$3 million, provided largely through the National Oceanic and Atmospheric Administration's coral reef conservation program and the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. With these funds, the duration of field visits and the number of dive teams were greatly expanded. Between 1998 and 2001 approximately 105 metric tons (116,000 kg) of net debris was removed from the islands and surrounding reefs. More than half of that total (approximately 57 metric tons, 62,800 kg) was collected in 2001. This expanded level of cleanup work is expected to continue through at least 2003.

Based on cleanup results and plans described at the Commission's April 2002 program review, the panel was impressed by the extent of work done to date. It recommended that the reef clean-ups and accumulation studies be continued and that monk seal field teams continue to disentangle seals and remove hazardous debris from atoll beaches. The panel also recommended that greater effort be focused on identifying the origins of the derelict netting and line so that education programs and other mitigation measures can be developed to



Figure 23. Hawaiian monk seal pups on Trig Island, French Frigate Shoals, have experienced high rates of shark predation. The pup in the foreground had its left hind flipper completely removed by a shark attack and died shortly after the picture was taken. (Photo by Brenda Becker, courtesy of the National Marine Fisheries Service.)

curtail the discharges or losses at the source. In its 10 September letters to the National Marine Fisheries Service, the National Ocean Service, and the Fish and Wildlife Service, the Commission noted its concurrence with the panel's recommendations.

During 2002, 10 entangled seals were observed by the field crews. One of those was a pup that apparently became entangled in debris on the beach at Lisianski Island and died. Of the other nine entanglements, six animals were released with human assistance and three were able to escape unaided. All but one entanglement occurred in the Northwestern Hawaiian Islands. The exception was an adult female found on Kauai with nylon line around its neck, which was removed by a biologist with the Division of Aquatic Resources. In 2002 cleanup work was extended to a six-month field season. A total of 107 metric tons (118,000 kg) of debris (more than all previous years combined) was removed and brought back to Oahu for disposal. Work was done at all atolls in the chain with most of the debris removed from Pearl and Hermes Reef. Accumulation study sites at Kure, Lisianski, and Pearl and Hermes Reef continued to be monitored and, as of the end of 2002, a paper on accumulation rates was nearing completion. Directed efforts to determine the sources of the debris have still not received funding.

## **Shark Predation and Aggressive Male Seals at French Frigate Shoals**

As noted above, the colony of monk seals at French Frigate Shoals has declined to about one-third its size in the mid-1980s. Although there is strong evidence that this decline has been at least partly the result of limited prey availability, in recent years other factors have also been involved. In particular, there has been a significant increase in shark predation on pups (see Fig. 23). To date, such predation has been identified as a problem only at French Frigate Shoals. In 1999 more than 25 percent of the pups born at the atoll (25 of 92) were thought to have been killed by Galapagos sharks patrolling two main pupping islands as close as a few feet from the beach. Virtually all of the pups were lost at two of the atoll's several islands—Trig Island and Whaleskate Island. (Since then Whaleskate Island has virtually disappeared due to erosion and currently is not suitable as a pupping site.) Staff of the National Marine Fisheries

Service believe that this problem may be the result of learned behavior by a few individual sharks.

Another problem at French Frigate Shoals has been aggressive behavior by adult male seals. This behavior, which also appears to be a learned one, is exhibited by just a few individual adult male seals at this atoll and is manifested in attacks on pups. The victims may drown or die from infected wounds. In 1991 after several such cases were documented, an adult male responsible for the attacks was euthanized under a permit. In 1998 after another series of attacks, two identified adult males were translocated. After both of these actions, the number of observed attacks and injuries declined.

A similar approach of identifying and removing problem animals has been tried to address the recent increase in shark predation. In 1997 and 1998 monk seal field teams began tagging sharks patrolling the pupping beach at Trig Island with spaghetti tags; they identified at least 14 individual Galapagos sharks exhibiting the behavior at that time. In 2000 a research project began using sonic tags to assess the sharks' behavior and movement patterns. National Marine Fisheries Service personnel also caught and killed two sharks in 2000 and five in 2001. Because the problem was limited largely to Trig and Whaleskate Islands, field crews also relocated some weaned pups to other islands within the atoll where shark predation was not observed or considered rare. In 2000 and 2001 shark-related deaths declined to six and nine animals, respectively. In 2002 the National Marine Fisheries Service, with strong support from the Hawaiian Monk Seal Recovery Team, sought permission from the Fish and Wildlife Service (which, as manager of the Hawaiian Islands National Wildlife Refuge, has jurisdiction over the atoll and adjacent waters) to expand the effort and take up to 15 sharks per year in 2002 and 2003.

Based on information provided at the Commission's April 2002 program review, the panel concluded that work to identify and remove problem sharks and aggressive adult male seals has been appropriate, but that efforts to address shark predation have proceeded too slowly. It therefore recommended that the National Marine Fisheries Service and the Fish and Wildlife Service consult on steps to accelerate progress to identify and remove problem sharks. It also suggested that the hypothesis that shark predation is a learned behavior prac-

ticed by a few sharks could be tested by removing sharks identified as exhibiting predatory behavior on pups. If such predation is not limited to a few sharks, further lethal taking may be ineffective and ill-advised.

In its 10 September letter to the Fish and Wildlife Service, the Commission noted that it shared the Service's concern about removing sharks from the reef ecosystem. It also believed, however, that a limited shark kill could mitigate a serious problem for monk seals with a minimal effect on the atoll shark population. It therefore recommended that the Service consult with the National Marine Fisheries Service to develop new permit conditions that would allow a more aggressive effort to identify and remove sharks observed patrolling Trig Island pupping beaches.

Following the April 2002 program review, the Fish and Wildlife Service authorized efforts to take up to 15 Galapagos sharks exhibiting predatory behavior through the 2003 field season. Recognizing the important role of sharks as top predators in the atoll's food chain and the need to justify their removal from nearshore waters at Trig Island, the Fish and Wildlife Service recommended that systematic observational data be collected to document shark attacks on pups and to determine the size of the Galapagos shark population at French Frigate Shoals. It also required that a report be provided on results of efforts after each increment of five sharks is taken. At the end of the 2003 field season, results of the effort are to be reexamined.

During the 2002 field season, two sharks were killed at Trig Island and only three shark-related pup deaths were recorded on the island. However, efforts to tag and kill sharks patrolling the beach have made them more wary and difficult to tag and catch. Thus, tagging efforts have had limited success. Also, shark-related deaths at atoll islands other than Trig and Whaleskate rose sharply in 2002 to eight pups. Whether these were sharks accustomed to preying on monk seal pups at Trig and Whaleskate or new individuals is not known.

During the 2002 field season, observations of injuries to pups due to aggressive male seals remained low at levels not considered to be a problem.

**Construction of a New Seawall at Tern Island**—Tern Island at French Frigate Shoals is the only island between the main Hawaiian Islands and

the Midway Islands with buildings and an airstrip to support a permanent human presence. The island was expanded from about 11 acres to more than 40 acres by the Navy during World War II, and its current buildings were erected by the Coast Guard for use as a LORAN station in the 1960s and 1970s. The island is now occupied year-round by Fish and Wildlife Service staff as a field station for the Hawaiian Islands National Wildlife Refuge. The facilities provide vital support for fieldwork at the atoll.

The future of the field station and the island itself is in doubt because the sheet-metal bulkhead built by the Navy more than 50 years ago to protect the island and its airstrip has rusted through at many points. The bulkhead must be replaced soon to prevent (1) the loss of facilities and the support they provide for essential research and management, (2) the dispersal of contaminants and debris buried on the island at unknown locations, (3) the loss of limited terrestrial habitat used by monk seals and many other species, and (4) the creation of entrapment hazards for seals and sea turtles. Over the past 15 years the Fish and Wildlife Service has contracted for the design of a new seawall, obtained about \$11 million for its construction (about \$4.1 million short of the estimated replacement cost), and taken many other steps to plan for construction that could begin as soon as 2003.

In 2000 a former Coast Guard dump site contaminated with PCBs was discovered in an erosion pocket behind a breach in the bulkhead. The Coast Guard promptly took steps to remove contaminated soils. Although most of the contaminated soils were removed, the extent of contamination was larger than anticipated and the cleanup effort did not remove all contaminants to levels meeting Environmental Protection Agency standards. Remaining cleanup work is estimated to cost \$1.3 million. The Coast Guard District Office requested additional funds for cleanup work, but in early 2002 it was unclear whether they would be made available. Failure to complete the cleanup could allow contaminants to erode into the surrounding lagoon, delay construction plans, and increase construction costs.

Based on information provided at the Commission's April 2002 program review the panel recommended that the Fish and Wildlife Service take all possible steps to secure the funds necessary to complete the seawall project as quickly as

possible, and that the Coast Guard ensure that funding is made available to complete cleanup of the dump site. The panel also recommended that the National Marine Fisheries Service and the Fish and Wildlife Service consult to ensure that everything possible is done to allow monk seal field crews at French Frigate Shoals to continue their monitoring and mitigation work during the construction.

The Commission concurred with the panel's findings. In its 10 September letter to the Fish and Wildlife Service, the Commission reiterated the panel's recommendation that everything possible be done to secure the funding needed to complete the Tern Island seawall project as quickly as possible. In its 10 September letter to the Coast Guard, the Commission commended the Coast Guard for its past work to clean up the Tern Island dump site and recommended that it approve funding to complete the cleanup and that it consult with the Fish and Wildlife Service on how best to integrate additional cleanup work into the seawall construction schedule.

On 11 October 2002 the Coast Guard responded to the Commission's letter, noting that it had spent approximately \$3 million to clean up the Tern Island dump site and removed 95 percent of the contaminants. Although recognizing the concerns expressed in the Commission's letter, it noted that it believed that additional cleanup work at the site would achieve nominal results at an exorbitant cost. Given other more pressing cleanup needs, the agency was not planning to approve the funding request. As of the end of 2002 the Fish and Wildlife Service had not responded to the Commission's letter.

## **Ecotourism at the Midway Islands**

Since the early 1900s the Midway Islands have been used for various purposes, including a trans-Pacific cable station, a stop for early trans-Pacific clipper flights, and a naval air station. The naval air station was expanded substantially in the 1960s to handle large jets and support a crew of nearly 3,000 people. During the 1960s and 1970s monk seals virtually disappeared from the atoll. In the mid-1990s the Navy closed the facility and, after spending \$50 million to clean up contaminants on the island, it transferred ownership of the atoll to the Fish and Wildlife Service in 1996 for use as the Midway Islands National Wildlife Refuge. Since closure of the air station, monk seals have reoccu-

pied the atoll. By 2001 the colony was estimated to number about 65 seals and was growing slowly.

When the Fish and Wildlife Service took ownership of the atoll, it assumed an obligation to maintain the airfield, which serves as an emergency landing site for trans-Pacific jets and a refueling station for Coast Guard air patrols and certain other aircraft. To meet these obligations and defray operational costs, the Service contracted with a concessionaire to maintain the airfield and other island facilities and to operate a public visitation program consistent with the purposes of the refuge. Although there were concerns that visitors could disturb monk seals and impede their recovery at the atoll, education and management actions to protect the seals were put in place and proved effective.

The concessionaire, however, reported that it was unable to make a profit and requested approval to conduct new activities for visitors that might increase revenues. Also fishery interests proposed a project to develop a fisheries support base on the Midway Islands that could provide revenues for the concessionaire. The Service rejected these proposals due to their incompatibility with refuge objectives. Therefore, in 2002 the concessionaire withdrew from the agreement and, pending the development of new plans to maintain the runway and operate a refuge visitor program, the Service has suspended visitor access to the atoll indefinitely.

Based on information provided by representatives of the Fish and Wildlife Service at the April 2002 monk seal program review, the panel commended the Service for its efforts to manage visitor activities at the atoll in a manner compatible with protection needs for monk seals and other wildlife. It recommended that the Service consult with the National Marine Fisheries Service if plans are developed to reinstate a visitor program or to allow new human uses. The Commission expressed its concurrence with the panel's findings and recommendations in its letter of 10 September to the Fish and Wildlife Service. At the end of 2002 a public access program at the atoll had not been reinstated.

## **Hawaiian Monk Seal Recovery Planning**

The National Marine Fisheries Service formed a Hawaiian Monk Seal Recovery Team in 1980 and adopted a Hawaiian Monk Seal Recovery Plan in

1983. For most of the past 15 years the recovery team, made up primarily of marine mammal scientists, met annually in early December to review past and ongoing recovery actions and provide advice on planning for the following spring and summer field season.

In November 2000 the Service unexpectedly canceled the team's December meeting and rescheduled it for late March 2001. The Service subsequently decided to reconstitute the team and to request that it update the 1983 recovery plan. The new team, which is larger than the former team, includes one former team member and a greater number of representatives from agencies and groups with interests related to monk seal conservation. Most of the new members, however, have had little direct experience with past monk seal conservation issues.

In March 2002 the new team met for the first time. It developed an outline for a revised draft recovery plan and assigned drafting responsibilities to team members and the staff of the National Marine Fisheries Service, with a view toward developing a final draft plan by December 2002.

Based on information provided during the Commission's April 2002 program review, the panel concluded that the new team provided a good mix of agency officials and scientific experts and that updating the monk seal recovery plan was urgently needed. Given the limited familiarity of most team members with past monk seal recovery efforts, the panel also concluded that it was appropriate and necessary for the Service's staff to help draft parts of the plan and it recommended that, to the extent possible, the Service's staff draft background sections of the plan. The panel also recommended that the updated plan define specific research and management objectives, describe the various tasks required to meet those objectives in sufficient detail to estimate needed costs and time frames, and identify the specific agencies or groups to be assigned lead responsibility for tasks such as public outreach, marine debris cleanup, responding to monk seal haul-outs in the main Hawaiian Islands, and mitigating shark predation impacts.

Although the panel believed that a new recovery plan should be completed as soon as possible, it considered it more important that the plan be done well, which might not be possible, given the planned schedule. It therefore recommended that the Service consider holding a team meeting

before December 2002 to review plan elements and, if necessary, defer finalizing a draft plan until a meeting in 2003. The panel also recommended that the new team assume the role of the former team with regard to annually reviewing research and management plans for the next field season and that it meet each year in December for this purpose.

The Commission concurred with the panel's findings and recommendations. In its 10 September letter to the Service, the Commission commended the Service for its efforts to update the recovery plan and recommended that the Service implement the panel's recommendations.

In the fall of 2002 it became apparent that limited progress had been made on drafting a plan since the team's March meeting and that it was unlikely that an additional team meeting would be held before December. Therefore, upon learning of the situation, the Commission after consulting with the National Marine Fisheries Service, contracted with an individual to work with the recovery team to help assemble and complete a draft plan.



Figure 24. Hawaiian monk seals recently have begun hauling out at popular swimming beaches on the island of Kauai. Volunteers post signs with yellow tape to keep people at a respectful distance. (Photo by Shawn C. Farry/David W. Laist, courtesy of the Hawaii Division of Aquatic Resources/Marine Mammal Commission.)

The contractor assembled a preliminary draft plan based on the 1983 plan and new text written by recovery team members and scientists from the Service's Honolulu Laboratory. At its second meeting on 4–6 December 2002 the team reviewed the draft and identified issues and recommendations to highlight in the document. It was agreed that the Commission's contractor would edit and incorporate those points in a revised draft of the background sections of the plan that would be reviewed by the team at its next meeting in April 2003. The chair of the recovery team will take the lead on developing a set of recommendations that will be included in the plan. The team is expected to provide a draft recovery plan to the Service by the end of 2003.

## Monk Seals in the Main Hawaiian Islands

Historical information indicates that monk seal occurrence in the main Hawaiian Islands has been rare but that sightings and births have increased significantly in recent years. Whereas only one birth was recorded in the main Hawaiian Islands before 1988, one to four births per year were documented in the following decade, and seven and eleven births were reported in 2000 and 2001, respectively. Based on a minimum count of 52 seals in 2001, the total number now in the main Hawaiian Islands likely numbers at least 100. Most animals occur on the westernmost islands, including Kauai and Niihau; however, births and sightings have been reported on all islands.

Although their increase in the main Hawaiian Islands raises promising prospects for the species' recovery, it also poses new management challenges. Monk seals haul out regularly on some popular recreational beaches where they sometimes are harassed by people. They also have given birth on popular beaches and on at least two occasions in the past two years they have bitten swimmers. Interactions between seals and both domestic pets and feral animals also pose threats of disease transmission to the seal population.

The Pacific Islands Area Office of the National Marine Fisheries Service is responsible for management activities related to monk seals, but currently it has only one staff member and one full-time contract employee to address management needs for monk seals, sea turtles, and all other protected marine species throughout Hawaii and the

Pacific Islands region. As a result, volunteers and officials with state and local governments respond to most monk seal haul-outs. In many cases, they cordon off the immediate area around seals to limit how closely people can approach them (Fig. 24). In one case, however, a popular beach on Kauai was closed by the State of Hawaii at the recommendation of the Service to protect a mother and pup. Such actions can have significant impacts on local tourist-based economies and have raised concerns among some residents and local businesses about the presence of seals on beaches.

To improve response efforts, the Pacific Islands Area Office considered holding a workshop to examine possible approaches for managing interactions between monk seals and people in the main Hawaiian Islands, but because of funding constraints, it was unable to plan or schedule such a meeting. The Hawaii Division of Aquatic Resources has helped to respond to many haul-out events and is interested in expanding its role in response work, but also has limited staff and funding. It is, however, considering steps to address this need by establishing a cooperative agreement with the Service and requesting a grant to help develop a program under provisions of section 6 of the Endangered Species Act.

**Panel Review**—Based on information provided at the Commission's April 2002 program review, the panel concluded that occupation of the main Hawaiian Islands by seals could significantly enhance the species' recovery and, if properly managed, could provide a valuable economic benefit, given widespread interest in ecotourism and marine mammals. It also was apparent that the staff and funding to address related management needs are inadequate and that an effective, coordinated strategy to minimize harmful interactions between people and seals was lacking. The panel concluded that developing a cooperative federal-state strategy to address these issues was perhaps the recovery program's most urgent need.

The panel therefore recommended that (1) the Service's Pacific Islands Area Office provide additional staff and funding specifically to address monk seal management needs in the main Hawaiian Islands, (2) the Hawaii Division of Aquatic Resources proceed with plans to develop a cooperative agreement with the Service under section 6 of the Endangered Species Act to help address monk seal management needs, and (3) the Marine

Mammal Commission, in collaboration with the Service and the Hawaii Division of Aquatic Resources, convene a workshop at the earliest possible date to develop a multiagency plan of action to respond to monk seal haul-out events.

The Commission concurred with the panel's recommendations. In its 10 September letter to the National Marine Fisheries Service, the Commission recommended that the Service (1) provide such additional funding as may be needed to hire at least one additional fulltime staff member to coordinate and carry out work to manage human interactions with monk seals in the main Hawaiian Islands, (2) develop a cooperative agreement with the Hawaii Division of Aquatic Resources under section 6 of the Endangered Species Act to expand and formalize that agency's role in responding to monk seal haul-out events, and (3) establish a monk seal management task force with appropriate state and local agencies and volunteer groups to coordinate haul-out response work. In making these recommendations, the Commission noted that it was essential that added support for the Pacific Islands Area Office not come at the expense of funding provided to the Honolulu Laboratory for its monk seal recovery work.

**Workshop Preparations**—In light of the panel's findings, the Marine Mammal Commission took steps shortly after the April program review to organize the recommended workshop. On 7 June 2002 it wrote to both the National Marine Fisheries Service and the Hawaii Division of Aquatic Resources transmitting draft terms of reference for the workshop and offering to provide funding for a workshop in the fall of 2002. It asked each agency to help defray meeting costs and to participate on a workshop steering committee. The terms of reference proposed a meeting of monk seal biologists, resource managers, veterinarians, and other interested parties to (1) review information on monk seal haul-out patterns, pinniped behavior, and interactions between people and seals on beaches, (2) develop a plan of action to address interactions between seals and people on main Hawaiian Island beaches, and (3) recommend related research and management actions.

Both agencies agreed to help cover workshop costs and participate on the steering committee. Because most interactions between people and seals occur on Kauai, it was agreed that the meeting should be held on Kauai in late October. The

steering committee developed final terms of reference, a draft agenda, and a list of prospective participants. It also invited a series of background papers on monk seal distribution and haul-out patterns, the effects of human disturbance on monk seals, the potential role of monk seals in the main Hawaiian Islands in the species' recovery, disturbance, disease considerations, legal requirements, experience in managing seals on recreational beaches in California, management actions to date by federal and state agency officials and volunteers, possible management options, and the use of an adaptive management approach.

**Management Actions on Kauai**—While preparations were being made for the workshop, representatives of the Service and the Division met several times with key individuals involved in responding to monk seal haul-outs on Kauai, including county officials, volunteers, and representatives of the hotel and tourist industry. During the meetings, they discussed and agreed on steps to better coordinate efforts to respond to haul-out events.

In addition, the Service transferred funds to the Division to contract for a person to serve temporarily as a monk seal coordinator on Kauai. The role of the coordinator was to assist the Service and the Division in monitoring and managing monk seal haul-outs on Kauai by documenting and responding to such events (especially those on crowded beaches); meeting with volunteers, hotel managers, county officials, and others to help clarify their respective roles in monk seal haul-out response efforts; and serving as liaison between local response efforts and staffs of the Service and the Division. Shortly before the workshop the Division hired a coordinator to serve through at least January 2003.

**Results of the Workshop**—On 29–31 October the Commission, the National Marine Fisheries Service, and the Hawaii Division of Aquatic Resources jointly convened the Workshop on the Management of Hawaiian Monk Seals on Beaches in the Main Hawaiian Islands in Koloa, Kauai, Hawaii. A representative of the Commission chaired the meeting, which involved more than 70 participants from federal, state, and local agencies, volunteer groups, the local hotel and tourist industry, environmental organizations, and the scientific community.

Because of resource limitations within the National Marine Fisheries Service for responding

to monk seal haul-out events, state and local agency officials, volunteers, environmental groups, and local businesses had stepped forward with little or no support to assist in protecting hauled-out seals in the main Hawaiian Islands. Although most seals appear to have received adequate protection, response efforts were sometimes undertaken with little guidance. At times this led to great frustration and strained relations among those attempting to help. Recognizing the importance of the work, however, participants of all groups expressed a strong desire to continue assisting response efforts to ensure that monk seals are able to coexist with people in harmony in the main Hawaiian Islands.

To help forge partnerships and cooperation in this regard, workshop participants recommended that island coordinators be designated or hired to work closely with local officials, businesses, residents, environmental groups, and volunteers to address haul-out events. It was agreed that this was most urgently needed on Kauai and that the recent hiring of a temporary coordinator for Kauai was an important step in that direction. It also was recommended that a single toll-free telephone number be set up for the public to report monk seal sightings and that the coordinators should determine on a case-by-case basis who, if anyone, should respond and what follow-up actions are necessary.

To clarify who should be involved and how, it was suggested that a three-tier system be developed. Persons designated as “Level 1” would assist with tasks that did not involve the “taking” of seals as defined under the Marine Mammal Protection Act and Endangered Species Act. Such tasks would include posting seal safety zones (i.e., signs and yellow tape around seals), monitoring seals from a safe distance, and public education. “Level 2” would include people who would do those activities and also be authorized to disturb or handle seals for certain limited purposes, such as assessing potential injuries, herding seals out of hazardous situations, disentangling some seals not seriously entangled or injured, or assisting people in Level 3 activities. “Level 3” would include people authorized and trained to treat sick or injured seals, translocate seals to other locations, or address other serious intervention needs.

Because of the need to respond quickly to situations that could require legal authorization to

disturb or handle animals, it was recommended that the Service train and authorize a pool of people on each island to carry out Level 2 activities. Those people could include agency officials and interested volunteers. Although Level 1 activities would not require such authorization, those participating at that level were recognized as fundamental for addressing most haul-out events and it was felt that people involved at that level should receive training and certificates of participation to ensure that their activities are carried out in a consistent, safe manner. The greatest number of people will be needed to carry out Level 1 activities and many, if not most, of them could be volunteers.

Other management recommendations included—

- reviewing existing education materials and efforts to evaluate their effectiveness;
- posting seal safety zones that are as small as possible to be effective;
- providing volunteers, agency officials, and other response participants cards or other means of identifying what they have been certified or authorized to do;
- avoiding the use of physical barriers to limit seal access to areas except perhaps to keep animals off roads;
- herding or translocating seals be undertaken only when (1) seals are in high-risk situations (e.g., on roads or boat ramps), (2) weaned pups are in populated areas where they could become acclimated to human attention, (3) seals are at risk from an unusual event (e.g., a hazardous substance spill), and (4) seals exhibit behavior that poses risks to human safety;
- developing a graduated set of methods for herding seals to safety such that least-disruptive methods are tried first; and
- convening a forum annually to review and share new information and new management approaches.

The workshop participants also identified steps and individuals to help implement those recommended management measures. They urged that agency or foundation funding be sought to extend the appointment of the temporary monk seal coordinator on Kauai and that efforts be pursued to make the position permanent through grants under section 6 of the Endangered Species Act or establishing it as a new position within the National Marine Fisheries Service. Workshop participants also were identified to—

- define roles and responsibilities for work at different levels based on the three-tier system noted above;
- develop a framework for training people involved at the different response levels;
- develop protocols for herding, capturing, and moving seals; and
- identify procedures to authorize individuals to carry out work that may constitute “taking” as defined under the Marine Mammal Protection Act and Endangered Species Act.

Finally, workshop participants identified 50 specific research needs under the topics of population dynamics, life history and ecology, abundance and distribution, foraging and food needs, genetics, health and disease, interactions between seals and people, and the effectiveness of management activities.

At the end of the year, a final workshop report was being readied by the Commission for publication early in 2003.

## **Steller Sea Lion (*Eumetopias jubatus*)**

Steller sea lions are found along the rim of the North Pacific Ocean from the Channel Islands in southern California to Hokkaido, Japan, and north into the Bering Sea and Sea of Okhotsk. Their center of abundance has been in the Aleutian Islands and Gulf of Alaska where historically nearly three-fourths of all Steller sea lions inhabiting U.S. territory were found. Steller sea lions haul out on land to mate, bear their young, nurse, avoid predators, and rest (Fig. 25). The location of rookeries is probably based on proximity to food sources, protection from terrestrial and marine predators, topography, surf conditions, and other factors. Steller sea lions are generally considered nonmigratory although some individuals, particularly juveniles and adult males, may disperse widely outside the summer breeding season. Most adult



Figure 25. Steller sea lion rookery. (Photo courtesy of the National Marine Fisheries Service.)