

# MARINE MAMMAL COMMISSION

---

**Annual Report to Congress**

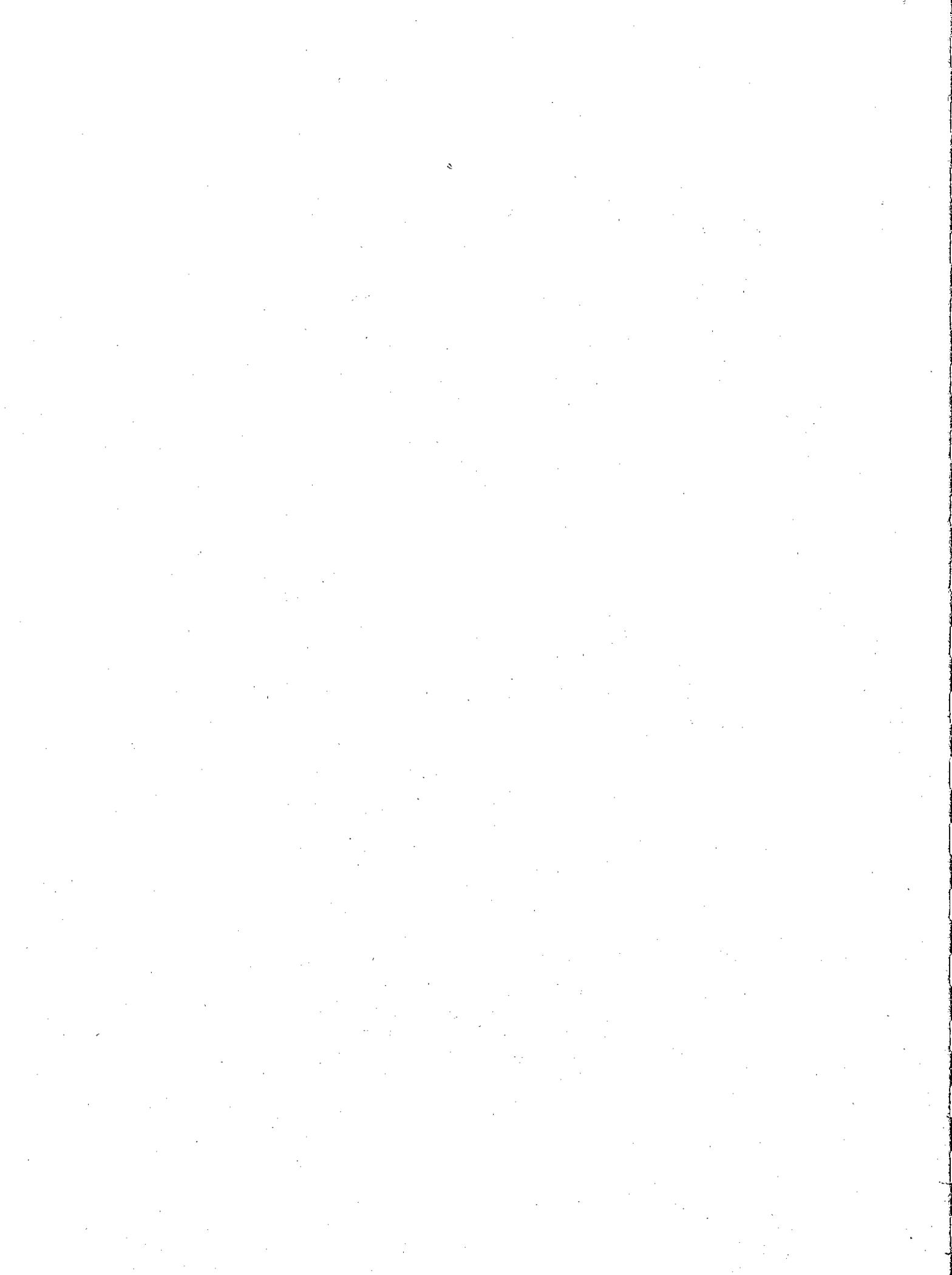
**1998**

---

**Marine Mammal Commission  
4340 East-West Highway, Room 905  
Bethesda, Maryland 20814**

**31 January 1999**

---



# **MARINE MAMMAL COMMISSION**

---

**Annual Report to Congress**

**1998**

---

**Marine Mammal Commission  
4340 East-West Highway, Room 905  
Bethesda, Maryland 20814**

**31 January 1999**

---



## Table of Contents

<b>List of Tables</b> . . . . .	<b>iii</b>
<b>List of Figures</b> . . . . .	<b>iv</b>
<b>Executive Summary</b> . . . . .	<b>v</b>
<b>I. Introduction</b> . . . . .	<b>1</b>
Personnel . . . . .	1
Funding . . . . .	1
<b>II. Species of Special Concern</b> . . . . .	<b>3</b>
Northern Right Whale . . . . .	3
Bowhead Whale . . . . .	24
Gray Whale . . . . .	27
Cook Inlet Beluga Whale . . . . .	33
Gulf of Maine/Bay of Fundy Harbor Porpoise . . . . .	35
Bottlenose Dolphin . . . . .	45
Hawaiian Monk Seal . . . . .	47
Steller Sea Lion . . . . .	56
Northern Fur Seal . . . . .	66
Pacific Walrus . . . . .	69
Polar Bear . . . . .	76
Sea Otter . . . . .	85
Florida Manatee . . . . .	91
<b>III. Marine Mammal-Fisheries Interactions</b> . . . . .	<b>105</b>
Incidental-Take Regime for Commercial Fishing . . . . .	105
The Tuna-Dolphin Issue . . . . .	113
Pinniped-Fisheries Interactions . . . . .	123
<b>IV. International Aspects of Marine Mammal Protection and Conservation</b> . . . . .	<b>129</b>
The Compendium of Treaties and International Agreements . . . . .	129
International Whaling Commission . . . . .	130
Conservation Issues in the Southern Ocean . . . . .	135
Conservation Issues in the Arctic . . . . .	148
Convention on International Trade in Endangered Species of Wild Fauna and Flora . . . . .	153

<b>V.</b>	<b>Marine Mammal Strandings and Die-Offs</b> . . . . .	<b>157</b>
	Unusual Mortality Events in 1998 . . . . .	158
	Response to Unusual Mortality Events . . . . .	160
	National Marine Mammal Tissue Bank . . . . .	160
	The National Contingency Plan . . . . .	161
	Development of Release Criteria . . . . .	162
<b>VI.</b>	<b>Effects of Pollution on Marine Mammals</b> . . . . .	<b>163</b>
	Effects of Chemical Contaminants . . . . .	163
	Effects of Noise . . . . .	164
<b>VII.</b>	<b>Outer Continental Shelf Oil and Gas Exploration and Development</b> . . . . .	<b>175</b>
	Beaufort Sea/Northstar Project . . . . .	175
	Gulf of Mexico Information Transfer Meeting . . . . .	176
<b>VIII.</b>	<b>Research and Studies Program</b> . . . . .	<b>179</b>
	Survey of Federally Funded Marine Mammal Research . . . . .	179
	Marine Mammal Workshops and Planning Meetings . . . . .	179
	Commission-Sponsored Research and Study Projects . . . . .	180
<b>IX.</b>	<b>Permits and Authorizations to Take Marine Mammals</b> . . . . .	<b>185</b>
	Permit-Related Regulations . . . . .	185
	Permit Application Review . . . . .	186
	Recreational Interactions with Marine Mammals in the Wild . . . . .	187
	Small-Take Authorizations . . . . .	191
<b>X.</b>	<b>Marine Mammals in Captivity</b> . . . . .	<b>201</b>
	Care and Maintenance Standards . . . . .	201
	Swim-with-the-Dolphin Regulations . . . . .	202
	Exports of Marine Mammals to Foreign Facilities . . . . .	203
	Release of Captive Marine Mammals to the Wild . . . . .	204
	<b>Appendix A: Marine Mammal Commission Recommendations in 1998</b> . . . . .	<b>207</b>
	<b>Appendix B: Reports of Commission-Sponsored Activities Available from the National Technical Information Service</b> . . . . .	<b>219</b>
	<b>Appendix C: Selected Literature Published Elsewhere Resulting from Commission-Sponsored Activities</b> . . . . .	<b>227</b>

## List of Tables

Table 1.	Marine mammal species and populations listed as endangered or threatened under the Endangered Species Act and depleted under the Marine Mammal Protection Act, as of 31 December 1998 . . . . .	4
Table 2.	IWC quotas and numbers of bowhead whales taken by Alaska Natives, 1973-1998 . . . . .	26
Table 3.	Estimates of harbor porpoise bycatch in sink gillnet fisheries in the Bay of Fundy (Canada), Gulf of Maine (U.S.), and off the U.S. mid-Atlantic states, 1990-1998 . . . . .	37
Table 4.	Counts of adult and juvenile Steller sea lions observed at rookery and haul-out trend sites in seven Alaska subareas during June and July aerial surveys, 1976-1998 . . . . .	57
Table 5.	Subsistence harvest levels of northern fur seals in the Pribilof Islands, 1985-1998 . . . . .	68
Table 6.	Estimated catches of Pacific walruses in Alaska and total reported catch of walruses in Russia, 1980-1997 . . . . .	73
Table 7.	Numbers of polar bears tagged during Alaska Native harvests, 1988-1998 . .	79
Table 8.	California sea otter population counts by the Fish and Wildlife Service and the California Department of Fish and Game, 1984-1998 . . . . .	87
Table 9.	Known manatee mortality in the southeastern United States (excluding Puerto Rico) reported through the manatee salvage and necropsy program, 1978-1998 . . . . .	93
Table 10.	Estimated incidental kill of dolphins in the tuna purse seine fishery in the eastern tropical Pacific Ocean, 1972-1998 . . . . .	114

## List of Figures

Figure 1.	Right whale found entangled in lobster fishing gear in Cape Cod Bay on 14 September 1998 . . . . .	7
Figure 2.	Unidentified fishing gear being removed from a right whale found entangled in Cape Cod Bay on 24 July 1998 . . . . .	17
Figure 3.	Management zones under the Gulf of Maine harbor porpoise take reduction plan and other related management plans . . . . .	40
Figure 4.	The Hawaiian Archipelago . . . . .	49
Figure 5.	Adult male Hawaiian monk seal found entangled in derelict trawl net on Laysan Island, 23 July 1998. . . . .	55
Figure 6.	A Steller sea lion rookery on Ugamak Island in the Aleutians illustrates the decline of the population over a 17-year period . . . . .	59
Figure 7.	Fishery management areas and catcher vessel operation area in the Bering Sea, Aleutian Islands, and Gulf of Alaska regions . . . . .	61
Figure 8.	Range and breeding islands of the northern fur seal . . . . .	67
Figure 9.	Range of the Pacific walrus . . . . .	70
Figure 10.	Ranges of the Beaufort Sea stock and Bering–Chukchi Seas stock of polar bears . . . . .	77
Figure 11.	Manatee with healed propeller wounds . . . . .	95
Figure 12.	Florida manatees in a thermal outfall at a power plant in Riviera Beach, Florida . . . . .	97
Figure 13.	Crabeater seals, the most abundant marine mammal in the world, rest on Antarctic ice floes . . . . .	142
Figure 14.	Mass stranding of long-finned pilot whales on Cape Cod in 1990 . . . . .	159
Figure 15.	Process by which permit applications to take marine mammals are reviewed . . . . .	187
Figure 16.	Illegal and risky feeding of wild bottlenose dolphin off Florida . . . . .	189

# EXECUTIVE SUMMARY

This is the 26th Annual Report of the Marine Mammal Commission and its Committee of Scientific Advisors on Marine Mammals. The Commission was established under Title II of the Marine Mammal Protection Act of 1972 to provide an independent source of policy and program guidance to Congress and the Executive Branch on domestic and international issues affecting marine mammal conservation.

The purpose of this report is to provide timely information on management-related issues and events to Congress, federal and state agencies, public interest groups, the academic community, private citizens, and the international community. When combined with previous annual reports, it provides a record of the nation's progress in developing policies and programs to conserve marine mammals and their habitats. To ensure factual accuracy, drafts of the report were provided to involved federal and state agencies and individuals for comment.

The following highlights certain issues addressed by the Commission in 1998.

## **Introduction (Chapter I)**

The Commission consists of three members required by statute to be knowledgeable in marine ecology and resource management. They are appointed by the President with the advice and consent of the Senate. The nine-member Committee of Scientific Advisors, required to be expert in marine ecology and marine mammal affairs, is appointed by the Chairman of the Commission in consultation with the other two Commissioners. Members of the Commission, the Committee, and the staff are listed in Chapter I, as is information on recent funding levels. For fiscal years 1998 and 1999, the Commission was appropriated \$1,185,000 and \$1,240,000, respectively.

## **Species of Special Concern (Chapter II)**

In 1998 the Commission devoted special attention to the conservation needs of several marine mammal species and populations. Among those discussed in Chapter II are northern right whales, Gulf of Maine harbor porpoises, Hawaiian monk seals, and Florida manatees.

**Northern Right Whales** — The northern right whale is the most endangered marine mammal in U.S. waters and the most endangered large whale in the world. Its largest population, about 300 animals, occurs off the east coasts of the United States and Canada. Half of the known mortality is caused by human activity, principally collisions with ships and entanglement in fishing gear. At the recommendation of the Marine Mammal Commission, the National Marine Fisheries Service developed a northern right whale recovery plan, which was adopted in 1991. Since 1996 the Service and cooperating federal and state agencies have intensified their protection efforts, guided in part by the Commission's 1996 and 1998 reviews of right whale recovery efforts.

To reduce ship collision risks, multi-agency efforts were continued in 1998 to warn ships of right whale locations. Further, the U.S. Coast Guard, acting on behalf of the United States, put forward within the International Maritime Organization a mandatory reporting system proposed by the National Oceanic and Atmospheric Administration with Commission assistance for ships transiting the population's calving and feeding grounds. Expected to go into effect in July 1999, this will require large commercial ships transiting these areas to contact shore stations for information on right whale protection measures.

To reduce entanglement risks, the Service adopted a take reduction plan in 1998 that includes measures to (1) deploy a team to free any right whales seen entangled, (2) design fishing gear less likely to entangle whales, and (3) regulate fishing in right whale critical habitats. In 1998 one entangled right whale was rescued, and research on fishing gear identified some promising design changes that might reduce entanglement risks. Although regulations were adopted to manage gillnet and lobster fishing at times and in areas in which right whales are most likely to occur, the potential effectiveness of the regulations seems limited.

Funding for right whale recovery work has been inadequate. Even with substantial increases in support by the National Marine Fisheries Service and other federal agencies, many essential recovery tasks have been unfunded or underfunded. Therefore, in 1996 the Commission suggested that a right whale trust fund be established to help increase support. Recognizing the limited funding available for conservation work on large whales, Senator Judd Gregg asked the Commission for drafting assistance with a bill to establish a National Whale Conservation Fund within the National Fish and Wildlife Foundation to encourage and direct funding from private and industry sources for conservation efforts. The Commission helped, and a bill entitled the National Whale Conservation Fund Act of 1998 was introduced by Senator Gregg and Senator Ted Stevens in June 1998. Later passed by Congress and signed into law by the President, the Act directs the Foundation to establish the fund in cooperation with the Marine Mammal Commission and the National Oceanic and Atmospheric Administration. This is being done.

In November 1998 the Commission conducted a review of right whale recovery efforts. Noting the significant progress over the past two years, the Commission commended the National Marine Fisheries Service, the Coast Guard, and the Navy for their many constructive actions. The Commission also recommended that the Service increase its base-level funding request for right whale recovery to at least \$1.385 million annually for the foreseeable future to meet ongoing program needs, including the operation of the mandatory ship reporting system, research on fishing gear modifications, efforts to disentangle right whales, annual right whale surveys in critical habitats, maintenance of the right whale photoidentification catalog, and the implementation of a satellite-linked tracking program to better identify essential right whale habitat. The Commission also wrote to the Minister of Canada's Department of Fisheries and Oceans urging that the department increase support for right whale recovery work in Canada.

**Gulf of Maine Harbor Porpoises** — Gulf of Maine harbor porpoises are a discrete harbor porpoise stock found in coastal waters from the Bay of Fundy, Canada, to North

Carolina. The gillnet fishery-related bycatch of this stock exceeds that of any other cetacean stock in U.S. waters. Estimates are that more than 1,500 porpoises were killed in gillnets off New England and the mid-Atlantic coastal states in 1997. The stock's potential biological removal level (*i.e.*, the number of animals that can be killed annually, not including natural mortality, while still allowing the stock to increase toward or remain at its optimum sustainable population) is calculated to be 483 porpoises per year. The Marine Mammal Protection Act required the National Marine Fisheries Service to reduce bycatch to below the stock's potential biological removal level by April 1997, but progress has been slow and relatively ineffective. Although the Service published a proposed take reduction plan for New England fisheries in August 1997, action on the plan was deferred and eventually the matter was raised in a lawsuit in August 1998.

In September 1998 the Service proposed a new take reduction plan. For New England, it proposed an expansion of existing time-area management zones in high bycatch areas, seasonal prohibition of gillnet fishing in some zones, and the required use of acoustic deterrent devices, called pingers, in other zones. For the mid-Atlantic area, the plan proposed a time-area fishing closure, limits on the number and length of nets, and certain gear restrictions, such as minimum twine diameters, for nets. Previously, there had been no take reduction measures for this area. Noting that the plan appeared to underestimate past bycatch levels in the mid-Atlantic and to overestimate the likely effectiveness of pingers in New England, the Commission concluded in October 1998 that stronger take reduction measures were needed and recommended requiring the use of pingers in all New England waters where harbor porpoises might be found and perhaps expanding some time-area fishing closures. The Service's final plan for New England, published on 2 December 1998, did not adopt these recommendations.

In November 1998 the Commission reviewed the Service's harbor porpoise take reduction plans and provided comments thereon on 8 December 1998. Although commending the Service for the steps it was taking to produce bycatch estimates more quickly, train fishermen in the use of pingers, plan a new harbor porpoise population survey for 1999, expand fishery observer efforts in the mid-Atlantic area, and address enforcement needs, the Commission also noted that information presented at the review confirmed that bycatch levels were higher in the mid-Atlantic area than assumed in the plan, and that using pingers at some times and in some areas has been less effective than assumed by the Service. The Commission therefore continued to recommend stronger take reduction measures to reduce bycatch below the stock's calculated potential biological removal level, that the Service consult with fishermen to develop an improved pinger design, and that the Service undertake studies to better document the sound characteristics of pingers that are most effective in deterring harbor porpoises.

On 22 October 1998 the Service reopened the comment period on a proposal it had first made in 1993 to list the east coast harbor porpoise stock as threatened under the Endangered Species Act. Action on the proposal had been deferred pending further take reduction efforts and new information. In its 8 December 1998 letter, the Commission recommended that the Service announce its intent to proceed with the action if the adopted take reduction measures did

not reduce bycatch below the potential biological removal level in the coming year. The Service planned to announce a decision on the proposal early in 1999.

**Hawaiian Monk Seals** — Hawaiian monk seals are the most endangered seals in U.S. waters. Limited almost exclusively to the remote Northwestern Hawaiian Islands, they number about 1,300 to 1,400 animals. The species' abundance declined by about 50 percent between the late 1950s and the late 1970s, and after a brief period of stability, it began declining again in the late 1980s. The largest breeding colony, located on French Frigate Shoals, had declined to about half its size in the late 1980s for reasons that are probably related to limited prey availability, and it has shown no signs of recovery. Threats to the species include entanglement in derelict fishing nets, human disturbance on pupping and haul-out beaches, and depletion of prey resources by commercial fisheries.

In 1998 the Commission commented on a U.S. Navy proposal for a missile defense testing program that included consideration of locating missile launching facilities on Tern Island, a small island at French Frigate Shoals. Because of likely impacts to monk seals, the Commission recommended that the site be removed from consideration as a possible launch site, and the Navy subsequently stated that it planned to remove the site from future consideration. The Commission commended the Navy for its decision and for its efforts to develop an alternative that would not require launch facilities in such an important wildlife habitat.

Lobsters and other species caught in the commercial lobster fishery in the Northwestern Hawaiian Islands are components of the monk seal diet. Their relative importance, however, is uncertain. Because of this uncertainty and the decline in monk seal numbers at French Frigate Shoals apparently due to limited prey availability, the Commission has recommended several times in past years that the National Marine Fisheries Service prohibit lobster fishing around French Frigate Shoals until better information on monk seal prey preferences is available. The Service has declined to do so citing, uncertainty about the importance of lobster in monk seal diets. In 1998 the Service altered management provisions for the lobster fishery with the result that fishing effort shifted to French Frigate Shoals and other atolls directly supporting major monk seal colonies. The Commission again recommended that the Service close French Frigate Shoals to lobster fishing and that other atolls directly supporting major monk seal breeding colonies also be closed pending better information on monk seal prey preferences. As of the end of 1998, the Service had not replied.

**Florida Manatees** — The Florida manatee, a subspecies of the West Indian manatee found only in the southeastern United States, is one of the most endangered marine mammals in the United States. Although the current population, numbering about 2,800 animals, is thought to be larger than it was in the mid-1970s, it suffered in 1998 the third highest annual mortality, 243 carcasses recovered, since the mid-1970s when records were first kept. About one-third of the deaths were due to human causes, principally collisions with boats. In 1998 a record 67 vessel-related deaths were reported.

The manatee recovery program is led by the Fish and Wildlife Service and the Florida Department of Environmental Protection and involves cooperative efforts by many other agencies and groups. The Marine Mammal Commission assisted both the Service and the state in developing their programs early in the 1980s. Since then it has continued to provide assistance and advice to both.

To reduce vessel-related manatee deaths, the Florida Department of Environmental Protection and county governments began developing boat speed regulations for 13 key counties in 1989. Although rulemaking has been slow, rules are now in place in 12 counties. Rule challenges in 1998 continued to delay adoption of rules for the thirteenth county. With regulatory signs now posted in most areas, efforts are needed to ensure compliance with the new rules. In 1997 the Fish and Wildlife Service designated an enforcement coordinator and began directed enforcement efforts in cooperation with local and state enforcement officers, and this was continued in 1998. In 1998 the Coast Guard, in cooperation with the Service, also increased its enforcement efforts.

In the past two decades manatee numbers have increased around localized winter warm-water refuges formed by power plant outfalls and natural springs in central Florida north of the species' historic winter range. Up to 585 animals have been counted at one power plant during a winter cold period. Such large concentrations increase the chance of a large-scale manatee die-off due to red tides, pollution events, or exposure to cold if a power plant outfall were to shut down. The latter concern has increased because of recent interest in deregulating Florida's electric utilities, which could affect the operation of power plants on which many manatees have come to depend. Early in 1998 the Service advised the Commission that it planned to hold a public forum to help develop a long-term strategy for managing warm-water refuges. The Commission provided advice on planning the forum and suggested that the Service consider the possibility of developing a network of non-industry-dependent artificial refuges within the population's current core winter range. In August the Service held an interagency meeting to examine possible management strategies and information needs. Based on the results, it decided to convene a workshop on warm-water refuges in the summer of 1999 rather than hold a public forum in 1998.

### **Marine Mammal-Fisheries Interactions (Chapter III)**

Marine mammals and fisheries interact in ways that can affect both adversely. Marine mammals may become entangled in fishing gear and be killed or injured. Also, marine mammals may compete with fishermen for the same fishery resources and, if entangled, may damage gear or catch.

The Marine Mammal Protection Act was amended in 1994 to establish a new regime for governing the taking of marine mammals incidental to commercial fishing operations. This chapter discusses actions taken to implement that regime, including the preparation of assessment reports for each marine mammal stock that occurs in U.S. waters, the annual listing of all U.S. fisheries according to the frequency with which they take marine mammals, and the

establishment of take reduction teams composed of scientists, representatives of the affected fisheries, and other interest groups to advise the National Marine Fisheries Service on the development of take reduction plans for strategic stocks. A strategic stock is one listed as endangered or threatened under the Endangered Species Act, designated as depleted under the Marine Mammal Protection Act, or for which human-caused mortality and serious injury exceed the potential biological removal level calculated for the stock. Based on the recommendations of the take reduction teams, the Service completes and implements take-reduction plans designed to reduce the levels of take to below the potential biological removal levels within a certain period.

The deaths of large numbers of dolphins in the eastern tropical Pacific Ocean was one of the issues that played a key role in enactment of the Marine Mammal Protection Act in 1972. At that time, about 500,000 dolphins were being killed annually in the tuna purse seine fishery. Since that time, annual mortality has declined considerably and, although a final estimate for 1998 is not yet available, it is expected to be about 1,900 dolphins, a record low number. In 1997, the Marine Mammal Protection Act was amended to recognize international efforts to reduce dolphin mortality through the establishment of the International Dolphin Conservation Program. The 1997 amendments require the National Marine Fisheries Service, in consultation with the Marine Mammal Commission, to conduct research on the effects of chasing and encircling dolphins in the course of setting purse seine nets around tuna. Based on whether that research indicates that chase and encirclement are having significant adverse effects on any depleted dolphin stock, the requirements for labeling tuna as "dolphin-safe" may change. The Secretary of Commerce is required to make an initial finding in March 1999 as to whether tuna fishing practices are having significant adverse effects. This chapter discusses the requirements of the 1997 amendments and actions taken by the Service and the Commission with respect to the research program and the establishment of criteria for making the initial determination.

Growing populations of seals and sea lions may be affecting the recovery of salmon stocks at certain locations along the west coast of the United States. On the east coast, in the Gulf of Maine, seals may enter fish pens and eat salmon being raised in aquaculture operations. Recognizing the potential conflicts between growing pinniped populations and fisheries, Congress amended the Marine Mammal Protection Act in 1994 to allow states to obtain lethal take authority to protect certain depleted salmonid stocks. To date, Washington is the only state that has requested authority to kill sea lions in an effort to prevent further decline of the depleted run of steelhead salmon that passes through the Ballard Locks in Seattle. Because of the apparently successful use of other measures, however, the state has not found it necessary to use its lethal take authorization. In addition, Congress directed the National Marine Fisheries Service to study and submit reports on pinniped-fishery interactions along the west coast and in the Gulf of Maine aquaculture industry.

#### **International Aspects of Marine Mammal Protection and Conservation (Chapter IV)**

The Marine Mammal Protection Act directs the Commission, in consultation with its Committee of Scientific Advisors, to undertake a continuing review of, and to advise the

Secretary of State and other federal officials on, measures necessary to conserve marine mammals and their habitats internationally, as well as domestically. During 1998 the Commission participated in interagency efforts to develop U.S. positions on international conservation regimes, including those concerning whaling and the protection of Antarctic and Arctic resources. In addition, as discussed in Chapter II, the Commission participated in efforts to negotiate a bilateral agreement with Russia to conserve the shared population of polar bears.

**The International Whaling Commission** — The International Whaling Commission (IWC) is the international body responsible for regulating whaling. Because its management program had proven ineffective in conserving whale stocks, the IWC adopted a moratorium on commercial whaling, which has been in effect since 1986. Some types of whaling continue to occur. Norway filed an objection to the moratorium and continues to take minke whales commercially in the North Atlantic. Japan continues to conduct scientific whaling, both in the Southern Ocean and the North Pacific, despite calls from the IWC for it to end its lethal research. In addition, the IWC establishes quotas for certain whale stocks for aboriginal subsistence whaling. Such quotas have been established for bowhead whales and gray whales, which may be taken by Natives in Alaska and Washington, respectively.

During 1998 the IWC continued its work on developing a revised management scheme under which commercial whaling might be resumed. Although a revised management procedure, under which allowable catch levels would be established, has been agreed to, the IWC members have yet to agree to other aspects including a system of monitoring and enforcement to ensure compliance with the catch limits and other conservation measures it may adopt.

In 1998 the Commission worked with the National Oceanic and Atmospheric Administration in developing U.S. positions on issues before the IWC, and representatives of the Commission participated in meetings of the IWC and its Scientific Committee.

**Conservation of Marine Mammals and Their Habitats in the Southern Ocean** — Many species of seals, whales, dolphins, and porpoises inhabit the Southern Ocean (the seas surrounding Antarctica). The Commission conducts a continuing review of activities in Antarctica and the Southern Ocean that could affect marine mammals directly or indirectly. This section describes the first meeting of the environmental protection committee established by the Protocol on Environmental Protection to the Antarctic Treaty, which entered into force on 14 January 1998. It also describes U.S. efforts to implement the Protocol and related matters considered at the 22nd Antarctic Treaty Consultative Meeting held in Tromsø, Norway, on 25 May–5 June 1998. It describes ongoing efforts by the Commission and the Scientific Committee for the Conservation of Antarctic Marine Living Resources to control the explosive growth of fisheries for toothfish (*Dissostichus eleginoides* and *D. mawsoni*) in the Southern Ocean, including U.S. efforts to establish a catch certification scheme. It also describes the research programs being conducted by the National Marine Fisheries Service and the National Science Foundation to obtain information needed to effectively implement the Convention for the Conservation of Antarctic Marine Living Resources.

**The Arctic Environmental Protection Strategy and the Arctic Council** — Marine mammals are important components of the Arctic marine ecosystem. They include polar bears; walruses; ringed, bearded, harp, hooded, ribbon, and spotted seals; narwhals; and bowhead, minke, fin, gray, and beluga whales. A number of these species are important to the cultures and subsistence economies of indigenous people in coastal Alaska and other Arctic areas.

The ranges of most marine species and many terrestrial species in the Arctic include areas under the jurisdiction of more than one country. Consequently, effective conservation of these species and their essential habitats requires cooperative efforts by the eight Arctic nations. Recognizing this need, the United States and the other Arctic countries adopted and in 1991 began implementing the Arctic Environmental Protection Strategy. In September 1996 the eight Arctic countries established the Arctic Council as a high-level forum to oversee and coordinate efforts to protect the Arctic environment and to promote sustainable development and utilization of Arctic resources. This section provides background and describes the establishment of the Arctic Council, including development of rules of procedure for the Council and its subsidiary bodies, and terms of reference for the sustainable development program. It also describes the ongoing efforts of the four working groups established to give effect to the Arctic Environmental Protection Strategy. It points out recommendations by the Commission and steps being taken by the Department of State to identify and promote priority activities during the next two years while the United States is providing the secretarial support for the Council.

### **Marine Mammal Strandings and Die-Offs (Chapter V)**

In the past 20 years the number of unusual marine mammal die-offs appears to have increased in the United States and elsewhere. Although some of these events have been linked to naturally occurring biotoxins and diseases, human causes may be contributing factors, as well. For example, pollution may spawn blooms of toxic algae, and contaminants introduced into marine food chains may affect the life spans and reproductive success of marine mammals. In 1998 the largest reported die-off involved the death of more than 1,600 New Zealand, or Hooker's, sea lion pups in the Auckland Islands concurrent with a bloom of toxic algae. In the United States more than 70 California sea lions died in central California in May coincident with a toxic algal bloom; large numbers of California sea lions, northern fur seals, and other pinnipeds continued to die along the west coast coincident with the unusually strong El Niño conditions that began in 1997; and 12 separate strandings of beaked whales, a pelagic species that rarely strands, occurred in the southeastern United States between late August and early October.

To promote better responses to unusual marine mammal mortality events, a new section on marine mammal health and stranding response was added to the Marine Mammal Protection Act in 1992. With regard to these provisions, a die-off contingency plan for Florida manatees, on which the Commission commented extensively in 1997, was completed in 1998 by the Florida Department of Environmental Protection and the Fish and Wildlife Service. Also, further steps were taken by the National Marine Fisheries Service to develop criteria for determining when it is safe to release rehabilitated stranded marine mammals back into the wild; to develop a

quality assurance and contaminant monitoring program for the National Marine Mammal Tissue Bank; and to catalog marine mammal serum samples for use in evaluating wildlife disease vectors and the development of new pathogens.

## **Effects of Pollution on Marine Mammals (Chapter VI)**

Marine mammals can be affected directly and indirectly by environmental contaminants. Direct effects include such things as mortality from toxic chemical spills. Indirect effects include such things as decreased survival and productivity due to contaminant-caused decreases in important prey species. This chapter describes efforts by the Commission and others to identify and minimize threats to marine mammals posed by chemical contaminants and noise from various human activities.

**Effects of Chemical Contaminants** — High levels of organochlorine compounds, toxic elements, and other potentially harmful anthropogenic contaminants have been found in marine mammals throughout the world, including those that died from diseases and naturally occurring biotoxins during some of the unusual mortality events described in Chapter V. Recognizing the threats possibly posed by environmental contaminants, the Commission began compiling and in 1996 published a bibliography of published papers and reports on anthropogenic contaminants in the marine environment and their effects on marine mammals. In 1998 the Commission, in cooperation with the National Marine Fisheries Service, the Environmental Protection Agency, and the National Fish and Wildlife Foundation, convened a workshop to review available information and identify critical research needs regarding the effects of contaminants on marine mammals. Participants included scientists from seven countries with expertise in environmental toxicology, environmental chemistry, immunotoxicology, and marine mammal population dynamics, ecology, physiology, and disease. The workshop report, expected to be completed in the spring of 1999, will be used by the Commission to identify and recommend actions that responsible regulatory agencies should take to resolve the critical uncertainties about the effects of contaminants on marine mammals as quickly and as economically as possible.

**Effects of Noise** — Many species of marine mammals use sound to communicate, navigate, and locate prey. Sounds from both natural and human sources may interfere with these vital functions. As noted in the Commission's previous report, an informal interagency group was established in 1997 to coordinate agency efforts to assess and determine how best to avoid or mitigate the possible adverse effects of sounds from various sources on marine mammals and other marine organisms. This section describes advice provided by the Commission and the interagency coordinating group, and actions taken in 1998 by the U.S. Navy, the Minerals Management Service, the National Marine Fisheries Service, and others to implement the marine mammal component of the Acoustic Thermometry of Ocean Climate Program; identify and determine how best to resolve uncertainties concerning the possible effects on marine mammals and other marine organisms of the Navy's plans for operational deployment of its low-frequency active sonar and plans for shock testing the SEAWOLF submarine; ensure that high-output acoustic harassment devices being used to try to keep pinnipeds away from aquaculture facilities do not cause serious injury; determine how high-energy seismic surveys and other activities

associated with offshore oil and gas exploration and development may affect marine mammals; identify and seek expert advice on how best to resolve uncertainties concerning effects and to structure guidelines to prevent the possible adverse effects of different types of anthropogenic sound on marine mammals and other marine organisms; and assess the possible use of active sonar to reduce right whale mortalities from ship strikes.

## **Outer Continental Shelf Oil and Gas Exploration and Development (Chapter VII)**

Marine mammals may be affected adversely by oil spills, waste water discharges, and noise from seismic profiling, drilling, and other activities associated with offshore oil and gas exploration and development. Under the Outer Continental Shelf Lands Act, the Minerals Management Service has lead responsibility for ensuring that such activities in U.S. waters beyond the jurisdiction of coastal states do not adversely affect marine mammals and their habitats. The U.S. Army Corps of Engineers has related responsibilities when development projects require permits under section 404 of the Clean Water Act. As discussed in this chapter, the Commission commented to the Corps in 1998 on a proposed project that required Clean Water Act permits to construct an artificial island and a buried pipeline to enable recovery of oil from the Northstar site in the southern Beaufort Sea. Also in 1998, a Commission representative participated in a Minerals Management Service review of information concerning marine mammals in the northern Gulf of Mexico and the effects on marine mammals of seismic surveys and the use of explosives to remove drilling platforms. In partial response to the review, the Service is planning to hold a workshop in June 1999 to assess and determine how best to resolve related uncertainties.

## **Research and Studies Program (Chapter VIII)**

The Marine Mammal Protection Act directs the Commission to conduct a continuing review of marine mammal research supported by federal agencies to help identify and avoid duplicative research. It also directs the Commission to facilitate or support such other activities as it deems necessary to further the purposes of the Act. To meet these directives in 1998 the Commission conducted its annual survey of federally funded marine mammal research. The results are being summarized in a report to be completed early in 1999. The Commission also organized or participated in numerous meetings and workshops bearing on the conservation of marine mammals domestically (*e.g.*, recovery programs for Hawaiian monk seals, Florida manatees, and northern right whales) and internationally (*e.g.*, programs for the conservation of Arctic and Antarctic resources and the regulation of whaling). Studies undertaken as part of the Commission's research program during 1998 included preparations for the contaminants workshop cited above and projects to identify and assess management needs related to the dependence of Florida manatees on thermal power plant outfalls, human interactions with wild bottlenose dolphins, the National Large Whale Conservation Fund, the introduction of diseases to Antarctic wildlife, and the conservation of Arctic ecosystems.

Funds available to the Commission to conduct its research remained at an unacceptably low level in 1998. As a result, the Commission was unable to address many of the issues that it considered important and appropriate for focused study.

## **Permits and Authorizations to Take Marine Mammals (Chapter IX)**

The Marine Mammal Protection Act established a moratorium on the taking of marine mammals. Taking is broadly defined to include harassing and capturing, as well as hunting and killing animals. To allow certain activities that would or could involve such taking while ensuring that they do not adversely affect marine mammals or marine mammal stocks, the Act provides for the issuance of permits (*e.g.*, for scientific research, public display, and enhancing species recovery), letters of authorization (*e.g.*, for activities related to offshore oil and gas exploration and development and certain military activities), and general authorizations for research involving only taking by harassment. Depending on the species involved, the Act requires decisions on authorizing such activities to be made by the Secretary of Commerce or the Secretary of the Interior in consultation with the Marine Mammal Commission. This chapter discusses the process by which permits and letters of authorization are issued. During 1998 the Commission reviewed and made recommendations on 27 permit applications and 43 requests to modify existing permits.

The National Marine Fisheries Service is considering revising its regulations governing permits for scientific research, public display, species enhancement, and educational and commercial photography. A proposed rule may be published for public review in 1999. The Fish and Wildlife Service has deferred plans to revise its marine mammal permit regulations until the National Marine Fisheries Service does so.

To streamline the process for authorizing certain types of marine mammal research, the Marine Mammal Protection Act was amended in 1994 to establish a general authorization for research activities that have the potential to disturb, but not injure marine mammals (*e.g.*, aerial surveys and photoidentification studies). This provision appears to have expedited authorization for many research activities not involving threatened or endangered species.

Section 101(a)(5)(A) of the Act directs the Secretaries of Commerce and the Interior to develop regulations to authorize the take of marine mammals incidental to activities other than commercial fishing if the take is unintentional, involves small numbers of marine mammals, has a negligible impact on the affected stocks, and has no unmitigable adverse effects on the availability of the species for taking by Alaska Natives. Such authorizations may be issued for up to five years. To streamline this process, the Act was amended in 1994 to allow authorization of such activities by the Secretaries without developing regulations if only taking by harassment is involved. These authorizations may be issued for up to one year. In 1998 the Commission reviewed and commented on regulations and requests for letters of authorization for a variety of activities under these provisions. The activities included those related to offshore oil and gas exploration and development (*e.g.*, seismic surveys, drilling, platform

removal, and related activities), certain military activities (*e.g.*, rocket launches near seal haul-outs and ship shock testing), and various shoreline development projects.

Certain recreational activities not authorized under the Act that pose safety risks for both people and wild marine mammals have become an increasing source of concern in recent years. These include people feeding and swimming with wild dolphins, and approaching hauled-out pinnipeds along the California coast. In 1998, the Commission contracted for studies to help assess feeding and swimming interactions with dolphins and provided assistance and advice concerning actions for managing interactions between people and elephant seals.

### **Marine Mammals in Captivity (Chapter X)**

Marine mammals are maintained in captivity for purposes of public display, scientific research, and enhancement of the survival of various species or stocks. The Animal and Plant Health Inspection Service in the Department of Agriculture has regulatory responsibility for the care and transportation of such animals under the Animal Welfare Act. In the early 1990s the Commission recommended that the Service update its regulatory standards for the care of captive marine mammals, which were last amended in 1984. Progress in revising the standards has been slow, in part because negotiated rulemaking procedures were used to try to resolve contentious issues. The Service has advised the Commission that it plans to issue proposed rules in two parts during 1999 — one part will address provisions agreed to by the negotiated rulemaking committee and the second will address provisions on which that committee did not reach agreement.

Other long-standing issues concerning captive marine mammals have included (1) the safety of dolphins and humans involved in programs that allow the public to swim with captive dolphins, (2) ensuring that foreign facilities seeking to import marine mammals from the United States meet standards comparable with those of U.S. facilities, and (3) whether it is appropriate and safe to return long-term captive marine mammals back to the wild. In 1998 the Animal and Plant Health Inspection Service issued regulations setting forth standards for swim-with-the-dolphin programs. Commission recommendations that the Service require foreign facilities seeking marine mammals from the United States to be inspected as part of the review process have not been adopted.

### **Appendices**

Appendix A lists recommendations made by the Marine Mammal Commission in 1998. Appendix B lists Commission-sponsored reports published by the National Technical Information Service and the Commission. Appendix C lists citations of other papers and reports resulting from Commission-sponsored work that have been published elsewhere.

# Chapter I

## INTRODUCTION

This is the 26th Annual Report of the Marine Mammal Commission, covering the period 1 January through 31 December 1998. It is being submitted to Congress pursuant to section 204 of the Marine Mammal Protection Act of 1972.

Established under Title II of the Act, the Marine Mammal Commission is an independent agency of the Executive Branch. It is charged with maintaining an overview of and making recommendations on domestic and international actions and policies of all federal agencies with respect to marine mammal protection and conservation and with carrying out a research program.

### Personnel

The Commission consists of three part-time Commissioners nominated by the President and confirmed by the Senate. The Marine Mammal Protection Act requires that Commissioners be knowledgeable in marine ecology and resource management. At the end of 1998 the Commissioners were John E. Reynolds, III, Ph.D. (Chairman), Eckerd College, St. Petersburg, Florida; Paul K. Dayton, Ph.D., Scripps Institution of Oceanography, La Jolla, California; and Vera Alexander, Ph.D., University of Alaska, Fairbanks.

The Commission's full-time staff includes John R. Twiss, Jr., Executive Director; Robert J. Hofman, Ph.D., Scientific Program Director; David W. Laist, Policy and Program Analyst; Michael L. Gosliner, General Counsel; Robert H. Mattlin, Ph.D., Assistant Scientific Program Director; Alison Kirk Long, Permit Officer; Nancy L. Shaw, Administrative Officer; Jacqueline L. Murphy, Staff Assistant in charge of publications; and Darel E. Jordan, Staff Assistant.

The Commission Chairman, with the concurrence of other Commissioners, appoints persons to the nine-member Committee of Scientific Advisors on Marine Mammals. The Marine Mammal Protection Act requires that committee members be scientists who are knowledgeable in marine ecology and marine mammal affairs. At the end of 1998 the committee members were Lloyd F. Lowry (Chairman), Alaska Department of Fish and Game, Fairbanks; Daryl J. Boness, Ph.D., Smithsonian Institution, Washington, D.C.; Robert L. Brownell, Jr., Ph.D., National Marine Fisheries Service, La Jolla, California; Joseph R. Geraci, V.M.D., Ph.D., National Aquarium in Baltimore, Baltimore, Maryland; Steven K. Katona, Ph.D., College of the Atlantic, Bar Harbor, Maine; Bruce R. Mate, Ph.D., Oregon State University, Newport; Barbara L. Taylor, Ph.D., National Marine Fisheries Service, La Jolla, California; Jeanette A. Thomas, Ph.D., Western Illinois University, Moline; and Douglas Wartzok, Ph.D., University of Missouri, St. Louis.

During 1998 Mr. Caleb Pungowiyi, Executive Director of the Eskimo Walrus Commission, former president of the Inuit Circumpolar Conference, and resident of Nome and Kotzebue, Alaska, served as Special Advisor to the Marine Mammal Commission on Native Affairs.

### Funding

Appropriations to the Marine Mammal Commission in the past five fiscal years have been: FY 1994, \$1,290,000; FY 1995, \$1,384,000; FY 1996, \$1,190,000; FY 1997, \$1,189,000; and FY 1998, \$1,185,000. The Commission's appropriation for the current fiscal year, FY 1999, is \$1,240,000.



## Chapter II

### SPECIES OF SPECIAL CONCERN

Section 202 of the Marine Mammal Protection Act directs the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, to make recommendations to the Department of Commerce, the Department of the Interior, and other agencies on actions needed to conserve marine mammals.

To meet this charge, the Commission devotes special attention to individual species and populations that are particularly vulnerable to various human impacts. Such species may include marine mammals listed as endangered or threatened under the Endangered Species Act or depleted under the Marine Mammal Protection Act (Table 1), as well as other species or populations facing special conservation challenges.

During 1998 special attention was directed to a number of endangered, threatened, or depleted species or populations. As discussed below, these include northern right whales, bowhead whales, Hawaiian monk seals, Steller sea lions, northern fur seals, southern sea otters, and West Indian manatees. Other species not so listed, but that received special attention include eastern North Pacific gray whales, Gulf of Maine harbor porpoises, bottlenose dolphins, beluga whales, Pacific walruses, polar bears, and sea otters in Alaska.

#### Northern Right Whale (*Eubalaena glacialis*)

The northern right whale is the world's most endangered large whale. Its largest known population, about 300 animals, occurs in the western North Atlantic Ocean along the east coasts of the United States and Canada. A second population of unknown

size occurs in the western North Pacific Ocean in the Okhotsk Sea. Right whale sightings from that area are too infrequent to develop a reliable abundance estimate, but the Okhotsk Sea population could number in the low hundreds of animals. Although northern right whale populations also occurred historically in the eastern North Atlantic and eastern North Pacific Oceans, recent sightings are so rare that it is doubtful that viable populations remain in those areas.

All northern right whale populations were severely depleted by commercial whaling and were commercially extinct by the end of the nineteenth century. Nevertheless, as whalers seeking other more abundant species chanced upon right whales, they were taken and by the 1930s surviving populations were reduced to the brink of biological extinction. Action to protect the species was first taken in 1935 when a ban on hunting right whales was adopted by international treaty. Despite the ban (since carried forward by the International Whaling Commission under the 1946 International Convention for the Regulation of Whaling), northern right whales continued to be killed. Some were hunted by whalers whose national governments were slow to sign the treaty; others were taken under provisions authorizing scientific research; and still others were killed by illegal whaling until at least the mid-1960s. Gradually, however, compliance with the ban improved, and currently whaling is not considered a direct threat to the species. However, the remaining populations now are so small that other human-related impacts, particularly collisions with ships and entanglement in fishing gear, threaten their recovery.

The western North Atlantic population is the only northern right whale population for which there is sufficient information on distribution, demography, and human interactions to develop protective mea-

**Table 1. Marine mammal species and populations listed as endangered (E) or threatened (T) under the Endangered Species Act and depleted (D) under the Marine Mammal Protection Act, as of 31 December 1998<sup>1</sup>**

<u>Common Name</u>	<u>Scientific Name</u>	<u>Status</u>	<u>Range</u>
<b>Manatees and Dugongs</b>			
West Indian manatee	<i>Trichechus manatus</i>	E/D	Caribbean Sea and North Atlantic from southeastern United States to Brazil; and Greater Antilles Islands
Amazonian manatee	<i>Trichechus inunguis</i>	E/D	Amazon River basin of South America
West African manatee	<i>Trichechus senegalensis</i>	T/D	West Africa coasts and rivers; Senegal to Angola
Dugong	<i>Dugong dugon</i>	E/D	Northern Indian Ocean from Madagascar to Indonesia; Philippines; Australia; southern China; Palau
<b>Otters</b>			
Marine otter	<i>Lutra felina</i>	E/D	Western South America; Peru to southern Chile
Southern sea otter	<i>Enhydra lutris nereis</i>	T/D	Central California coast
<b>Seals and Sea Lions</b>			
Hawaiian monk seal	<i>Monachus schauinslandi</i>	E/D	Hawaiian Archipelago
Caribbean monk seal	<i>Monachus tropicalis</i>	E/D	Caribbean Sea and Bahamas (probably extinct)
Mediterranean monk seal	<i>Monachus monachus</i>	E/D	Mediterranean Sea; northwest African coast
Guadalupe fur seal	<i>Arctocephalus townsendi</i>	T/D	Baja California, Mexico, to southern California
Northern fur seal	<i>Callorhinus ursinus</i>	D	North Pacific Rim from California to Japan
Western North Pacific Steller sea lion	<i>Eumetopias jubatus</i>	E/D	North Pacific Rim from Japan to Prince William Sound, Alaska (east of 144°W longitude)
Eastern North Pacific Steller sea lion	<i>Eumetopias jubatus</i>	T/D	North Pacific Rim from Prince William Sound, Alaska, to California (east of 144°W longitude)
Saimaa seal	<i>Phoca hispida saimensis</i>	E/D	Lake Saimaa, Finland
<b>Whales, Porpoises, and Dolphins</b>			
Baiji	<i>Lipotes vexillifer</i>	E/D	Changjiang (Yangtze) River, China
Indus river dolphin	<i>Platanista minor</i>	E/D	Indus River and tributaries, Pakistan
Vaquita	<i>Phocoena sinus</i>	E/D	Northern Gulf of California, Mexico
Northeastern offshore spotted dolphin	<i>Stenella attenuata</i>	D	Eastern tropical Pacific Ocean
Eastern spinner dolphin	<i>Stenella longirostris orientalis</i>	D	Eastern tropical Pacific Ocean
Mid-Atlantic coastal bottlenose dolphin	<i>Tursiops truncatus</i>	D	Atlantic coastal waters from New York to Florida
Northern right whale	<i>Eubalaena glacialis</i>	E/D	North Atlantic, North Pacific Oceans; Bering Sea
Southern right whale	<i>Eubalaena australis</i>	E/D	South Atlantic, South Pacific, Indian, and Southern Oceans
Bowhead whale	<i>Balaena mysticetus</i>	E/D	Arctic Ocean and adjacent seas
Humpback whale	<i>Megaptera novaeangliae</i>	E/D	Oceanic, all oceans
Blue whale	<i>Balaenoptera musculus</i>	E/D	Oceanic, all oceans
Finback or fin whale	<i>Balaenoptera physalus</i>	E/D	Oceanic, all oceans
Western North Pacific gray whale	<i>Eschrichtius robustus</i>	E/D	Western North Pacific Ocean
Sei whale	<i>Balaenoptera borealis</i>	E/D	Oceanic, all oceans
Sperm whale	<i>Physeter macrocephalus</i>	E/D	Oceanic, all oceans

<sup>1</sup> From Fish and Wildlife Service Regulations at 50 C.F.R. §17.11 and National Marine Fisheries Service Regulations at 50 C.F.R. §216.15.

tures. Even for this population, however, major information gaps exist. The only areas known to be used regularly in winter by more than a few whales are Cape Cod Bay and the population's only calving grounds in coastal waters off the east coasts of Florida and Georgia. The former area is used by at least a few tens of animals, mostly adults, and the latter area is used by females about to give birth or those with new calves and by some juveniles, which constitute perhaps 10 to 20 percent of the total population. It is not known where the remainder of the population can be found in winter. During non-winter months, most right whale sightings occur in coastal waters off New England and southeastern Canada (*i.e.*, New Brunswick and Nova Scotia), where four principal feeding areas have been identified: Cape Cod Bay and the Great South Channel off Massachusetts, the Bay of Fundy just north of the U.S.-Canada border, and the Roseway Basin off southern Nova Scotia. At any one time, the proportion of the population using these areas may be small, and it is not clear whether or where other non-winter feeding areas occur.

Over the past 20 years the number of calves born annually has averaged fewer than 12 and has shown no sign of increasing. Between 1993 and 1997 annual calf counts were 6, 9, 7, 22, and 20. Preliminary data suggest that only 6 calves were born in 1998, one of which was found dead. Data for the past 10 years also suggest that the calving interval for mature females has increased from less than four years to nearly six years, implying that reproduction rates are declining. These data and trends raise grave doubts about the survival of this population. Any increase in mortality beyond natural levels, even the death of a few additional animals, may be the difference between recovery and decline toward a point where recovery is impossible.

There are two principal causes of human-related right whale death and injury in the western North Atlantic: collisions with ships and entanglement in commercial fishing gear. From 1970 through 1998, 43 dead right whales have been confirmed by direct observation along the east coasts of the United States and Canada. Of these, 13 were killed by ships, 2 by entanglement in fishing gear, and 2 others were entangled in fishing gear when struck and killed by ships. Thus, at least 40 percent (17 of 43 carcasses)

of all confirmed deaths since 1970 are attributable to human factors. As suggested in previous annual reports, perhaps two-thirds of all right whale deaths are never observed. If the proportion of deaths due to human causes is the same for both observed and unobserved deaths, human factors would be responsible for nearly doubling right whale mortality. Such an increase could explain why the western North Atlantic right whale population has shown little evidence of recovery.

The National Marine Fisheries Service has lead responsibility for the recovery of northern right whales under the Marine Mammal Protection Act and the Endangered Species Act. At the recommendation of the Marine Mammal Commission, the Service developed a northern right whale recovery plan that was adopted in 1991. The plan lists research and management actions needed to promote the recovery of right whale populations in U.S. waters. Because right whale sightings in the eastern North Pacific are so sparse (about 30 sightings of one or two animals each scattered between Alaska, California, and Hawaii in the 20 years before plan development), it was determined that research and management tasks for the eastern North Pacific population were impractical. The plan therefore focused available resources on recovery of the western North Atlantic population.

One of the first steps taken by the National Marine Fisheries Service to implement a recovery program for the western North Atlantic population was to form two regional implementation teams: one along the southeastern U.S. coast and the other for the northeastern U.S. coastal waters. The southeastern team was established in 1993 to help oversee protection of right whales using the calving area off Florida and Georgia, and the northeastern team, which also helps coordinate recovery of humpback whales, was established in 1994 to coordinate right whale protection in feeding areas off New England. Each team includes representatives of regional offices of federal agencies, state agencies, relevant industry groups, environmental organizations, and research organizations involved in funding or carrying out right whale recovery work.

Federal and state agencies participating on one or both teams include the Army Corps of Engineers, the Coast Guard, the Marine Mammal Commission, the

National Marine Fisheries Service, the Navy, the Florida Department of Environmental Protection, the Georgia Department of Natural Resources, the Massachusetts Division of Fisheries, and the Massachusetts Port Authority. Non-governmental participants include the Center for Coastal Studies, the New England Aquarium, the Humane Society of the United States, the International Fund for Animal Welfare, the Massachusetts Environmental Trust, the University of Georgia, and the University of Rhode Island. Officials from Canada's Department of Fisheries and Oceans also participate regularly to help ensure that related programs in Canada are coordinated as effectively as possible.

Between July 1995 and March 1996 eight dead right whales were found, including five in the first three months of 1996, on the species' calving grounds. This focused intense attention on the need to strengthen recovery efforts. To help identify priority needs, the Commission reviewed the right whale recovery program during its annual meeting on 12–14 November 1996. Recovery efforts increased substantially between 1996 and 1998 and, in view of that progress and new information, the Commission held another review of the right whale recovery program during its 1998 annual meeting held in Portland, Maine, on 10–12 November. Recent developments and results of the Commission's 1998 review are described below.

### **Right Whale Mortalities and Injuries in 1998**

During 1998 two dead right whales were observed. The first was a female calf found floating off St. Simons Island, Georgia, on 10 January by a right whale aerial survey team. Within a few hours the Coast Guard had a vessel on site to tow the animal ashore. Necropsy results indicate that the calf died of natural causes during or shortly after birth. Without the Coast Guard's rapid response, it would not have been possible to retrieve the animal and assess the cause of death, and on 23 February 1998 the Commission wrote to the Coast Guard to commend its staff for the prompt response. The second dead animal, an adult male, washed ashore near the Virginia–North Carolina border. Already badly decomposed when found on 7 October 1998, it had several fractured vertebrae, possibly caused by a ship collision. At the

end of 1998 laboratory tests to determine if the bone fractures occurred before or after death had not been completed and the cause of death was uncertain.

Two other right whales were entangled in fishing gear in 1998. One, a seven-year-old male, became entangled on three separate occasions. It had previously been seen entangled in August 1997 in the Bay of Fundy with fishing gear wrapped around its tail stock. At that time, the entanglement did not appear serious and no attempt was made to disentangle it. In July 1998, however, the animal was resighted in Cape Cod Bay still entangled and with deep gashes cut into its tail flukes by the attached rope. A disentanglement team from the Center for Coastal Studies successfully removed the ropes on 24 July, but the animal became entangled two more times in Cape Cod Bay. On 12 September it was found entangled with rope and line from a lobster pot in its mouth. The Center's disentanglement team removed the material. Two days later, the animal was found immobilized by a string of 15 lobster pots and barely able to keep its head above water (see Figure 1). The Center's disentanglement team again freed the animal.

The second entangled whale was seen by a researcher in the Gulf of St. Lawrence, Canada, on 15 August. It was followed for several hours, during which time it was able to free itself. In addition to these entanglements, two right whales became trapped simultaneously in a fishing weir in the Bay of Fundy, Canada, on 13 July. Both were released unharmed by fishermen.

In addition to the two entanglements, a one-year-old animal was sighted in January 1998 off the southeastern U.S. coast with half of its tail fluke severed by a ship's propeller. Although it is not known when or where the animal was struck, it previously had been seen with no injury in the Bay of Fundy in September 1997. It was subsequently resighted in Cape Cod Bay in February and March 1998 and again in August and September 1998 in the Bay of Fundy. While it appeared to be in satisfactory condition, the injury may compromise its swimming ability and reduce its long-term chances for survival.

Information on right whale deaths and injuries indicates that calves and juveniles are far more likely than

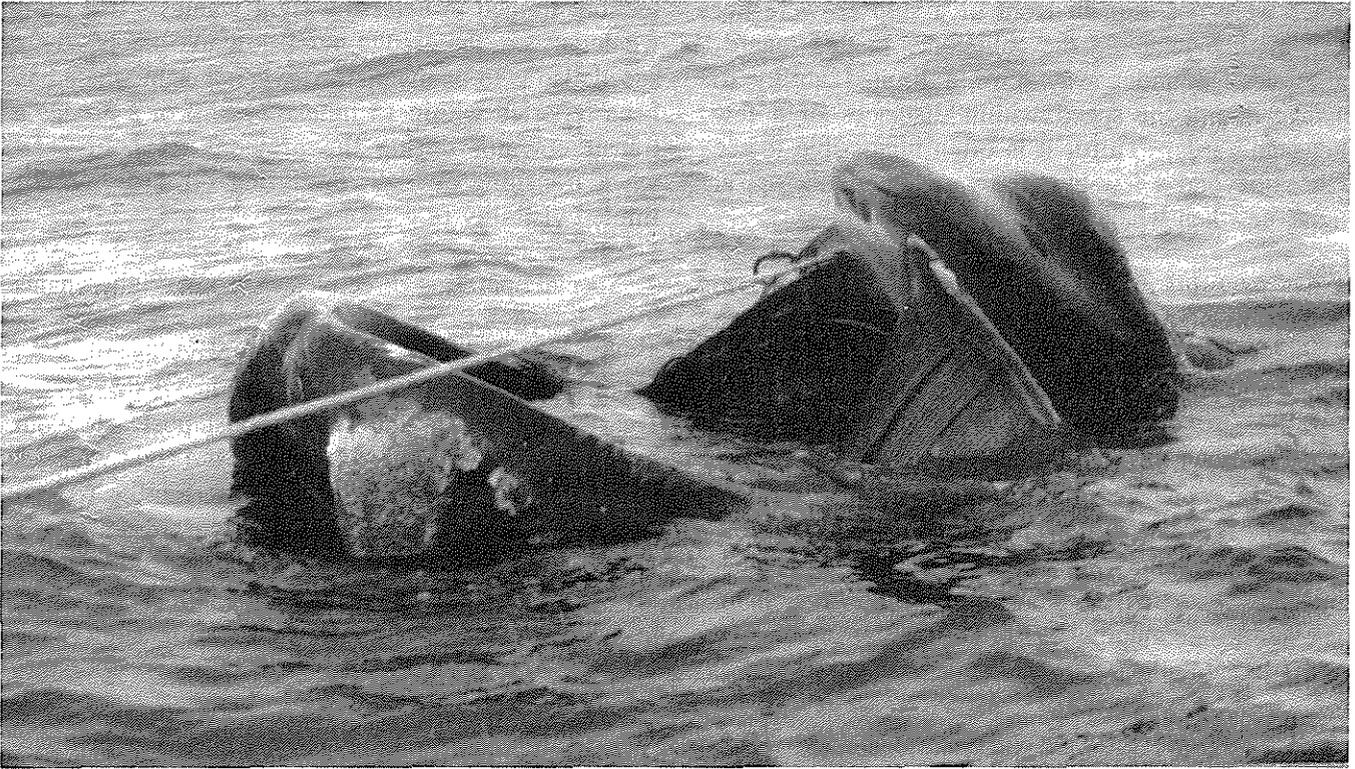


Figure 1. Right whale found entangled in lobster fishing gear in Cape Cod Bay on 14 September 1998. (Photograph courtesy of Center for Coastal Studies, Provincetown, Massachusetts)

adults to become entangled or to be struck by ships. Preliminary results of a study sponsored by the Commission in 1998 (see Chapter VIII) report evidence of at least 50 serious injuries (including 17 confirmed deaths) caused by ship collisions or entanglement between 1970 and 1998. Of these, 27 (54 percent) were calves or juveniles, 6 (12 percent) were adults, and 17 (34 percent) were of unknown age. The results suggest that reducing ship collisions and entanglements in areas frequented by juveniles and females with calves merits special attention.

### Collisions between Right Whales and Ships

Since 1970 nearly 90 percent (15 of 17) of all human-related right whale deaths confirmed by direct observation have been attributed to ship collisions. Massive propeller slashes, severed tail stocks, and crushed skulls indicate that large, rather than small, vessels were responsible. The proportion of ship strikes among total observed mortality (15 of 43

deaths) is much higher than that observed among other stranded whales, suggesting that right whales may be more vulnerable to ship strikes than other large whales. This may be due to common right whale behavior, such as logging (resting quietly at the surface), skim feeding, nursing, and mating that occur at the surface, and the species' preference for coastal waters where vessel traffic is greatest. When engaged in such behavior, right whales often appear oblivious to approaching ships. In addition, right whale calves have limited diving ability and spend most of their time at or near the surface.

Actions to reduce the likelihood of ship strikes therefore have received particular attention. For several reasons, this has proven to be a difficult management challenge. First, given vessel traffic through right whale habitat and the small number of right whales, collisions with right whales are rare from a mariner's perspective. Second, such events are unintentional. They appear to involve whales that

either were not seen in front of a ship or were not seen in time to avoid the collision. In this regard, large vessels under way have a limited ability to change course or speed within distances of a few thousand yards. Third, it is often impossible to see whales beyond a few hundred yards (*e.g.*, in fog, at night, or when whales are submerged).

To meet this challenge, efforts have been focused on the following approaches: (1) modifying operating procedures for government vessels that frequently transit key right whale habitats; (2) establishing early warning systems to advise vessel operators of the location of whales on a real-time basis and on the need for special caution; (3) preparing educational materials for mariners on the need and ways to avoid hitting right whales with ships; (4) developing mandatory ship reporting systems in key right whale habitats; and (5) conducting research to better understand and mitigate collision risks.

**Vessel Operating Procedures** — The U.S. Navy, the Coast Guard, and the Army Corps of Engineers routinely operate vessels in waters where right whales occur. The Navy has several major installations, including the Kings Bay Submarine Base and the Mayport Naval Station, adjacent to the right whale calving grounds off Florida and Georgia; the Coast Guard carries out enforcement and search and rescue missions throughout the right whale's range along the U.S. Atlantic coast; and the Corps of Engineers oversees the operation of dredges in ship channels extending into the right whale calving grounds. Each of these agencies, in consultation with the National Marine Fisheries Service, has developed vessel operating directives to reduce the risk of hitting right whales while continuing to meet their respective missions. In so doing, these agencies have helped to define new standards of prudent seamanship with regard to operating large vessels in essential right whale habitats.

The Corps of Engineers was the first agency to establish special measures to protect right whales. Some dredges transporting dredged spoil to offshore disposal sites are capable of speeds approaching 15 knots. Since 1989 the Corps has required that dredges operating in the right whale calving area during the calving season (December through March) post a

lookout trained in detecting right whales. If a right whale is seen, the dredge must slow to 5 knots. This speed also is to be maintained when a right whale has been reported within 15 miles (24 km) of a dredge's transit corridor during the previous 24 hours and when transiting at night or during other periods of limited visibility (*e.g.*, fog).

Special operating directives to protect right whales were issued for Navy and Coast Guard vessels in 1996. As with Corps dredges, the Navy has directed that its vessels operating in the right whale calving area during the calving season must post a lookout trained in identifying right whales. If a right whale is seen from the ship or reported within 5 miles (8 km) of a ship's position during the previous 12 hours, the vessel is to slow to a speed below normal safe operating speeds (*e.g.*, less than 15 knots) and, if necessary, to slow to the minimum speed needed to control the vessel's course. To ensure that its vessel operators are aware of recent right whale sighting reports, all Navy ships entering the area's designated right whale critical habitat plus a buffer area 5 nautical miles (nmi) wide around the critical habitat, must contact the Navy's Fleet Activities Control and Surveillance Facility before doing so. The facility, which serves as a clearinghouse for the regional right whale early warning system (see below), relays whale sighting locations as they are received and, based on these sightings, may issue special whale protection recommendations to Navy ships in the area.

In addition, the Navy has issued other directives applicable to its ships during the calving season. These include prohibiting north-south transits of the calving area to minimize travel distance through areas where right whales are most abundant; avoiding vessel approaches closer than 500 yards (457 m) to right whales; to the extent possible, limiting night transits through the calving area; moving gunnery and bombing ranges farther offshore and away from the designated critical habitat and the associated buffer area; requiring that gunnery and bombing exercises use inert ordnance; and limiting vessel exercises within the critical habitat and the buffer area to those that can be conducted at very slow speed.

To reduce the chances that its vessels might hit a right whale, the Coast Guard has directed its cutters

and boats to use extreme caution when transiting right whale critical habitat, migratory routes, or high-use areas. Unless engaged in disentangling a whale, the Coast Guard also directed its vessels to avoid approaches closer than 500 yards (457 m) to rights whales and 100 yards (91 m) to all other whales. In non-emergency situations, Coast Guard vessels are to reduce speed as appropriate in these areas and to consider additional speed reductions when a whale is sighted from the vessel or known to be within five nautical miles of a ship's position.

To date, other than promulgating a rule prohibiting approaches closer than 500 yards to right whales, little has been done to encourage similar operating procedures by commercial vessels. Therefore, on 12 December 1996 the Commission wrote to the National Marine Fisheries Service recommending that it undertake a project to work with major shipping companies operating in ports adjacent to key right whale habitats. In part, it recommended that the Service develop cooperative agreements with key shipping companies to identify and implement voluntary measures to reduce the risk of hitting right whales by doing such things as posting lookouts to watch for right whales and providing extra time so that vessels can use slower speeds when transiting areas in which right whales are most likely to occur. To provide extra transit time, the Commission suggested exploring options to adjust travel schedules or slightly increase speed on voyage legs through waters where right whales are not likely to occur. The recommendation was endorsed by both implementation teams and the Commission offered to provide partial funding for the project. The Service attempted to obtain partial funding from the Canada Department of Fisheries and Oceans to include ports in Canada, but the Department was unable to do so and the Service deferred the project late in 1998. At the end of 1998, it was the Commission's understanding that the Service would provide support for the effort in 1999.

**Early Warning Systems** — In ocean areas where right whales and ships are most likely to interact, cooperating agencies and research groups have organized early warning systems to alert transiting ships of the presence of right whales and the need for special precautions. Two such systems have been established along the U.S. Atlantic coast: one for the popula-

tion's calving grounds off Florida and Georgia and the other for right whale feeding areas off Massachusetts. Both systems rely on reports of whale locations from aerial survey teams and opportunistic vessel-based observations. The sighting locations are relayed to area ships as quickly as possible through a regional sightings clearinghouse.

The southeastern early warning system, begun in 1994, is a cooperative, multi-agency effort that has been strengthened steadily over the past four years. Its core is an aerial survey program conducted under contract with the New England Aquarium and jointly funded by the Army Corps of Engineers, the Coast Guard, and the Navy. The surveys are flown daily (weather permitting) over a core area in the northern half of the calving grounds from 1 December to 1 April. They follow 22 tracklines spaced 3 nmi apart and extending perpendicular to about 17 nmi offshore from about St. Augustine, Florida, to 10 miles north of Brunswick, Georgia. Supplemental surveys funded by the National Marine Fisheries Service are flown one or more times a week north, south, and seaward of the core area by the Georgia Department of Natural Resources and the Florida Department of Environmental Protection. In addition, the Navy has supported surveys of offshore waters.

As noted above, the Navy's Fleet Activities Control and Surveillance Facility serves as the regional clearinghouse for all sightings by survey teams as well as by other sources, such as vessel operators and the public. It immediately relays confirmed sighting locations to the Coast Guard, port pilots, and Corps of Engineers dredges, as well as to Navy vessels. The Coast Guard, in turn, broadcasts sighting locations to commercial vessels via a radio teletype communication system (NAVTEX) and voice radio (Broadcast Notice to Mariners). Through close coordination, the time between most initial sightings and the broadcast of advisories to ships has been reduced to about 5 to 15 minutes. The role of the Navy's Fleet Activities Control and Surveillance Facility in disseminating sighting reports has been particularly important in improving the efficiency of the regional early warning system. The voluntary acceptance of this task and the diligent work by its involved staff have made the Facility a much appreciated and indispensable component of the regional effort to protect right

whales. In recognition of these efforts, the Commission wrote to the Navy on 26 May 1997 commending the Facility's staff members responsible for establishing and operating the regional right whale sightings clearinghouse.

During the winter of 1997–1998, the core survey program completed surveys on 69 percent of the days, about 48 percent of which were conducted in good survey conditions (*i.e.*, Beaufort sea state 3 or less). Fewer whales were sighted compared with previous years. There were 44 sightings of 26 individual whales plus five mother-calf pairs.

The northeastern early warning system, begun in 1996, focuses on right whale feeding areas in Cape Cod Bay in late winter and spring and the Great South Channel in spring. It too is a cooperative multi-agency effort. Funding has been provided by the National Marine Fisheries Service, the Coast Guard, the Massachusetts Department of Wildlife and Environmental Law Enforcement, and the Massachusetts Environmental Trust. Most of the survey effort in Cape Cod Bay has been made by researchers with the Center for Coastal Studies and the National Marine Fisheries Service; most survey effort in the Great South Channel has been that of Service researchers. Sightings from survey teams as well as other reliable sources (*e.g.*, whale-watching boats and Coast Guard vessels and aircraft) are reported to a central clearinghouse maintained by the National Marine Fisheries Service. These reports are then relayed to Coast Guard communications operators, the Army Corps of Engineers Cape Cod Canal vessel traffic control system, and National Oceanic and Atmospheric Administration (NOAA) weather radio for broadcast to vessel operators.

The northeastern program differs from the southeastern program in several ways. The northeastern survey area is substantially larger (350 track miles in Cape Cod Bay and 4,300 track miles in the Great South Channel), it includes waters much farther offshore, and sighting conditions are often worse. For these and other reasons, surveys are usually flown no more than twice a week. The surveys also produce more sightings. To manage the number of broadcast alerts, to account for whale movements after a sighting is made, and to avoid direct approaches by

curious vessel operators, the whale advisories broadcast in the northeast have cited the coordinates of a rectangle whose size varies depending on the number and density of concurrent whale sightings. Late in 1998 this was changed to describe a circle around a single point with the radius length varying depending on the number and distribution of concurrent sightings. In the first six months of 1998, more than 100 sighting reports of one or more right whales were made by the survey teams. Also, because right whale sightings occur year-round in the area, opportunistic sighting reports are tracked and broadcast throughout the year.

Observer teams in the northeastern early warning system also surveyed other areas to confirm opportunistic sighting reports. This effort verified reports of a large concentration of right whales (at least 26 animals) in April in the ship channel off Narragansett Bay, Rhode Island. The observations may have been a unique occurrence or, alternatively, they may reflect a spring feeding area whose importance has not previously been recognized.

**Education and Awareness Materials** — Initial efforts to inform mariners of right whale protection needs were made by the recovery plan implementation teams discussed above. Among other things, they developed flyers, brochures, and videos, and held meetings with shipping agents and port officials. Over the past two years the International Fund for Animal Welfare, in consultation with the Commission, the Service, regional implementation teams, and representatives of the maritime community, expanded these education and outreach efforts by developing material on right whales to be added to regional navigation charts and *United States Coast Pilots* published by the National Ocean Service. The charts and *Coast Pilots* are basic references designed to inform mariners of environmental conditions, navigation features, and general knowledge required to navigate safely within the geographic area covered.

The additions to nautical charts cite relevant regulations prohibiting approaches to right whales closer than 500 yards and mark the boundaries of designated critical habitats. Additions to the regional *Coast Pilots* provide information on the status of right whales, how to identify them, and where they are

likely to occur. They also provide excerpts from relevant regulations and advice on how to avoid hitting whales. Among other points, they note that vessel operators should not assume that whales will avoid ships, but should keep a sharp watch for right whales, listen for whale advisory broadcasts, remain at least 500 yards from right whales, and be aware that reduced speeds will likely reduce the chance of hitting right whales as well as other whales.

The Commission helped draft the new material, and on 30 September 1998 the National Marine Fisheries Service wrote to the Commission advising that the National Ocean Service had published new editions of *Coast Pilots 1* and *2* for the northeastern U.S. coast in May 1998 and that new editions of *Coast Pilots 3* and *4* for the mid-Atlantic and southeastern coast would be published in 1999. They also noted that 27 nautical charts would need to be changed and that, as they are reissued over the next several years, references to right whale rules and the boundaries of critical habitats would be shown on each chart.

In addition, the International Fund for Animal Welfare has developed a brochure, placard, and short film for distribution to mariners. The brochure and placard, initially intended for use in New England, were completed in 1997 and include information similar to that being added to the charts and *Coast Pilots*. They were subsequently modified to apply to both New England and the southeastern U.S. coast, and in 1998 the National Marine Fisheries Service, the Coast Guard, and the Massachusetts Port Authority jointly provided funds for printing and distribution. Also in 1998 the International Fund for Animal Welfare began development of a short film on right whale protection needs intended for distribution to operators of large vessels calling at east coast ports. The film, jointly funded by the agencies cited above plus the Navy, Canada's Department of Fisheries and Oceans, the Massachusetts Environmental Trust, and the Gulf of Maine Council, is expected to be distributed in 1999. Also in 1999 the Coast Guard expects to revise its examination for maritime licenses, which are required for professional mariners, to include questions on right whale protection needs.

**Mandatory Ship Reporting System** — As noted above, the Navy has directed that its vessels transiting the right whale calving grounds contact its Fleet Activities Control and Surveillance Facility before entering the area to obtain recent whale sighting reports and related recommendations. The measure helps ensure that its vessel operators are reminded of the need for special vigilance and caution regarding right whales. The Navy also restricts north-south travel through the calving grounds to the extent possible to minimize travel distances through areas where right whales are most likely to occur. Similar measures have not been established for commercial ships operating in the same area, although the need to do so has been recognized.

In this regard, the International Maritime Organization (IMO), a specialized agency of the United Nations, provides a forum for countries to address management needs related to international shipping. The U.S. Coast Guard has lead responsibility for representing the United States at IMO meetings. As discussed below, in December 1998 the IMO unanimously approved a mandatory ship reporting system to provide mariners with information to help reduce the risk of hitting right whales.

Given the relevance of IMO responsibilities for international shipping, the Marine Mammal Commission determined that the IMO should be advised of the conservation issues involving collisions between ships and right whales and the possible need for action. Therefore, the Commission, in consultation with the National Oceanic and Atmospheric Administration, drafted an information paper for submission to the IMO. The draft paper described the effects of ship traffic on right whales, the steps being taken by the United States to address the problem, and the possible need to apply IMO measures, such as those for ship routing and mandatory ship reporting, to help mitigate vessel-related impacts on right whales. The draft paper was transmitted jointly to the Coast Guard by the two agencies and, after further revision, it was submitted for consideration at the 40th session of the IMO's Marine Environment Protection Committee on 18–25 September 1997.

To ensure that vessel operators are aware of right whale protection needs, related advice in *Coast Pilots*,

and broadcasts of right whale sightings, the National Oceanic and Atmospheric Administration determined that immediate steps should be taken to develop a mandatory ship reporting system for the right whale calving grounds off the southeastern U.S. coast and key feeding areas off Massachusetts. Therefore, in 1997 the Service began developing a proposal and action paper to the IMO for a mandatory ship reporting system covering the key shipping corridors in both areas. Its efforts were undertaken in consultation with the Commission, the Coast Guard, and the regional implementation teams, and with technical assistance from the International Fund for Animal Welfare.

The system proposed by the Service would require all commercial ships greater than 300 gross tons to contact a shore station for information on right whales as the vessel enters defined areas around the calving grounds off Florida and Georgia and feeding areas off Massachusetts. These areas encompass critical habitats and adjacent waters where right whales are likely to occur and also include major shipping lanes. Because about 90 percent of all commercial vessels greater than 300 gross tons carry equipment for INMARSAT communications — a satellite communications system that transmits telex messages to ships around the world — it was decided to develop an automated reporting system using the INMARSAT communications system.

The system would work as follows. When entering either of the two designated areas, the ship would be required to contact a shore station via INMARSAT and provide its call sign, position, course, speed, and destination. This information will be used to help evaluate ship strike risks. Upon contact, the shore station would automatically send a response noting the importance of the area for right whales, the need for special caution to avoid hitting right whales, the availability of related advice in *Coast Pilots*, current information on right whale sighting locations, and the need to monitor NAVTEX and other broadcasts for any new right whale advisories. The few large vessels without INMARSAT communication equipment would be required to report via voice radio to receive the same message.

To date, fewer than 10 ship reporting systems have been approved by the IMO worldwide. In each case

the purpose has been to enhance navigational safety or to increase protection of the marine environment from pollution. Using the measure to protect an individual endangered species was therefore a novel application that raised concern that other countries might propose similar systems to protect less endangered species and thereby cause a proliferation of ship reporting systems that would infringe on navigational freedom. The National Security Council and the Council on Environmental Quality examined this possibility closely. To address this concern, the National Oceanic and Atmospheric Administration's proposal was revised to explain the particularly unusual and urgent needs that prompted its action. In doing so, it set forth the high standards considered necessary to proceed with a mandatory ship reporting system to protect the highly endangered northern right whale. With this clarification, and strong support from the National Oceanic and Atmospheric Administration, the Marine Mammal Commission, and certain other agencies, President Clinton on 23 April 1998 instructed U.S. representatives to the IMO to seek approval of the proposed mandatory ship reporting system.

IMO approval of ship reporting systems is a two-step process. Proposals first must be approved by the IMO Subcommittee on Safety of Navigation and then by the Maritime Safety Committee. As directed by the President, the Coast Guard submitted an action paper drafted by the National Oceanic and Atmospheric Administration, in consultation with other agencies, including the Marine Mammal Commission, for the 44th session of the Subcommittee on Safety of Navigation held on 20–24 July 1998. An information paper based on the initial draft prepared by the Marine Mammal Commission for the 1997 meeting of the Marine Environment Protection Committee also was submitted to provide background. Delegations of some countries expressed concern about the possible proliferation of reporting systems to protect individual species. However, the U.S. delegation, led by the Coast Guard and including a representative of the National Oceanic and Atmospheric Administration, succeeded in securing the approval. A discussion of the unusual circumstances necessitating use of the measure to protect northern right whales was included in the subcommittee's report and the proposal was referred to the 70th session of the Maritime Safety Committee scheduled for 7–11 December 1998.

On 3 December 1998 the Marine Mammal Commission wrote to commend the Coast Guard for its efforts to secure approval of the proposal by the IMO subcommittee and to recommend that it place a high priority on obtaining approval by the Maritime Safety Committee. Coast Guard and National Oceanic and Atmospheric Administration officials attending the meeting did so and, on 7 December 1998, the committee adopted the proposal unanimously. The committee's meeting report called for implementing the reporting system by 1 July 1999 and conducting a review of its effectiveness within three to five years. Recognizing concerns about the possible proliferation of ship reporting systems to protect individual species, the report expressed the committee's view that such systems may be warranted to protect individual species when there is clear evidence of direct physical impacts from ships on that species, the impacts constitute the species' greatest known threat, the species is in imminent danger of extinction, and the affected area is essential habitat through which major shipping routes pass.

To clarify domestic authority for the mandatory ship reporting system, the U.S. Congress also amended section 11 of the Ports and Waterways Safety Act. The amendment, included in the Coast Guard Authorization Act of 1998 passed in December, provides the Coast Guard with explicit authority to implement and enforce the mandatory ship reporting system in cooperation with the IMO.

At the end of 1998 the National Oceanic and Atmospheric Administration and the Coast Guard were developing arrangements to implement the ship reporting system by 1 July 1999.

**Ship Collision-Related Research** — Early in 1998 the Marine Mammal Commission learned that a high-speed catamaran had been purchased to replace a conventional ferry that ran between Bar Harbor, Maine, and Yarmouth, Nova Scotia. The new ferry, scheduled to begin operating in June 1998, was to run at speeds of up to 42 knots (48 miles per hour) across the Gulf of Maine through waters used by right whales to reach preferred feeding and nursery areas in the Bay of Fundy. Some right whales also occasionally feed in waters along the ferry route. Given the vessel's speed and its operation during periods of poor

visibility (*e.g.*, in fog or at night), concern was raised in both the United States and Canada that it would not always be possible to avoid whales. Concern also was raised about the vessel's engine noise and its effect on whale distribution and movements.

Neither U.S. nor Canadian vessel certification requirements involve an assessment of environmental impacts associated with routine vessel operation. However, given plans for the new ferry and similar plans to introduce other high-speed vessels off New England, the National Marine Fisheries Service, the Northeast Implementation Team, the Stellwagen Bank National Marine Sanctuary, and the New England Aquarium jointly convened a workshop on 11 May 1998 to review plans for new high-speed vessels, their possible effects on whales, and related research needs. In response to concerns about possible effects on whales, the Canadian company operating the Bar Harbor-Yarmouth ferry voluntarily contracted for research and monitoring studies to help assess the risk of interactions between whales and the new ferry. The studies included placing a trained whale observer aboard the vessel to assess the crew's ability to detect and avoid whales, and a study to assess noise levels produced by the ferry.

On 6 July 1998 the Commission commented to the ferry operator's contractor on its research efforts. The letter commended the constructive efforts being taken by the ferry operator and the contractor to examine the issue and suggested that they consult with the National Marine Fisheries Service and other agencies to design and carry out certain complementary studies to improve the ability to evaluate the research results. The letter also suggested establishing a protocol of steps to be followed in the event a whale is known or thought to have been struck (*e.g.*, reporting the accident to officials and making efforts to verify the species and condition of the animal). The letter also expressed serious doubt that the ferry operator would be able to detect and avoid any right whales when traveling at the high speeds at which the ferry would operate, particularly given the frequency of dense fog and severe weather along the route.

The Commission also wrote to the National Marine Fisheries Service on 10 July sending a copy of its comments to the contractor and offering related

recommendations. In its letter to the Service, the Commission recommended that it consult with the vessel operator to develop a protocol on steps to be taken if a whale is struck. The Commission also noted that the potential for hitting whales was not unique to the new ferry, and that if the risk is related to vessel speed, which seems likely, then the potential for hitting whales could increase as the number of high-speed vessels increases. The Commission therefore concluded that there was an urgent need to assess factors related to the likelihood of whales being hit by high-speed as well as conventional vessels.

In this regard, the Commission noted that whales could be vulnerable to ship strikes for one of three reasons: (1) they are unable to detect approaching ships when they are at the surface in front of an approaching vessel; (2) they are able to detect ships but fail to recognize the danger and take no action to avoid them; or (3) they are able to detect ships and recognize the danger, but they cannot react in time to avoid being hit. These alternative hypotheses would be a useful point from which to begin investigating factors related to ship strikes, and the Commission recommended that the Service consult with the ferry operator and its contractor, as well as the Coast Guard and the Navy, to design and cooperatively fund studies to determine sound levels likely to reach whales in front of various classes of commercial and military ships, and the responses of different whale species to those sounds.

The National Marine Fisheries Service replied by letter of 3 October 1998 noting that it was working with the ferry operator's contractor to evaluate the ability of onboard observers to detect whales, to examine data on the occurrence of whales along the ferry's route, and to develop a protocol for reporting and searching for whales that may be hit by the ferry. The Service also noted that, within funding constraints, it would consider support for the recommended studies to examine noise levels and whale behavior in front of different types of ships.

Another fundamental research need is to improve the detection of right whales in order to warn ships of their presence. As noted above, early warning systems established for this purpose currently rely on aerial observers. Given the length of time whales are

submerged, aerial observers can detect only about 50 percent of the whales present along a survey track, even under the best of conditions. The frequency of poor sighting conditions, the size of areas where right whales may occur, and bad weather further restrict detection by aerial surveys. Recognizing these limits and the importance of finding a better means to detect whales, the Navy took the initiative to examine the use of fixed and towed hydrophone arrays to detect whales by triangulating the position of vocalizing whales. Although the results of research conducted in 1996 in the calving grounds demonstrated an ability to locate some animals, whales did not vocalize frequently enough for the approach to be useful.

On 10 July 1997 the Commission wrote to commend the Navy for its past efforts and initiative. Because of the limited success of passive acoustic technology, the Commission asked the Navy to consider support for studies to assess the use of active sonar to detect whales. In this regard, the Commission suggested studying the feasibility of placing active sonar units along a ship channel to detect the presence of whales. The Navy expressed a willingness to consider this request and, to help determine the merits and scope of such research, the Commission wrote to the Navy on 12 November 1997 suggesting that a workshop be held to define what, if any, research might be warranted. The Navy sought further advice on organizing such a workshop from an interagency coordinating committee on ocean noise that includes representatives from the Navy, the National Marine Fisheries Service, the Commission, the Minerals Management Service, and the U.S. Geological Survey. A workshop, scheduled for early October 1998, had to be canceled for procedural reasons and, as of the end of 1998, it was the Commission's understanding that the Navy planned to schedule a new meeting early in 1999.

As a related matter, scientists with the National Marine Fisheries Service's Northeast Fisheries Science Center participated in a study in 1998 that demonstrated an ability to detect whales with active sonar.

### **Entanglement of Right Whales in Fishing Gear**

The second principal source of human-related right whale mortality and injury is entanglement in com-

mercial fishing gear. Although only two of 43 confirmed deaths since 1970 have been attributed solely to entanglement and only two other entangled whales were struck and killed by a ship, the low number of confirmed entanglement deaths is believed to underrepresent the threat that commercial fishing gear poses to right whales in the western North Atlantic Ocean. An analysis of scars seen on photographs of individual right whales indicates that more than 60 percent of the population has been entangled at some time in fishing gear. In addition, eight whales were last seen with potentially fatal entanglements or related injuries and may have died, and 14 other whales have been photographed with serious, although non-fatal, injuries caused by entanglements. Based on gear removed from entangled animals, most interactions appear to involve gillnets and lines associated with lobster traps.

To address entanglement threats, the National Marine Fisheries Service formed the Atlantic Large Whale Take Reduction Team on 6 August 1996. Established pursuant to the 1994 amendments to the Marine Mammal Protection Act, the team was charged with developing and subsequently reviewing the effectiveness of take reduction plans to reduce incidental take levels for right whales, as well as humpback, fin, and minke whales along the U.S. east coast. Measures set forth in the plan are required to reduce incidental take levels below a potential biological removal level calculated separately for each affected whale population. The team includes representatives of involved fisheries, environmental groups, state and federal agencies (including the Marine Mammal Commission), and the academic community. The fisheries of concern to the team are the east coast lobster fishery, the New England sink gillnet fishery, the mid-Atlantic coastal gillnet fishery, and the southeastern U.S. shark gillnet fishery.

The potential biological removal level is calculated using a formula intended to estimate the maximum number of animals that can be removed from a stock (not including natural mortality) and still ensure that it remains at or increases toward its optimum sustainable population level. For right whales in the western North Atlantic Ocean, the Service has calculated this number to be 0.4 whales per year. Given the critical status of the right whale population and the fact that it is the only large whale population along the east

coast whose entanglement rate exceeds the calculated potential biological removal level, the team devoted virtually all of its attention to right whales.

To reduce the incidental take of right whales to less than one whale per year, the team considered measures in three areas: (1) fishing restrictions in key habitats where right whales and gear are most likely to occur; (2) the identification and use of fishing gear designs thought to be less likely to entangle whales (*e.g.*, gear with breakaway links or light line from which whales might break free); and (3) efforts to detect entangled whales and remove the attached gear. Although the team was required to develop a plan within six months that all members could support, it was unable to agree on a set of measures to meet the required objective. The most contentious issues involved the extent of seasonal time-area fishing closures and requirements for gear thought to be less likely to entangle whales. Therefore, on 3 February 1997 the team submitted a report to the National Marine Fisheries Service identifying those areas of agreement and of disagreement.

After considering the team's report, the Service developed a proposed take reduction plan incorporating measures in each of the three areas considered by the team. The proposed plan, published in the *Federal Register* on 7 April 1997, included gear design requirements that would have required most New England lobster fishermen to purchase new line or buoy systems intended to reduce entanglement risks. The measures, however, elicited strong opposition from affected fishermen because of the cost and the questionable likelihood that whales would encounter fishing gear in all areas. In the Marine Mammal Commission's 5 June 1997 comments on the proposed plan, it noted that gear design requirements were largely untested and based on questionable assumptions. It therefore recommended that most gear design restrictions be deferred pending further research. To achieve some of the risk reduction that had been anticipated from the gear design requirements, it recommended strengthening time-area fishing closures within right whale critical habitats.

On 22 July 1997 the Service published an interim final take reduction plan that eliminated most of the proposed gear design requirements pending further

studies. It also called for increased efforts to detect and disentangle whales. It did not strengthen the time-area fishing closures for designated critical habitats beyond those in its April proposal. A more detailed description of these developments is included in the Commission's annual report for 1997. At the end of 1998, the Service was preparing a final rule to implement its take reduction plan and a meeting of the Atlantic Large Whale Take Reduction Team was scheduled to review recent Service actions. Some of the actions taken in 1998 are briefly described below.

**Research on Fishing Gear Designs** — To identify and develop fishing gear less likely to entangle whales, the Service formed a gear advisory group in 1997. Based on its recommendations the Service provided approximately \$130,000 for a series of studies in 1998. Most studies were directed toward designing gillnets and lobster gear from which whales might break free and thereby avoid injuries and deaths associated with lengthy periods of entanglement. They included studies to identify the components of fishing gear most likely to entangle whales, the parts of a whale's anatomy most likely to become entangled and how this occurs, the profiles of line and other gear components in the water, the breaking strength of various gear components currently in use, the minimum breaking strength necessary for those components to function effectively in different fishing situations, the forces that whales of different sizes might exert against those gear components if they became entangled, and possible designs and applications for weak links that would allow gear to function properly while also increasing the ability of whales to escape unentangled. Other approaches being considered include the use of degradable line and designs for remote acoustical release buoy systems that would keep gear marking buoys at the bottom until the gear is ready to be retrieved.

As of the end of 1998 some promising approaches had been identified for further field testing.

**Disentanglement Efforts** — Using techniques developed in Canada to disentangle humpback whales, a team of scientists with the Center for Coastal Studies in Provincetown, Massachusetts, began attempts to disentangle right whales early in the 1990s. To date the team has disentangled four right

whales, one of which, as noted above, was disentangled three times during 1998 (see Figure 2). To expand such capabilities to areas other than southern New England, the Service's take reduction plan called for purchasing additional disentanglement equipment, training other entanglement response teams, and holding a series of outreach workshops for fishermen.

For these purposes, the Service provided approximately \$145,000 in 1998. The outreach workshops conducted in 1998 were held principally in Maine. They sought commitments from fishermen to promptly report observations of entangled whales and, if possible, to remain with the animals until a disentanglement team arrived. The workshops were well attended, and plans are being made to hold additional workshops in other east coast states. Disentanglement equipment is being purchased for placement at strategic locations and arrangements have been made with the Coast Guard to transport disentanglement teams at a moment's notice to rescue any right whale reported as entangled.

**Time-Area Fishery Management Measures** — As noted above, the Service's interim final take reduction plan includes time-area fishing restrictions for each of the three critical habitats designated for right whales along the U.S. east coast. These areas include Cape Cod Bay and the Great South Channel off Massachusetts and the calving grounds off Florida and Georgia.

Regulations for the Cape Cod Bay critical habitat close the entire area to gillnet fishing from 1 January through 31 May. This period includes the peak period of right whale occurrence in the bay. Lobster fishing during this period is permitted subject to certain gear design requirements, such as stringing at least four traps to each buoy and using a weak link between the buoy and buoy line that would detach when pulled with a force of 1,100 pounds or greater.

For the Great South Channel, the entire critical habitat is closed to lobster fishing from 1 April to 30 June, which is the peak period of right whale occurrence in that area. Gillnet fishing also is prohibited during this period in most of the critical habitat; however, the principal gillnet fishing area within the critical habitat — an area along its western boundary — is open to fishing provided that gillnets meet



Figure 2. Unidentified fishing gear being removed from a right whale found entangled in Cape Cod Bay on 14 July 1998. (Photograph courtesy of Center for Coastal Studies, Provincetown, Massachusetts)

certain gear design requirements. For the calving area off Florida and Georgia, fishing with drift gillnets is prohibited from 1 November through 31 March. This is the only time right whales are present in those waters.

In most cases, the fishing closures apply during times when almost no fishing traditionally occurs. For example, in Cape Cod Bay the January–May gillnet fishing closure applies to a period when virtually no gillnet fishing takes place. Similarly, closure of the lobster fishery in the Great South Channel coincides with a period when no lobster fishing has occurred in that area. Conversely, when low levels of fishing effort in critical habitats have coincided with periods of peak whale occurrence, the regulations typically allow fishing to continue or increase subject to certain gear requirements that incorporate design features already in common use. Thus, with the possible exception of the calving area, it seems doubtful that the plan's time-area manage-

ment measures will substantially alter existing fishing gear or fishing practices in ways that would reduce entanglement risks to right whales.

### **Establishing a National Whale Conservation Fund**

In November 1996 the Marine Mammal Commission reviewed both the northern right whale and manatee recovery programs. The manatee recovery program, long considered one of the best marine mammal conservation programs in the United States, has been a success because it can carry out a broad range of research and management activities thanks to strong financial support provided by the State of Florida through a dedicated Manatee Trust Fund. The trust fund, established by the state legislature in the late 1980s and supported largely by a share of state boat registration fees, the sale of state manatee license plates and stickers, and voluntary donations, has

contributed more than \$2 million per year to manatee recovery work. This is in addition to federally appropriated money. In comparing the manatee and right whale recovery programs, it became apparent that chronic underfunding was severely hampering right whale recovery work and that new sources of support were needed.

On 12 December 1996 the Commission recommended to the National Marine Fisheries Service that it try to establish a conservation fund for northern right whales to supplement normal appropriations. In particular, the letter suggested soliciting contributions from interested members of the public and industries, such as shipping companies or whale-watching operators, whose activities either affected or benefitted from right whales. The Service's 16 October 1997 response expressed interest in the idea and a willingness to work with the Commission in exploring such an approach.

During the summer of 1997 Senator Judd Gregg of New Hampshire, believing the idea to be potentially beneficial, asked the Marine Mammal Commission, in consultation with the National Fish and Wildlife Foundation, to help draft a bill to establish a whale conservation fund to be administered by the National Fish and Wildlife Foundation. The fund was to provide supplemental support for research and management activities to conserve whale populations of the United States, with priority attention to endangered species, such as the northern right whale. The fund also was to rely on voluntary contributions from private, industry, and government sources, with no direct congressional appropriations.

In response to the request, the Commission prepared a draft bill that was subsequently revised and introduced on 16 June 1998 by Senators Gregg and Ted Stevens of Alaska. To expedite action on S. 2172, the "National Whale Conservation Fund Act of 1998," it was offered as an amendment to the appropriations bill for State, Commerce, Justice, and related agencies, which was passed by Congress on 19 October 1998.

The National Whale Conservation Fund Act of 1998 amends the National Fish and Wildlife Foundation Establishment Act. It notes the inadequacy of

available funds for the conservation and recovery of whale populations in U.S. waters and the need to raise money from non-federal sources to carry out such work. It authorizes the Foundation, in consultation with the Marine Mammal Commission and the National Oceanic and Atmospheric Administration, to establish a separate interest-bearing account called the National Whale Conservation Fund to support research, management, and educational programs contributing to the protection, conservation, or recovery of whale populations in U.S. waters. It directs that priority be given to the conservation needs of whale populations that are most endangered, including the northern right whale.

To generate income for the fund, the Foundation may accept gifts and bequests from any sources and enter into agreements for the design, production, copyright, and marketing of logos, seals, decals, stamps, and other items. For example, fund administrators could enter into voluntary agreements with whale-watching operators to authorize use of a Fund logo for advertising purposes in return for a commitment to donate a nominal non-taxable amount from ticket sales (*e.g.*, \$1 per ticket). With perhaps one million participants annually on whale-watching trips in New England alone, involvement by whale-watching operators throughout the United States could generate substantial money for the fund. In addition, the Act authorizes the Secretary of Commerce to transfer to the fund any civil penalties it receives pursuant to violations of section 105(a)(1) of the Marine Mammal Protection Act.

At the end of 1998 the Commission was working closely with the office of Senator Gregg, the National Fish and Wildlife Foundation, and the National Oceanic and Atmospheric Administration to complete plans for the fund.

### **Marine Mammal Commission Northern Right Whale Review**

Between July 1995 and March 1996 eight right whale carcasses were found along the east coasts of the United States and Canada. These deaths alone equaled nearly 3 percent of the western North Atlantic Ocean right whale population. Considering the

possibility that other deaths occurred unobserved during this period, the eight confirmed deaths underscored the urgency of strengthening recovery efforts for the population. The Marine Mammal Commission therefore held a review of the right whale recovery program during its 12–14 November 1996 annual meeting. Based on that review, the Commission concluded that at least \$3 million a year would be needed to carry out an adequate right whale recovery program. Funding by the Service and other federal and state agencies participating in the right whale recovery program fell far short of this level. To meet additional funding needs, the Commission wrote to the Service on 12 December 1996 recommending that it increase funding for its recovery efforts and, as noted above, that it explore alternative ways of encouraging and directing supplemental funding for right whale work from private and industry sources.

With regard to the Service's program, the Commission's December 1996 letter recommended that the Service increase support for its right whale recovery activities to at least \$1.25 million per year. Specifically it recommended that those funds be used to hire a right whale recovery program coordinator; initiate or expand surveys in key right whale feeding areas in the northern part of the population's range; develop fishing gear less likely to entangle whales; identify and implement steps to reduce ship strikes by commercial vessels; initiate a long-term telemetry program to better identify right whale habitat-use patterns; develop a geographic information system to improve and speed analyses of data on right whales and right whale habitats; and develop a population model based on available life history data. Recognizing that, even at this level, support would not be adequate to accomplish all that should be done, the Commission recommended that the Service seek greater support from relevant private and industry sources, such as shipping companies whose actions pose such a substantial threat to right whales but that have contributed little to address the problem, by exploring steps to establish a right whale conservation fund.

As discussed above, the Service, in cooperation with other agencies and groups significantly strengthened right whale recovery efforts in 1997 and 1998. At the same time, however, new information and analyses on right whales in the western North Atlantic

Ocean indicated that the population's status was even more critical than previously recognized. The Marine Mammal Commission therefore held another review of the right whale recovery program during its 1998 annual meeting on 10–12 November in Portland, Maine. Its purpose was to reexamine the recovery program in light of new developments and progress since 1996 to ensure that everything possible was being done to encourage the population's recovery.

Based on its review, the Commission wrote to the National Marine Fisheries Service on 21 December 1998 providing further comments and recommendations. It was apparent that many of the priority needs identified during the Commission's 1996 review either had been or were being addressed and that impressive progress had been made. Among other things the Service had increased funding for its right whale recovery activities to more than \$1 million in 1998, it had taken steps to develop a three-year funding plan, most of the work it had supported either complemented or supplemented essential tasks also receiving support from other agencies and groups in both the United States and Canada, and available funding appeared to be directed to good effect toward necessary, constructive tasks. The Commission commended the Service for the steps it had taken to build on and coordinate cooperative partnerships with various state agencies, the Coast Guard, the Navy, and non-governmental research groups.

Based on information presented during the review, however, it was apparent that certain vital recovery tasks either were not being addressed at all or were not being adequately funded, that some fundamental tasks still depended on unpredictable private funding sources, and that steps to ensure a stable, long-term funding base for ongoing activities were not being taken. For example, the Service's fiscal year 1999 budget request included only \$200,000 for right whale recovery work. Although Congress appropriated \$350,000 for this purpose in 1999 — an increase over the requested level that reflects Congressional concern for the species — the Service will still need to allocate more than \$700,000 from other sources in order to maintain funding at the 1998 level. Even this level of funding, however, is not sufficient to undertake all essential tasks. Because the Service did not include necessary ongoing costs in its base-level funding

request for the program, the Commission was concerned that continued support for fundamental recovery tasks remained uncertain, long-term planning efforts were being gravely compromised, and the Service's long-term commitment to leading cooperative recovery efforts appeared uncertain.

To redress this situation, the Marine Mammal Commission's 21 December 1998 letter recommended that the Service increase its annual base-level funding request for the right whale recovery program to at least \$1.385 million for the foreseeable future. The Commission based this recommendation on the need to ensure continued support for the following fundamental ongoing tasks: archiving and analyzing photo catalog data (\$100,000); providing an appropriate share of costs for annual right whale surveys off Florida and Georgia (\$250,000), off Massachusetts (\$160,000), and in the Bay of Fundy (\$25,000); providing an appropriate share of costs for operating a mandatory ship reporting system in the species' calving grounds and key feeding areas (\$125,000); continuing efforts to disentangle right whales and develop fishing gear less likely to entangle whales (\$325,000); developing and maintaining a right whale geographic information system (\$50,000); implementing a satellite telemetry program (\$150,000); and providing reasonable flexibility to address other short-term projects, studies, emergencies, or needs on an annual basis (\$200,000).

As noted above, the Service's fiscal year 1999 budget included no funding for certain important tasks, including some recommended by the Commission in 1996. For example, there were no plans to help support right whale surveys in the Bay of Fundy, to initiate a telemetry program to track whales using satellite-linked radio tags, to conduct surveys of right whales off the Chesapeake Bay, to help support efforts to investigate the use of active sonar to detect whales, or to study noise levels and the behavior of whales in front of approaching vessels. To address these tasks during the coming year without affecting other high-priority work already planned, the Commission recommended that the Service, in consultation with the Commission, develop a supplemental budget request.

Finally, as noted above, the Commission's 21 December 1998 letter to the Service noted that the National Whale Conservation Fund Act of 1998 provided a valuable mechanism to encourage and direct financial contributions from private and corporate entities to whale conservation programs, including the right whale program. To meet this goal, an initial infusion of funds is needed to pay start-up costs, such as hiring a fund director. To initiate fund operations, the Commission therefore recommended that the Service ask the National Oceanic and Atmospheric Administration to provide \$250,000 to the National Fish and Wildlife Foundation for deposit in the National Whale Conservation Fund. The Commission noted that this one-time expenditure would produce many times that amount to help carry out essential recovery work for right whales and other large whales.

As indicated above, the Coast Guard has become an essential partner in many recovery activities. In particular, it has contributed aircraft and substantial funding to help carry out early warning system surveys to alert mariners of the presence of whales in the calving grounds and key feeding areas, broadcast whale advisories to mariners over its NAVTEX and voice radio systems, helped develop the proposal for a mandatory ship reporting system in key right whale habitats, and sought approval for the system from the International Maritime Organization. It also has provided vessel and air support to retrieve floating right whale carcasses and deploy whale disentanglement teams, helped fund the production of educational materials on right whales for mariners and distributed those materials, enforced related fishery and whale protection regulations, and participated in meetings of the regional right whale implementation teams.

From presentations at the Commission's 1998 review, it was clear that the Coast Guard was giving a high level of attention to all these areas. On 3 December 1998 the Commission wrote to the Coast Guard noting the importance of these contributions to the right whale recovery program and commending the Coast Guard for its constructive, well-placed support. The Commission noted the Coast Guard's important role in securing approval of the proposed regional mandatory ship reporting system by the IMO's Subcommittee on Safety of Navigation. The

organization's approval of the proposed system was to be decided at a meeting of its Maritime Safety Committee on 7–11 December 1998. Given the Coast Guard's lead role in representing the United States at this meeting, the Commission's 3 December letter recommended that Coast Guard officials participating in the meeting seek the committee's approval of the proposal as a matter of highest priority. As noted above, this was done and the committee unanimously approved the proposal on 7 December 1998.

As a related matter, the Commission wrote to the Coast Guard on 23 December 1997 about the need to improve the Coast Guard's NAVTEX broadcasting system in the northern portion of the right whale calving grounds off Florida and Georgia. Existing NAVTEX facilities for this area have been unable to provide complete or dependable coverage and, because of reliance on the system to transmit regional right whale advisories, as well as other navigational safety advisories, the Commission recommended that the Coast Guard take steps to fill the regional gap in NAVTEX broadcast coverage by installing an additional transmitter. During the Commission's review, a representative of the Coast Guard advised the Commission that the Coast Guard had obtained funding for a new NAVTEX transmitter scheduled to be installed in mid-1999. In its 3 December letter to the Coast Guard, the Commission noted the added importance of this new facility given efforts to develop a regional mandatory ship reporting system, and it extended the Commission's sincere thanks to the Coast Guard for its efforts to address this need.

The Navy, which operates several major facilities adjacent to the right whale calving grounds, also has been an essential partner in the right whale recovery program. Among other things, it has modified its vessel operations and exercises in the calving grounds to improve protection of right whales, provided staff and expertise to coordinate the immediate dissemination of right whale sighting reports filed by right whale survey teams and other sources along the coasts of Florida and Georgia, contributed substantial funding to support regional early warning system surveys and complementary surveys in and around the right whale calving area, helped fund a radio tracking study of right whales, undertaken studies to assess the ability of acoustic technology to locate whales and

helped gather and correlate environmental data with right whale sighting data to assess factors affecting right whale distribution and movements.

These activities, as well as Navy involvement in other pressing marine mammal conservation issues, make it apparent that the Navy is strongly committed, not only to the principle of operating in an environmentally responsible manner, but also to making the extra effort wherever possible to apply its expertise and resources to help others address urgent conservation problems. Therefore, by letter of 10 December 1998, the Commission wrote to commend the Navy for its constructive and important contributions to the right whale recovery program, as well as to certain other pressing marine mammal conservation issues.

Feeding habitats essential to the western North Atlantic population of right whales also occur in Canada, where lead responsibility for right whale recovery rests with the Department of Fisheries and Oceans. The department has implemented a right whale recovery program and concerted efforts have been made by the staff of the department and the National Marine Fisheries Service to coordinate related efforts. Among other things, the two agencies have jointly funded various research and management projects and adopted similar approaches to identify essential habitats and mitigate impacts associated with ship traffic and commercial fishing. A representative of the department participated in the Commission's 1998 meeting.

Based on presentations at the meeting, it was apparent that there is broad agreement among officials in Canada and the United States on the needs to be addressed and that the efforts to coordinate action on right whale recovery had the potential to become a model for international collaboration on pressing living marine resource conservation issues. As in the United States, however, funding for right whale recovery efforts have been far below what is needed. Therefore, based on information presented during the Commission's review, the Commission wrote to Canada's Department of Fisheries and Oceans on 8 December 1998. Because of the high level of international concern for right whales and the fact that its recovery would depend on both countries' ability to increase funding for essential recovery tasks, the

Commission noted steps that had been taken to increase funding in the United States and it requested that the department also do all that it could to increase funding for Canada's right whale recovery program.

### **Northern Right Whales in the Eastern North Pacific Ocean**

Historical whaling records indicate that a population of right whales occurred in the eastern North Pacific in waters south of Unimak Pass and Kodiak Island, Alaska, during summer. Intensive whaling in the mid- to late 1800s severely depleted the population. There is little information on the population's status through the early 1900s. Although about two dozen right whales may have been killed during the first third of this century, the population may have been recovering during that period. By the late 1950s and early 1960s it is estimated that several hundred animals occurred in this population. However, previously classified data concerning illegal whaling by the former Soviet Union indicates that several hundred right whales were taken from this population during the mid-1960s. Fewer than 30 right whale sightings, most involving one or two animals, have been recorded in the eastern North Pacific between the mid-1960s and mid-1990s, and the survival of this population seems uncertain at this time.

In the summer of 1996, and again in the summer of 1997, however, one or more small groups of right whales were sighted in the eastern Bering Sea. In 1996 one sighting was made of at least four animals. In 1997 a group of five to nine animals was seen. To determine the status of right whales in the southeastern Bering Sea, the National Marine Fisheries Service and the Coast Guard made arrangements for a cooperative survey during the summer of 1998. The Service scheduled an aerial survey and the Coast Guard was to make available a ship for sea-based observers. Shortly before the survey was to begin, however, the Coast Guard had to divert its vessel to another mission and thus, only the aerial portion of the survey was conducted. During the survey a group of six whales was sighted in the eastern Bering Sea in the same area as the sightings made in 1996 and 1997. All of the animals were adults with the exception of a probable calf or juvenile seen in the 1996 sighting.

During the Commission's 10-12 November 1998 annual meeting, it was noted that the Service was considering plans to organize another joint survey with the Coast Guard for the summer of 1999. Therefore, in the 3 December 1998 letter to the Coast Guard noted above, the Commission urged the Coast Guard to make a vessel available for right whale surveys in the Bering Sea in 1999 if the National Marine Fisheries Service asked it to do so.

### **Right Whale Litigation**

Litigation alleging various violations of the Marine Mammal Protection Act, the Endangered Species Act, and other laws has been important in shaping actions by the National Marine Fisheries Service, the Coast Guard, and others to protect northern right whales. The national campaign director of GreenWorld has filed several lawsuits related to right whales. Action in the following cases was taken in 1998.

*Strahan v. Linnon* — This case began in June 1994, when the plaintiff filed suit alleging violations of the Endangered Species Act, the Marine Mammal Protection Act, the National Environmental Policy Act, and the Whaling Convention Act by the Coast Guard, whose vessels had struck and killed two right whales. The plaintiff contended that these incidents constituted illegal takings and, unless enjoined, were likely to continue. An initial ruling in this case in May 1995 directed the Coast Guard to consult with the National Marine Fisheries Service under section 7 of the Endangered Species Act, apply for an incidental take authorization under the Marine Mammal Protection Act, and prepare an environmental assessment under the National Environmental Policy Act.

The plaintiff filed an amended complaint in June 1996 raising several new claims and adding officials of the Department of Commerce as defendants. The plaintiff contended that the biological opinion prepared by the National Marine Fisheries Service for Coast Guard activities, and the biological assessment upon which it was based, were deficient. He also sought to compel the National Marine Fisheries Service to take other actions designed to conserve right whales.

As discussed in the previous annual report, the court issued a ruling in favor of the federal defendants

on 20 May 1997. The court noted that the government's actions to establish a take reduction team and develop a take reduction plan to address right whale-fishery interactions, classify the lobster fishery as a category I fishery (see Chapter III), and issue approach regulations had rendered many of the plaintiff's claims moot. As to the other claims, the court ruled that the National Marine Fisheries Service had adequately analyzed the cumulative impact of Coast Guard operations and had used the best available scientific and commercial data in preparing its biological opinion. The court also agreed with the government that the Endangered Species Act does not set time limits for implementing recovery plans or specify their content. Nevertheless, it appeared to the court that the Service was taking adequate steps to implement its right whale recovery plan.

On 3 November 1997 the plaintiff appealed the district court's ruling. The U.S. Court of Appeals for the First Circuit issued an unpublished decision in the case on 16 July 1998 affirming the lower court ruling.

*Coates v. Strahan* — This lawsuit was filed in April 1995 alleging four separate violations of the Endangered Species Act and the Marine Mammal Protection Act by Massachusetts officials. Although federal statutes were at issue, no federal agencies were parties to that litigation.

As discussed in previous annual reports, the district court ruled in 1996 that the plaintiff had demonstrated a sufficient likelihood that endangered whales are periodically taken through entanglement with gillnets and lobster gear in waters regulated by the state and that no permit authorizing such incidental taking had been issued by the National Marine Fisheries Service. The court found that the state's continued licensing of these fishing operations was likely to continue to cause harm to endangered whales and violated the Endangered Species Act. In the court's view, it was irrelevant that the permitting of fishing gear by Massachusetts was only an indirect cause of whale entanglement.

Consistent with these rulings, the court ordered the defendants to apply to the National Marine Fisheries Service for an incidental take permit for right whales under the Endangered Species Act. The court also

ordered the state to develop and submit a proposal to restrict, modify, or eliminate the use of fixed fishing gear in coastal waters of Massachusetts listed as right whale critical habitat.

The defendants appealed the ruling, claiming that (1) state licensure of gillnet and lobster pot fishing does not constitute a taking under the Endangered Species Act, (2) Massachusetts should not be required to restrict the use of this gear when it was allowed by the National Marine Fisheries Service outside of state waters, (3) it should be left to the National Marine Fisheries Service, through its rulemaking authority, to determine whether certain fishing activities should be banned in critical habitat areas, and (4) the court order violates the Constitutional division of authority between federal and state governments. The plaintiff also appealed the district court ruling, claiming that it did not go far enough to protect right whales.

In a 9 October 1997 ruling, the U.S. Court of Appeals for the First Circuit affirmed the lower court's ruling with one exception. It vacated the ruling that required Massachusetts to apply for an incidental take authorization under the Marine Mammal Protection Act. The appellate court reasoned that, because the district court had no jurisdiction to consider plaintiff's claims under the Marine Mammal Protection Act, it was not proper for the court to require compliance with the Act's provisions.

On 6 March 1998 Massachusetts petitioned the U.S. Supreme Court to review the appellate court ruling. The state asked the Supreme Court to consider three issues: (1) whether state officials commit a taking under the Endangered Species Act when they issue regulations that do not eliminate all risk that state-licensed fishermen might violate the Act; (2) whether the Endangered Species Act violates the Tenth Amendment if its taking prohibition applies to the licensing of fishing operations in state waters that might take listed species, and (3) whether the state action of licensing fishermen is the proximate cause of impermissible takings that might occur.

As noted above, the federal government was never a party to this lawsuit. Nevertheless, because of its interest in the matter, the Supreme Court invited federal officials to file a brief expressing the views of

the United States. The Solicitor General, on behalf of the United States, submitted a brief in October 1998. It noted that, since the original ruling in this case, actions taken by the National Marine Fisheries Service to establish a take reduction team and to regulate New England fisheries had significantly altered the factual underpinnings of the case. The federal government therefore recommended that the Supreme Court either (a) review the case, vacate the appellate court ruling, and remand the case to the district court to reconsider the case in light of the Service's regulations, or (b) decline to review the case.

The Supreme Court chose not to review the case.

*Humpback Whale v. Hurst* - Following an incident on 20 July 1997 when a Coast Guard vessel struck a whale, Richard Max Strahan, on behalf of the humpback whale, the right whale, and himself, filed suit against Coast Guard officials on 16 April 1998 seeking to enjoin activities that pose a risk to six species of whales and three species of sea turtles. The plaintiff contended that Coast Guard operations are "a clear and present danger to the safety of listed species..." that, unless enjoined, will result in additional, unauthorized takings. The plaintiff is seeking a declaratory judgment from the court that current Coast Guard operations violate the Endangered Species Act and the Marine Mammal Protection Act and an order directing the Coast Guard either to cease its operations or to alter them by decreasing the frequency of non-emergency operations and by imposing speed limitations. Among other things, the plaintiff asked the court to order the Coast Guard to restrict vessel speed to 5 knots during daylight hours and to cease operations entirely at night or in bad weather in areas designated as right whale critical habitat and within the boundaries of the Stellwagen Bank National Marine Sanctuary.

The defendants filed an answer to the complaint on 19 June 1998. No other action was taken in this case during 1998.

*Dead Humpback Whale v. Schmitten* — Subsequent to striking a whale on 20 July 1997, the Coast Guard reinitiated consultation on its operations with the National Marine Fisheries Service under section 7 of the Endangered Species Act. Mr. Strahan, on behalf

of five endangered species of whales and himself, filed suit on 2 July 1998 alleging that the Service has failed to complete that consultation within the required time period. He also alleged that the Service impermissibly refused to allow him to offer information or otherwise to participate in the consultation.

In a brief opposing the plaintiff's motion for a temporary restraining order in this case, the defendant noted that, contrary to allegations in the complaint, the consultation on Coast Guard operations had been concluded with the issuance of a new biological opinion on 8 June 1998. The government therefore argued that the case was moot. On this basis, the government filed a motion on 1 September 1998 to dismiss this case. The government also argued that the dead whales, named by Mr. Strahan as plaintiffs, lacked standing to sue and requested that they be dismissed from the action. As of the end of 1998 no further action had been taken in this matter.

## **Bowhead Whale** *(Balaena mysticetus)*

Bowhead whales occur exclusively in Arctic and sub-Arctic waters. There are several discrete stocks. All were severely depleted by commercial whaling by the early 1900s. Since the mid-1900s they have been classified as protected stocks by the International Whaling Commission (IWC). In the United States, the species has been listed as endangered since 1970 when the Endangered Species Conservation Act, the predecessor to the Endangered Species Act, was enacted. Despite this protection, the Bering-Chukchi-Beaufort Seas stock, perhaps the least exploited of the stocks, is the only one that has shown any signs of recovery. The other stocks in the Okhotsk Sea off eastern Russia, in the Davis Strait and Hudson Bay in northeastern Canada, and in the eastern Arctic off eastern Greenland, Norway, and northwestern Russia all number in the hundreds or fewer and show no signs of recovery.

The Bering-Chukchi-Beaufort Seas stock numbers about 8,200 animals and includes about 90 percent of all bowhead whales worldwide. Whales in this stock migrate seasonally with the advance and retreat of sea

ice, wintering in the open water and polynyas of the Bering Sea and summering in more northern feeding areas, principally in the eastern Beaufort Sea and, to a lesser extent, in the Chukchi Sea.

During the spring and fall migrations along the northern and eastern coasts of Alaska, bowhead whales are hunted by Alaska Natives from 10 coastal villages. The hunts, part of a centuries-old subsistence whaling tradition, are major cultural events and an important source of food for these villages. Recognizing the cultural and subsistence importance of such hunts, the IWC has adopted an aboriginal whaling regime under which it has established recommended quotas for subsistence hunting, including quotas for bowhead whales hunted by Alaska Natives.

### **Native Subsistence Whaling in Alaska and Eastern Russia**

Recommended quotas for aboriginal subsistence whaling are established by the IWC at the request of member nations. Quotas for protected stocks are set at a level that will allow the stocks to recover while meeting the documented needs of the affected Native communities. Member nations are responsible for implementing the recommended quotas. In the United States, bowhead whale quotas are implemented under a cooperative agreement between the National Oceanic and Atmospheric Administration and the Alaska Eskimo Whaling Commission — a Native organization established to represent and oversee whaling by Alaska Native whalers. Among other things, the Eskimo Whaling Commission allocates quotas among whaling villages in Alaska and works to improve the safety and efficiency of Native subsistence whaling.

As noted in the Marine Mammal Commission's previous annual report, the IWC at its annual meeting in October 1997 set a five-year block quota of 280 bowhead whales for the Bering-Chukchi-Beaufort Seas stock. The quota was adopted in response to a joint proposal from the United States and the Russian Federation. It applies from 1998 through 2002 and reflects a decision by the Russian Federation to allow Chukotka Natives in eastern Russia to resume the take of small numbers of bowhead whales for subsistence

purposes — a practice that was stopped by the former Soviet Union in the early 1970s.

Under the five-year block quota, Natives in Alaska and Chukotka may land 280 bowhead whales over the five-year period. No more than 67 animals may be struck each year, except that up to 15 unused strikes in any year may be carried forward to the next year.

In June 1998 representatives of the United States and the Russian Federation signed an agreement specifying steps that will be taken to ensure that the quotas are not exceeded. Under the agreement, Russian Natives were allocated up to 7 strikes in 1998, and Alaska Natives were allocated up to 75. Early in 1999 representatives of the two countries are to confer to decide on allocations for 1999, including any strikes that may be carried forward from 1998. Similar meetings will be held in subsequent years to allocate the quotas.

The annual numbers of strikes and landings by Alaska Natives since 1973 are shown in Table 2. In 1998 Chukotka Natives reported taking only one bowhead off Sireniki.

### **Native Subsistence Whaling in Canada**

As noted in previous annual reports, Natives in Canada took four bowhead whales between 1991 and 1996. Two were taken from the Bering-Chukchi-Beaufort Seas stock (one in 1991 and one in 1996), and two were taken from the highly endangered Davis Strait and Hudson Bay stocks (one in 1994 and the other in 1996). Three of the whales were taken under licenses issued by the Canadian government and one was taken without authorization. The Canadian government also issued several other licenses that lapsed without any whales being taken.

Canada withdrew from the IWC in 1982 and, since then, has neither sought nor obtained recommended quotas from the IWC before licensing its Natives to hunt bowhead whales. These actions diminish the effectiveness of the IWC as the international body responsible for regulating hunting and conserving whale stocks worldwide.

**Table 2. IWC quotas<sup>1</sup> and number of bowhead whales taken by Alaska Natives, 1973–1998**

Year	Quotas <sup>2</sup>		Struck		% Struck and Landed
	(Landed/ Struck)	No. Landed	but not Landed	Total Struck	
1973	--	39	20	59	66
1974	--	20	34	55	36
1975	--	15	28	43	35
1976	--	48	43	91	53
1977	--	29	82	111	26
1978	14/20	12	6	18	67
1979	18/27	12	15	27	44
1980	18/26	16	28	44	36
1981	17/27	17	11	28	61
1982	17/27	8	11	19	42
1983	17/27	9	9	18	50
1984	—/43	12	13	25	48
1985	—/26	11	6	17	65
1986	—/26	20	8	28	71
1987	—/32	22	9	31	71
1988	—/35	23	6	29	79
1989	41/44	18	8	26	69
1990	41/47	30	14	44	68
1991	41/44	28	19	47	60
1992	41/54	38	12	50	76
1993	41/54	41	11	52	79
1994	41/52	34	12	46	74
1995	—/68	43	14	57	75
1996	—/77	39	5	44	89
1997	—/76	48	18	66	73
1998	—/82	41	13	54	76

<sup>1</sup> Cited quotas established by the International Whaling Commission; data on numbers of whales landed, struck but not landed, and total struck are from R. S. Suydam, R. P. Angliss, J. C. George, S. R. Braund, and D. P. DeMaster. 1995. Revised data on the subsistence harvest of bowhead whales (*Balaena mysticetus*) by Alaska Eskimos, 1973–1993. Forty-fifth report of the International Whaling Commission 45:335–338. Information for the years 1994, 1995, 1996, 1997, and 1998 was provided by the National Marine Fisheries Service.

<sup>2</sup> Whaling is to cease whenever the number of whales landed or the number of strikes made reaches the specified number, whichever comes first.

Under the Pelly Amendment to the Fisherman's Protective Act, the Secretary of Commerce is required

to formally notify the President of actions by a nation that diminish the effectiveness of any international fishery conservation program. The President is authorized, but is not required, to restrict the importation of fish or any other products from nations so certified. He is required to notify Congress within 60 days of actions taken in response to certification.

The IWC's conservation program is considered a fishery conservation program for purposes of the Pelly Amendment. As noted in previous annual reports, the Marine Mammal Commission recommended in 1991 that the Secretary of Commerce certify to the President that Canada's authorization to take bowhead whales without consultation with and concurrence by the IWC was diminishing the effectiveness of the IWC's conservation program. The Secretary of Commerce refrained from certifying Canada in 1991 because the Canadian ambassador indicated that a review was under way to decide whether Canada should rejoin the IWC. Canada subsequently decided not to rejoin the IWC, but continued to issue licenses allowing its Natives to take bowhead whales. At its June 1996 meeting, the IWC adopted a resolution calling on Canada to rejoin the IWC or to refrain from issuing licenses authorizing its Natives to take bowhead whales without obtaining IWC concurrence.

Despite the IWC's stated concerns, Canada issued two licenses in 1996 under which two bowhead whales were taken: one from the Bering-Chukchi-Beaufort Seas stock and the other from the highly endangered eastern Canadian stock. As noted in previous Commission reports, the Secretary of Commerce certified to the President on 12 December 1996 that Canada's actions were diminishing the effectiveness of the IWC's conservation program. On 10 February 1997 the President advised Congress that actions against Canada were warranted to bring about compliance with the IWC's conservation program. Toward this end, he instructed the Department of State to oppose Canadian efforts to address issues on the hunting and trade of marine mammals within the Arctic Council (see Chapter IV). The President also advised Congress that he had instructed the Secretary of Commerce to withhold consideration of any Canadian request for waiver of the Marine Mammal Protection Act's moratorium on importing seals or seal products into the United States. These actions

were intended to counter Canadian efforts to move whaling issues to forums other than the IWC and to promote the take of marine mammals in ways that are inconsistent with sound conservation practices.

In 1997 Canadian Natives neither requested licenses nor took any bowhead whales. However, in 1998 Canada issued a license and on 20 July Native whalers took a bowhead whale from the highly endangered eastern Canadian stock. After learning of the take, the Department of State conveyed to the Canadian government its continuing belief that these actions diminished the effectiveness of the IWC's conservation program. The State Department urged Canada to rejoin the IWC or to refrain from allowing its Natives to hunt bowhead whales without review of their subsistence needs and recommended quotas by the IWC. It also advised Canada that the United States would continue to oppose Canadian efforts to address marine mammal trade and other issues within the Arctic Council until Canada either rejoins or complies with the IWC's aboriginal whaling regime.

### IWC Stock Assessment

During its 1998 meeting, the IWC's Scientific Committee conducted a comprehensive assessment of the status of the Bering-Chukchi-Beaufort Seas bowhead stock. During the assessment, it was noted that bowhead whales, particularly males, may live for more than 100 years. Evidence for this includes the recovery of six harpoon points (four of stone) of types not known to have been used for more than 100 years from whales taken in recent years by Alaska Natives. The assessment concluded that the stock is near its maximum sustainable yield level and likely would continue to grow with catch levels up to 108 animals per year. Consequently, the currently authorized quotas are appropriately conservative.

## Gray Whale (*Eschrichtius robustus*)

Gray whales occur only in the North Pacific Ocean, where they inhabit primarily coastal waters. They once occurred in the eastern and western North Atlantic Ocean. The eastern North Atlantic popula-

tion apparently survived into the 1700s. However, it became extinct at about that time, probably due, at least in part, to whaling.

There are two extant gray whale stocks: the eastern North Pacific (California) stock and the western North Pacific (Korean) stock. The eastern North Pacific stock migrates along the coast between winter calving and breeding areas off Baja California, Mexico, and summer feeding areas as far north as the Bering and Chukchi Seas. The western North Pacific stock migrates between summer feeding grounds in the Okhotsk Sea and winter breeding areas thought to be along the coast of China.

Pacific gray whales were severely depleted as a result of commercial whaling in the mid-1800s and again in the early 1900s. In the eastern North Pacific, the species was probably reduced to no more than a few thousand individuals. It first received international protection in the 1930s when the League of Nations banned commercial whaling for gray whales. This ban has since been carried forward by the IWC under the International Convention for the Regulation of Whaling of 1946. In 1970 additional protection was provided by the United States when the species was listed as endangered under the Endangered Species Conservation Act of 1969, the predecessor to the Endangered Species Act of 1973.

Protection from commercial whaling has enabled the eastern North Pacific gray whale stock to recover, and its current population is estimated at about 23,000 individuals. This stock is believed to be at or near pre-exploitation levels, and in June 1994 it was removed from the U.S. list of endangered and threatened wildlife. In contrast, the western North Pacific gray whale stock remains severely depleted and has shown no signs of recovery. This stock, believed to contain only a few hundred animals, is one of the world's most endangered populations of baleen whales. It remains listed as endangered under the Endangered Species Act.

Because gray whales use nearshore waters and bays for migrating, feeding, calving, and breeding, they remain vulnerable to the effects of various human activities. Gray whales are entangled occasionally in gillnets and also may be affected by offshore oil and

gas development, coastal development, commercial shipping, recreational boating, whale watching, military activities, and industrial activities. In addition, under aboriginal subsistence whaling quotas set by the IWC, gray whales are taken by Natives in Russia and, in the past, by Alaska Natives. Between 1966 and 1991 an average of 177 gray whales per year was taken for subsistence, primarily in Russia. Reports submitted by Russia to the IWC indicate that 42, 85, 43, and 79 gray whales were taken for subsistence purposes in Russia in 1994, 1995, 1996, and 1997, respectively.

In 1997 the IWC adopted a new, five-year gray whale quota of 620 whales with the further requirement that no more than 140 whales be taken in any one year. As discussed below, the United States has negotiating an agreement with the Makah Indian Tribe in Washington state whereby an average of four gray whales per year may be taken under this quota, with the remainder of the quota being allocated for subsistence in Russia. Russia reported that during 1998 its nationals landed 122 gray whales. The Makah Tribe did not take any gray whales in 1998.

### **Five-Year Research and Monitoring Plan**

As noted above, the eastern North Pacific stock of gray whales was removed from the list of endangered and threatened wildlife in June 1994. During the delisting process undertaken by the National Marine Fisheries Service, the Marine Mammal Commission commented to the Service on the proposal, noting among other things that habitat degradation was a significant threat to the stock's survival. The Commission recommended that a more appropriate action would be to downlist the stock to threatened status rather than removing it from the list. However, the National Marine Fisheries Service and the Fish and Wildlife Service jointly amended the list by removing the eastern North Pacific gray whale stock.

The Endangered Species Act requires that, if a species is delisted, a program must be implemented to monitor its status for at least five years. The National Marine Fisheries Service prepared a draft five-year plan of research and monitoring of the eastern North Pacific gray whale stock and forwarded the draft to the Commission for review. The Commission provid-

ed comments to the Service in July 1994 recommending, among other things, that the plan be revised to provide for the identification and assessment of human activities that could affect the principal wintering lagoons in Baja California and feeding grounds in the Bering and Chukchi Seas.

The Commission followed up with a letter in July 1995, requesting an update on the status of the five-year plan. In particular, the Commission asked what the Service was doing or intended to do to identify and prevent activities that may pose threats to essential gray whale habitats. In particular, the Commission noted the potentially adverse effects of a proposal to construct a commercial salt operation in San Ignacio Lagoon, Baja California, one of the few gray whale calving and breeding sites. The Commission again recommended that, within its gray whale research program, the Service give highest priority to identifying and determining how to prevent or mitigate threats to essential gray whale habitats, particularly the calving and breeding lagoons of Baja California.

Although the Service did not finalize its research and monitoring plan for the eastern North Pacific stock of gray whales, it has continued to monitor the population in accordance with the draft plan. Each year, the Service has conducted counts of gray whales as they migrate past the California coast. In addition to yielding abundance estimates, these surveys have provided estimates of annual calf production for the population.

In June 1999 it will have been five years since the delisting of the eastern North Pacific stock of gray whales. As such, the National Marine Fisheries Service has scheduled a workshop for March 1999 to review the status of the stock based on the results of its monitoring program and an assessment of threats currently faced by the population.

### **Potential Threats to Gray Whale Breeding Lagoons**

As discussed in previous annual reports, gray whales are exposed to a variety of human activities because much of their lives is spent in nearshore waters, including the shallow, warm-water lagoons

along the west coast of Baja California, Mexico. A variety of development activities being proposed at the lagoons may adversely affect the whales and their wintering habitat. For several years, the Marine Mammal Commission has continued to track these activities and has endeavored to identify ways to prevent adverse effects.

One of the greatest potential threats is construction of a new solar salt-processing facility proposed for San Ignacio Lagoon. The plan calls for the construction of a 1.25-mile-long (2 km) deepwater pier with conveyor belts for loading salt onto freighters, and the development of approximately 8 square miles (20 km<sup>2</sup>) of evaporation ponds along the northern shore of the lagoon. This construction would substantially alter the character of the lagoon shoreline. The facility would be situated within the buffer zone of the El Vizcaino Biosphere Reserve, part of the United Nations Environment Programme's international biosphere reserve network, and could compromise efforts to maintain the reserve.

A permit for the project was denied by the Mexican government in February 1995 on the grounds that an environmental impact assessment of the project did not identify or adequately address possible environmental consequences. Although the salt production company appealed the decision, it later withdrew the appeal, indicating that it intended to submit a new study that more appropriately considered the environmental issues and identified steps to conserve the natural resources of the biosphere reserve.

It is the Marine Mammal Commission's understanding that, although work continued on drafting the revised environmental impact assessment during 1998, the assessment had not been completed by the end of the year. When a revised assessment is submitted to Mexico's Ministry for the Environment, Natural Resources, and Fisheries, it will be forwarded to a seven-member international scientific advisory committee, established by the ministry, for review.

### **Subsistence Take of Gray Whales**

The IWC is the international organization responsible for setting catch limits for both commercial and aboriginal subsistence whaling (see Chapter IV). In

May 1995 the Makah Tribal Council of Washington state wrote to the Departments of Commerce and State indicating that the council intended to ask the agencies formally to seek IWC approval of an annual ceremonial and subsistence harvest of up to five gray whales. The council indicated that whaling has been a traditional part of the tribe's way of life for 1,500 years. It further contended that there were no legal impediments to the tribe's rights to take whales because the eastern North Pacific gray whale stock had been removed from the Endangered Species Act's list of endangered and threatened wildlife and because the enactment of the Marine Mammal Protection Act had not abrogated the tribe's whaling rights recognized under the 1855 Treaty of Neah Bay.

As discussed in previous annual reports, the National Marine Fisheries Service, the Department of State, and the Department of the Interior reviewed the tribe's proposal and related information and decided to seek a quota from the IWC on behalf of the Makah. However, at the 1996 IWC meeting, the United States announced that, after consultations with the Makah representatives, it was asking the IWC to defer consideration of the proposal until 1997. This deferral gave the tribe an opportunity to provide additional background on its proposal, including information on the nutritional value of subsistence foods and the health benefits to be derived from including whales in the diet of the tribe and on the steps it was taking to develop a safe, effective, and humane method of killing gray whales. The revised proposal indicated that the tribe intended to hunt whales from traditional cedar canoes and was considering using a specially modified rifle to kill the whales.

The deferral of the Makah proposal also gave the National Oceanic and Atmospheric Administration the opportunity to prepare an environmental assessment of the proposal under the National Environmental Policy Act before seeking a gray whale quota from the IWC. On 22 August 1997 the National Marine Fisheries Service published a draft environmental assessment on the annual harvest of up to five gray whales by the Makah Tribe for cultural and subsistence uses. The draft environmental assessment preliminarily concluded that landing up to five gray whales, or striking up to ten gray whales, per year would have no impact on

the status of the eastern Pacific stock and no measurable effect on seabirds or other marine organisms in the Olympic Coast National Marine Sanctuary, where the whaling would occur.

The Commission's comments on the draft assessment are discussed fully in the previous annual report. In general, the Commission believed that the assessment did a good job of discussing several possible effects of resumption of whaling by the Makah Tribe. It noted, however, that the assessment suffered from incomplete analyses of some key issues, such as whether Makah treaty rights to take whales had been abrogated since the treaty was signed in 1855 and whether other tribes might be encouraged to resume whaling if Makah whaling were sanctioned by the IWC.

The National Marine Fisheries Service issued a final environmental assessment on 17 October 1997. The assessment concluded that U.S. support for the taking of gray whales by the Makah would not significantly affect the quality of the human environment, provided that the whaling is conducted in accordance with the IWC Schedule, applicable regulations, and a cooperative agreement entered into between the National Oceanic and Atmospheric Administration and the Makah Tribal Council.

As discussed in the previous annual report, the IWC considered the U.S. request for a gray whale quota for the Makah Tribe at its 1997 annual meeting. The IWC approved a joint proposal submitted by the United States and Russia for a five-year quota of 620 gray whales beginning in 1998, with no more than 140 whales available in any one year. The U.S.-Russian proposal, adopted by consensus, included a statement that the "meat and products of such whales are to be used exclusively for local consumption by the aborigines whose traditional subsistence and cultural needs have been recognized." The United States interpreted the resolution as an acceptance by the IWC that the Makah's cultural and subsistence needs are consistent with those historically recognized by the IWC and indicated its intent to authorize the taking of up to five gray whales per year, with an average of four per year, subject to the development of an acceptable management plan. Some delegations at the meeting, however, questioned whether the IWC

had acted to recognize the subsistence and cultural needs of the Makah and contended that the tribe was not entitled to take gray whales. Despite this difference of views, no resolution opposing the U.S. interpretation that the quota applied to the Makah Tribe was introduced at the IWC's 1998 meeting.

On 17 October 1997 a lawsuit challenging the Department of Commerce's actions to promote and authorize whaling by the Makah was filed by Rep. Jack Metcalf of Washington state, several environmental organizations, and others opposed to whaling (*Metcalf v. Daley*). The action alleged that the defendants, who had yet to issue a final environmental assessment, had failed to meet their obligations under the National Environmental Policy Act and other laws. On the same day that lawsuit was filed, however, the National Marine Fisheries Service published a final environmental assessment of the harvest of up to five gray whales per year by the Makah Tribe.

On 26 November 1997, after the IWC had taken action on the U.S.-Russian gray whale proposal, the plaintiffs in this case filed an amended complaint to reflect the changed circumstances. The complaint alleged that the agency had violated the National Environmental Policy Act by (1) failing to conduct an environmental review of its decision to enter into cooperative agreements with the Makah Tribal Council with respect to whaling by the tribe, (2) failing to consider all relevant issues in the environmental assessment, (3) deciding not to prepare an environmental impact statement, and (4) deciding to seek a gray whale quota from the IWC before completion of the environmental review process. Plaintiffs also alleged that the National Marine Fisheries Service had violated the Marine Sanctuaries Act by failing to consult on the impacts to resources within the Olympic Coast National Marine Sanctuary before deciding to authorize and promote whaling by the Makah. In addition, the complaint alleged that defendants had violated the Whaling Convention Act by declaring that the Makah may engage in subsistence whaling despite no definitive ruling from the IWC that the tribe qualifies for such whaling. Further, the plaintiffs claimed that the agency's actions in authorizing and promoting Makah whaling were arbitrary and capricious in that they contravened the purposes of the Endangered Species Act, the Marine Mammal Protec-

tion Act, and the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

In light of the Makah Tribe's interest in the matter, the tribe filed a motion on 13 November 1997 seeking authority to intervene in the case. The tribe also filed a motion seeking to have the case transferred from the U.S. district court in the District of Columbia, where the case was filed, to the district court for the Western District of Washington, where the tribe and most of the plaintiffs reside. Both motions were granted.

The district court for the Western District of Washington issued its ruling in the case on 21 September 1998, granting the federal defendants' motion for summary judgment, thereby clearing the way for whaling by the Makah to begin. The court believed the question of the timing for preparing the environmental assessment to be a close one. The judge noted that an environmental assessment is supposed to be a tool to aid in the decision-making process and not simply provide a justification as to why a choice that has already been made is permissible. Nevertheless, the court thought that, because of the special trust relationship between the federal government and the tribe, it was equally arguable that the defendants had no realistic choice but to explore the possibility of Makah whaling first and to consider alternatives only when determining whether to allow whaling by the tribe after a quota had been approved by the IWC.

The court also examined the adequacy of the environmental assessment prepared by the National Marine Fisheries Service. The key question considered by the court was whether the Service had adequately considered the impact of whaling by the Makah on "summer residents," those gray whales that reside during the summer in waters near the Olympic Peninsula, rather than migrating past on their way to or from the wintering grounds in Mexico. The court found that, although the discussion of this issue in the environmental assessment was somewhat conclusory in nature, sufficient evidence had been considered to indicate that the likely effect on whales in the area was insignificant because, even if some resident whales are taken, new whales are likely to take their place in subsequent seasons.

The court ruled that preparation of an environmental impact statement, which is required if the proposed action will significantly affect the environment, was not required in this instance. The court, although somewhat concerned that whaling by the Makah may have a significant effect by setting a precedent under which other tribes in the Pacific Northwest would seek authority to hunt whales, ultimately found the number of tribes situated to take advantage of any such precedent to be small. Citing the finding of the IWC's Scientific Committee that up to 407 gray whales can be taken annually on a sustainable basis, the court found that the defendants were not unreasonable in concluding that, even if other tribes are encouraged by the Makah example to resume whaling, the effect on the stock is likely to be minimal.

As discussed above, the gray whale quota adopted by the IWC in 1997 is, by its terms, applicable only to "aborigines whose traditional subsistence and cultural needs have been recognized." The plaintiffs contended that the Makah Tribe is not covered by the quota because its cultural or subsistence need for whales was not recognized by the IWC. In considering this question, the court turned first to the National Marine Fisheries Service's regulations that implement the Whaling Convention Act (50 C.F.R. Part 230). The court disagreed with the plaintiffs that those regulations limited whaling to "aboriginal groups 'previously recognized' by the IWC as having a cultural or subsistence need for whaling." The court also considered the language of the gray whale quota in the context of the International Convention for the Regulation of Whaling and action at the IWC's 1997 meeting that led to the quota's adoption. The court observed that under the Convention, the IWC is not authorized to allocate quotas for specific aboriginal groups or countries. In addition, the ruling noted that the IWC had specifically disapproved an amendment that would have limited aboriginal subsistence whaling of gray whales to groups whose traditional subsistence and cultural needs "have been recognized by the International Whaling Commission." Inasmuch as the court believed that there was an adequate basis for finding that the Makah Tribe has a cultural and subsistence need for whaling, it could not see that the approval of the quota by the Secretary of Commerce violates the International Convention for the Regula-

tion of Whaling, the Whaling Convention Act, or applicable regulations.

The court found no violations of the Marine Sanctuaries Act or the Marine Mammal Protection Act. In the case of the Marine Mammal Protection Act, the court explained that, under section 102(a)(2) of the Act, the moratorium on taking marine mammals does not apply to takings provided for by pre-existing international treaties, conventions, or agreements, such as the International Convention for the Regulation of Whaling.

To govern whaling in 1998 and subsequent seasons, the Makah Whaling Commission developed, and the Makah Tribal Council adopted, the "Management Plan for Makah Treaty Gray Whale Hunting for the Years 1998–2002." The plan establishes procedures for issuing whaling permits, specifies hunting methods to be used, and, except for the creation and domestic sale of traditional handicrafts fashioned from non-edible parts, limits the use of landed whales to non-commercial, local consumption and ceremonial purposes. The plan also indicates that the tribe intends to develop ceremonial and subsistence whale hunts gradually over the five-year period covered by the IWC authorization to allow for the development of tribal management capabilities, refinement of hunting methods, and further assessment of the tribe's cultural and subsistence needs.

One provision of the management plan specifies that "[w]haling permits shall be issued with the intent of targeting migrating whales." In a 6 March 1998 letter to the chairman of the Makah Tribal Council, the Administrator of the National Oceanic and Atmospheric Administration noted that the gray whale migration extends from approximately 1 November through 30 June. As such, it is likely that any whales in the vicinity of Neah Bay between 1 July and 31 October are non-migratory. The Administrator therefore interpreted the provision of the management plan as a statement that the tribe did not intend to issue whaling permits for the period before 1 November or after 30 June unless the tribe, in consultation with the National Marine Fisheries Service, determines that there is reason to believe that the gray whale migration is ongoing at other times. Under this interpretation, Makah whaling could have begun any

time after 1 November 1998 without first consulting with the Service. Nevertheless, no attempts were made to hunt gray whales during 1998.

### Western North Pacific Population

As noted above, a small population of gray whales occurs in the western North Pacific Ocean. This population, which once may have numbered between 10,000 and 15,000 individuals, was subject to heavy whaling pressure during the past three centuries. By the time whaling on this stock ended in the mid-1960s, the population had been reduced to a very low level. The current size of the population is estimated to be about 250 animals; however, no quantitative data exist to confirm this estimate.

This population of gray whales occurs in the Okhotsk Sea during the summer and migrates to breeding grounds believed to be somewhere along the southern coast of China. During the spring and winter, small numbers of gray whales may be found off Korea and Japan, migrating to or from the Okhotsk Sea.

The Scientific Committee of the IWC reviewed the status of the western North Pacific population of gray whales at its 1997 meeting. The Scientific Committee noted several threats to this population, including habitat degradation along its migratory corridor and the effects of climate change. However, the most immediate and pressing concern identified by the Scientific Committee was planned oil and gas development in the Okhotsk Sea. Not only does such development expose whales to the risk of oil spills, but the noise associated with seismic surveys, ship traffic, aircraft, and exploratory drilling has the potential to disturb whales in this important feeding area.

The Sakhalin Energy Investment Company, a joint venture formed by several major oil companies, has exploration and development activities under way in the area off the northeast coast of Sakhalin Island. It is estimated that these two fields contain about one billion barrels of oil and 408 billion cubic meters (14 trillion cubic feet) of natural gas. Oil production from the first phase of this operation will begin in the summer of 1999.

In light of the planned oil and gas development in the Okhotsk Sea, the IWC Scientific Committee has recommended that high priority be given to research and environmental monitoring programs concerning this population of gray whales. Without such programs, it will not be possible to develop a mitigation plan to reduce the effects of oil and gas development on these whales. A long-term joint U.S.–Russian research and monitoring program of these gray whales was initiated in 1997 by Sakhalin Energy Investment Company and Exxon Neftegas.

### **Cook Inlet Beluga Whale** *(Delphinapterus leucas)*

Beluga whales are found seasonally in ice-covered waters throughout the Arctic and sub-Arctic. During winter, beluga whales migrate offshore, where they are closely associated with open leads and polynyas in the pack ice. In spring, they move into warmer coastal areas to molt and calve. For management purposes, five stocks are recognized in U.S. waters. This distinction is based on the species' discontinuous summer distribution and on mitochondrial DNA analyses that indicate clear genetic differences among stocks in the summering areas. The five stocks are the Cook Inlet, Bristol Bay, eastern Bering Sea, eastern Chukchi Sea, and Beaufort Sea stocks.

The Cook Inlet stock has been the subject of particular concern for several reasons. Separated from the other four summer concentration areas by the Alaska Peninsula and nearly 1,000 miles (1,610 km) by sea, the Cook Inlet stock is the most isolated population of beluga whales in U.S. waters. Because of their proximity to Anchorage, beluga whales in Cook Inlet are exposed to the largest urban coastal area in Alaska. They also have been subject to intensive harvesting by Alaska Natives.

Since 1994 the National Marine Fisheries Service has carried out aerial surveys of beluga whales in Cook Inlet every June or July to help assess the stock's distribution and abundance. An analysis of beluga whale sightings in Cook Inlet indicates that the stock's summer range has contracted in recent years.

In contrast to the 1970s and 1980s, animals now are rarely seen in offshore waters or the lower reaches of the inlet. During mid-summer, most of these beluga whales now concentrate in a few groups in the upper reaches of the inlet around river mouths and disburse as winter approaches.

The draft 1998 stock assessment report on Cook Inlet beluga whales prepared by the Service estimated a population size of 834 whales, including calves, with a minimum population estimate of 712 animals. Based on these estimates, the draft assessment calculated the potential biological removal level for this population at 14 animals per year, utilizing a recovery factor of 1.0. The potential biological removal is the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while providing reasonable assurance that the stock will recover to or remain within its optimum sustainable population level.

The Alaska Regional Scientific Review Group is a scientific committee appointed by the Service that, among other things, provides scientific advice on the status of Alaska marine mammal stocks. At its meeting of 18-20 November 1998 the group considered new information on the population status of the Cook Inlet beluga whale stock. Reanalysis by the National Marine Fisheries Service of survey data from 1994 through 1998 incorporating video analysis of surfacing behavior indicate a decline in the Cook Inlet population from an estimated 653 individuals in 1994 to 347 in 1998, or about a 47 percent reduction in numbers. Based on these analyses, the group recommended that the Service use the 1998 population size point estimate of 347 animals and a recovery factor of 0.5 when calculating the potential biological removal level for the 1999 Cook Inlet beluga whale stock assessment. These changes would result in a substantial decrease in the estimated number of beluga that could safely be removed from the stock, from 14 to about 3 animals annually.

### **Native Subsistence Harvest**

Provisions of the Marine Mammal Protection Act allow Alaska Natives to take marine mammals for subsistence or handicraft purposes provided the take

is not accomplished in a wasteful manner. The Alaska Beluga Whale Committee, made up of Alaska Native beluga whale hunters and biologists, was established to help conserve beluga whales and manage beluga whale hunts. Based on information from a variety of sources, the committee reported an average subsistence harvest of Cook Inlet beluga whales of about 15 animals per year between 1990 and 1994. However, this is almost certainly an underestimate because it does not take into account animals that were struck and lost; neither does it include beluga whales taken by Natives who hunt in Cook Inlet but live outside the region. The Cook Inlet Marine Mammal Council, in consultation with beluga hunters from Cook Inlet, estimated that more than 30 beluga whales were taken by subsistence hunters annually through 1994.

The most thorough survey of beluga whale subsistence harvests in Cook Inlet was undertaken in 1995 and 1996 by the Cook Inlet Marine Mammal Council. The council reported through the Alaska Beluga Whale Committee that 72 beluga whales were taken in 1995, including 22 that were struck and lost. Between 98 and 147 were reportedly taken in 1996, including 49 to 98 that were struck and lost.

To further compound the problem of high harvests, beluga whale muktuk is being regularly sold to Alaska Natives in Anchorage under section 101(b) of the Marine Mammal Protection Act, which allows edible portions of marine mammals taken by Alaska Natives to be sold in Native villages and towns. Muktuk, the skin and blubber from the whale, is a highly valued Native food. As a result, beluga whales hunted near Anchorage have a substantial cash value, and some hunters reportedly are taking them in large numbers.

Clearly, the number of beluga whales being taken by Native hunters far exceeds the potential biological removal level of 14 whales per year calculated in the Service's 1998 draft Cook Inlet beluga whale stock assessment or the 3 whales per year that could be taken safely if procedures recommended by the Alaska Regional Scientific Review Group were adopted.

As of the end of 1998 there was no effective mechanism in place to limit the Native subsistence harvest of Cook Inlet beluga whales. The National

Marine Fisheries Service, in consultation with Alaska Natives, has been exploring the possible use of the co-management process provided for in section 119 of the Marine Mammal Protection Act to better manage the Native beluga whale harvest. Both the Alaska Beluga Whale Committee and the Cook Inlet Marine Mammal Council are working closely with the Service to rectify this problem. To this end, these groups will host a workshop in spring 1999 to discuss Cook Inlet beluga whale issues and a co-management approach to reducing harvests. However, a number of contributing factors have made this a particularly difficult issue to address through the co-management process. Cook Inlet is a large area that includes many communities. Its Alaska Native population includes residents of local villages as well as those who have moved into the region from elsewhere in Alaska. Beluga hunters who have moved into the area may not be members of local tribes, the Cook Inlet Marine Mammal Council, or other tribal groups. Consequently, they may not be bound by any cooperative agreements between the Service and these entities. In addition, Cook Inlet beluga whales may be hunted legally by Alaska Natives living in other parts of the state, and some beluga whales are taken by visiting Native hunters.

Ultimately, the greatest difficulty lies in enforcing provisions agreed upon through the co-management process. Although amendments to the Marine Mammal Protection Act provide for co-management agreements, as currently interpreted by the National Marine Fisheries Service, they do not convey any additional authority to enforce such agreements. Thus, despite agreement by the Service, the Alaska Beluga Whale Committee, and the Cook Inlet Marine Mammal Council that commercial sale of beluga whale parts should be disallowed and hunting curtailed, it appears that, to accomplish this, the Service will need to designate the stock as depleted under the Marine Mammal Protection Act or list it as threatened or endangered under the Endangered Species Act and promulgate accompanying regulations using formal rulemaking procedures.

### **Status Review of Cook Inlet Beluga Whales**

Concern over the decreasing population of beluga whales in Cook Inlet and the apparent overharvest of these animals prompted the Service to publish a notice

in the 19 November 1998 *Federal Register* that it intends to conduct a status review of Cook Inlet beluga whales. The notice further requested that interested parties submit pertinent information and comments regarding these whales to the Service by 19 January 1999. The review will consider the current status of the Cook Inlet stock, including its distribution, abundance, population dynamics, food habits, health, the effects of the Native subsistence harvests, and potential effects of other anthropogenic impacts.

At the end of 1998 the Commission, in consultation with its Commissioners and Committee of Scientific Advisors, was developing comments to the Service in response to the notice. Among other things, the Commission expected to emphasize the need for a cooperative approach to the sustainable harvest issue, in which the Native community and the Service share responsibility for conserving the Cook Inlet beluga whale stock. It also expected to recommend that the Cook Inlet beluga whale stock be listed as endangered or threatened under the emergency listing provisions of the Endangered Species Act. The Commission also was considering recommendations on various approaches that the Service might take to reduce the harvest of beluga whales from Cook Inlet to a number that the population can sustain.

### **Gulf of Maine/Bay of Fundy Harbor Porpoise (*Phocoena phocoena*)**

Harbor porpoises are one of the smallest and shortest lived of all cetaceans. Less than two meters long when fully grown, they reach sexual maturity at about the age of three and have an average life span of only 10 years. Harbor porpoises are distributed among relatively discrete coastal stocks and occur only in the Northern Hemisphere at temperate and boreal latitudes. Harbor porpoises are vulnerable to becoming entangled and drowned in gillnets. Because they feed on small schooling fish, such as herring, capelin, and silver hake that are either sought by gillnetters or eaten by other fish sought by gillnetters, harbor porpoises are caught in significant numbers in some areas and many regional stocks have declined substantially.

One such stock experiencing a high level of bycatch occurs along the east coasts of the United States and Canada. Known as the Gulf of Maine/Bay of Fundy harbor porpoise stock (hereafter called the Gulf of Maine harbor porpoise stock), its range extends from the Bay of Fundy, Canada, to Cape Hatteras, North Carolina. The fishery-related bycatch from this stock exceeds that of any other cetacean stock in U.S. waters. Gulf of Maine harbor porpoises probably have been taken in Canada since at least the 1960s, when gillnet fisheries for groundfish (*e.g.*, cod, flounder, and haddock) began in the Bay of Fundy, and in New England since the early 1970s, when a similar fishery began in the Gulf of Maine. It is not known when this bycatch reached levels that could adversely affect the stock's abundance.

Most of the harbor porpoise bycatch has been taken from these areas in summer and fall. During summer, when most of the stock is concentrated near the northern end of its range, most of the catch has been in the Bay of Fundy region. Between fall and spring the stock disperses throughout its range, and harbor porpoises are caught incidentally in gillnet fisheries for dogfish, monkfish, herring, and shad, as well as groundfish. During spring and fall, most bycatch has been taken between New Hampshire and New Jersey. In January and February, harbor porpoises are taken as far south as Maryland and by spring, as far south as North Carolina.

The size of the Gulf of Maine harbor porpoise stock has been estimated from three population surveys conducted during the summers of 1991, 1992, and 1995. Estimates from these three surveys were 37,500 porpoises (95 percent confidence interval 26,700 to 86,000), 67,500 porpoises (95 percent confidence interval 32,900 to 104,600), and 74,000 porpoises (95 percent confidence interval 40,900 to 109,100), respectively. Because harbor porpoises spend little time at the surface and because their distribution may vary from year to year depending on environmental conditions, they are difficult to survey and resulting abundance estimates have wide, overlapping confidence intervals that cannot be used to assess population trends during the five years. However, by pooling and weighting data from the three surveys, a best estimate of population size has been developed —

54,300 porpoises (95 percent confidence interval 41,300 to 71,400).

A direct measure of population trends is not possible because no regionwide harbor porpoise surveys have been conducted before 1991 or since 1995 (another survey is scheduled for the summer of 1999). However, using information on harbor porpoise life history, population size, and incidental take levels, the National Marine Fisheries Service concluded early in the 1990s that the number of harbor porpoises being caught in gillnets was probably exceeding sustainable levels for the stock.

Reliable estimates of harbor porpoise bycatch levels were not available in the 1980s. Because of growing concern about the possible effects on the regional harbor porpoise stock, the National Marine Fisheries Service began a program in 1989 to place observers aboard a representative sample of gillnet boats fishing in coastal waters of the Gulf of Maine to assess incidental take rates. By expanding the observed bycatch rates with a measure of total gillnet fishing effort for the Gulf of Maine, the Service was able to estimate bycatch levels for the area. A similar observer program began in Canada in the Bay of Fundy in 1994. As information on gillnet fishing and the resulting incidental take of harbor porpoises became available for other areas off New England and along U.S. mid-Atlantic coastal states, observer efforts were initiated and bycatch estimates were developed for those areas as well (Table 3).

Most gillnet fishing involving the incidental take of Gulf of Maine harbor porpoises in U.S. and Canadian waters is now sampled by observers. However, there are no bycatch estimates for fishing in the Bay of Fundy before 1993 and no estimates for the mid-Atlantic region before 1995. Thus, for recent years, the sum of the three regional bycatch estimates provides a relatively complete reflection of overall bycatch from the stock, but earlier estimates omit substantial amounts of bycatch.

As shown in Table 3, bycatch estimates for the Gulf of Maine and the Bay of Fundy appear to have declined substantially since 1993, including a decline of about 50 percent between 1994 and 1997. This is due, at least in part, to management actions designed

to reduce gillnet fishing effort and protect harbor porpoises. The decline since 1993 includes a sharp drop in bycatch levels in Canada, which appears to be due to a substantial decrease in overall fishing effort. However, the establishment of time-area fishing closures and the use of pingers in Canadian waters also may have contributed partially to the reduced catch in this area. Bycatch data for U.S. waters also indicate that, in areas where past bycatch levels have been high and extensive time-area fishing closures established (*e.g.*, coastal waters between northeastern Massachusetts and southern Maine), bycatch levels have declined substantially. These decreases, however, have been offset by increases in bycatch in other areas, such as inshore waters south of Cape Cod and offshore waters in the southern Gulf of Maine, where fishing effort has expanded and time-area management efforts have been absent or limited in scope.

The recent increase in bycatch estimates off U.S. mid-Atlantic coastal states, from about 100 in 1995 to about 570 in 1997, also is a significant factor in why the total bycatch estimates for all areas have declined little. The increase in this area could correspond to expansion in the mid-Atlantic area observer program, increased fishing effort, or both. For the most part, the increase in bycatch estimates for this area probably reflects a more complete and accurate regional estimate, rather than an actual fivefold increase in the incidental take levels.

### **Management Actions before 1998**

In October 1992 the National Marine Fisheries Service asked the New England Fisheries Management Council to amend the northeast multi-species fishery management plan under which the New England sink gillnet fisheries for groundfish are managed. Specifically, it asked the Council to include an objective in the plan for reducing harbor porpoise bycatch. Pursuant to this request, the Council began recommending management measures to reduce harbor porpoise bycatch off New England. The first of these, implemented by the National Marine Fisheries Service in 1994, established seasonal time-area fishing closures in areas of high bycatch. They proved to be too brief and too narrowly drawn to be effective and, since then, the time period, size, and number of closures have gradually been increased.

**Table 3. Estimates of harbor porpoise bycatch in sink gillnet fisheries in the Bay of Fundy (Canada), Gulf of Maine (U.S.), and off the U.S. mid-Atlantic states, 1990–1998<sup>1</sup>**

<u>Year</u>	<u>Gulf of Maine<sup>2</sup></u>	<u>Bay of Fundy<sup>3</sup></u>	<u>U.S. Mid-Atlantic<sup>4</sup></u>
1990	2,900 (1,500–5,500)	—	—
1991	2,000 (1,000–3,800)	—	—
1992	1,200 (800–1,700)	—	—
1993	1,400 (1,000–2,000)	424 (200–648)	—
1994	2,100 (1,400–2,900)	101 (80–122)	—
1995	1,400 (900–2,500)	87	103 (11–254)
1996	1,200 (800–1,400)	20	310 (162–567)
1997	1,000 (500–1,600)	43	572 (300–1,100)
1998	(not yet available)	10	(not yet available)

<sup>1</sup> Numbers in parentheses are ranges of the 95 percent confidence interval where available.

<sup>2</sup> D. Palka. 1997. Gulf of Maine Harbor Porpoise By-catch. Prepared for the Gulf of Maine Harbor Porpoise Take Reduction Team Meeting, December 16–17, 1997. National Marine Fisheries Service, Woods Hole, Massachusetts. Estimate for 1997 provided by National Marine Fisheries Service as unpublished data.

<sup>3</sup> E. A. Trippel. 1998. Harbour Porpoise By-Catch in the Lower Bay of Fundy Gillnet Fishery. DFO Maritime Regional Fisheries Status Report 98/7E. Canadian Department of Fisheries and Oceans, Dartmouth, Nova Scotia.

<sup>4</sup> D. Palka. 1997. Mid-Atlantic Harbor Porpoise By-Catch and Gear Characteristics. Prepared for the Gulf of Maine Harbor Porpoise Take Reduction Team Meeting, December 16–17, 1997. National Marine Fisheries Service, Woods Hole, Massachusetts. Estimate for 1997 provided by National Marine Fisheries Service as unpublished data.

In addition, the Service has encouraged New England gillnetters to use acoustic deterrent devices called pingers. Attached to gillnets at intervals along their length, pingers emit periodic sound pulses intended to keep harbor porpoises away from nets. Experiments indicate that, in at least some areas, pingers can reduce harbor porpoise bycatch rates by 90 percent or more when properly deployed and maintained. It is not clear whether these devices annoy and repel porpoises or simply alert them to the presence of nets. Nor is it clear precisely what sound characteristics elicit the avoidance response. Time-area management zones to prohibit gillnet fishing or require that nets be equipped with pingers have been the principal approaches to date for reducing harbor porpoise bycatch off New England.

Measures to reduce bycatch off mid-Atlantic states, first adopted by the Service late in 1998, will go into effect during the winter and spring 1999 fishing seasons. Thus, their effectiveness is currently

unknown. As discussed below, initial bycatch reduction measures for this area involve time-area fishing closures, net design requirements, and limits on the amount of gear that can be fished. There are no provisions for using pingers in the mid-Atlantic area.

Recent actions to reduce harbor porpoise bycatch have been guided by the 1994 amendments to the Marine Mammal Protection Act that established a new regime for managing marine mammal-fishery interactions. In part, the approach requires the Service to calculate a potential biological removal level for each marine mammal stock in U.S. waters. The potential biological removal level is an estimate of the number of animals that can be removed from a marine mammal stock annually (not including natural mortality), while ensuring that the stock will increase toward or remain at its optimum sustainable population level. For Gulf of Maine harbor porpoises, the Service has calculated the potential biological removal level to be 483 harbor porpoises per year.

As indicated in Table 3, past incidental take levels in commercial fisheries have been several times higher than the calculated potential biological removal level. In such cases, the Service is required to develop and implement an incidental take reduction plan. In part, these plans must set forth measures to reduce bycatch below the potential biological removal level within six months. Given particular concern for the Gulf of Maine harbor porpoise stock, the 1994 amendments specifically required that the Service implement a take reduction plan no later than 1 April 1997.

The 1994 amendments also required the Service to establish take reduction teams to help develop and review take reduction plans. Each team is to focus on a marine mammal stock or group of stocks affected by a particular fishery or related group of fisheries. Teams are to be composed of representatives of relevant fisheries, environmental groups, federal and state agencies, and academia. Within six months of being established, a team is to submit a recommended take reduction plan to the Service that is agreeable to all team members. Thereafter, teams are to meet periodically and recommend needed improvements until the goals of the take reduction plan are met.

The Service established two take reduction teams for Gulf of Maine harbor porpoises: a Gulf of Maine team established on 12 February 1996 to address New England gillnet fisheries and a mid-Atlantic team established on 25 February 1997 for gillnet fisheries between New York and North Carolina. Two teams, rather than one, were established because, when the Gulf of Maine team was formed, information was not yet sufficient to develop bycatch estimates or take reduction measures for the mid-Atlantic region. Also, because of regional differences in target species, gillnet fishing methods, participants, and the status of efforts to address the problem, the Service determined that it would be more efficient for separate teams to develop take reduction measures for each area.

As discussed in previous annual reports, the Gulf of Maine team provided the Service a recommended take reduction plan reflecting a consensus of its members on 7 August 1996. It recommended a series of time-area management zones in which gillnet fishing would either be prohibited entirely or permitted only if gillnets were equipped with pingers. It

also recommended related research and management actions for training fishermen in the use of pingers, collecting and analyzing observer data, studying the effects and effectiveness of pingers, and undertaking certain other related tasks. Through these measures, the team projected that the bycatch level in New England would be reduced to 382 porpoises.

At about the same time that the Gulf of Maine team submitted its plan, the New England Fishery Management Council proposed modifying the system of time-area management zones for gillnet fishing in New England. The changes, which were adopted by the Service, made its system of time-area management zones similar to that which the team recommended. Although the Service is required to circulate and implement a team's plan (with any changes the Service deems appropriate) within six months of receiving a plan, the Service apparently decided that immediate action on the plan was unnecessary, given its action on the Council's recommendation. However, on 13 August 1997 the Service published a proposed take reduction plan in the *Federal Register* that was slightly less restrictive than the one recommended by the team in August 1996.

The mid-Atlantic team submitted its recommendations to the Service on 25 August 1997. Observer data reviewed by the team suggested that bycatch rates among New England gillnetters fishing in the mid-Atlantic region in winter were substantially higher than bycatch rates of local fishermen. This appeared to be due to combinations of different gear characteristics, such as twine diameter, mesh size, and the number and length of nets. Therefore, to reduce harbor porpoise bycatch off the mid-Atlantic states, the team recommended a combination of fishery closures, gear requirements (e.g., the use of nets with certain twine diameters), and restrictions on the number and length of nets.

During the final four months of 1997 new information indicated that the bycatch reduction measures adopted in 1996 were ineffective, and the Service extended the comment period on its August proposal and sought further advice from the Gulf of Maine team. In its 14 October 1997 comments to the Service on the proposed plan, the Commission noted that, given new information indicating a significant

level of bycatch in the mid-Atlantic region and requirements to reduce the total bycatch throughout the stock's range to below the potential biological removal level within six months, it was highly unlikely that measures proposed more than a year earlier for the Gulf of Maine would be sufficient. Therefore the Commission recommended that the Service immediately reexamine its proposed plan in light of new bycatch data and either (1) develop a separate emergency rule to implement bycatch reduction measures for the 1998 winter-spring gillnetting fishing season in the mid-Atlantic region concurrent with implementing new measures for the New England area, or (2) modify the proposed take reduction measures for New England to further reduce bycatch off New England by an amount that would compensate for expected bycatch levels in the mid-Atlantic region.

The Gulf of Maine take reduction team, which includes a representative of the Marine Mammal Commission, met on 16–17 December 1997 to consider new information on the bycatch of harbor porpoises and further take reduction measures. As of the end of 1997, the team had not yet forwarded the results of its meeting and the Service had taken no further steps to implement its proposed take reduction plan for New England waters or to act on recommendations by the mid-Atlantic team for take reduction measures off the mid-Atlantic states.

### Developments in 1998

On 14 January 1998 a report on the Gulf of Maine team's December 1997 meeting was sent to the Service. Because many fishermen were unable to attend, the report did not reflect a consensus of its members. However, those present concluded that information on bycatch levels made available since its previous meeting in mid-1996 indicated that take reduction goals were not being met and that the team's August 1996 recommended plan as modified by the Service in August 1997 was unlikely to reduce bycatch levels below the potential biological removal level. An alternative system of time-area management zones was discussed, but, in the absence of several representatives of the fishing industry, no recommendations were put forward.

Based on the comments received and further deliberation, the Service developed a new harbor porpoise take reduction plan proposal. In the interim, no action was taken to implement any harbor porpoise take reduction measures for the mid-Atlantic region or to modify the New England system of time-area management zones for harbor porpoises last amended in 1996. As a related matter, however, the National Marine Fisheries Service, at the recommendation of the New England Fishery Management Council, adopted additional time-area fishery closures off New England to prevent overfishing on a collapsing cod stock in the Gulf of Maine. The new closures were published in the *Federal Register* on 31 March 1998 and became effective on 1 May 1998. They include some areas where harbor porpoise bycatch rates have been high and, as a result, were expected to coincidentally reduce harbor porpoise bycatch.

On 11 September 1998 the Service published a new proposed harbor porpoise take reduction plan in the *Federal Register* replacing its August 1997 proposal. The new plan proposed take reduction measures for both New England and the mid-Atlantic region.

For the New England area, the new plan proposed a complex system of expanded time-area management zones that overlaid other time-area closures previously adopted to conserve fish stocks and to reduce entanglement of right whales. The new time-area management zones for harbor porpoise substantially expanded the areas in which fishing with pingers would be required. Given the closures and assuming that pingers would reduce porpoise bycatch by 80 percent compared to fishing without pingers, the Service predicted that bycatch levels in New England would be reduced from an average of 1,883 porpoises per year between 1990 and 1995 to 309 harbor porpoises per year.

For the mid-Atlantic area, the Service proposed the closures and gear requirements recommended by the mid-Atlantic take reduction team in its August 1997 report. These measures included a complex set of restrictions that varied depending on the location of the fishing activity and whether the mesh size is greater or less than seven inches. The restrictions set limits on the number and length of nets and the

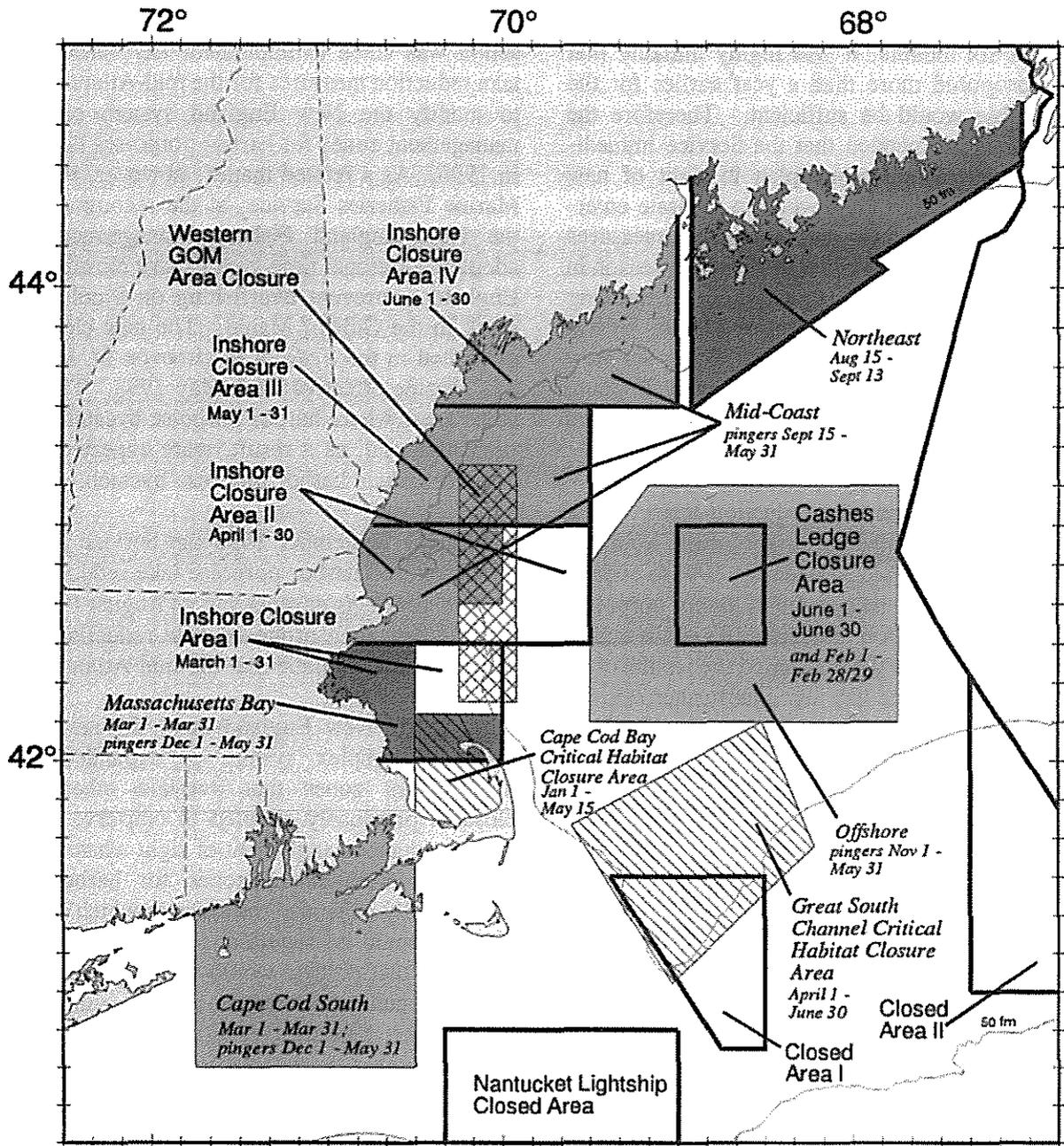


Figure 3. Management zones under the Gulf of Maine harbor porpoise take reduction plan and other related management plans. Management zones in black and gray shading with italic type are established to protect harbor porpoises under the harbor porpoise take reduction plan. Management zones delineated by diagonal lines with italics are established to protect right whales under the Atlantic large whale take reduction plan. Areas delineated by bold, linear outlines and regular type are fishing closures established to protect groundfish under the northeast multispecies fishery management plan.

minimum diameter of twine used for net webbing. They also include requirements for tie-downs (*i.e.*, tying floatlines and leadlines together to minimize the vertical height of the net) and affixing identification tags to nets. With these measures, the Service projected that bycatch levels in the mid-Atlantic area would be reduced by 79 percent. Based on an average annual bycatch estimate of 207 for 1995 and 1996, it projected that bycatch in the mid-Atlantic area would be reduced to 50 per year.

The proposed plan also included several non-regulatory provisions. These include a mandatory training program on the use and maintenance of pingers; efforts to randomly check pingers for their functional reliability; the development of hydrophones for enforcement officers to help ensure that deployed nets are equipped with functioning pingers; studies to assess the possibility that porpoises may habituate to pinger sound (thereby reducing the effectiveness of pingers); studies of the effects of pinger sounds on other ecosystem components; efforts to make bycatch estimates available in a more timely manner; and an expanded observer program for the mid-Atlantic area.

The Commission provided comments on the proposed plan to the Service on 13 October 1998. In its letter, the Commission noted that the new proposal incorporated important new features, such as take reduction measures for the mid-Atlantic area, measures to expand the use of pingers off New England, and the implementation of relevant rules under provisions of the Marine Mammal Protection Act rather than fishery management plans. The Commission concluded that the rules should contribute substantially to reducing the harbor porpoise bycatch.

The Commission also noted, however, that some assumptions used by the Service to predict expected bycatch levels under the proposed plan were overly optimistic. For example, it noted that available pingers require a level of maintenance difficult to provide in commercial operations and that experience to date with their use in commercial operations suggests that porpoise bycatch would be reduced 50 percent or less in some times and areas. Thus, it did not seem reasonable to expect that pingers, at least in the initial year of broadscale use, would achieve an 80 percent reduction in bycatch in all areas. In addition,

the Commission noted that time-area restrictions have often displaced fishing effort and associated bycatch to surrounding areas and times. The plan did not account for such shifts in predicting future bycatch estimates. Further, the Commission noted that bycatch estimates for the mid-Atlantic area were based on questionable assumptions that almost certainly underestimated bycatch in that area. Thus, the Service was underestimating bycatch reduction needs for the mid-Atlantic area.

Therefore, the Commission recommended that the Service use a more conservative estimate of the likely effectiveness of pingers and reexamine the accuracy of the mid-Atlantic area bycatch estimates used as the basis for developing its plan. Noting the need to offset higher bycatch levels given its reduced expectations for the initial effectiveness of pingers, the Commission recommended that the Service replace its complex system of time-area management zones for pingers with a blanket provision requiring that pingers be used on all gillnets in all times and areas off New England except Massachusetts Bay and south of Cape Cod in summer when harbor porpoises are unlikely to occur in those areas. Doing so, the Commission noted, would increase the level of bycatch reduction realized by using pingers, simplify the regulations, and facilitate enforcement. With regard to enforcement, the Commission noted that, by requiring all gillnets to be equipped at all times with functioning pingers, it would be possible to check for properly functioning pingers in port as well as on fishing grounds. If a blanket requirement for using pingers still was insufficient to reduce projected bycatch below the potential biological removal level, the Commission recommended that the Service reconsider a provision recommended by the Gulf of Maine team, but not adopted by the Service, to close an area between northeastern Massachusetts and southern Maine to all gillnet fishing during March.

On 2 December 1998 the Service published final rules in the *Federal Register* to implement the regulatory portions of its harbor porpoise take reduction plan. Although the final rule included some changes, they did not differ significantly from the proposed measures. For the New England area, the Service retained its approach of overlaying new time-area management zones (*i.e.*, for fishing closures and

fishing only with pingers) on the existing system of gillnet fishing closures to protect groundfish and right whales (see Figure 3). The time period for one management zone was shortened, it was extended for another, and it was shifted for a third. For the mid-Atlantic area, the Service adopted its proposed measures with one change. It eliminated application of the rules to gillnets with small mesh (less than 5-inch mesh) used to catch bluefish, weakfish, croaker, baitfish, and other species. The exemption was based on a very low estimate of bycatch levels in the small-mesh gillnet fishery.

Regarding the Commission's recommendations, the Service noted that if bycatch levels are not reduced below the potential biological removal level, further bycatch reduction measures, including those recommended by the Commission and others, would be reconsidered.

### **Marine Mammal Commission Harbor Porpoise Review**

To help determine if all necessary and possible steps were being taken to assess and monitor the status of the Gulf of Maine harbor porpoises and to reduce porpoise bycatch levels, the Commission held a review of the harbor porpoise research and management program during its 10–12 November 1998 annual meeting in Portland, Maine. At the meeting the Service reviewed its ongoing and planned activities to implement the above-noted take reduction plan.

With regard to research activities, representatives of the Service noted that another harbor porpoise population survey is planned for the summer of 1999. The results are expected to provide a basis for assessing recent population trends. They also noted that the Service and the Canadian Department of Fisheries and Oceans plan to jointly sponsor a study in 1999 to assess the effectiveness of "reflective" net designs to reduce harbor porpoise bycatch. Reflective nets are made of materials that harbor porpoises might detect and thereby avoid more readily.

With regard to research on pingers, it was noted that an initial study had been supported during 1998 to determine if harbor porpoises habituate to pinger

sounds over time, thereby lessening the devices' effectiveness as a deterrent. Preliminary results suggest some evidence of habituation, but there were no strong indications in this regard. Further studies of habituation and studies of the effects of pinger sound on other marine species are being planned. The Commission also was advised that a 1997 study on the effectiveness of pingers in reducing bycatch also tested the ability of different sound characteristics (e.g., frequencies) to deter harbor porpoises. Although the results indicate that different frequencies and frequency sweeps are effective, no plans for research to further define effective sound characteristics were identified.

Representatives of the Service also reviewed steps being taken to resolve a number of management issues. They noted that bycatch estimates would be developed and made available in a more timely manner. In the past, availability of these estimates has lagged one or two years behind the end of a fishing season. In the future, the Service stated that bycatch estimates would be developed quarterly and be made available three to four months after a fishing season. It also noted that some gillnetters have thwarted Service efforts to place observers aboard their vessels to monitor bycatch, even though they are required to take observers when asked. It was noted that efforts to enforce this requirement would be strengthened in the future. For fishing boats too small to carry an observer, observations would be made from a separate boat.

Representatives of the Service also noted that steps were being taken to ensure that gillnetters meet the requirements for using pingers. They noted that a series of regional workshops for gillnetters on the deployment and maintenance of pingers had already been initiated. Gillnetters fishing with pingers will be required to have a certificate attesting to their participation in one of these workshops. The Commission also was advised that the Service was exploring means of defraying the cost of purchasing pingers, estimated at perhaps \$3,000 to \$6,000 per vessel depending on the number of nets carried. It also was noted that work was being done to develop and provide enforcement officials with hydrophones for checking whether deployed gillnets are equipped with functioning pingers in times and areas where they are required.

Based on its review, the Commission wrote to the Service on 8 December 1998 to provide further comments and recommendations on implementing the harbor porpoise take reduction plan. In its letter, the Commission noted that it was clear that the Service was devoting a high level of attention to the issue and the Commission commended the Service for the steps it was taking to implement the plan.

The Commission remained concerned, however, that the plan was based on low bycatch estimates for the mid-Atlantic area and overly optimistic expectations for bycatch reduction measures. For example, the Service provided a new 1997 estimate of bycatch for the mid-Atlantic region of 572 porpoises, which was more than twice the estimate used to develop the take reduction plan (*i.e.*, an average of 207 for 1995 and 1996). As noted above, the 1997 estimate, based on improved observer data, is likely more accurate. If the Service's assumed bycatch reduction of 79 percent under the plan's measures is applied to the 1997 figure, then the predicted bycatch level for the mid-Atlantic region would be more than twice that projected by the Service (*i.e.*, 120 porpoises rather than 50 porpoises). In addition, for some times and areas, information provided by the Service indicated that bycatch rate reductions during commercial fishing operations using pingers have been substantially less than the 80 percent level assumed in the Service's plan. Therefore, in the Commission's 8 December letter it restated its belief that take reduction measures should be strengthened and it referenced recommendations in this regard that were set forth in its 13 October 1998 letter.

In addition, because of the increasing reliance on pingers to reduce bycatch, the Commission recommended that the Service undertake additional research on pingers to improve understanding of the factors, such as the frequencies, frequency variations, and harmonics, that serve to prevent harbor porpoises from being caught. It also recommended that the Service determine how pinger sound characteristics and associated bycatch rates change over time as battery power declines. Also, to speed progress in designing pingers that are easier to use and require less maintenance, the Commission recommended that the Service (1) consult with fishermen and scientists experienced in using pingers to identify ways of

making pingers more reliable and easier to use, and (2) as warranted, contract with a qualified engineer to design an improved prototype pinger incorporating desired features.

### **Proposal To List Gulf of Maine Harbor Porpoise as Threatened**

In September 1991 the Sierra Club Legal Defense Fund, on behalf of 13 environmental organizations, petitioned the National Marine Fisheries Service to list the Gulf of Maine harbor porpoise stock as threatened under the Endangered Species Act. Shortly thereafter, the Service published a *Federal Register* notice announcing receipt of the petition and requesting comments and related information on the action. In considering the petition and available information, the Service determined that bycatch in the gillnet fisheries was exceeding sustainable levels and that the population was likely to become endangered in the foreseeable future if bycatch levels were not reduced. At the time no measures were in place to reduce porpoise bycatch levels. Therefore, on 7 January 1993 the Service published a proposed rule in the *Federal Register* to list the Gulf of Maine harbor porpoise as threatened. Shortly thereafter, the New England Fishery Management Council began developing measures to reduce harbor porpoise bycatch, and in 1994 amendments to the Marine Mammal Protection Act set in motion steps to develop take reduction plans. In light of these efforts, the Service deferred final action on its proposal.

As noted above, initial actions proved insufficient and steps were taken to strengthen them. Although incidental take levels remained high and the Endangered Species Act requires action to be taken on a petitioned listing within one year, the Service continued to defer action on its proposed rule. As noted below, a lawsuit was filed on 21 August 1998 by the Center for Marine Conservation, the Humane Society of the United States, and the International Wildlife Coalition alleging a number of violations by the National Marine Fisheries Service with regard to its efforts to reduce harbor porpoise bycatch. The Service's failure to take final action on the petition to list harbor porpoises as threatened was among the violations cited.

To help resolve action on the petition and proposed rule and in light of the elapsed time since the previous comment period, the Service published a *Federal Register* notice on 22 October 1998 reviewing new information and developments bearing on the proposed action since 1993 and reopening the comment period. In this regard, the Commission's 8 December 1998 letter to the Service noted that bycatch levels have remained several times higher than the potential biological removal level since 1993 and, in the Commission's view, it seemed doubtful that actions currently proposed would reduce bycatch below that level. Even if the Service's plan is successful in reducing bycatch to levels below the potential biological removal level, the Commission noted that it could take several years of successful management for the stock to recover from past decades of unsustainable bycatch levels. Therefore, the Commission recommended that the Service announce an intent to proceed with listing the Gulf of Maine harbor porpoise stock as threatened unless measures adopted under the take reduction plan successfully reduce bycatch levels to less than the potential biological removal level.

The Commission also recommended that the Service keep the population's status under close review and continue to improve information on the stock's abundance and trends by (1) completing the planned population survey scheduled for the summer of 1999; (2) developing a correction factor to account for ship avoidance behavior by harbor porpoises during population surveys; (3) conducting a retrospective analysis of past bycatch levels to account for harbor porpoise bycatch in areas, such as the mid-Atlantic region and the area south of Cape Cod, that were not previously considered because of limited data on local bycatch rates; (4) developing a harbor porpoise population model using the best available information on key biological parameters to assess population status and trends; and (5) conducting a population viability analysis based on the analysis of population size and trends to determine the probability of extinction.

At the end of 1998 the Service expected to announce a decision regarding its listing proposal in early January 1999.

## Litigation

After efforts to persuade the National Marine Fisheries Service to adopt additional protective measures for harbor porpoises proved unsuccessful, the Center for Marine Conservation, the Humane Society of the United States, and the International Wildlife Coalition filed suit in U.S. district court on 21 August 1998 to compel the Service to implement such measures (*Center for Marine Conservation v. Daley*). The plaintiffs alleged that the Service had violated the Endangered Species Act by failing to take final action on its proposed rule to list harbor porpoises as threatened within the prescribed timeframe. They also claimed that the Service had violated the Marine Mammal Protection Act by failing to publish a take reduction plan by 1 April 1997 that would reduce the incidental mortality and serious injury of harbor porpoises to below the stock's potential biological removal level within six months.

The plaintiffs filed a motion for summary judgment on 29 September 1998, but before the case could be argued, the parties worked out a settlement. Under the settlement agreement, approved by the court on 2 November 1998, the National Marine Fisheries Service committed to issuing a final take reduction plan for the Gulf of Maine harbor porpoise population by 1 December 1998. The Service agreed that, if pingers are required to be deployed off New England during December under the plan, they would be required immediately in coastal waters off northeastern Massachusetts, Rhode Island, and southern Maine, within 7 days in offshore waters of the Gulf of Maine, and within 15 days in all other New England fishing areas. All other elements of the plan were to take effect by 1 January 1999.

The parties also agreed to a schedule for completing the listing process under the Endangered Species Act. The Service committed to issue a final determination on the listing proposal by 4 January 1999. In the event that the Service does not list the harbor porpoise, it will undertake and, by 31 March 2000, complete a 90-day review of the status of the Gulf of Maine harbor porpoise stock.

The defendants also agreed to provide information on harbor porpoise incidental take levels for 1998 and

the first four months of 1999 to the plaintiffs by 31 July 1999. Thereafter, the Service will provide the plaintiffs and the public with quarterly updates of harbor porpoise take levels. The Service also pledged to provide the plaintiffs by 30 June 1999 information on the status and scope of a research program to investigate the effects of pingers on the marine ecosystem and the potential for harbor porpoise habituation to or displacement by pingers.

### **Bottlenose Dolphin** *(Tursiops truncatus)*

Bottlenose dolphins occur throughout the world both inshore and offshore in temperate and tropical waters. It is the most common cetacean in the coastal waters of the southeastern United States and is the marine mammal species most likely to be affected by fisheries, oil and gas exploration and development, and other human activities in those waters. The bottlenose dolphin also is the cetacean species maintained most frequently in captivity for public display and scientific research.

Between June 1987 and March 1988 more than 700 bottlenose dolphins were found dead along the Atlantic coast between New Jersey and Florida (see Chapter V for information on this and subsequent marine mammal unusual mortality events). The National Marine Fisheries Service estimated that this mass mortality may have reduced the mid-Atlantic coastal migratory population of bottlenose dolphins by as much as 60 percent. On 11 November 1988 the Center for Marine Conservation petitioned the Service to list that population as depleted under the Marine Mammal Protection Act. Subsequently, the Service proposed and on 6 April 1993 listed the population as depleted.

As noted in its 1993 annual report, the Commission recommended on three separate occasions that the Service not list the population as depleted without simultaneously describing the steps that would be taken to decide when it had recovered. Toward this end, the Commission recommended that the Service develop and implement a conservation plan for the affected population. On 6 April 1993, the date that it

published notification of the depletion listing, the Service advised the Commission that it planned to prepare a conservation plan that would address the means for determining when the population had recovered.

There also have been several unusual mortality events involving bottlenose dolphins in the Gulf of Mexico. As noted in previous Commission reports, morbillivirus was determined or suspected to be the cause of several of these events. Because of uncertainty concerning the effects of the events on population size and productivity, the National Marine Fisheries Service requested in August 1990 that organizations holding permits to collect bottlenose dolphins for public display refrain from doing so unless absolutely necessary to maintain a display. Permit holders agreed and, since that time, no bottlenose dolphins have been taken from U.S. waters for public display. Instead, facilities are maintaining displays by breeding previously captured animals.

Although live captures and removals are no longer a concern, there is growing evidence that incidental take in fisheries may be adversely affecting some bottlenose dolphin populations. In some areas, the estimated incidental take in fisheries is greater than the calculated potential biological removal level for the affected populations. As noted in Chapter IX, boaters feeding and otherwise interacting with wild dolphins also are a growing concern. As noted in Chapters VI and VII, it also is not clear whether offshore oil and gas exploration and development or other activities in the northern Gulf of Mexico may be affecting bottlenose dolphins.

Although there is no evidence that any bottlenose dolphin population in U.S. waters currently is declining, there are several reasons for concern:

- it is uncertain whether the concentrations of bottlenose dolphins in different geographic areas constitute discrete population units and, if so, the boundaries, sizes, and productivity of those units;
- the species is long-lived (males can live more than 40 years and females more than 50) and occupies coastal waters affected by a variety of human activities, including pollution;

- indications in at least one local area — Sarasota Bay — that contaminants may be causing immunosuppression and affecting the life span of dolphins;
- first-born calves survive poorly, possibly because of accumulation of fat-soluble contaminants in the blubber of pre-reproductive females and their transfer in milk during nursing;
- high levels of persistent organic contaminants were found in the tissues of many of the dolphins that died during the unusual mortality events along both the mid-Atlantic and Gulf coasts; and
- apparently large, but still undocumented, numbers of bottlenose dolphins are being killed incidentally in commercial and recreational fisheries along the mid-Atlantic and Gulf coasts.

These and other factors were considered during a December 1996 review of the marine mammal research program at the Southeast Fisheries Science Center in Miami, Florida. This Center is responsible for providing the information needed by the National Marine Fisheries Service to conserve bottlenose dolphin populations in the coastal waters of the mid-Atlantic and Gulf states. During the program review, the participants were advised that the Service's regional office in St. Petersburg, Florida, had drafted a bottlenose dolphin conservation plan but, because of other more pressing issues, it did not expect to complete the plan in the foreseeable future. The reviewers identified a broad range of actions that should be included in the conservation plan.

Representatives of the Marine Mammal Commission participated in the 1996 review. On 31 December 1996 the Commission forwarded to the National Marine Fisheries Service its recommendations for staffing and improving the marine mammal research program at the Southeast Center. The Commission also provided an outline illustrating how the various actions identified by the reviewers could be incorporated into a conservation plan. Many of the actions recommended by the reviewers and the Commission subsequently were undertaken.

During the Marine Mammal Commission's annual meeting in Portland, Maine, on 10–12 November 1998, representatives of the Service presented information on ongoing efforts to determine the discrete-

ness, size, and productivity of bottlenose dolphin populations in the coastal waters of the mid-Atlantic and Gulf states, and the threats to them. The information indicated that, although funding has been limited, programs have been initiated to delineate stock structure and to document sources and levels of human-caused mortality and injury, particularly along the Atlantic coast. With regard to the latter point, it was noted that more than 200 bottlenose dolphin deaths in the southeastern United States in the past year were linked to human activities, mostly entanglement in fishing gear. The Commission was advised that the Service had contracted with three scientists familiar with bottlenose dolphins and related conservation issues to prepare a conservation plan for bottlenose dolphins in the northern Gulf of Mexico and along the eastern coast of the United States.

On 18 December 1998 the Commission wrote to commend the Service for the actions it had taken. The Commission noted that it continued to believe that a conservation plan is needed and that the individuals retained by the Service to draft the plan are well qualified to do so. The letter suggested that the outline developed by the Commission following the December 1996 program review might be useful in this regard. The Commission also noted that much potentially useful research was being done by volunteer organizations, students, and non-government researchers. Because of the limited funding available to the Service, the Commission recommended that the conservation plan indicate how volunteers, students, and non-government researchers could be used to help meet the program objectives.

The Commission pointed out that available information suggests that there may be at least four reasonably discrete types of bottlenose dolphin populations in U.S. Gulf and Atlantic waters: (1) a nearshore east coast population that migrates annually between summering areas north of Cape Hatteras, North Carolina, and wintering areas off Georgia and northern Florida; (2) year-round resident populations in places such as Sarasota Bay and surrounding areas; (3) populations that occur in deep waters off both the Atlantic and Gulf states; and (4) intermixing resident and migratory populations that overlap seasonally in places such as the Indian and Banana Rivers in east-central Florida. In this regard, the Commission noted

that long-term mark/resighting and/or radio-tagging programs were required to verify this presumption and that program development plans prepared by the Southeast Fisheries Science Center in the late 1970s and early 1980s had called for establishing long-term mark/resighting programs in Sarasota Bay, Mississippi Sound, and the Indian River/Banana River complex. Pilot studies were initiated in each of these areas, but have been continued only in the Sarasota area.

Participants in the December 1996 program review recommended that the Service identify and initiate long-term longitudinal studies in additional areas thought to be representative of the different types of bottlenose dolphin populations that may occur along the southern Atlantic and Gulf coasts. The Commission reiterated this recommendation in its 18 December 1998 letter. The Commission also recommended that the Service consult with the Environmental Protection Agency, the Minerals Management Service, and relevant coastal state agencies to determine whether everything necessary is being done to assess the sources, levels, and effects of anthropogenic contaminants present in bottlenose dolphins along the coasts of the southeastern and Gulf states.

At the end of 1998 it was the Commission's understanding that a draft conservation plan would be completed and circulated for comment by the Service in the first half of 1999. The Commission believes that the plan should be both aggressive and proactive (*i.e.*, be designed to identify and deal with problems before they have substantial biological, ecological, or socioeconomic impacts). Further, the Commission believes that the plan should identify the personnel, financial, and other resources needed to address priority research and management issues most cost-effectively. The Commission will work with the Service in 1999 to develop and promote implementation of a conservation plan that meets these objectives.

### **Hawaiian Monk Seal** *(Monachus schauinslandi)*

The Hawaiian monk seal is the most endangered pinniped in U.S. waters and is second only to the northern right whale as the nation's most endangered

marine mammal. The Hawaiian monk seal population currently is estimated to number about 1,300 to 1,400 seals, which appears to be less than half its abundance in the late 1950s. The species breeds only in the Hawaiian Archipelago, with most monk seals inhabiting the remote, largely uninhabited atolls and surrounding waters of the Northwestern Hawaiian Islands (Figure 4). More than 90 percent of all pups are born at six major breeding colonies located at French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island, Kure Atoll, and Midway Atoll. A few births also occur annually at Necker Island, Nihoa, Niihau, and the main Hawaiian Islands. Although monk seals occasionally move between islands, females generally return to their natal colony to pup. Contributing to the species' decline over the past four decades have been human disturbance, entanglement in derelict fishing gear, reduced prey availability, shark predation, natural environmental perturbations, attacks by aggressive adult male monk seals on females and immature seals of both sexes (called "mobbing"), and possibly disease.

Ensuring monk seal recovery continues to be a daunting task. The National Marine Fisheries Service has lead responsibility for Hawaiian monk seals under both the Endangered Species Act and the Marine Mammal Protection Act. To meet its responsibilities, the Service, at the recommendation of the Marine Mammal Commission, established the Hawaiian Monk Seal Recovery Team in 1980. In recent years, the team has met annually to review and provide advice on recovery needs. The Service also has provided recommendations on activities that could affect monk seals pursuant to section 7 of the Endangered Species Act, established regulations to reduce interactions with commercial fisheries, and initiated programs to monitor the status of monk seals throughout their range, remove entangling debris from monk seals and their habitat, reduce male mobbing, and characterize monk seal foraging ecology and diet.

Because all of the Northwestern Hawaiian Islands except Kure Atoll are within either the Hawaiian Islands National Wildlife Refuge or the Midway Atoll National Wildlife Refuge, the Fish and Wildlife Service also has major responsibilities regarding the recovery of monk seals. Among other things, the Fish and Wildlife Service assists with monk seal

research and monitoring and factors monk seal protection needs into management decisions related to public use of refuge areas.

Other key agencies and groups whose activities, programs, or responsibilities bear on monk seal recovery include the Army Corps of Engineers, the Coast Guard, the Navy, the State of Hawaii, the Western Pacific Regional Fishery Management Council, the University of Hawaii and the University of Hawaii's Sea Grant Program, the Hawai'i Wildlife Fund, and the Center for Marine Conservation. As discussed in past annual reports, the Marine Mammal Commission was instrumental in initiating the monk seal recovery program late in the 1970s and has since continued to provide advice and assistance to the National Marine Fisheries Service and other agencies on monk seal recovery needs. Important issues in 1998 are discussed below.

### Population Trends and Survival

Little is known about Hawaiian monk seals or their population status before the 1950s. It generally is acknowledged that the species was heavily exploited in the 1800s during a short-lived sealing venture. What is thought to be the last Hawaiian monk seal taken by commercial sealers was killed in 1824 by the crew of the brig *Aiona*. Some seals were killed for food by shipwreck victims and other transient visitors to the islands.

The first attempt at estimating Hawaiian monk seal numbers was made in 1958, when a total of 1,206 seals was counted. Between then and the mid-1970s, the overall population size declined by about 50 percent. During this period, colonies at the western end of the archipelago between Kure Atoll and Laysan Island declined by at least 60 percent, and the colony at Midway Island all but disappeared. Most human activity was concentrated at the westernmost atolls of the chain during this period, suggesting that human disturbance contributed to the decline. The Navy undertook a major expansion of its air facility on Midway Atoll during the 1950s, and in 1960 the Coast Guard established a LORAN station at Kure Atoll that was occupied year-round. As described in the previous annual report, ownership of Midway Atoll was transferred from the Navy to the U.S. Fish

and Wildlife Service in 1996, and the atoll is now managed as the Midway Atoll National Wildlife Refuge. The Coast Guard closed the LORAN station at Kure Atoll in 1992 and removed most of the man-made structures by 1993.

The decline in monk seal numbers seemed to have slowed by the early 1980s, due primarily to a seven-fold increase in monk seal counts at French Frigate Shoals between the 1960s and mid-1980s. However, the overall population again began to decline in the late 1980s and early 1990s. The downward trend was driven primarily by the colony at French Frigate Shoals, which has been declining significantly since 1989. In the mid-1990s total monk seal numbers appear to have stabilized at about 1,300 to 1,400 individuals. However, the poor juvenile survival experienced in recent years, especially at French Frigate Shoals, is expected to initiate a renewed population decline because fewer females will be entering the breeding population.

The poor juvenile survival rate at French Frigate Shoals does not appear to be due to direct human disturbance. Rather, evidence indicates that limited prey availability may be a factor. The small size of pups at weaning, the absence of apparent disease-related deaths, the low female reproductive rate, and the delayed age of first reproduction at this location support this hypothesis.

Aggressive behavior or mobbing of females and immature seals by adult males also is a source of mortality. This can be a direct result of injuries inflicted by the aggressive males or as a result of later shark attacks on wounded seals or pups chased into the water by aggressive males. During the 1997 field season at French Frigate Shoals, 14 incidents of adult male aggression toward pups were documented, and eight pups subsequently died. Two adult males were identified as being responsible for most of these injuries. After similar behavior by the same animals was observed again in 1998, the two offending males were translocated to Johnston Atoll, located about 1,125 km (700 miles) south of French Frigate Shoals, on 8 June 1998. At the end of 1998 neither animal had been resighted at French Frigate Shoals, and the incidence of injury or death caused by aggressive behavior had declined dramatically at this site.

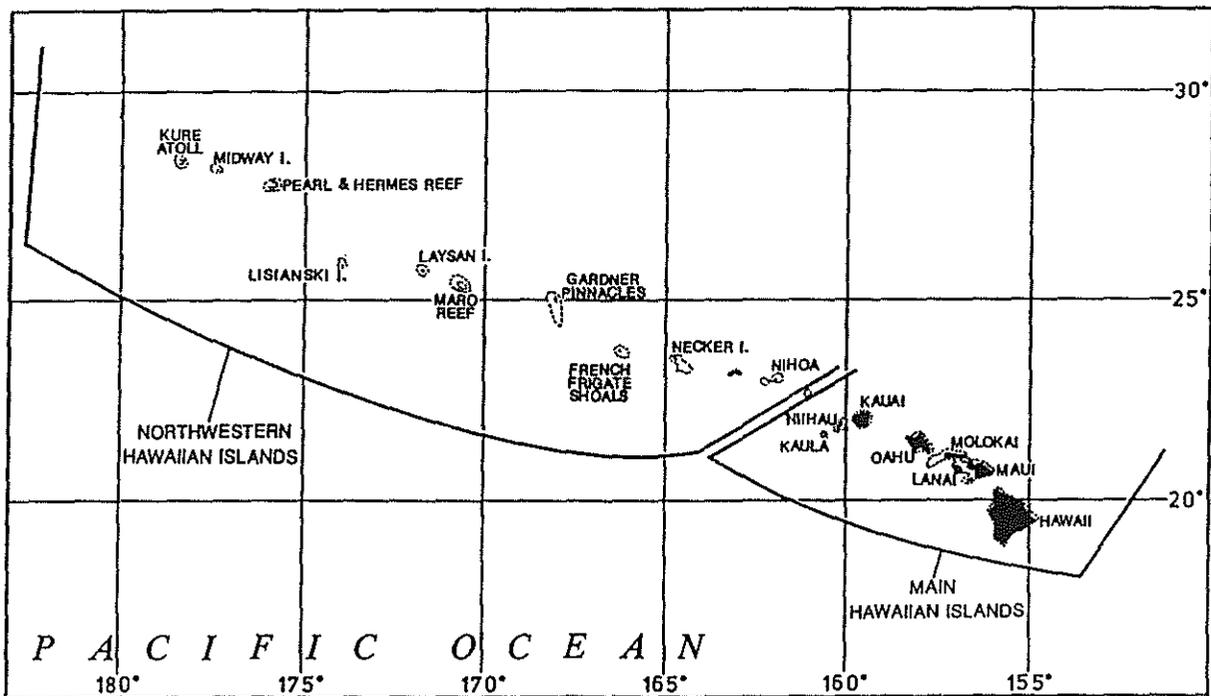


Figure 4. The Hawaiian Archipelago. The Northwestern Hawaiian Island, extending about 1,900 km (1,200 miles) northwest of the main Hawaiian Islands, provides pupping beaches for all major breeding colonies of Hawaiian monk seals.

Overall, during the 1998 field season there were 13 documented cases of male aggression toward females, juveniles, or pups that resulted in injury or death. Of these, three were at French Frigate Shoals, one of which resulted in a death; two were at Laysan Island, one of which resulted in a death; and eight were at Lisianski Island, one of which resulted in a known mortality. In addition to shark attack and mobbing, other natural factors that may affect monk seal populations include disease and biotoxins and environmental changes brought on by climate shifts and perturbations that may affect the abundance of monk seal prey.

Human-related interactions are a known cause of monk seal mortality through interactions with commercial fisheries, entanglement in discarded or lost fishing nets and other debris, pollution from human activities, and entrapment in deteriorating seawalls.

### Theater Missile Defense Program

In fiscal year 1995 Congress directed the U.S. Navy to develop a theater missile defense program at

the Pacific Missile Range Facility, Kauai, Hawaii. To meet this directive, the Navy plans to design and test the use of interceptor missiles to destroy or knock down target missiles launched from sites at various distances and locations around Kauai. Additional tracking stations and launch sites within the Hawaiian Islands would be required. A draft environmental impact statement on the proposed program indicated that target missiles potentially could be launched from either of two types of free-floating barges, specially configured aircraft, and/or new land-based launch facilities. Potential sites for land-based launch and tracking facilities include Johnston Atoll, Tern Island in French Frigate Shoals, and Niihau.

On 26 May 1998 the Commission commented on the draft environmental impact statement, expressing concern about the possible effects on monk seal behavior and survival from the construction, operation, and human presence at new land-based missile launch facilities, particularly on Tern Island. Given the possibility of severe impacts on monk seal survival at Tern Island, the Commission recommended that it

be withdrawn from consideration as a potential target missile launching site, and that the Navy not consider any land-based sites located in the Northwestern Hawaiian Islands. Rather, it urged that emphasis be directed toward mobile sea-based launch sites or, preferably, air-drop target missile launches. On 21 December 1998 the Commission received a letter from the Navy indicating that Tern Island and Johnston Atoll were being withdrawn from consideration.

On 2 September 1998 the Commission received from the Department of Defense, Ballistic Missile Defense Organization, a finding of no significant impact and an associated final programmatic environmental assessment for an air-dropped, short-range target missile to help develop and test ballistic missile defense capabilities. The air-launch target system would involve the release of target missiles from a C-130 aircraft and would not require land-based launch pads. In its comment letter of 18 September 1998 the Commission commended the Department of Defense for exploring target missile systems that did not require land-based launch platforms. It noted that it seemed reasonable to conclude that deployment of air-drop target missiles over the open ocean could be undertaken so as to have no significant impact on marine mammals or their habitat. To help ensure this, the Commission recommended that, if it had not already done so, the Department of Defense initiate consultations with the National Marine Fisheries Service pursuant to section 7 of the Endangered Species Act to identify such measures as may be needed to avoid significant adverse impacts on marine mammals and their habitats.

During 1999 the Commission expects to continue following this issue closely.

### **Tern Island**

Tern Island, one of several small islets at French Frigate Shoals, is an important haul-out site for Hawaiian monk seals as well as for endangered sea turtles, and is a rookery for a variety of birds. During World War II, the Navy enlarged the island from its original 4.5 hectares (11 acres) to about 16.2 hectares (40 acres) to accommodate a landing strip. To do so, the Navy constructed a sheet metal bulkhead around most of the island and backfilled behind

the structure with dredged spoil and coral rubble from the surrounding lagoon. The Coast Guard took over the island from 1952 to 1979 to operate a LORAN station. Since then, it has been used by the Fish and Wildlife Service as a field station for its Hawaiian Islands National Wildlife Refuge.

The airstrip and small buildings on Tern Island have made it possible to occupy the site year-round since the late 1970s. As the only site with such facilities between the main Hawaiian Islands and Midway Atoll, a distance of about 2,200 km (1,370 miles), it is a strategically important base for providing a regional enforcement presence, a rapid response and evacuation capability in case of maritime emergencies, and a means of facilitating research and management work, including year-round studies of resident monk seals.

The continued existence of the runway and field station — in fact, the integrity of the entire island — is in doubt because the sheet metal bulkhead, now more than 50 years old, is badly deteriorated. If the bulkhead fails, the airstrip would be lost, the field station would have to be abandoned, most of the island would erode away, buried debris would be exposed and create entanglement hazards to wildlife, and erosion pockets behind the rusted-out seawall would become serious entrapment hazards for monk seals and other wildlife. Removal of such hazardous structures and debris would be costly.

As noted in past annual reports, the Commission has recommended that the Fish and Wildlife Service and other agencies take steps to replace the bulkhead as quickly as possible. The Service shared the Commission's concerns, and in 1993 it contracted with the Army Corps of Engineers to develop detailed construction plans for a rock revetment to replace the decaying bulkhead. Although designs were completed in 1995, the Service was unable to obtain funding to construct the new seawall until late in 1998.

The shoreline near the island's buildings continued to erode, and by mid-1997 they were in imminent danger of being undermined by storms. Therefore, late in 1997 the Service contracted with the Army Corps of Engineers for emergency repairs along the short stretch of shoreline fronting Tern Island's

buildings. Repairs costing about \$300,000 were completed by the end of 1997. In 1998 the Commission learned that the Fish and Wildlife Service received \$1 million in the beginning of fiscal year 1999 as an initial investment for seawall construction; additional monies are expected over the next three years. The total cost of the project is estimated to be about \$15 million. The complete restoration of the island's integrity along the lines proposed in 1995 by the Army Corps of Engineers is highest priority.

### Midway Atoll National Wildlife Refuge

Midway Atoll, located near the western end of the Hawaiian Archipelago, consists of two principal islands, Sand Island (about 445 hectares or 1,100 acres) and Eastern Island (about 135 hectares or 334 acres). The atoll supports an exceptional assemblage of wildlife including the world's largest colony of Laysan albatrosses, at least 13 other species of migratory seabirds, and four species of migratory shorebirds. It also provides habitat for threatened green sea turtles and Hawaiian monk seals.

Midway is the most intensively developed atoll in the Northwestern Hawaiian Islands. It was used as a trans-Pacific cable relay station beginning in 1903, and in 1935 was developed as a refueling base for commercial trans-Pacific clipper flights. In 1940 the atoll was further developed as a U.S. naval station, and up to 10,000 people were stationed at the atoll during World War II. In 1950 the naval station was reactivated for the Korean War and in 1957 a major expansion and rebuilding program took place. As use of the station decreased, it was redesignated as a Naval Air Facility in 1978 and was closed in 1993.

The Navy transferred ownership of Midway Atoll and the surrounding reefs to the Fish and Wildlife Service in 1996 for management as the Midway Atoll National Wildlife Refuge. Because of the importance of the airfield on Midway for emergency landings, refueling Coast Guard enforcement planes, and other purposes, transfer of the atoll to the Fish and Wildlife Service included an obligation to maintain the runway and associated equipment (*e.g.*, pumps and fuel tanks). The facilities allow easy access for researchers and refuge staff and for public use compatible with wildlife conservation, which is a fundamental purpose

of national wildlife refuges. Because the Fish and Wildlife Service has neither the expertise nor the funding to maintain and operate an airfield, it negotiated arrangements with a private contractor in 1996 to maintain and operate the airfield and manage a public visitation program.

As discussed in last year's annual report, the Fish and Wildlife Service developed a Midway Atoll National Wildlife Refuge Public Use Plan. To accommodate and manage public uses compatible with wildlife conservation, the plan proposed a series of compatibility determinations defining allowed activities and related restrictions for public participation in refuge research and management work, recreational fishing, wildlife observation and photography, diving and snorkeling, environmental education, and interpretation of refuge wildlife and historical resources.

Largely as a result of the change in stewardship at Midway Island and the cooperative agreement between the Fish and Wildlife Service and its contractor, monk seals on and around the island have been monitored continuously since February 1997 in a cooperative effort between the National Marine Fisheries Service and the Hawaii Wildlife Fund. The mean beach count of 24 animals in 1998 was far higher than that of any year since 1960. Eleven pups were born at the atoll in 1998, the same number born in 1997. Ten of the 11 survived to weaning in both years. The recent increases in beach counts and births are encouraging signs of the possible reestablishment of the Midway Islands as a major monk seal breeding site.

The National Marine Fisheries Service, the Fish and Wildlife Service, and the Service's contractor continue to work cooperatively to address the array of issues that face monk seals. An overriding concern is that ecotourism and other activities need to provide enough revenue for the contractor to continue to maintain the facilities at Midway Island. Discussions are ongoing about increasing the visitor cap (currently 100 people at a time), possible tour boat visits, and sportfishing opportunities. Other potentially important issues include regulating access to beaches and reefs to minimize disturbance to monk seals, education and policing of visitors, location for a swim platform, and fishing for lobsters and other species by island residents and visitors.

## Prey Availability and Commercial Fisheries

The number of monk seals at French Frigate Shoals, the species' largest colony, declined significantly from 1989 to the mid-1990s. As mentioned earlier, the poor juvenile survival at this site may be a result of limited prey availability. Monk seals feed on reef fish, octopuses, crabs, and lobsters, all of which are taken in the Northwestern Hawaiian Islands' lobster fishery.

The small sizes of banks in the Northwestern Hawaiian Islands and their isolated locations away from other recruitment sources for marine life make them vulnerable to impacts from overfishing. Thus, the Commission has been concerned that, if lobster fishing were to occur around French Frigate Shoals, it could adversely affect stocks of lobsters and other potentially important prey species for monk seals. As noted in its past annual reports, the Commission has repeatedly recommended that the Service close French Frigate Shoals to lobster fishing until better information becomes available on the importance of lobsters in the diet of monk seals and the effects of lobster fishing on important monk seal prey resources. The Commission also has recommended that the Service expedite research to determine the relative importance of lobsters and other species in the diet of monk seals, but funding to do so has not been provided.

By letter of 23 December 1997 to the Service, the Commission repeated its earlier recommendations that the Service increase funding for prey studies and close French Frigate Shoals to lobster fishing. The letter also repeated earlier requests not met by the Service for information on the criteria the Service would use to determine if lobster fishing were either causing or contributing to the monk seal population decline.

On 1 April 1998 the Service wrote to the Commission, advising that it did not plan to close French Frigate Shoals to lobster fishing because, based on previous experience, it was expected that little if any fishing effort would be expended in the area. In addition, the Service stated that it was implementing a vessel-tracking system that would ensure the effective monitoring of fishing vessels anywhere in the Northwestern Hawaiian Islands.

The Service's response failed to address Commission concerns about the impact that lobster fishing at French Frigate Shoals could have on the availability of monk seal prey. Once again, it also failed to provide the requested description of criteria the Service would use to determine the point at which lobster fishing might adversely affect Hawaiian monk seals. Therefore, the Commission wrote to the Service on 17 July 1998 again recommending that French Frigate Shoals be closed to lobster fishing and that, if the Service again declined to do so, it provide the Commission with a detailed description of the criteria it would use to determine the point at which lobster fishing at French Frigate Shoals might have an adverse effect on Hawaiian monk seal survival. It also asked the Service to provide information on the procedures to be taken to ensure that lobster fishing at French Frigate Shoals did not exceed the level of lobster removal that could adversely affect monk seal survival. The Service subsequently wrote to the Commission on 24 August 1998 noting that it would require additional time to address the points in the Commission's letter. At the end of 1998, the Commission had not received a further reply.

At the Marine Mammal Commission's 1998 annual meeting in Portland, Maine, on 10–12 November and at the 1–3 December 1998 meeting of the Hawaiian Monk Seal Recovery Team, new information was provided indicating that management measures implemented by the Service in 1998 had resulted in a redistribution of lobster fishing effort in the Northwestern Hawaiian Islands. The total quota of 186,000 lobsters was divided into four areas: Necker Island, Gardner Pinnacles, Maro Reef, and the remainder of the Northwestern Hawaiian Islands. As a result of these management measures, lobster fishing effort shifted to the western end of the monk seal's population range, including atolls directly supporting major monk seal breeding colonies.

As noted in the Commission's past letters, lobsters and octopuses are known components of monk seal diets, but their relative importance is uncertain. The Service has discounted the possibility that octopus bycatch in lobster traps may affect monk seal prey availability because they currently constitute a very small component of the lobster fishery bycatch. Although this now may be true, past bycatch may

have been higher and may have reduced octopus stock levels. A report entitled "Magnuson-Stevens Act Definitions and Required Provisions," published by the Western Pacific Regional Fishery Management Council in September 1998 noted that mollusks account for just 1 percent of the lobster fishery bycatch in the Northwestern Hawaiian Islands, but that 23 percent of the bycatch is crabs, 25 percent is reef fishes, 11 percent is moray eels, and 4 percent is other lobster species. All of these are components of the monk seal diet. In addition, preliminary results of research to identify the relative importance of monk seal prey species using fatty acid signatures of prey in seal blubber were presented at the recovery team's December meeting. The results suggested that this is a promising means of assessing the composition of monk seal diets, and that lobsters, as well as crabs, eels, reef fishes, and octopuses, are important dietary components. With sampling and analyses done to date, however, it is not possible to reach firm conclusions about the relative importance of different species in the diet of monk seals.

In light of new information on the fishing effort at atolls with major monk seal breeding colonies and available information indicating that lobsters and other species taken as bycatch in the lobster fishery may be significant components in the monk seal diet, the Marine Mammal Commission wrote to the Service on 31 December 1998. It recommended that the Service immediately reinstate consultations pursuant to section 7 of the Endangered Species Act on the possible effect of lobster fishing in the Northwestern Hawaiian Islands on Hawaiian monk seals. In addition, the Commission again recommended that the Service immediately close French Frigate Shoals to lobster fishing pending the availability of better information on (1) the importance of lobsters and other species taken in the lobster fishery in the diet of monk seals, and (2) the status of lobster stocks at French Frigate Shoals.

In this regard, the Commission recommended that the Service provide at least \$50,000 to expedite and support a research program to investigate monk seal prey preferences using fatty acid signatures. The Commission also recommended that the Service immediately act to prohibit lobster fishing at reefs surrounding Kure Atoll, Pearl and Hermes Reef, and

Lisianski Island until there is better information on the importance of lobsters and other species taken in the fishery in the diet of Hawaiian monk seals and on the status of monk seal stocks at those atolls. The Commission looks forward to a response from the Service early in 1999.

### **Enhancing Survival of Pups Born at French Frigate Shoals**

In past years the National Marine Fisheries Service has rescued and rehabilitated female yearling monk seals unlikely to survive at French Frigate Shoals and released them at Kure Atoll to help rebuild that depleted colony. The purpose of the effort was to salvage some of the reproductive potential that was being lost at French Frigate Shoals because of low juvenile survival. In 1992 the Service switched release efforts to Midway Atoll to help increase the small but growing colony there. Unlike translocations to Kure Atoll, however, initial releases at Midway Atoll experienced poor survival. Further translocations were suspended pending a thorough review of the program.

After that review, the Commission recommended that translocations to Midway be reinitiated. The Service captured 12 female pups at French Frigate Shoals for this purpose in 1995 and brought them to Oahu for rehabilitation. While in captivity, the animals developed an undiagnosed eye problem never before observed, and they could not be released. A 1997 review of the situation by an independent panel of veterinarians and wildlife managers recommended, in part, that translocation efforts be renewed, but that instead of bringing animals to Oahu, rehabilitation be carried out at the capture or release site and the animals be moved directly to Midway.

During the Commission's 1998 annual meeting, representatives of the Service advised the Commission that funds would be available in fiscal year 1999 for translocating weaned female pups from French Frigate Shoals to Midway Atoll. In anticipation of translocating pups this year, the Service carried out a health and disease assessment involving seals at French Frigate Shoals, Pearl and Hermes Reef, and Midway Island. Preliminary results indicated the presence of

antibodies to morbillivirus in three seals from French Frigate Shoals, but not in seals at the other sites. Although antibody levels were low, there is a possibility that seals at French Frigate Shoals have been exposed to a morbillivirus while monk seals at other sites have not. The proposed translocation could therefore inadvertently introduce this virus to seals at Midway and possibly precipitate a die-off. The Service plans to retest samples and collect additional samples from seals at French Frigate Shoals in early 1999 to verify results.

Based on information provided at its annual meeting and at the 1–3 December recovery team meeting, the Commission wrote to the Service on 31 December 1998 recommending that the translocation of weaned pups from French Frigate Shoals not proceed until uncertainties regarding the risk of introducing morbillivirus or other significant disease agents have been thoroughly reviewed by marine mammal veterinarians and epidemiologists. If further consideration indicates that it is not safe to translocate animals from French Frigate Shoals to Midway Island, then the Commission recommended that funding currently allocated to translocation work be redirected to a headstart program at French Frigate Shoals. This would be similar to previous Hawaiian monk seal headstart programs where female weaned pups were kept in an enclosure and fed during the critical period just after weaning.

As a related matter, the Commission was concerned that an outbreak of morbillivirus could occur with devastating effect on the entire Hawaiian monk seal population. The Commission therefore recommended in its 31 December letter that the Service assess the effectiveness and feasibility of carrying out a program to inoculate Hawaiian monk seals with a vaccine against morbillivirus. If such a program is determined to be potentially beneficial and feasible, the Commission recommended that the Service give serious consideration to developing a plan for implementing a vaccination program.

## Marine Debris

Marine debris, particularly derelict fishing nets, poses a serious risk of injury and death to Hawaiian monk seals. The inquisitive nature of seals, particularly pups and juveniles, tends to make them attracted

to debris. Subsequent interactions can lead to entanglement and, unless they are able to free themselves quickly, entangled seals risk drowning or death through injuries caused by the entangling gear. During the 1998 field season, 18 seals were found entangled in debris. Of these, 5 were able to disentangle themselves, 12 were disentangled by field crews (Figure 5), and 1 was found dead in a net caught on the reef at Laysan Island.

For several years, the Service has partially addressed the issue by removing debris from seals and beaches during field visits. Submerged debris, however, represents a greater threat because animals caught may drown or be killed by sharks. Therefore, in 1998 the National Marine Fisheries Service organized a multi-agency cleanup effort to remove derelict fishing nets and other debris from the reefs surrounding French Frigate Shoals and Pearl and Hermes Reef. An estimated 94 pieces of netting per square kilometer occurs on the reef surrounding French Frigate Shoals, and an estimated 64 pieces of netting per square kilometer occurs on reefs around Pearl and Hermes Reef. The Service was able to remove only a small proportion of this debris and estimates that 38,000 pieces of netting remain in the waters surrounding each of these locations. Agencies involved in the cleanup included the Coast Guard, the Navy, Hawaii state government, the Fish and Wildlife Service, the Center for Marine Conservation, the Hawai'i Wildlife Fund, the city of Honolulu, the University of Hawaii Sea Grant Program, the University of Alaska Marine Advisory Program, and BFI Industries. Clean-up will require a long-term commitment to remove the substantial amounts of debris now present. The Service is planning to continue this effort in 1999 at a location yet to be determined.

As a related matter, on 16 October 1998 the lobster fishing boat *Paradise Queen II* ran aground on reefs at Kure Atoll. Although more than 15,000 liters (4,000 gallons) of fuel were spilled, it apparently dissipated with no observed impact on monk seals. However, as of December 1998 the vessel and about 3.2 km (2 miles) of line and 500 lobster traps remained on the reef. Recognizing the danger posed by the wreck, the National Marine Fisheries Service explored a variety of options to remove the vessel and its gear before the vessel breaks up and debris is



Figure 5. Adult male Hawaiian monk seal found entangled in derelict trawl net on Laysan Island, 23 July 1998. Service personnel removed the netting and the seal was released with no apparent injuries. (Photograph courtesy of Dorothy Dick)

strewn across the reef by storms. The derelict line and other debris could pose a direct entanglement risk for monk seals as well as other species, such as sea turtles. No funds remain from the vessel's insurance policy to pay for a salvage operation. The Service has asked the Navy for help in removing the vessel from the reef but, to date, the Navy has not been able to comply. The removal of the wreck and its associated debris is an urgent matter. The Marine Mammal Commission therefore recommended in its letter of 31 December 1998 to the National Marine Fisheries Service that it continue its efforts to consult with the Navy and other appropriate state and federal agencies to secure assistance to remove the wreck and associated debris from the reef as soon as possible.

### **Captive Seals at Kewalo Basin**

As noted above and in previous annual reports, 12 underweight female pups were removed from French Frigate Shoals in 1995 and taken to facilities on Oahu for rehabilitation prior to release at Midway or Kure Atoll. However, shortly after arriving at Oahu, most of the seals developed an eye problem never before encountered. Plans for their release were suspended, and the monk seals remained in captivity pending efforts to identify the cause of the eye problem. Two of the original 12 animals died in 1997 of unrelated causes. The cause of the eye problem has not been determined but the clinical result has been corneal opacities limiting vision in one seal and causing total blindness in eight animals. The tenth is unaffected.

The cost of maintaining these animals in captivity has been a significant financial burden on the Service. However, the possibilities that the condition could be contagious, that the monk seals would be unable to adapt to the wild and evade sharks after years in captivity, have made it inadvisable to release them. The Service therefore convened a review panel on 1–4 June 1997 to obtain advice and recommendations on what to do with the seals and whether rehabilitation work should be resumed. The panel included independent experts in veterinary medicine, population biology, and wildlife management. A report of the panel's findings was circulated in June 1997. Among other things, it recommended that the seals now in captivity not be released and that the Service make every effort to find a facility willing to care for the animals and provide access to them for research.

In light of the panel's recommendations, the Service developed a plan, including a list of potential facilities and transfer criteria, for moving the animals now held in captivity to approved facilities for long-term care. Based on discussions of these plans at the Commission's November 1997 annual meeting, the Commission wrote to the Service on 23 December 1997 urging that, if at all possible, the Service avoid transferring the monk seals to a foreign facility because of their importance for research and because of the less rigorous husbandry and maintenance standards found in some foreign facilities. The Commission recommended that the Service increase efforts to find a suitable U.S. facility to care for the animals.

During the Commission's 10–12 November 1998 annual meeting, it was advised that an agreement has been reached with Sea World of Texas, San Antonio, for the permanent care and maintenance of all of the captive monk seals. The Sea World facility is an appropriate long-term husbandry facility that has the capability to regulate the environment of the holding facility and thereby alleviate potential sources of stress. Also, the monk seals will be kept together as a group and will be available for approved research projects to obtain information that cannot be obtained from wild animals. Pending final approval, the transfer of these animals is expected in February 1999. By letter of 31 December 1998 the Commission commended the Service for its efforts to find a suitable U.S. facility to accept the animals.

## Steller Sea Lion (*Eumetopias jubatus*)

Steller sea lions range along the rim of the North Pacific Ocean from the Channel Islands in Southern California to Hokkaido, Japan, with centers of abundance in the Aleutian Islands and the Gulf of Alaska. Although some individuals, particularly juveniles and adult males, disperse widely outside the breeding season (late May to early July), animals tend to return to their natal rookery to breed. About three-fourths of all Steller sea lions haul out and pup in U.S. territory. Over the past 30 years, Steller sea lion abundance has declined dramatically throughout most of the central and western part of its range (Table 4). Numbers of Steller sea lions at some sites have declined by more than 80 percent since the mid- and late 1970s, and the species has all but disappeared at other sites (Figure 6). Because of this decline, in 1990 the National Marine Fisheries Service designated the Steller sea lion as threatened under the Endangered Species Act.

The cause of the decline is uncertain, and may be due to a number of factors. The most commonly held hypotheses are that available prey species have decreased in abundance or that there has been a significant change in prey species composition. Either may have led to an increase in sea lion mortality, particularly among juveniles. Steller sea lions are known to prey upon a variety of species, including Atka mackerel, walleye pollock, salmon, herring, and flatfishes, all of which are taken by commercial fisheries. The extensive commercial fisheries in Alaskan waters therefore may be a significant factor affecting prey availability for Steller sea lions. Other possible factors contributing to the species' decline include incidental taking by foreign and joint-venture trawl fisheries from the late 1960s to the late 1980s, human disturbance at haul-out sites, deliberate shooting, a commercial sea lion harvest in parts of Alaska from the 1950s to the early 1970s, hunting in British Columbia from the early 1900s to the early 1960s to reduce predation on commercial fish stocks, subsistence hunting by Natives in Alaska and Russia, and environmental perturbations.

**Table 4. Counts of adult and juvenile (non-pup) Steller sea lions observed at rookery and haul-out trend sites in seven Alaska subareas during June and July aerial surveys, 1976–1998**

Year	Southeast Alaska	Gulf of Alaska			Aleutian Islands		
		Eastern	Central	Western	Eastern	Central	Western
1976	n/d*	7,053	24,678	8,311	19,743	n/d	n/d
1979	6,376	n/d	n/d	n/d	n/d	36,632	14,011
1985	n/d	n/d	19,002	6,275	7,505	23,042	n/d
1990	7,629	5,444	7,050	3,915	3,801	7,988	2,327
1991	7,715	4,596	6,273	3,734	4,231	7,499	3,085
1992	7,558	3,738	5,721	3,720	4,839	6,399	2,869
1994	8,826	3,369	4,520	3,982	4,421	5,790	2,037
1996	8,231	2,133	3,915	3,741	4,716	5,528	2,190
1997	n/d	n/d	3,352	3,633	n/d	n/d	n/d
1998	n/d	n/d	3,346	3,361	3,847	5,761	1,913

\* n/d indicates incomplete or no survey data.

Source: J. L. Sease, J. P. Lewis, D. C. McAllister, R. L. Merrick, and S. M. Mellow. 1993. Aerial and ship-based surveys of Steller sea lions (*Eumetopias jubatus*) in Southeast Alaska, the Gulf of Alaska, and Aleutian Islands during June and July 1992. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-AFSC-17. 57 pp.

The National Marine Fisheries Service has lead responsibility for the recovery of Steller sea lions under the Marine Mammal Protection Act and the Endangered Species Act. At the recommendation of the Marine Mammal Commission, among others, the Service established the Steller Sea Lion Recovery Team in 1990 and adopted the Steller Sea Lion Recovery Plan in 1992 to help guide recovery efforts. Key partners in the Service's recovery program include the Alaska Department of Fish and Game, the North Pacific Fishery Management Council, and the North Pacific Universities Marine Mammal Research Consortium. The latter group, a consortium of academic institutions in Alaska, British Columbia, Oregon, and Washington, was established in 1992 at

the request of fishing industries to investigate the causes of the Steller sea lion decline.

The Service, in cooperation with other agencies and groups, has maintained an intensive research effort to monitor the status of Steller sea lions and to identify the cause or causes of the population decline. As mentioned earlier, commercial fisheries are suspected of contributing either directly or indirectly to the decline. To mitigate possible effects of commercial fisheries on Steller sea lions, the Service established regulations in 1992 and 1993 to (1) prohibit discharge of firearms within 91.4 m (100 yards) of a sea lion, (2) prohibit (with some exceptions) the operation of vessels within 3 nmi of major rookeries in Alaska, (3) establish no-trawl zones within 10 nmi

of certain major sea lion rookeries in Alaska, and within 20 nmi of major rookeries in the Gulf of Alaska and eastern Aleutian Islands to protect sea lion foraging areas, and (4) adjust time and area allocations to prevent concentrated fishing effort in foraging areas beyond the no-trawl zones around major haul-out sites. In 1993 the Service extended critical habitat designation to include all major rookeries and adjacent waters under U.S. jurisdiction. The designated areas include waters within 20 nmi of major rookeries and haul-out sites west of Cape Suckling, and within 3 nmi east of Cape Suckling. Three pelagic foraging areas also were designated as critical habitat in 1993. They are the Shelikof Strait area in the Gulf of Alaska, the Bogoslof area on the Bering Sea shelf, and the area incorporating Seguam Pass. Specific boundaries for these foraging areas are given in the Service's *Federal Register* notice of 27 August 1993.

Despite these efforts, the species' decline in the western portion of its range has continued. Recent efforts to address this situation are described below.

### **Steller Sea Lion Status under the Endangered Species Act**

When Steller sea lions were designated as endangered under the Endangered Species Act in 1990, the designation applied throughout their range and treated the species as a single population. It is now known that the species is composed of at least two distinct stocks, one east and one west of 144°W longitude, near Cape Suckling, in the north central Gulf of Alaska. Research initiated by the Service has documented genetic differences between the eastern and western stocks. The results indicate that there is little exchange of animals between rookeries and haul-out sites east and west of Cape Suckling. With the exception of a decline in Steller sea lion numbers at their southernmost rookeries in California, the eastern stock appears to be relatively stable or increasing slightly. Based on 1996 census data, there are at least 30,400 animals (including pups) in the eastern stock. This is a minimum estimate because no correction was made for animals missed because they were at sea. The western stock of Steller sea lions has experienced steady declines (Table 4).

During the 1998 survey, a total of 28,714 non-pups were counted in the Gulf of Alaska (12,229) and the Bering Sea (16,415). The counts for the Gulf of Alaska were incomplete because only 3 of the 25 sites in the eastern gulf were surveyed during 1998. These three sites are major rookeries and included a majority of the animals counted in the sub-area during the 1994 and 1996 surveys (52 and 60 percent, respectively). As a result, the estimate of the number of non-pups is conservative. Combining the pup count (9,353) and non-pup count data (28,714) results in a minimum abundance estimate of 38,067 Steller sea lions in the western U.S. stock in 1998.

In light of what is now known of Steller sea lion stock structure, the Steller Sea Lion Recovery Team and the Marine Mammal Commission recommended that the Service revise the species' listing under the Endangered Species Act to more accurately reflect the east-west stock division. The Service agreed that the change was warranted, and on 4 October 1995 it published a proposed rule in the *Federal Register* designating the stock west of 144°W longitude as endangered, while maintaining the threatened status for the stock east of this line. On 5 May 1997 the Service published final rules confirming these changes, effective 4 June 1997. In doing so, the Service noted that it did not appear necessary to modify designated critical habitat for Steller sea lions or existing protection measures. The Service did, however, indicate that it was taking steps to reassess the effectiveness of existing protective measures with a view toward improving them.

### **Section 7 Consultations on Atka Mackerel and Walleye Pollock Fisheries**

Section 7(a)(2) of the Endangered Species Act requires that every federal agency ensure that any action it authorizes, funds, or carries out is not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of its critical habitat. The development and implementation of fisheries management plans by the National Marine Fisheries Service and Fishery Management Councils established pursuant to the Magnuson-Stevens Fishery Conservation and Management Act constitute such actions. If it is deemed that an

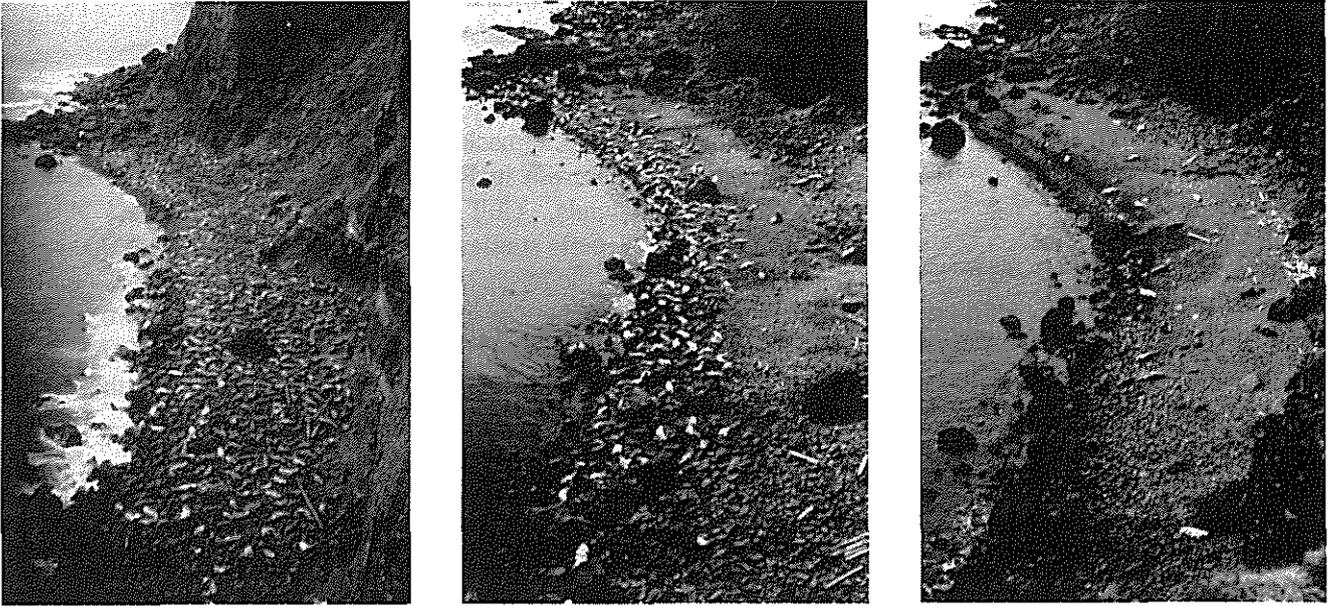


Figure 6: A Steller sea lion rookery on Ugamak Island in the Aleutians illustrates the decline of the population over a 17-year period. Photographs were taken in June of 1969, 1979, and 1986. (Courtesy of National Marine Fisheries Service, National Marine Mammal Laboratory)

action undertaken by a federal agency may adversely affect a protected species, then the federal agency must confer with the National Marine Fisheries Service or the Fish and Wildlife Service, depending on the species, to identify and determine ways to resolve potential conflicts. Section 7(b) of the Endangered Species Act requires that the consultation results be published in a biological opinion detailing how the action may affect the species in question.

As mentioned earlier, abundance, availability, or composition of prey species are thought to be factors possibly contributing to the Steller sea lion decline west of Cape Suckling. Large commercial fisheries for groundfish are found in this area. Concerns that the fisheries in the Gulf of Alaska and the Bering Sea/Aleutian Islands region may have an adverse effect on Steller sea lions have resulted in a number of section 7 consultations between the National Marine Fisheries Service's Sustainable Fisheries Division and its Office of Protected Resources.

The first consultation took place in 1991. On 18 April 1991 the Service issued a biological opinion on

the Bering Sea/Aleutian Islands fishery management plan and a second opinion on the fishery management plan for Gulf of Alaska groundfish fisheries, concluding that the fisheries were not likely to jeopardize the continued existence and recovery of the Steller sea lion.

In 1995 the Service reinitiated formal section 7 consultations on the possible effects on sea lions of the proposed Bering Sea/Aleutian Islands and the Gulf of Alaska groundfish fishery management plans, and the proposed 1996 total allowable catch specifications. Consultations were reinitiated because of new information on the fisheries and the continued Steller sea lion decline. On 26 January 1996 the Service issued two new biological opinions, both of which concluded that the fisheries and the proposed 1996 catch quotas were not likely to jeopardize the continued existence of Steller sea lions or result in the destruction or adverse modification of their critical habitat.

On 26 February 1998 the Service determined that the 1996 biological opinion on the effects of the Bering Sea/Aleutian Islands groundfish fishery on

Steller sea lions would remain valid for 1998. On 2 March 1998 the Service released a biological opinion that concluded that the Gulf of Alaska groundfish fishery also was not likely to jeopardize the continued existence of Steller sea lions; however, it did not address the Gulf of Alaska fisheries management plan beyond 1998.

Later in 1998, partially in response to the litigation discussed below, section 7 consultations were initiated on (1) the Atka mackerel fishery because new information indicated that localized depletion of Atka mackerel by this fishery have a detrimental effect on Steller sea lion foraging success; (2) the Bering Sea/Aleutian Islands walleye pollock fishery because of a new scheme for allocating the total allowable catch of pollock to inshore/offshore sectors of the fishery and because of continued concern that the fishery may compete with Steller sea lions; and (3) the Gulf of Alaska walleye pollock fishery because of concern that the fishery may compete with Steller sea lions, and because the previous biological opinion was to expire at the end of 1998.

On 3 December 1998 the Service issued a biological opinion on the possible effects of the Atka mackerel and walleye pollock fisheries under the 1999–2002 Bering Sea/Aleutian Islands Groundfish Fisheries Management Plan and the walleye pollock fishery under the 1999–2002 Bering Sea/Aleutian Islands groundfish fisheries management plan, and (3) the walleye pollock fishery under the 1999–2002 Gulf of Alaska groundfish fishery management plan.

The biological opinion concluded that the Atka mackerel fishery is not likely to jeopardize the continued existence of Steller sea lions or result in the destruction or adverse modification of their critical habitat, because the fisheries management plan includes measures to avoid possible significant impacts on Steller sea lions. However, the biological opinion concluded that the walleye pollock fisheries in the Bering Sea/Aleutian Islands region, and the walleye pollock fishery in the Gulf of Alaska region are likely to jeopardize the continued existence of Steller sea lions and adversely modify their critical habitat. Discussions of these three fisheries and their respective biological opinions follow.

### **Atka Mackerel Fishery under the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan**

Atka mackerel are found from the Kamchatka Peninsula in Russia to the seas around the Aleutian Islands, Gulf of Alaska, and southeast Alaska. Genetic studies indicate that they comprise one stock, but the larger fish taken in the Gulf of Alaska and the time lag in recruitment between the two regions suggest that the fishery in the Gulf of Alaska is dependent on recruitment of fish from the Bering Sea/Aleutian Islands region.

Since the early 1990s the fishery generally has commenced in mid- to late January, with most of the allocated catch taken by March or April. Fish are caught by bottom trawl at depths of 200 m (656 feet) or less, in relatively well-defined areas throughout the central and western Aleutian Islands. Because much of the sea floor in these areas is too rocky and rough to bottom trawl, most trawling takes place repeatedly over the same grounds.

The Bering Sea/Aleutian Islands groundfish fishery management plan came into effect in 1982. Because of concerns that the fishery could deplete regional stocks, particularly around Seguam Pass, the Aleutian Islands were divided into three management areas in 1993 (management areas 541, 542, and 543; Figure 7), with the total allowable catch apportioned between these three areas. A total of 20 Steller sea lion rookeries and 28 major haul-out areas, and most of the Atka mackerel fishery occur within these three management areas. The current fishery plan stipulates that at no time are vessels allowed to fish within the 10-nmi no-trawl zones surrounding major rookeries west of 150°W longitude, nor are vessels allowed to fish between 20 January and 15 April within 20 nmi of rookeries on Sea Lion Rock and Ugamak, Akun, Akutan, Seguam, and Agligidak Islands.

Since 1979 the majority of the Atka mackerel catch has been taken in areas designated as Steller sea lion critical habitat. More than 70 percent of the catch (about 66,400 mt of Atka mackerel per year) occurred within these designated areas from 1995 through 1997. Major species taken as bycatch includ-

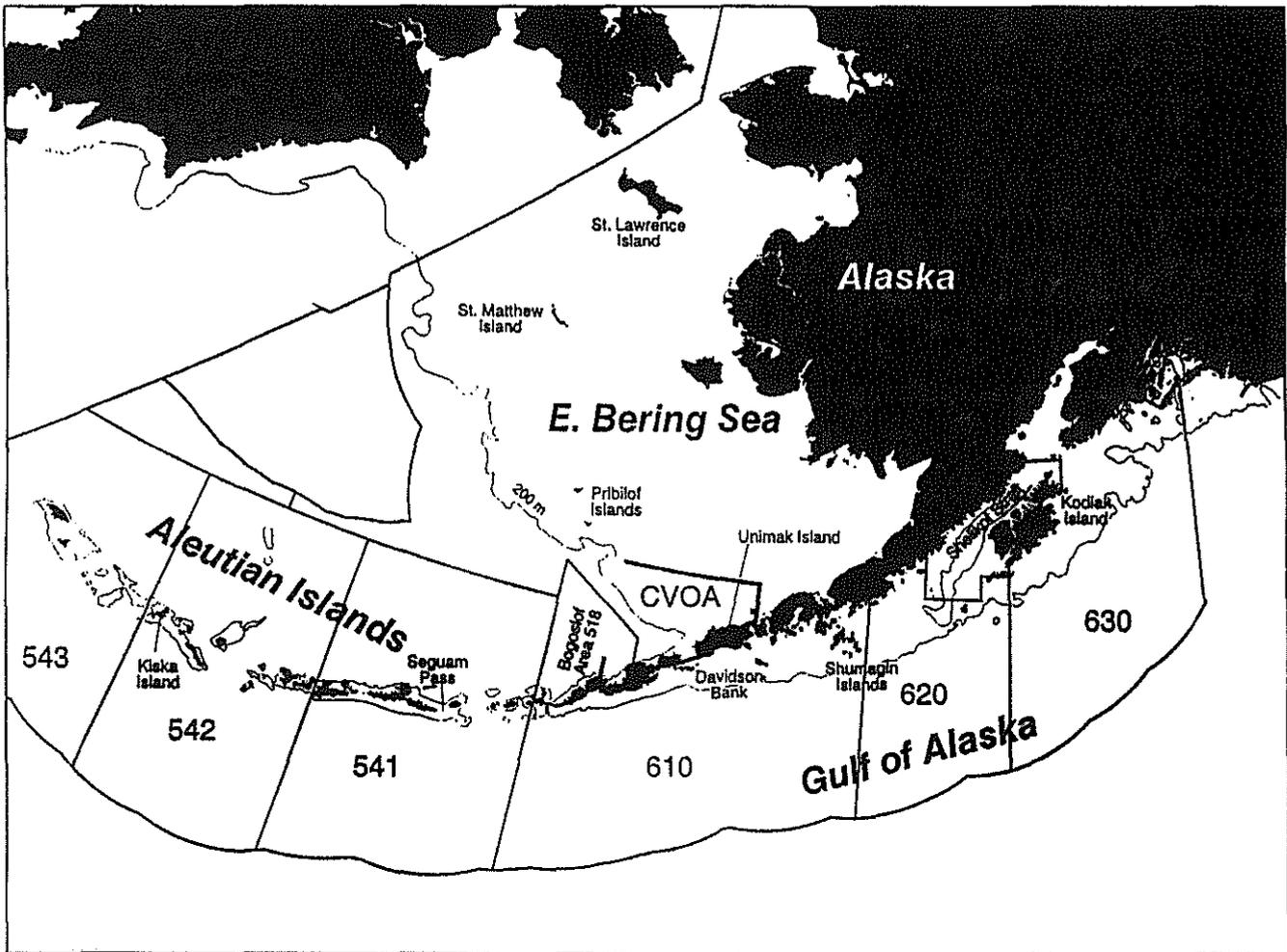


Figure 7: Fishery management areas and the catcher vessel operation area in the Bering Sea, Aleutian Islands, and Gulf of Alaska regions.

ed halibut, king crab, salmon, Pacific cod, walleye pollock, Pacific ocean perch, and rockfish. With the exception of king crab, all are prey species of Steller sea lions. Analyses of the 1992–1995 Atka mackerel catch and effort data indicated significant localized reductions in Atka mackerel abundance during the course of eight fisheries that lasted between 3 and 17 days in the Bering Sea/Aleutian Islands and Gulf of Alaska management areas.

The analyses suggested that the exploited populations would recover over time through immigration from adjacent areas; however, the short-term rate of removal by fisheries, and possibly by emigration, far exceeded the rate of immigration. Harvest rates in some areas may have approached 90 percent of the

standing stock. Analyses of other Atka mackerel fisheries demonstrated an inverse relationship between fishing effort and catch. That is, as total catch increased, the catch per unit of effort declined, indicating localized stock depletion. These analyses indicate a consistent pattern of Atka mackerel depletion due principally to fishing. The Scientific and Statistical Committee of the North Pacific Fishery Management Council also reviewed the analyses of fishing data for 37 time-area Atka mackerel fisheries and concluded, among other things, that the fisheries may have a significant effect on localized Atka mackerel abundance.

The North Pacific Fishery Management Council reviewed the evidence for localized depletion of Atka

mackerel stocks, and in June 1998 recommended to the Secretary of Commerce that the fishery be split evenly into two seasons (an "A" season and a "B" season) in each of the three management areas. The Council further recommended that the fishery catch be shifted in areas 542 and 543 until a split of 40:60 inside and outside critical habitat is reached in 2002. Additional recommendations included a year-round ban on all trawling within 20 nmi around Seguam rookery in area 541, the mandatory use of an automated vessel monitoring system for all vessels participating in the fishery, the exemption of the Atka mackerel jig fishery, exemption of the Community Development Quota fisheries from the recommended A-season/B-season split, A/B seasons corresponding to the pollock fishery discussed below, annual review of the amendment, and cooperative research by the Service and other parties to determine the effects of the measures.

By letter of 7 October 1998 the National Marine Fisheries Service requested the Commission's comments on a proposed rule to implement the Council's recommendations. In its letter of 29 October 1998 to the Service, the Commission recommended that the Service adopt the recommendations as described and that the vessel monitoring system be implemented as soon as possible.

The 3 December 1998 biological opinion concluded that as proposed the Atka mackerel fishery under the amended Bering Sea/Aleutian Islands groundfish fishery management plan would not appreciably reduce the likelihood of the survival and recovery of the Steller sea lion provided the proposed conservation measures noted above are fully implemented by 2002. Barring new information or other changes that will require reinitiation of consultation, the biological opinion will remain in effect through 2002.

### **Walleye Pollock Fishery under the Bering Sea/Aleutian Islands Groundfish Fishery Management Plan**

The walleye pollock fishery occurs throughout much of the Bering Sea but is most concentrated in the eastern Bering Sea shelf and along the shelf break from the Aleutian Islands to the U.S.-Russia border and in waters north of Unimak Island in the eastern

Aleutian Islands. Although the stock structure of walleye pollock in the Bering Sea/Aleutian Islands is not well defined, three stocks are recognized for management purposes (Figure 7). They are the eastern Bering Sea, Aleutian Islands, and Aleutian Basin stocks.

To spread the fishing effort out seasonally, in 1990 the Bering Sea/Aleutian Islands total allowable catch for pollock in these three management areas was divided and allocated into a winter "A" season roe fishery that began in January and ran through mid-April and a summer "B" surimi-fillet season that began in June and continued until the total allowable catch was taken. The "A" season was allocated 40 percent of the total allowable catch. In 1993 the "A" season allocation was increased to 45 percent, and the starting date for the "B" season was moved to 15 August. In 1996 the "B" season starting date was further delayed to 1 September.

To spread the fishery out geographically, the fishery also was divided into an onshore and an offshore sector. Fish that are processed aboard vessels at sea constitute the offshore sector, and fish that are taken ashore for processing constitute the onshore sector. Vessels participating in the offshore fishery are generally larger and capable of catching more fish in a shorter period of time than the smaller vessels that fish the onshore sector. The rapid removal of pollock by the large vessels in the offshore fishery may result in a temporary localized depletion of fish available to dependent marine predators including Steller sea lions. Furthermore, the rapid removal of the total allowable catch over a short period of time is likely to be more disruptive to the ecosystem than the removal of fish over a greater time period. The smaller vessels associated with the inshore sector, on the other hand, have limited storage capacity and range. Vessels associated with the inshore fishery therefore tend to concentrate close to shore and in habitat essential to Steller sea lions, which also may result in localized pollock depletion.

Since the mid-1980s the amount and overall percentage of the Bering Sea/Aleutian Islands pollock total allowable catch within designated Steller sea lion critical habitat has doubled. From 1992 through 1997, 53 to 89 percent (between 250,000 mt and

550,000 mt) of the winter or "A" season pollock catch has been taken in critical habitat. Since 1992 pollock catches in critical habitat during the "B" season have declined from about 350,000–400,000 mt to about 250,000 mt, or about 30 to 40 percent. Combined, as much as 800,000 mt, or more than 60 percent, of the total pollock catch was taken in 1994 and 1995 from within Steller sea lion critical habitat.

In 1992 the Bering Sea/Aleutian Islands groundfish fishery management plan was amended so that 7.5 percent of the total allowable pollock catch was allocated as a Community Development Quota. Of the remainder, 35 percent was allocated to the onshore sector and 65 percent to the offshore sector. Furthermore, a catcher vessel operation area was established in 1992 (Figure 7). From 1 September until the end of the year, motherships and catcher-processors acting like motherships were allowed to receive pollock catches from within the catcher vessel operation area provided they themselves did not directly fish for pollock. Motherships are vessels that process fish at sea but do not trawl. Catcher-processors are vessels that process fish at sea, and also are capable of trawling. In 1995 the western boundary of the Catcher Vessel Operation Area was moved 30 minutes longitude west, and the regulations were changed to allow catcher-processors to fish for pollock provided the pollock allocation for the inshore sector had been taken before the end of the season.

After subtracting the 7.5 percent allocated as a Community Development Quota, the proposed Bering Sea/Aleutian Islands fishery management plan for 1999–2002 called for allocating 39 percent of the total allowable pollock catch to the inshore sector and 61 percent to the offshore sector. It also called for allocating 2.5 percent of the inshore total allowable catch to catcher vessels under 38.1 m (125 feet) in length on or about 25 August of each year, and prohibiting all vessels harvesting pollock for offshore processing from fishing inside the catcher vessel operation area after 1 September, unless the inshore pollock fishery total allowable catch has been taken.

The American Fisheries Act of 1998 mandated additional changes to the Bering Sea/Aleutian Islands pollock allocations beginning in 1999. Under this Act, the Community Development Quota program is

to receive 10 percent of the total allowable pollock catch. The remaining 90 percent, after subtracting an allowance for bycatch in other fisheries, would be allocated such that 50 percent goes to the inshore sector, 40 percent to the offshore sector, and 10 percent to catcher vessels delivering to motherships. These new regulations will result in a 15 percent shift of the total allowable catch from the offshore sector to the inshore sector.

The 3 December 1998 biological opinion considers the Bering Sea/Aleutian Islands region critical to the survival of the western population of Steller sea lions. It states that the proposed Bering Sea/Aleutian Islands pollock fishery would remain concentrated in time and space, thus posing a serious threat to the survival of Steller sea lions. Whereas the fishery was pursued over about 10 months in 1990, in recent years the total allowable catch has been taken within three months. About 45 percent of the total allowable catch is taken during the winter fishery, at a time when Steller sea lions are hypothesized to be most sensitive to decreases in prey. As much as 70 percent of the Bering Sea/Aleutian Islands pollock may be caught within Steller sea lion critical habitat. Because of the seasonal and regional concentration of catches, the biological opinion concluded that the Bering Sea/Aleutian Islands walleye pollock fishery is likely to jeopardize the continued existence of Steller sea lions and adversely modify its critical habitat. The opinion therefore set forth reasonable and prudent alternatives, discussed below.

### **Walleye Pollock Fishery under the Gulf of Alaska Groundfish Fishery Management Plan**

The Gulf of Alaska walleye pollock fishery is divided into three management areas covering the area from south of Prince William Sound to west of Unimak Island in the Aleutian Islands to the shelf break. As shown in Figure 7, these include the western Gulf (area 610), the central Gulf (area 620), and the eastern Gulf (area 630). Considerable overlap exists between Steller sea lion habitat and the central and western management areas; hence, these two regions are the areas of most concern. Twelve rookeries and 33 haul-out sites have been identified in the Gulf of Alaska fisheries management areas.

The estimated biomass of the Gulf of Alaska walleye pollock stock was less than 0.8 million mt in the late 1960s. However, it increased to a high of almost 3 million mt in 1980–1981, then declined to about 1.5 million mt in 1985 and continued to decline to about 1 million mt in 1997. From 1986 through 1997, about 4 to 10 percent of the Gulf of Alaska pollock biomass has been harvested annually.

With the exception of a bycatch quota, the entire Gulf of Alaska total allowable pollock catch has been allocated to the inshore sector. From 1992 to 1995 the total allowable catch was allocated evenly among four seasons that began on 20 January, 1 June, 1 July, and 1 October. In 1996 the number of seasons was reduced to three because of the steady decline in Gulf of Alaska pollock stocks. For 1996 and 1997 the fishery was divided into a winter roe fishery, beginning 20 January with an allocation of 25 percent of the total allowable catch, a summer fishery beginning on 1 July with an allocation of 25 percent of the total allowable catch, and a summer/autumn fishery beginning on 1 September with 50 percent of the total allocation. In 1998 the fishery allocation was changed to a 25:35:40 split. Opening dates remained the same.

Although the total allowable pollock catch for the Gulf of Alaska was decreased as the pollock biomass declined, the percentage taken from Steller sea lion critical habitat has remained high. The 1995 to 1997 average percentages of the Gulf of Alaska pollock catch taken from Steller sea lion critical habitat were about 90 percent for the winter fishery, 73 percent for the summer fishery (June and July), and 58 percent for the summer/autumn fishery (September and October).

The Service's 3 December 1998 biological opinion states that the Gulf of Alaska region is critical to the survival and recovery of the western population of Steller sea lions, and that the Gulf of Alaska pollock fishery as proposed by the North Pacific Fishery Management Council will continue to be concentrated in time and space. The biological opinion further states that it is not possible to determine whether the proposed Gulf of Alaska pollock fishery is structured in a way that is likely to reduce the potential for localized pollock depletions, particularly during the

critical winter period for the sea lions. The Service's biological opinion therefore concludes that the fishery as proposed is likely to jeopardize the continued existence of Steller sea lions and adversely modify the species' critical habitat.

### Reasonable and Prudent Alternatives

As noted above, the Service's 3 December biological opinion on the Bering Sea/Aleutian Islands groundfish fishery and Gulf of Alaska groundfish fishery included a series of reasonable and prudent alternatives to mitigate the likelihood of jeopardizing the survival of the endangered western population of Steller sea lions. These alternatives sought to distribute fishing effort spatially and temporally. Among other things, they recommended designating pollock trawl exclusion zones and temporally redistributing catch to avoid removing pollock during the critical winter months for sea lion survival. The latter would involve a winter closure of the fishery and a more even distribution of the total allowable catch throughout the remainder of the year.

In response, at its December 1998 meeting the North Pacific Fishery Management Council recommended the following measures for emergency action by the Service in 1999. The total allowable catch allocations referenced below apply to the catch total after removing the 10 percent for Community Development Quotas. For the Bering Sea/Aleutian Islands region, the Council recommended the following:

- closing the Aleutian Islands area to directed pollock fishing;
- partitioning the fishery into four seasons, beginning on 20 January ("A1" season), 20 February ("A2" season), 1 August ("B" season), and 15 September ("C" season), with no more than 30 percent of the total allowable catch coming from any one season;
- reducing the winter roe fishery to 40 percent of the total allowable catch;
- limiting the overall "A" season catch from sea lion critical habitat and the catcher vessel operation area to 62.5 percent of the total allowable catch for each of the four seasons; and
- expanding areas closed to trawling around rookeries and haul-out sites.

For the Gulf of Alaska region, the Council recommended the following:

- partitioning the fishery into four seasons, beginning on 20 January (“A” season), 1 June (“B” season), 1 September (“C” season), and no later than 1 October and no sooner than five days after closing the “C” season (“D” season);
- establishing catch limits of 30 percent of the total allowable catch for the “A” season, 20 percent for the “B” season, 25 percent for the “C” season, and 25 percent for the “D” season;
- establishing pollock trawl exclusion zones around Steller sea lion critical habitat and haul-out sites; and
- establishing a 136-mt (300,000-pound) trip limit for directed pollock fishing in the western and central management areas.

The North Pacific Fishery Management Council adopted a motion recommending certain changes to the reasonable and prudent alternatives described in the biological opinion. In response to the Council’s recommendations, on 16 December 1998 the Service revised the reasonable and prudent alternatives that, with a few modifications, continued to request significant temporal and spatial dispersion of the Bering Sea/Aleutian Islands pollock fishery and expansion and addition of pollock trawl exclusion zones. As of 31 December 1998 differences between the Council and the Service on implementing the reasonable and prudent alternatives have not been resolved.

The Council further requested that the Service, in consultation with the Council, the Marine Mammal Commission, the Alaska Department of Fish and Game, and other relevant management agencies, conduct an independent review of the biological data, the biological opinion, and other information relating to factors affecting Steller sea lions and their prey.

### Litigation

On 15 April 1998 Greenpeace, American Oceans Campaign, and the Sierra Club filed suit against the National Marine Fisheries Service in the District Court for the Western District of Washington challenging the Service’s management of groundfish fisheries in Alaska (*Greenpeace v. NMFS*). The

plaintiffs alleged that the Service had violated section 7 of the Endangered Species Act because its biological opinions on the fisheries did not adequately evaluate the effects of the fisheries on Steller sea lions and their critical habitat. The plaintiffs also claimed that the Service had violated the National Environmental Policy Act by failing to supplement its environmental impact statements despite significant changes in the fisheries and the environmental baseline and by concluding in an environmental assessment that the 1998 fisheries would not have a significant impact on the environment. Shortly after the suit was filed, several fishery industry groups and Alaskan coastal communities intervened as parties in the case.

The plaintiffs never sought to enjoin the 1998 fishing operations, but filed a motion for summary judgment on 8 August 1998, claiming that the alleged violations would be relevant to the 1999 pollock fishery. The government responded by seeking a stay of the litigation, noting that the Service was in the process of preparing a biological opinion and an environmental impact statement that would be applicable to the fisheries in 1999. The court granted the government’s request and stayed the litigation until 16 December, at which time the Service would be expected to complete its review of the fisheries under the National Environmental Policy Act and to produce a biological opinion evaluating the effects of the pollock and Atka mackerel fisheries on Steller sea lions and their critical habitat.

At a status conference held on 18 December the judge considered the parties’ plans for the remainder of the litigation. He gave the parties until 31 December 1998 to file additional claims they may have. In response, the plaintiffs filed an amended complaint setting forth four causes of action. They claimed that the supplemental environmental impact statement published by the Service was inadequate. They also argued that the biological opinion was flawed because the reasonable and prudent alternatives did not ensure that the pollock trawl fisheries in the Gulf of Alaska and in the Bering Sea will not jeopardize the continued existence of Steller sea lions or adversely modify critical habitat. The plaintiffs also contested the Service’s conclusion that the Atka mackerel trawl fishery is not likely to jeopardize Steller sea lions or adversely modify Steller sea lion critical habitat.

The four intervenor defendants in this case filed cross claims challenging the Service's actions. Although there are slight differences among the filings from these groups, they basically make similar claims. They believe that the Service acted arbitrarily by making a jeopardy finding in the 3 December 1998 biological opinion. Their filings noted that the previous biological opinions all had been "no jeopardy" determinations and that there was no new scientific information contained in the most recent biological opinion that warranted a different outcome. Likewise, they did not believe that there was an adequate basis for the Service's determination that the pollock fisheries are likely to adversely modify Steller sea lion critical habitat. Citing the regulatory requirement that reasonable and prudent alternatives be economically and technologically feasible, the intervenors argued that the Service had failed to assess the feasibility of implementing the alternatives set forth in the biological opinion. Arguments also were made that the biological opinion failed to take into account changes in fishing practices that will result from enactment of the American Fisheries Act.

Under the schedule adopted by the court, parties have until 14 January 1999 to determine whether they intend to seek a preliminary injunction in this case.

### Steller Sea Lion Subsistence Harvests

Steller sea lions have been hunted by Alaska Natives for subsistence purposes for centuries, but little is known of historic harvest levels. In 1992 the National Marine Fisheries Service contracted with the Alaska Department of Fish and Game to gather data on the annual subsistence harvest of Steller sea lions and harbor seals in Alaska. A system was established by which Native hunters from about 2,100 households in 60 coastal villages within the species' range are interviewed annually. At least 40 of the communities are located within the range of the western stock of Steller sea lions.

Survey results indicate that the total subsistence take has steadily declined from about 549 in 1992 to about 339 in 1995. Through 1995 about 79 percent were taken by Aleut hunters from the Aleutian and Pribilof Islands. Overall, about 99 percent were from the western population. Preliminary analyses of the

1996 data indicate that 179 were taken, of which 149 were harvested and 30 were struck and lost. Initial analyses of the 1997 data indicate that 164 Steller sea lions were taken, of which 146 were harvested and 18 were struck and lost. As of 31 December, estimates of the 1998 Native subsistence harvest were not yet available. As discussed in last year's annual report, the Service has met with Native hunters to discuss the development of a co-management agreement for Steller sea lions that would lessen the impact of the subsistence harvest on the western population. Discussions were still under way at the end of 1998.

### Northern Fur Seal (*Callorhinus ursinus*)

Northern fur seals occur in coastal waters of the North Pacific Ocean from southern California to Japan and in pelagic waters from about 35°N latitude to the central Bering Sea (Figure 8). Approximately three-fourths of all northern fur seals breed and pup on St. George Island and St. Paul Island in Alaska's Pribilof Islands. Elsewhere, northern fur seals breed and pup in Russia on the Robben, Kuril, and Commander Islands. Small rookeries also are found on Bogoslof Island in the central Aleutian Islands and San Miguel Island off southern California. When not at these islands, northern fur seals usually remain at sea feeding. Most pups remain at sea for up to 22 months once they leave their natal rookery. Fur seals display a high degree of site fidelity and usually return to their natal islands to breed and molt.

Northern fur seals were harvested commercially for their pelts beginning in the late 1700s. By the 1800s excessive pelagic harvests of males and females of all ages threatened the species' economic and biological viability. As a result, the principal harvesting nations (Canada, Japan, Russia, and the United States) signed the Fur Seal Treaty of 1911. The treaty banned pelagic harvests in lieu of arrangements to share pelts from a managed onshore harvest of subadult male seals taken at U.S. and Russian rookeries. By limiting the harvest to subadult males, fur seal numbers were able to increase substantially over the next 30 years.

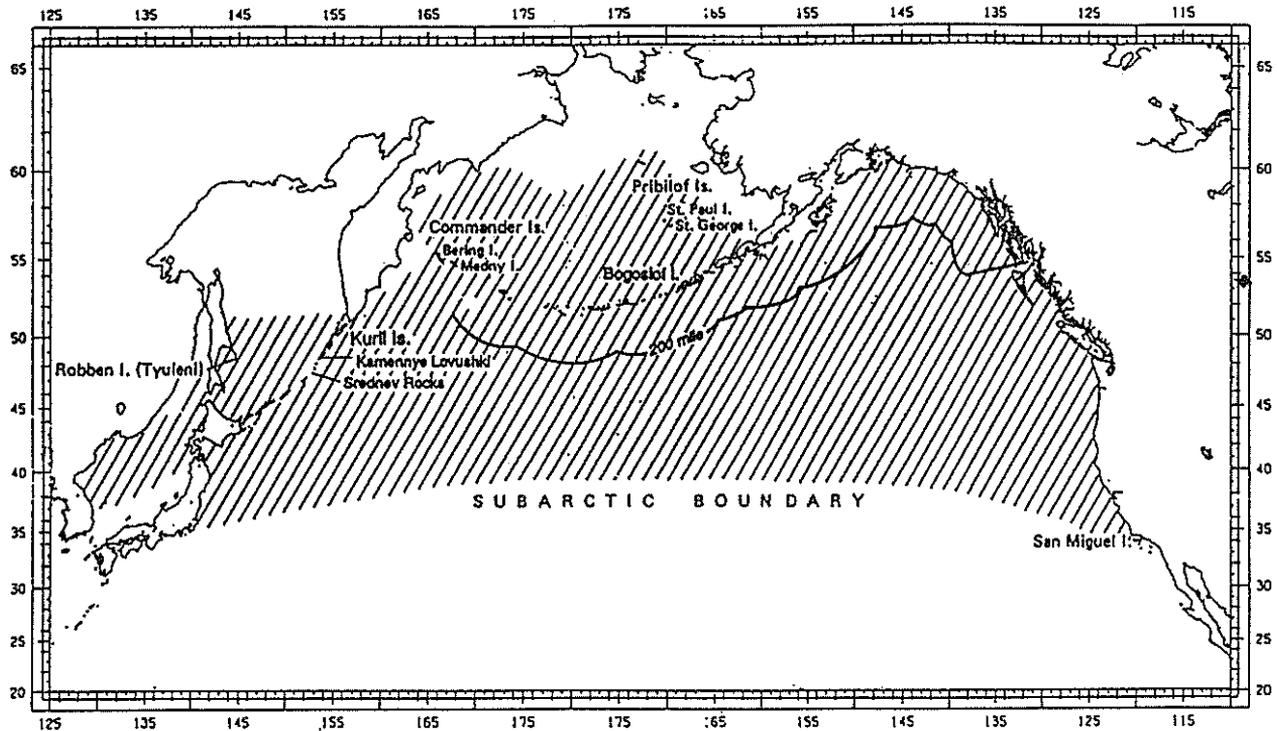


Figure 8. Range and breeding islands of the northern fur seal.

The treaty lapsed during World War II, and by the early 1950s the Pribilof Islands fur seal population had swelled to about two million animals, a number thought to be at or near its pre-exploitation size. Beginning in 1956 some females as well as juvenile males were taken. This harvesting strategy was developed under a prevailing wildlife management theory that predicted after an initial decline in fur seal numbers, pup production and survival would increase as the population attempted to compensate for animals removed by the harvest.

This harvest was continued under the Interim Convention for the Conservation of North Pacific Fur Seals signed by the four signatories to the former treaty, in 1957. As expected, the Pribilof Islands' population began to decline, but instead of rebounding a few years later, it continued to decline. The harvest of females was therefore stopped in 1968. After a continued decline through 1970, it began to increase and reached a size of 1.25 million fur seals in 1974. However, from 1976 through the early 1980s it again declined for reasons that could no longer be attributed

to the earlier female harvest. Estimated pup production fell by about 7 percent per year over this period, and by 1983 the population had declined to about 877,000 animals, less than one-half its size in the early 1950s. Since 1983, fur seal colonies on St. Paul Island have remained relatively stable, with about 180,000 pups born each year. Colonies on St. George Island, however, continued to decrease by 4 or 5 percent per year until 1996, when they increased by 6 percent. In 1998 the St. George Island colony again declined by 4 to 5 percent. Based on surveys conducted on the Pribilof Islands and San Miguel Island in 1994, 1996, and 1998, and a 1997 census at Bogoslov Island, the National Marine Fisheries Service estimates the size of the fur seal herd in U.S. waters to be about 1,005,000 individuals.

The interim convention under which fur seals were managed was extended by a series of protocols. In 1984 the convention lapsed, and management authority in the United States reverted to domestic authority under the Fur Seal Act of 1966 and the Marine Mammal Protection Act of 1972. Under these acts,

commercial harvests were stopped and only a much smaller subsistence harvest by Aleut Natives on the Pribilof Islands continued. Because of the magnitude of the decline prior to the early 1980s, the Pribilof Islands fur seal population was designated as depleted under the Marine Mammal Protection Act in 1988.

Although causes of the population decline in the 1970s remain puzzling, research indicates that it was related to an increase in mortality of juvenile fur seals during their first few years of life. Among the more plausible factors thought to have been involved are entanglement in marine debris, incidental take in high seas driftnet fisheries in the North Pacific Ocean, long-term environmental change, and reduced prey availability. Effects of disease and parasites are poorly understood but also may be factors. Causes not thought to be significant include lingering effects of the commercial harvest of subadult males before 1985, emigration, and predation. Failure of the population to recover since the early 1980s also is puzzling. It may be related to the continuing effects of entanglement in marine debris, environmental change, and reduced prey.

**Subsistence Harvest**

Before 1985 Aleut residents of St. George and St. Paul Islands used a portion of the commercial fur seal harvest for food and other purposes. Since then, these needs have been met by a comparatively small subsistence harvest of subadult male fur seals taken between June and August using methods similar to those of past commercial harvests (Table 5). The subsistence harvest is regulated by the National Marine Fisheries Service pursuant to the Fur Seal Act and the Marine Mammal Protection Act.

Initially regulations required that, before each annual harvest began, the Service was to estimate the upper and lower harvest levels likely to meet the annual subsistence needs of Aleuts on the Pribilof Islands. When the estimated lower level was reached, harvesting was suspended until it could be determined how many additional fur seals were needed. Harvest levels are now estimated for three-year periods, with the most recent period beginning in 1997. For 1997, 1998, and 1999, the Service has projected that the subsistence harvest levels for St. Paul Island will be

1,645 and 2,000 fur seals, the same as those for the previous three-year period. The lower bound of estimated subsistence requirements for St. George Island during this period was increased from 281 to 300 seals; the upper limit of 500 seals was unchanged.

In 1998 the total subsistence harvest was 1,553 fur seals, consisting of 256 animals harvested on St. George Island and 1,297 animals on St. Paul Island.

**Table 5. Subsistence harvest levels of northern fur seals in the Pribilof Islands, 1985-1998**

<u>Year</u>	<u>St. Paul</u>	<u>St. George</u>	<u>Total</u>
1985	3,384	329	3,713
1986	1,299	124	1,423
1987	1,710	92	1,802
1988	1,145	113	1,258
1989	1,340	181	1,521
1990	1,077	164	1,241
1991	1,645	281	1,926
1992	1,482	194	1,676
1993	1,518	319	1,837
1994	1,616	161	1,777
1995	1,265	260	1,525
1996	1,590	232	1,822
1997	1,153	227	1,380
1998	1,297	256	1,553

Source: National Marine Fisheries Service, Alaska Region.

**Research Activities in 1998**

In response to recommendations by the Marine Mammal Commission and a provision added to the Marine Mammal Protection Act in 1988, the National Marine Fisheries Service developed and in 1993 adopted a conservation plan for northern fur seals. The plan's primary purpose is to identify and guide research and management actions. Among other things, the plan identifies research needed to explain why the population has failed to recover to former levels and to continue monitoring the status and trends of fur seal populations. In the first two years after adopting the plan, funding by the Service was sufficient to do little more than monitor the population.

This work was supplemented by cooperative studies with Native organizations, universities in the United States, and research institutes in Japan and Russia.

In 1995 the Service provided \$291,000 for fur seal research, significantly increasing the research budget for the species. In 1996 and 1997 the Service provided \$209,000 and \$286,000, respectively. In 1998 the Service provided no money specifically for fur seal research; however, using funding from other programs, the Service was able to continue basic population monitoring work and cooperative studies. Among the cooperative research projects continued from 1995 and 1996 were disease studies, maternity studies, and monitoring population trends and mortality at rookeries on the Pribilof Islands for possible impacts associated with discharges from seafood processing plants on the islands. During the summer of 1999 the Service intends to initiate a contaminants study to assess pollution in the vicinity of the islands. The Service has also continued to monitor marine debris entanglement rates among juvenile male fur seals returning to the rookeries after their first few years at sea. The juvenile entanglement rates in 1997 were similar to those observed in 1996: 0.19 percent on St. Paul Island and 0.23 percent on St. George Island. In 1998 the Service trained Natives to monitor entanglement rates during the subsistence harvest. Entanglement data for 1998 are still being processed.

As noted earlier, the decline in fur seal numbers during the mid-1970s through the early 1980s was linked to a decrease in juvenile survival. To help assess factors affecting juvenile survival rates, the Service is continuing studies begun in 1995 to investigate the proportion of time pups spend at sea and on land before departure from the rookeries to begin their one- to two-year period of life at sea. In 1996 the Service also experimented with the deployment of lightweight satellite tags on fur seal pups to determine their migration routes and at-sea habitat-use patterns. Based on the success of this work, 12 satellite transmitters were placed on fur seal pups in 1997. The results documented movements into various parts of the North Pacific Ocean. The Service initially planned to continue this study through 1999; however, no funds were available to do so in 1998. The 1996–1997 data analyses for the satellite transmitter work are in progress.

## Pacific Walrus (*Odobenus rosmarus divergens*)

At the time of the last rangewide population survey in 1990, more than 200,000 Pacific walrus were thought to inhabit the continental shelf of the Bering and Chukchi Seas off Alaska and eastern Russia (Figure 9). Since 1990 no information has been collected with which to assess overall population size and trends. Genetic studies indicate that they constitute a single stock, most of which migrate north and south with the seasonal advance and retreat of the pack ice as it melts in spring and refreezes in winter. In spring, however, some walrus, principally adult males, move south into Bristol Bay, where they remain throughout the summer. Walrus feed almost exclusively on benthic invertebrates, principally clams. When this prey is scarce, they may also eat fish or ringed, spotted, and bearded seals.

Since the 1860s Pacific walrus have undergone at least three cycles of depletion due to excessive commercial hunting. The stock was first depleted by Yankee whalers in the 1870s. After a period of recovery, it again was depleted by U.S., Canadian, and Norwegian hunters early in the 1900s. A second period of recovery occurred between 1910 and the 1930s, after which the stock was depleted a third time by Russian hunters shortly before and after World War II. Under conservation programs administered by the State of Alaska and the Soviet Union in the 1950s and 1960s, the population recovered to current levels, which may be at or near their pre-exploitation population levels.

Pacific walrus are vital cultural and subsistence resources for Native people in both Alaska and the Chukotka Peninsula in easternmost Russia. When walrus were depleted in the 1870s, their scarcity contributed to the widespread starvation and death of people in Native villages around the Bering Sea. Since then coastal communities have continued to rely on walrus for food as well as ivory, which is worked into traditional articles of Native handicraft and sold. In addition to providing food and income from the sale of ivory carvings, walrus hunting is an important part of maintaining Native cultural traditions.

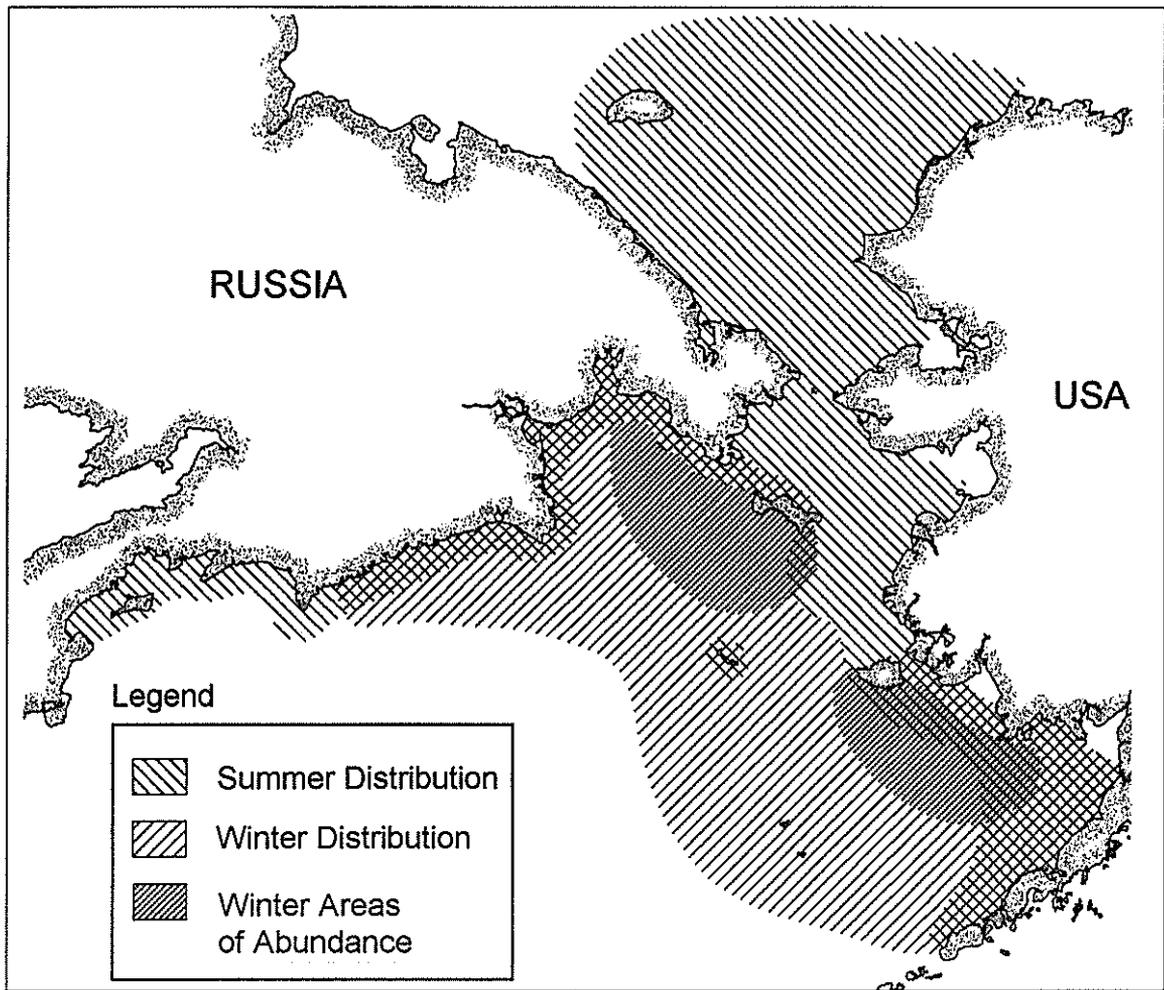


Figure 9. Range of the Pacific walrus.

The Department of the Interior has lead responsibility for walrus research and management under provisions of the Marine Mammal Protection Act. In 1994 the Fish and Wildlife Service adopted a conservation plan outlining actions needed to maintain Pacific walrus at their optimum sustainable population level. As discussed in past annual reports, the plan was developed by the Service at the recommendation of the Commission and with assistance from the Commission, the Native community, the State of Alaska, and others. Also in 1994 the Marine Mammal Protection Act was amended to facilitate the development of cooperative marine mammal management agreements with Native groups, and officials in the United States and Russia signed a protocol of intent to negotiate a bilateral agreement on the conser-

vation of walrus. Recent activities on these and related matters are discussed below.

### Pacific Walrus Stock Assessment Report

Amendments to the Marine Mammal Protection Act in 1994 required the Fish and Wildlife Service and the National Marine Fisheries Service to prepare and periodically update stock assessment reports for each marine mammal stock in U.S. waters. The purpose of the reports is to provide a basis for making management decisions to address the incidental take of marine mammals in commercial fisheries. These reports must include a calculation of the potential biological removal level for each stock and a determination as to whether the stock is a strategic stock

requiring special management efforts. The potential biological removal level is calculated from a formula designed to estimate the total number of animals that can be removed from the stock annually (not including natural mortality), while ensuring that the stock will increase toward or remain at its optimum sustainable level. A strategic stock is one either listed as threatened or endangered under the Endangered Species Act or as depleted under the Marine Mammal Protection Act, or whose human-caused mortality level exceeds the potential biological removal level.

The Fish and Wildlife Service completed an initial stock assessment report for Pacific walrus in 1995. In September 1998 it released a revised stock assessment report. The revised report cited the same minimum population estimate (188,316 walrus based on a rangewide population survey conducted in 1990) and potential biological removal level (7,533 walrus per year) as cited in the 1995 report, but considered new information on human-caused mortality. It noted that about 17 walrus a year have been killed in commercial fisheries, and that the average annual mortality in U.S. and Russian subsistence harvests between 1992 and 1996 was 4,866 walrus. Because Pacific walrus are not listed as threatened, endangered, or depleted and because estimates of recent human-caused mortality are below the calculated potential biological removal level, the 1998 report, like the 1995 report, concluded that walrus are not a strategic stock as defined under the Marine Mammal Protection Act.

### **U.S.–Russian Cooperative Agreements**

Between the 1970s and 1990s mutual interest by the United States and the former Soviet Union in conserving Pacific walrus led to a number of cooperative research projects, including a series of rangewide population surveys conducted at five-year intervals from 1975 to 1990. After the collapse of the Soviet government, steps were initiated to strengthen and formalize cooperative arrangements for research and management activities between Russia and the United States on Pacific walrus, as well as the Chukchi–Bering Seas stock of polar bears, which also ranges across the U.S.–Russia border. A protocol expressing mutual interest in negotiating a bilateral agreement on polar bears was signed in 1992 and, as

noted above, a similar protocol on walrus was signed in 1994. Both protocols envision separate government-to-government and Native-to-Native agreements between respective counterparts in Russia and the United States.

The Fish and Wildlife Service is the lead federal agency responsible for negotiating agreements on both species. Officials in both countries agreed to complete negotiations on the government-to-government polar bear agreement before proceeding to negotiate the walrus agreement. As noted in the polar bear section elsewhere in this chapter, a final text for the bilateral polar bear agreement was developed during 1998, but final approval and signature by the two countries was not completed before the end of 1998. Work to develop a bilateral walrus agreement was therefore deferred during 1998. However, during 1998 the Eskimo Walrus Commission continued to work on a Native-to-Native walrus agreement with walrus hunters in Russia. The Service plans to work closely with the Alaska Native community during 1999 to develop a U.S. negotiating position on provisions for a U.S.–Russia walrus agreement when bilateral discussions resume.

### **Subsistence Harvests of Pacific Walrus**

Because of the importance of marine mammal hunting to Alaska Natives, the Marine Mammal Protection Act exempts subsistence hunting by Alaska Natives from the Act's general moratorium on taking marine mammals. The exemption allows Native hunting to continue unregulated by the federal government provided that the harvest is done for subsistence purposes, it is not wasteful, and that the marine mammal stock is not listed as depleted under the Act. Although walrus currently are taken by Native hunters in many coastal villages, about three-fourths of the Alaska subsistence harvest is taken by residents of four coastal villages: Gambell and Savoonga on St. Lawrence Island, Diomed on Little Diomed Island in the Bering Strait, and Wales on the tip of the Seward Peninsula on Alaska's mainland. Walrus also are taken for subsistence purposes by Native communities in Russia.

Since 1980 when the Fish and Wildlife Service first assumed lead responsibility for walrus research and

management in the United States, the Service has estimated walrus catch levels in Alaska through a walrus harvest monitoring program. Except in 1990 and 1991, when the program was suspended because of a lack of funding, harvest monitoring has been conducted cooperatively with the Eskimo Walrus Commission, a Native organization established to help oversee and manage the walrus population. Under the program, harvest monitors are placed in the principal walrus hunting villages to record catch data and to collect biological samples.

Over the past decade, estimated catch levels by Alaska Natives from the walrus harvest monitoring program have ranged from about 1,000 to 2,500 animals (see Table 6). Over the same period, reported catch levels in Russia have declined from more than 4,500 to fewer than 1,000 walruses. In addition to the number of walruses landed, some animals are shot, but escape wounded or sink before they can be retrieved. Because of the rarity of healed bullet wounds seen on live walruses, it is thought that most walruses that are shot and not retrieved probably die soon after they are struck. Recent data on the number of walruses struck and lost by hunters are not available; however, based on data collected in Alaska from 1952 to 1972, it has been estimated that 42 percent of the walruses shot during the harvest die but are not recovered.

In addition to collecting catch data, the walrus harvest monitoring program also provides an opportunity to collect biological samples and relevant information to help assess trends in the general health and population status of Pacific walruses. In this regard, Native hunters reported seeing far fewer calves in 1998 than in previous years. Although weather tended to limit hunting opportunities in 1998 and may have affected observations, there was concern among Native hunters that the observation might indicate a decline in reproductive rates.

To help ensure that harvest monitoring programs in Alaska and Russia are providing the best possible information on catch levels, the Eskimo Walrus Commission and the Fish and Wildlife Service jointly hosted a workshop to examine opportunities to improve and standardize harvest monitoring methods. The workshop, held on 21–25 September 1998 in

Nome, involved U.S. and Russian officials as well as Alaska Natives. Unfortunately, Native hunters from Chukotka, Russia, were unable to attend because of weather problems. Participants reviewed harvest monitoring methods in both countries, recent walrus harvest data, management organizations and subsistence user groups, and the importance of subsistence hunting among indigenous residents. Severe funding constraints due to the Russian economic crisis have almost eliminated support for the Russian harvest monitoring program. As a result, Russian harvest estimates are no longer considered reliable. Therefore, as a matter of urgency, workshop participants identified alternative funding strategies and recommended action to secure funding to continue the Russian harvest monitoring program. At the end of 1998, a report of the workshop was being completed.

### **Marking, Tagging, and Reporting Program**

In 1988 the Service also began a marine mammal marking, tagging, and reporting program to document harvest levels in all hunting villages and to help control illegal trade in certain walrus, sea otter, and polar bear parts. Under the program, Alaska Native hunters must present marine mammal parts, such as walrus tusks, for tagging within 30 days of an animal being taken. Taggers, usually village residents hired and trained for this purpose, are located in more than 100 coastal villages around the state. To assess compliance with the marking, tagging, and reporting program at the major walrus hunting villages, the Service undertook a study to compare harvest data for the spring 1994 and 1995 hunts obtained from the walrus harvest monitoring program and the marine mammal tagging program.

The findings, published in 1998, suggest that harvest levels reported through the marking, tagging, and reporting program varied by village. They ranged from between about 65 to 99 percent of the catch levels recorded by the walrus harvesting monitoring program. As a result, the study concluded that walrus harvest levels reported through marking, tagging, and reporting program are below actual harvest levels. Calves (which lack tusks), in particular, were underreported.

Table 6. Estimated catches of Pacific walruses in Alaska<sup>1</sup> and total reported catch of walruses in Russia, 1980-1997

Year	Alaska		Russia		Total Catch	Total Catch and Struck/Lost <sup>2</sup>
	Catch	Struck/Lost	Catch	Struck/Lost		
1980	2,625	—	2,653	—	5,278	—
1981	3,518	—	2,574	—	6,092	—
1982	2,557	—	3,569	—	6,126	—
1983	2,261	—	3,946	—	6,207	—
1984	4,929	—	4,424	—	9,353	—
1985	3,903	—	4,708	—	8,611	—
1986	3,207	—	3,884	—	7,091	—
1987	2,734	—	4,673	—	7,407	—
1988	2,567	—	3,989	—	6,556	—
1989	1,008	—	3,678	—	4,686	—
1990	—	—	3,269	—	—	—
1991	—	—	2,514	—	—	—
1992	1,683	1,219	1,670	1,209	3,353	5,781
1993	1,183	857	856	620	2,039	3,516
1994	1,611	1,167	1,013	734	2,624	4,525
1995	1,674	1,212	1,071	776	2,745	4,733
1996	2,419	1,752	941	681	3,360	5,793
1997	1,558	1,128	731 <sup>3</sup>	529	2,289	3,946 <sup>3</sup>

<sup>1</sup> Estimates are extrapolated from recorded catches at selected villages.

<sup>2</sup> Based on a struck/lost ratio of 42 percent.

<sup>3</sup> Because of funding cutbacks in the Russian walrus harvest monitoring program, Russian harvest estimates were not considered reliable.

Sources: F. H. Fay and C. E. Bowlby. 1994. The harvest of Pacific walrus, 1931-1989. Technical Report MMM 94-2. Fish and Wildlife Service, Anchorage, Alaska. 44 pp.  
 Pacific Walrus (*Odobenus rosmarus divergens*): Alaska Stock. U.S. Fish and Wildlife Service, Marine Mammals Management, Anchorage, Alaska. September 1998.  
 Data since 1990 from U.S. Fish and Wildlife Service.

The number of walruses tagged and reported statewide between 1992 and 1997 were 1,192, 1,336, 1,120, 1,585, and 1,175, respectively. Incomplete data indicate that at least 1,482 walruses were tagged and reported in 1998.

### Implementation of a Co-Management Program with the Eskimo Walrus Commission

In 1994 the Marine Mammal Protection Act was amended to authorize funding for cooperative agree-

ments between the Fish and Wildlife Service or the National Marine Fisheries Service and Alaska Native organizations on co-managing marine mammal stocks of mutual interest. Pursuant to this provision, the Fish and Wildlife Service signed a co-management agreement with the Eskimo Walrus Commission in 1997. The agreement set forth steps that would be taken to expand the scope of cooperation between the Service and the Native community on conserving the Pacific walrus population, and funds to help implement the agreement were provided by the Service to

the Walrus Commission. As indicated above, in 1998 the Eskimo Walrus Commission continued to help facilitate monitoring of the Alaska Native walrus harvest and it served as a co-convenor for a workshop on harvest monitoring programs in the United States and Russia. In addition, the Walrus Commission distributed information on walrus conservation issues and needs to the Native community and developed an incentive program to encourage Native hunters to provide information and walrus tissue samples to walrus harvest monitors.

Late in 1998 the Service provided \$80,000 to the Eskimo Walrus Commission to continue cooperative efforts in 1999. The money will be used to help maintain its efforts to disseminate information on walrus conservation needs, encourage cooperation by Native hunters with the walrus harvest monitoring program, and participate in meetings and deliberations regarding walrus research and management plans and the reauthorization of the Marine Mammal Protection Act. The Walrus Commission also plans to devote particular attention to (1) the negotiation of walrus conservation agreements between the Native communities in Russia and Alaska, (2) the development of effective policies and strategies among tribal governments in key walrus hunting villages on managing the walrus harvest and improving compliance with the marking, tagging, and reporting program, and (3) providing support to the Bristol Bay Native Association (also called the Qayassic Walrus Commission) for managing and monitoring subsistence walrus hunts at Round Island in Bristol Bay.

### **Pacific Walrus Research Activities**

As indicated above, the best available information indicates that the Pacific walrus population numbers at least 188,000 walrus and probably more than 200,000. Reliable estimates of population size and population trends are fundamental for making informed decisions with regard to subsistence hunting and other matters. However, the best available data in this regard are based on four rangewide surveys conducted jointly at five-year intervals by U.S. and Russian researchers beginning in 1975. The last of these surveys was conducted in 1990. No surveys have been undertaken since because of the expense (they require extensive aircraft and ship support in

remote areas of the Chukchi Sea) and economic constraints, particularly in Russia where virtually all government funding for walrus research and management has been eliminated in recent years. A comparable survey today could cost \$1.5 million.

There also has been a reluctance to consider further rangewide surveys because of fundamental sampling problems that make it difficult to develop a reliable population estimate from survey results or to compare survey results between years. For example, reliable methods have not been found to extrapolate a population estimate from survey counts because of uncertainty regarding at-sea walrus distribution patterns and the proportion of animals along a trackline that may be submerged as a survey plane or ship passes.

The situation has left the Service in the difficult position of relying on an estimate of population size derived from a rangewide survey that is scientifically weak and becoming increasingly out of date. At the same time, it has no sound alternative approach to develop a more accurate estimate of overall population size or trends. The situation has been exacerbated by limited funding that has been insufficient to support research to resolve sampling problems, conduct effective population surveys, or investigate alternative monitoring approaches.

Within these constraints, the Service has attempted to monitor a segment of the walrus population that can be observed relatively easily at low cost, while, at the same time, developing techniques and information to resolve fundamental sampling questions with regard to walrus survey techniques. This has been done by using most walrus research funding in recent years for the study of walrus that occur in Bristol Bay during the summer. Specifically, the Service and cooperating agencies and groups have conducted counts of walrus at most major haul-out sites in Bristol Bay and developed a satellite tracking program to improve information on at-sea habitat use patterns of walrus using Bristol Bay. In 1998, as discussed below, research in both areas was continued. In addition, a study was undertaken in the northern portions of the population's range to assess the age-sex composition and reproductive success of the population.

**Monitoring Haul-Out Sites in Bristol Bay** — As noted above, most walrus migrate north with the edge of the pack ice as it retreats in spring. However, some walrus, principally adult males, move south to Bristol Bay in the southeastern Bering Sea, where they remain throughout the summer. To help determine the status and trend of this segment of the walrus population, the Service, the Togiak National Wildlife Refuge, the Alaska Department of Fish and Game, and more recently the Bristol Bay Native Association have cooperated in a long-term effort to monitor three major summer walrus haul-out sites located on the northern coast of Bristol Bay. The three haul-out sites are at Round Island, Cape Peirce, and Cape Newenham. As noted in the previous annual report, counts at these sites in 1997 indicated that at least 9,400 walrus were present in northern Bristol Bay, a number that was 15 percent greater than the average annual estimate over the previous five-year period.

In addition to these three haul-out sites, another major walrus haul-out site is at Cape Seniavin along the south shore of Bristol Bay on the Alaska Peninsula. This site has been surveyed infrequently and information on the number of walrus using the site has been limited. To develop a better estimate of the number of walrus using Bristol Bay in summer, all four major haul-out sites around Bristol Bay were monitored continuously for one month during the summer of 1998. These are the only major land-based walrus haul-out sites in the United States and, for the first time, all four sites were monitored at the same time. Preliminary results indicate that more walrus use Cape Seniavin than previously thought. As of the end of 1998, monitoring data had not yet been fully analyzed to determine a maximum count of walrus hauled out at one time at the four sites.

**Telemetry Studies** — In 1995 the U.S. Geological Survey initiated a multi-year study to develop satellite tracking techniques for walrus. Its purpose is to improve understanding of at-sea habitat-use patterns of walrus. After successful trials on 8 animals in Bristol Bay during 1995, 8 walrus were tagged in 1996, 18 in the summer of 1997, and 14 in 1998. All tags were attached to adult males at haul-out sites in northern Bristol Bay, most at Cape Peirce, but some at Round Island, and a few at Cape Newenham.

Time-depth recorders also were attached to five animals in 1997 and to three animals in 1998 to document dive patterns and feeding activity. In addition to providing new insights on the distribution, movement, and ecology of walrus using Bristol Bay, the results are expected to help resolve questions about the proportion of time walrus spend hauled out in order to develop correction factors for use in evaluating aerial survey results.

The results of work to date have identified preferred feeding areas in central Bristol Bay. They also suggest that, although animals used different haul-out sites in Bristol Bay, there was a strong indication of site fidelity. For example, animals tagged at Cape Peirce appeared to haul out principally, though not exclusively, at that site. To date, tags have continued transmitting for up to 198 days, and some animals have been tracked from their summer habitat in Bristol Bay to the winter breeding grounds off St. Lawrence Island.

At the end of 1998 it was the Commission's understanding that the U.S. Geological Survey was considering substantially reducing the number of satellite tags it would deploy in 1999, while expanding efforts to test new drugs to immobilize walrus and summarizing study findings for publication. Also being considered were studies to evaluate whether analyses of stable isotopes in walrus vibrissae might be used to determine walrus movement patterns more cost effectively than satellite tagging.

**Assessments of Age-Sex Composition and Reproduction** — Morphological differences in tusks and facial features of walrus have been found useful for identifying the age and sex of individual walrus. With such differences, observers can generally assign specific ages to observed animals younger than age four and also can assign older animals to broader multi-year age groups. Using this ability, researchers on a series of vessel-based walrus surveys conducted early in the 1980s attempted to determine the age and sex composition of the walrus population and the survivorship rates of young animals. Among other things, the studies found that roughly one-third of the mature females were accompanied by calves of the year and another third were accompanied by animals born in the preceding calving season.

To further evaluate and refine this research technique for purposes of monitoring trends in the status of the Pacific walrus population, a survey similar to those conducted in the early 1980s was undertaken in September 1998. It was conducted by personnel from the University of Alaska and the Fish and Wildlife Service with funding from the National Fish and Wildlife Foundation and using an ice-breaking vessel made available at no charge by Greenpeace. The survey involved a 17-day cruise along the ice edge of Chukchi Sea between Barrow, Alaska, and Wrangel Island, Russia, and along the coasts of the Chukotka Peninsula and northwestern Alaska.

During the survey, the ages and sex of approximately 1,000 walrus were determined. Preliminary findings indicate that only about 5 percent of the mature females were accompanied by yearlings and that another 5 percent were accompanied by year-old animals. The results suggest that, for at least the past two years, either the number of births or the survival of young animals has been very low — a finding that is consistent with observations by Native hunters who reported observing very few calves during the spring 1998 hunt. At the end of 1998 a report of survey results had not yet been completed.

Most walrus calves remain with their mothers two or three years after birth, and mature females typically give birth once every two or three years. Thus, potential population growth rates are low compared with those of most pinnipeds that give birth annually, and juvenile walrus survival rates are much higher than those of most pinnipeds. With such a life history, the limited information on the population size and trends, and uncertainty as to when recruitment rates may have first declined, the preliminary indication of at least two successive years of poor recruitment into the population is of concern. As a possibly related matter, warm temperatures in 1998 caused pack ice in the Chukchi Sea to retreat farther north than past years. Low reproductive rates and/or juvenile survival could be related at least in part to this climatic change.

If funding is available, researchers plan to conduct a similar survey in 1999.

## Polar Bear (*Ursus maritimus*)

Polar bears occur throughout the Arctic region in several largely discrete stocks that are shared between countries. The species can be found within the national boundaries of the United States, Canada, Greenland, Norway, and Russia, as well as in international waters. The total population has been estimated at 21,000 to 28,000 animals. Two polar bear populations occur in Alaska: the western Alaska (Chukchi/Bering Seas) population, which is shared with Russia; and the northern Alaska (southern Beaufort Sea) population, shared with Canada (see Figure 10). The total number of polar bears in Alaska and adjacent waters is estimated at 2,000 to 5,000 animals.

Both the Chukchi/Bering Seas stock and the Beaufort Sea stock may have declined as a result of sport hunting that occurred before enactment of the Marine Mammal Protection Act in 1972. The stock assessment issued by the Fish and Wildlife Service in September 1998, and discussed below, suggests that both stocks have grown as a result of protection provided by the Act. However, it has been difficult to obtain accurate estimates of the current and historic size of the populations because of inaccessibility of the habitat, the movement of bears across international boundaries, and the costs of conducting surveys.

Until the middle of this century, polar bears in Alaska were taken primarily by Natives for subsistence purposes and for the sale of hides. Beginning late in the 1940s a sport hunt developed that involved trophy hunters using professional guides to hunt animals, sometimes with the use of aircraft. As a result, hunting pressure on polar bear populations in Alaska and elsewhere increased substantially. Recognizing this, the State of Alaska adopted regulations in 1961 to restrict the sport hunting season and require hunters to present all polar bear skins for tagging and examination. At the same time, preference was provided to subsistence hunters and a prohibition was adopted on shooting cubs and females with cubs. Between 1961 and 1972 an average of 260 polar bears was taken annually in Alaska, 75 percent of which were males. In 1972 the state banned hunting with the use of aircraft.

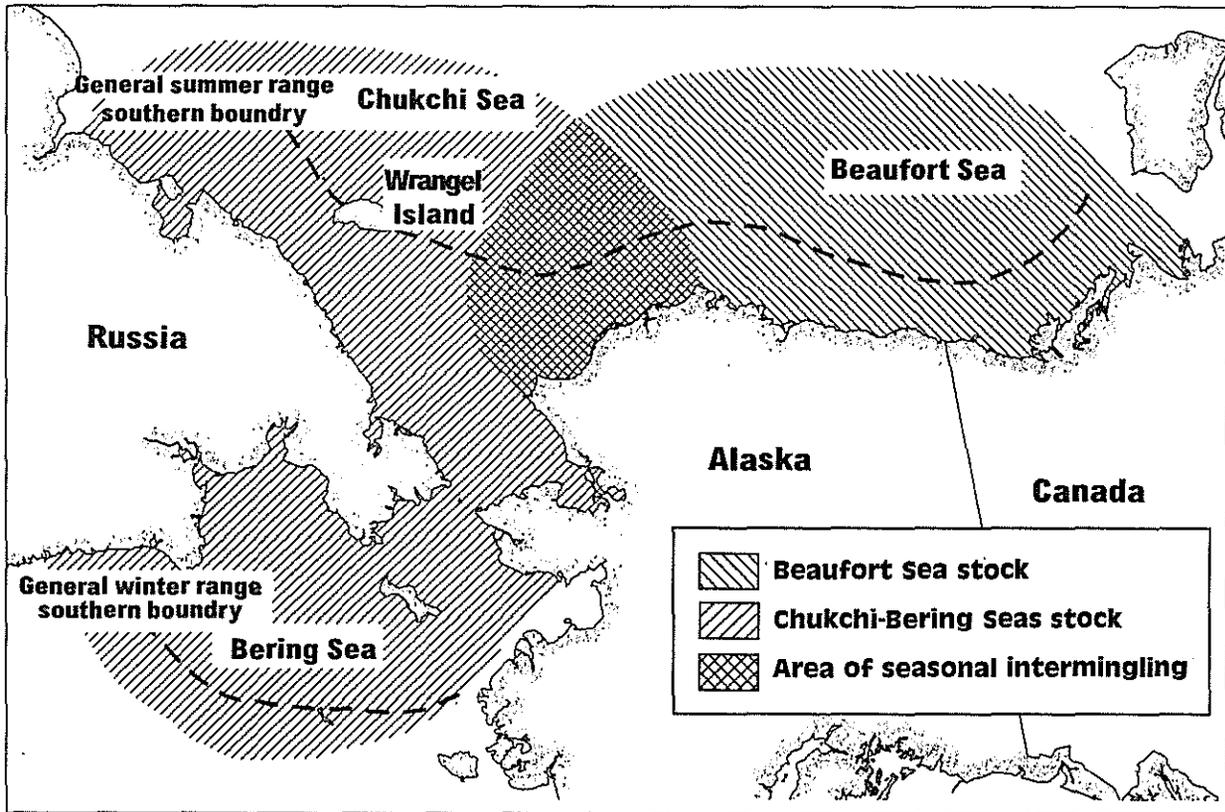


Figure 10. Ranges of the Beaufort Sea stock and Bering-Chukchi Seas stock of polar bears.

Also in 1972, enactment of the Marine Mammal Protection Act established a moratorium on the take of polar bears and other marine mammals and transferred management responsibility from the states to the federal government. Under the Act, Alaska Natives are allowed to take polar bears and other marine mammals for subsistence purposes and for purposes of creating and selling traditional handicrafts and clothing. The Act does not restrict the number of animals that can be taken or prohibit the take of cubs or females with cubs by Alaska Natives, provided that the take is not wasteful and the population is not determined to be depleted.

The Act also provides other exceptions to its taking prohibition, including a general waiver provision. Although it is possible that sport hunters could seek a waiver of the moratorium for polar bears in Alaska, they have not done so. The taking of small numbers of polar bears incidental to oil- and gas-related activi-

ties in the Beaufort and Chukchi Seas is discussed in Chapter IX.

Because the ranges of many polar bear populations cross national boundaries, efforts to protect and conserve polar bears require cooperation among the various nations. Concern over the dramatic increase in the polar bear harvest levels in the 1950s and 1960s led to negotiation of the international Agreement on the Conservation of Polar Bears. The agreement was concluded in 1973 by the governments of Canada, Denmark (for Greenland), Norway, the Soviet Union, and the United States.

In 1994 Congress amended the Marine Mammal Protection Act, adding a number of measures related to polar bears. Among these was a provision allowing the issuance of permits to import sport-hunted polar bear trophies legally taken by U.S. citizens in Canada. Efforts by the Fish and Wildlife Service to promulgate regulations allowing imports from certain populations

and further amendments enacted in 1997 have been discussed in previous annual reports. The 1994 amendments also called on the Secretary of the Interior to initiate two reviews relative to the 1973 polar bear agreement. Activities in this regard, along with efforts related to implementing an agreement between Natives in Canada and Alaska regarding the shared population of polar bears, are discussed below.

### **Polar Bear Conservation Plan**

In 1988 Congress amended the Marine Mammal Protection Act to direct the Secretaries of the Interior and Commerce to develop conservation plans for depleted and, when appropriate, non-depleted marine mammal species and populations. In January 1989 the Marine Mammal Commission recommended to the Fish and Wildlife Service that it prepare conservation plans for polar bears, walruses, and sea otters in Alaska. The Service agreed and, to help in this task, the Commission developed and provided preliminary draft conservation plans for the three species. The preliminary draft plan for polar bears was forwarded to the Service on 28 June 1992.

As discussed in previous annual reports, from 1992 through 1994 the Commission worked closely with the Service to ensure that the polar bear conservation plan identified research and management actions necessary to maintain populations in Alaska within their optimum sustainable population range, as required by the Marine Mammal Protection Act. In September 1994 the Service forwarded to the Commission and others the final conservation plan for the polar bear in Alaska, as well as conservation plans for walruses and sea otters in Alaska. The Service noted that the plans would be reviewed annually and considered for rewriting and updating in three to five years. During 1999 the Service intends to review its conservation plans for polar bears and other marine mammal species and to revise the plans, as needed.

### **Co-Management Agreements**

The 1994 amendments to the Marine Mammal Protection Act included a new section 119, which provides for cooperative agreements between the Secretaries of Commerce and the Interior and Alaska

Native organizations to conserve marine mammals and provide for co-management of subsistence uses by Alaska Natives. Under such agreements, the Secretaries may make grants to Native organizations for collecting and analyzing data on marine mammal populations, monitoring the taking of marine mammals for subsistence purposes, participating in marine mammal research, and developing marine mammal co-management programs with federal and state agencies.

On 19 February 1997 the Fish and Wildlife Service and the Alaska Nanuuq Commission signed a cooperative agreement pursuant to section 119 for the co-management of polar bears. Under the agreement, the Service provided \$90,000 to the Nanuuq Commission in 1997 and the same amount in 1998. The funds are designated primarily to cover operational expenses of the Nanuuq Commission and to support its involvement in efforts to conclude bilateral agreements between the United States and Russia on conservation of polar bears in the Bering and Chukchi Seas, discussed below.

### **Marking, Tagging, and Reporting Program**

As noted above, the Marine Mammal Protection Act allows Alaska Natives to take marine mammals for purposes of subsistence and for making and selling traditional handicrafts. Under amendments to the Act adopted in 1981, the Fish and Wildlife Service and the National Marine Fisheries Service were provided specific authority to establish marking, tagging, and reporting programs to monitor the Native harvest of marine mammals. The Fish and Wildlife Service established such programs for sea otters, walruses, and polar bears. The purpose of these programs is to obtain biological data needed to manage the species and stocks and to help control illegal trade in products from those species.

Marking, tagging, and reporting regulations were issued by the Fish and Wildlife Service on 28 June 1988. They require that, within 30 days of taking a polar bear, walrus, or sea otter, Native hunters report the take to an authorized Service agent and present specified parts, including polar bear hides, to be marked and tagged. Since promulgating its regulations, the Service has worked closely with Native groups and the State of Alaska to implement the pro-

gram. Data obtained from the program are maintained by the Service in a computerized database. During the harvest year running from 1 July 1997 to 30 June 1998, 46 polar bears were presented for marking and tagging by Alaska Natives. The numbers of polar bears tagged during the past 10 harvest years are shown in Table 7.

**Table 7. Numbers of Polar Bears Tagged during Alaska Native Harvests, 1988-1998**

<u>Harvest Year</u>	<u>Number Tagged</u>	<u>Harvest Year</u>	<u>Number Tagged</u>
1988/89	132	1993/94	121
1989/90	99	1994/95	92
1990/91	76	1995/96	38
1991/92	59	1996/97	67
1992/93	66	1997/98	46

### **Agreement on the Conservation of Polar Bears**

As noted above, polar bears occur throughout the Arctic in relatively discrete populations that overlap national boundaries. Thus, effective conservation of polar bears requires cooperative actions by the several nations. Activities concerning international efforts to conserve polar bears and actions to review the effectiveness of those efforts are discussed below.

In 1973 the governments of Canada, Denmark (for Greenland), Norway, the Soviet Union, and the United States concluded the Agreement on the Conservation of Polar Bears. The Agreement was prompted by growing concern about the possible effects of sport and commercial hunting of polar bears, which had increased in the 1950s and 1960s, and the effects of industrial activities on polar bears and their habitat.

Article I of the Agreement prohibits the taking of polar bears, subject to certain exceptions set forth in Article III. Article II requires that each contracting party "take appropriate action to protect the ecosystems of which polar bears are a part, with special attention to habitat components such as denning and

feeding sites and migration patterns...." Article IV prohibits the use of aircraft and large motorized vessels for purposes of taking polar bears. In addition to these provisions of the Agreement, the parties adopted a resolution calling on each party to ban the hunting of polar bear cubs, female bears with cubs, and bears moving into denning areas or in dens.

As discussed in previous annual reports, the Marine Mammal Commission and others questioned whether the Marine Mammal Protection Act or other domestic statutes provide sufficient legal authority for the United States to implement fully all provisions of the Agreement, particularly with respect to habitat protection. In 1992 the Commission contracted for an examination of the Agreement's provisions, the Marine Mammal Protection Act, and other domestic legislation to identify possible inconsistencies and provide suggestions as to how provisions of the Agreement and the Act might be reconciled. The report of that study was provided to the Fish and Wildlife Service in January 1994. That report was updated to reflect amendments to the Marine Mammal Protection Act enacted in 1994 and forwarded to the Service in 1995 (see Appendix B, Baur 1995).

In response to concerns that the Agreement may not have been implemented fully by the United States and other parties, Congress amended section 113 of the Marine Mammal Protection Act in 1994 to require the Secretary of the Interior to initiate two reviews. Section 113(b) requires the Secretary, in consultation with the other contracting parties, to review the effectiveness of the Agreement. That review was to be initiated by the end of April 1995. Also, the Secretary was directed to work with the contracting parties to establish a process by which future reviews of the Agreement will be conducted. Section 113(c) requires the Secretary of the Interior, in consultation with the Secretary of State and the Marine Mammal Commission, to review the effectiveness of U.S. implementation of the Agreement, particularly with respect to habitat protection. A report on the results of that review was to be submitted to Congress by 1 April 1995.

As the Commission had recommended in July 1994, the Service in June 1995 convened a meeting of representatives of interested governmental agencies

*not from  
Ninety  
final*

and non-governmental organizations to review U.S. implementation of the Agreement. The Service subsequently prepared a draft report assessing U.S. compliance with each of the provisions of the Agreement and with the resolution concerning the taking of female bears, cubs, and denning bears.

The draft report, which is discussed in previous annual reports, identified four principal areas of concern: incidental taking of polar bears as a result of oil- and gas-related activities; habitat protection; the prohibition on using aircraft to hunt polar bears; and the taking of female bears with cubs, cubs, or bears in denning areas.

The Commission's comments on the draft report, transmitted to the Service on 5 July 1996, are discussed in the previous annual report. Although the Commission generally believed that the draft report had done a good job of identifying the areas in which the United States may not have fully implemented the provisions of the polar bear agreement, it suggested several technical revisions and clarifications to be incorporated into the report before it is provided to Congress. The Commission also noted that the Commission-sponsored report on reconciling U.S. law and the Agreement discussed many of the relevant issues in greater detail than did the Service's report and recommended that it be provided to Congress along with the report.

As noted in the previous annual report, at the end of 1997 it was the Commission's understanding that a final report had been prepared and was undergoing clearance within the Department of the Interior for transmittal to Congress early in 1998. At the end of 1998, however, the report had not yet been submitted to Congress.

As noted above, section 113 of the Marine Mammal Protection Act also directs the Secretary of the Interior to consult with contracting parties to review the effectiveness of the Agreement on the Conservation of Polar Bears. On 5 May 1997 the Fish and Wildlife Service sent letters to the other parties seeking their assistance in conducting the review. The Service asked each party to apprise the United States on the status of its compliance with the Agreement

and to provide its view as to whether a further review by the parties is warranted.

As of the end of 1998 the Service had received final reviews from Canada, Norway, and Greenland, and a preliminary response from the Russian Federation. Once all final responses are in hand, the Service intends to prepare a report on international compliance with the Agreement and the other parties' views as to what further review of the effectiveness of the Agreement is needed.

### **Bilateral Polar Bear Agreements**

As discussed above, two discrete polar bear populations occur in Alaska, and both are shared with other countries. The northern (Beaufort Sea) population is shared with Canada and the western (Bering-Chukchi Seas) population is shared with Russia. Efforts to develop cooperative programs with these countries for the management and conservation of polar bears are discussed below.

**North Slope Borough/Inuvialuit Polar Bear Agreement** — The Beaufort Sea polar bear population is hunted by Natives from northwestern Canada as well as Alaska. If not regulated effectively, such hunting, by itself and in combination with other activities, could cause the population to decline. Recognizing this, the Fish and Game Management Committee of Alaska's North Slope Borough and the Inuvialuit Game Council of Canada's Northwest Territories entered into an agreement in January 1988 to govern cooperatively the hunting of polar bears in the area between Icy Cape, Alaska, and the Baillie Islands, Canada.

In certain respects the agreement between the North Slope Borough and the Inuvialuit Game Council is more restrictive than the Marine Mammal Protection Act. For example, the agreement calls for protecting cubs, females with cubs, and all bears inhabiting or constructing dens, and prohibits airborne hunting. Other provisions of the agreement prohibit hunting at certain times of the year and provide that a harvest quota, based on the best available scientific evidence, be established annually. Quotas are allocated equitably between Natives in Alaska and Canada, and data are collected and shared on the number,

location, age, and sex of bears killed. Although the agreement is not legally binding as a matter of federal law, both Alaska and Canadian Natives have largely complied with the mutually agreed conservation measures.

**U.S.-Russian Polar Bear Agreement** — A relatively discrete polar bear population, the western or Bering-Chukchi Seas population, which occurs partially in Alaska and partially in Russia, has traditionally been used for subsistence by Native people in both the United States and Russia. As discussed in previous annual reports, the Marine Mammal Commission wrote to the Fish and Wildlife Service in 1992 about the possible need for a cooperative U.S.-Russian program to manage the take of polar bears from the Bering-Chukchi Seas population. Such action was initiated by the Fish and Wildlife Service on 22 October 1992 when the Service's Alaska Regional Director and a representative of the Russian Ministry of Ecology and Natural Resources signed a protocol stating the parties' intentions to conclude a bilateral agreement on the conservation and regulated use of polar bears from the shared Bering-Chukchi Seas population. The protocol called on both governments to create special working groups composed of representatives of government agencies and Native communities to prepare proposals for such an agreement and to convene a meeting of the working groups to prepare a draft agreement.

At about the same time, informal discussions between the Fish and Wildlife Service and Alaska Native groups concerning the development of a polar bear conservation plan identified the desirability of forming an Alaska polar bear commission similar to the Alaska Eskimo Walrus Commission and the Alaska Sea Otter Commission to represent the interests of Alaska Native communities in matters affecting the conservation of polar bears. In 1994 the Alaska Nanuuq Commission was established to represent Native polar bear hunters in 20 Alaska communities. Formation of this group moved the negotiating process along by giving the Fish and Wildlife Service a single Alaska Native entity from which advice on a U.S.-Russian polar bear agreement could be obtained.

In 1994 representatives of Native organizations and government agencies from the United States and

Russia held technical discussions concerning joint conservation of the shared population of polar bears occupying the Chukchi, Bering, and eastern Siberian Seas. As a result of those discussions, the parties signed the Protocol on U.S./Russia Technical Consultation for the Conservation of Polar Bears of the Chukchi/Bering Sea Regions on 9 September 1994. Further scientific and technical discussions concerning the proposed government-to-government agreement were held in Russia during 1995. Participants included both government officials and representatives of the affected Native communities. The U.S. delegation at that meeting included a representative of the Marine Mammal Commission.

Before the Department of the Interior could begin to negotiate a formal bilateral polar bear agreement, it was required to obtain authorization from the Department of State. As discussed in the previous annual report, in July 1996 the Fish and Wildlife Service circulated a "Draft Environmental Assessment on the Development of a U.S./Russia Bilateral Agreement for the Conservation of Polar Bears in the Chukchi/Bering Seas." The assessment described three basic alternatives: (1) no U.S. government action, (2) government-to-Native agreements in each country, or (3) a government-to-government agreement with a Native-to-Native side agreement. The third alternative, identified as the preferred one, called for undertaking joint efforts with respect to research and management, population and harvest monitoring, enforcement, and habitat protection. A key feature of the alternative was establishment of a joint commission, composed of government and Native representatives from each country, to set annual take limits and to oversee implementation of the agreement. The Commission's comments on the draft environmental assessment, provided to the Service on 20 December 1996, are discussed in the previous annual report.

The Service published its final environmental assessment on 12 March 1997, concluding that its preferred alternative would have no significant environmental impact. Shortly thereafter, the Service prepared and transmitted to the Department of State a request for authority to negotiate the agreement. The request was granted early in 1998, and formal negotiations between U.S. and Russian officials were held 9-12 February 1998 at Orcas Island, Washington. A

representative of the Marine Mammal Commission served as a member of the U.S. delegation.

The U.S.–Russian negotiations resulted in *ad referendum* agreement on the text of a bilateral agreement for submission to the two national governments for approval. Among other things, the agreement recognizes that Native people in the United States and Russia share an equal interest in and responsibility for the conservation and sustainable use of the Alaska/Chukotka polar bear population. The agreed text further recognizes the important ecological role and aesthetic values of the polar bear and the need to maintain broad public support for conservation of the species and its marine and terrestrial habitats. At the same time, the text affirms the rights of Native people in both countries to hunt polar bears to satisfy traditional subsistence needs and to manufacture and sell handicrafts and clothing.

Accordingly, the text provides that Native people of Alaska and Chukotka may take polar bears for subsistence purposes, provided that the take is consistent with the Native exemption in Article III(1)(d) of the 1973 Agreement for the Conservation Polar Bears. In addition, the agreed text bans the taking of females with cubs, cubs less than one year old, and bears in dens; the use of aircraft and large motorized vessels and vehicles to hunt polar bears; and use of poisons, traps, and snares.

The text also recognizes the importance of ensuring the full involvement of Natives in the implementation and enforcement of its provisions. Toward this end, it calls for establishment of a U.S.–Russian Polar Bear Commission, to be composed of a U.S. section and a Russian section. Each section will have two appointed commissioners, and all decisions and recommendations of the commission will require the approval of both sections.

The responsibilities of the joint commission will include, among other things, the following:

- promoting cooperation with and between Native people of Alaska and Chukotka;
- determining the annual sustainable harvest level of the polar bear population based on reliable scientific data and traditional knowledge;
- determining annual take limits to be shared equally by Alaska and Chukotka Natives;
- adopting enforceable measures to restrict the use and take of polar bears for subsistence purposes consistent with annual take limits;
- identifying habitats essential to polar bears and recommending habitat conservation measures;
- considering scientific research programs and preparing recommendations for such programs; and
- establishing a scientific group to advise the commission on the preceding points.

Subsequently, the text of the joint polar bear agreement was submitted to the governments of the United States and the Russian Federation for approval. The U.S. Department of State reviewed the text of the agreement and forwarded it to the Russian Federation with minor changes. However, political changes occurring in Russia during 1998 prevented a prompt review of the agreed text in that country. At the end of 1998, it was believed that approval by the Russian Federation would shortly be forthcoming. At that time, the U.S. State Department will enter into consultations with other parties to the 1973 Agreement for the Conservation of Polar Bears before forwarding the bilateral U.S.–Russian agreement to the Senate for its advice and consent.

### **Polar Bear Trophy Imports**

Amendments to the Marine Mammal Protection Act enacted in 1994 allowed the Secretary of the Interior to issue permits to import sport-hunted polar bear trophies from Canada. Such permits may be issued under section 104(c)(5) of the Act to authorize the importation of legally acquired polar bear parts (other than internal organs), provided that the Secretary, in consultation with the Marine Mammal Commission, makes the following findings:

- Canada has a monitored and enforced sport-hunting program consistent with the purposes of the Agreement on the Conservation of Polar Bears;
- Canada has a sport-hunting program based on scientifically sound quotas ensuring the maintenance of the affected population stock at a sustainable level;

- the export and subsequent import are consistent with the provisions of the Convention on International Trade in Endangered Species of Wild Fauna and Flora and other international agreements and conventions; and
- the export and subsequent import are not likely to contribute to illegal trade in bear parts.

The amendments also direct the Secretary to charge a reasonable fee for permits. Monies received are to be used for developing and implementing cooperative research and management programs for the conservation of polar bears in Alaska and Russia.

After consulting with the Marine Mammal Commission concerning several threshold questions, the Fish and Wildlife Service on 3 January 1995 published proposed regulations to implement the polar bear import provision. The proposed rule addressed application requirements, permit procedures, issuance criteria, permit conditions, and a special issuance fee for permits to import polar bear trophies from Canada. A supplemental proposed rule addressing the required legal and scientific findings listed above was published on 17 July 1995.

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed the Service's proposed findings and provided comments by letter of 9 November 1995. The Commission concluded that some of the findings needed to be explained better or further justified. In particular, the Commission believed that findings with respect to consistency with the Agreement on the Conservation of Polar Bears and the scientific soundness of Canada's sport-hunting program needed additional explanation. A summary of the Commission's comments may be found in the previous annual report.

Comments received on the proposed rule prompted the Service to secure additional information from Canada on the status and management of polar bears. After reviewing this information and drafting responses to comments, the Service published a final rule on 18 February 1997, making affirmative findings for 5 of 12 Canadian management units. The management units from which imports were authorized included Southern Beaufort Sea, Northern

Beaufort Sea, Viscount Melville Sound, Western Hudson Bay, and M'Clintock Channel.

The final rule noted that regulations adopted by the Northwest Territories protect female polar bears from being hunted in denning areas, when in dens, or when moving into dens. Further, Canadian regulations prohibit the hunting of bears in family groups.

Comments submitted by the Commission and others prompted the Service to reconsider its proposal concerning imports of those bears taken before enactment of the 1994 amendments. In its final rule, the Service agreed that the plain language of the statute did in fact make such imports subject to the four findings applicable to imports of other trophies. The Service noted, however, that the statutory provision is written in the present tense and therefore that it was unnecessary to examine historical data to determine if the taking of such trophies is sustainable. Consistent with its interpretation of the Marine Mammal Protection Act, the rule limited imports of previously taken bears to those from the five approved management units. As recommended by the Commission, the Service dropped its proposal to authorize retroactively imports of polar bears taken after enactment of the 1994 amendments from populations for which affirmative findings had not been made at the time of taking.

Another key feature of the final rule was the establishment of a \$1,000 permit issuance fee. This fee, which is in addition to the usual \$25 processing fee, was authorized by Congress as a means of raising funds to be used for polar bear conservation.

Upon publication, the rule was attacked both by groups that supported and those that opposed the measure. Hunting groups and some members of Congress believed that the Service had interpreted the 1994 amendments too narrowly and, as a result, had not authorized imports from all of the populations they believed met the statutory criteria. On the other hand, animal welfare groups believed that the Service had erred by making affirmative findings for any of the management units. Both sides threatened to file suit challenging the regulations.

As discussed in the previous annual report, the House Resources Committee convened a hearing early in 1997 to review the Service's implementation of the polar bear import provisions. That led to enactment of an amendment to the Marine Mammal Protection Act to allow imports of all polar bear trophies legally taken in Canada prior to 30 April 1994.

Shortly after the publication of the final regulations in February 1997, the Commission requested and received from the Service additional information on Canada's polar bear program. Among other things, Canada had revised the boundaries of some of the polar bear management units. What previously had comprised three management units (Queen Elizabeth Island, Parry Channel, and Baffin Bay) had been realigned into smaller Baffin Bay and Queen Elizabeth Islands units and three new management units (Kane Basin, Lancaster Sound, and Norwegian Bay). The Commission contracted with a biometrician to review and evaluate Canada's polar bear management program, particularly as it relates to the current status and sustainability of those populations for which the Fish and Wildlife Service deferred making findings under the final rule. A final contract report was submitted to the Commission on 21 April 1997 (see Appendix B, Testa 1997). The report concluded that the Canadian polar bear program is consistent with generally accepted principles of sound resource management. The report also concluded that available data supported Canada's realignment of the Queen Elizabeth Islands, Parry Channel, and Baffin Bay management units.

Based on the analyses in the contract report and its independent review of the available data, the Commission wrote to the Fish and Wildlife Service on 22 April 1997, providing a copy of the contract report and noting that it appears that the Lancaster Sound and Norwegian Bay management units have management programs in place that satisfy the Marine Mammal Protection Act's import requirements. The Commission recommended that the Service, if it concurs with that conclusion, initiate a rulemaking to make affirmative findings for these two management units.

The Fish and Wildlife Service published a proposed rule on 2 February 1998 to make affirmative findings for the Lancaster Sound and Norwegian Bay management units. The Commission provided comments by letter of 1 April 1998. The Commission supported the proposed findings, noting that the sport-hunting programs for these populations are based on scientifically sound quotas ensuring their maintenance at sustainable levels. The Commission noted that Canada has implemented a new, flexible system for establishing quotas, which appears to be conceptually sound. The Commission nevertheless recommended that the Service closely track implementation of the new system to ensure that it works as expected and continues to meet the Marine Mammal Protection Act's requirements. The Service expected to publish a final rule early in 1999, making findings for imports of polar bear trophies from the Lancaster Sound and Norwegian Bay management units. It was expected that the Service would defer approval of the Baffin Bay, Queen Elizabeth Islands, and Kane Basin populations pending the establishment of cooperative management arrangements between Canada and Greenland.

Under the 1994 amendments to the Marine Mammal Protection Act, the Fish and Wildlife Service was directed to undertake a scientific review of the impact of issuing import permits on the polar bear populations in Canada. The review was to be completed by 30 April 1996. No permits could be issued after 30 September 1996 if the review indicated that the issuance of such permits was having a significant adverse effect on Canadian polar bear stocks. Because the regulations authorizing imports had not been issued by the time the review was to be completed, no review was undertaken. In this regard, the regulations published by the Service on 18 February 1997 specified that the review would be undertaken within two years of 20 March 1997. Now that the regulations have been in place a sufficient amount of time, the Service is conducting a review.

As of the end of 1998 the Service had issued 183 permits authorizing the import of polar bear trophies from Canada.

## Sea Otter (*Enhydra lutris*)

The sea otter is the only member of the genus *Enhydra* and, after the marine otter (*Lutra felina*) in South America, is the smallest marine mammal in the world. Three subspecies are recognized: *E. lutris lutris*, *E. lutris nereis*, and *E. lutris kenyoni*.

Historically, sea otters occupied nearshore waters of the North Pacific Ocean from Hokkaido in northernmost Japan through the Kuril Islands, Kamchatka Peninsula, the Commander Islands, the Aleutians, peninsular and south coastal Alaska, and southward down the west coast of North America to Baja California. The species' worldwide population before exploitation is estimated to have been 150,000 to 300,000 animals.

Commercial hunting of sea otters began in 1741 with the Russian discovery of Alaska and continued on an intense scale and without regulation for more than 150 years. By the early 1900s the total sea otter population had been reduced to as few as 1,000 to 2,000 animals existing in 13 small and widely scattered remnant groups.

The first protective measures were taken in 1911 when the United States, Russia, Great Britain, and Japan signed the North Pacific Fur Seal Convention. In addition to banning the pelagic take of northern fur seals, the convention provided much-needed protection for sea otters by bringing an end to commercial sea otter hunts. Since that time, sea otters have recolonized or have been reintroduced into a substantial part of their historic range in Russia, the Aleutian Islands, south coastal Alaska, British Columbia, Washington, and California. In the past 20 years, however, new threats have developed. They include possible oil spills from tanker accidents and well blowouts, entanglement in fishing gear, chemical pollution, toxic algal blooms, and possible new and rare diseases.

Efforts by the Marine Mammal Commission and others to ensure the continued protection of sea otters and their habitat have been discussed in previous annual reports. A summary of these actions and a description of efforts undertaken in 1998 follows.

## The Central California Population

As elsewhere in the species' range, the sea otter population in California was nearly eradicated by commercial hunting in the eighteenth and nineteenth centuries. By the time protection was afforded in 1911, the total population in California may have numbered fewer than 50 animals within a few miles of nearshore habitat along the rocky Point Sur coast. Under the Fur Seal Convention and additional protective measures later implemented by the State of California, the population increased slowly.

In the early 1970s the California population of sea otters was limited to less than 200 miles of coastal waters and contained only about 1,000 individuals. Because of its small size and limited distribution, and the growing risk of oil spills as a result of increasing tanker traffic in the area, the population was designated as threatened under the Endangered Species Act in January 1977.

At that time, it was believed that the best way to minimize the threat from oil spills would be to encourage expansion of the population's range. Such range expansion, however, could impact commercial and recreational abalone and other shellfish fisheries that had developed in the absence of sea otters. In light of this possibility, the Marine Mammal Commission recommended in December 1980 that the Fish and Wildlife Service implement a zonal management strategy by which one or more sea otter colonies would be established outside the existing California sea otter range and, at the same time, sea otters would be prevented from recolonizing areas where substantial shellfish fisheries existed.

The zonal management concept was incorporated by the Fish and Wildlife Service into the southern sea otter recovery plan adopted in February 1982. At the time, the Marine Mammal Protection Act contained no provisions for authorizing the take of depleted species of marine mammals for purposes other than scientific research. In 1986 Congress enacted Public Law 99-625 authorizing the development and implementation of a program to establish at least one sea otter colony outside the then-existing sea otter range in California. The law specified establishment of a translocation zone that would meet the habitat needs

of the translocated sea otters and provide a buffer against possible adverse activities that might occur outside that zone. It required that the area surrounding the translocation zone be designated as a management zone from which sea otters would be excluded by non-lethal means to protect fishery resources.

The Fish and Wildlife Service, in consultation with the Marine Mammal Commission, the California Coastal Commission, and the California Department of Fish and Game, subsequently developed a plan to establish a reserve sea otter colony at San Nicolas Island in the California Channel Islands. In August 1987, the California Department of Fish and Game and the Fish and Wildlife Service concluded a memorandum of understanding on the translocation and study of sea otters, and the Fish and Wildlife Service began translocating sea otters to San Nicolas Island.

Ultimately, 139 sea otters were captured along the California coast and moved to San Nicolas Island before the translocation effort was halted in mid-1990. Most of the animals subsequently left the area or disappeared; 36 returned to the mainland range and 11 were captured in the management zone and returned to the mainland range. A few sea otters have remained in the water around San Nicolas. Although at least 50 pups are known to have been born at San Nicolas Island, the colony has not grown and remains static at about 17 individuals. The reasons for the lack of growth are unknown; possibilities include mortality from natural causes, entrapment in lobster traps and pots, illegal taking, and dispersal of animals after weaning.

**Update of the Southern Sea Otter Recovery Plan** — In 1989 the Fish and Wildlife Service reconstituted the Southern Sea Otter Recovery Team to review and recommend changes necessary to update the southern sea otter recovery plan. This action was precipitated, in part, by the 1989 *Exxon Valdez* oil spill and the subsequent realization that the entire California sea otter population could be jeopardized by a similar large oil spill.

Based on the recovery team's recommendations, the Fish and Wildlife Service drafted a plan update and in August 1991 provided it to the Commission and others for review and comment. As discussed in

previous annual reports, the Commission in November 1991 commented to the Service that the draft did not adequately address several important issues and recommended that the Service prepare a second draft for review.

Based on recommendations from the recovery team, the Service revised the draft update, and on 3 July 1996 provided a second draft to the Commission and others for comment. The Commission forwarded comments on the revised draft to the Service on 24 September 1996. Among other things, the Commission pointed out that the document differed in several important ways from the original recovery plan adopted in 1982. For example, it proposed to discontinue the "zonal" management approach embodied both in the original recovery plan and in Public Law 99-625, which provided the authority for establishing the reserve sea otter colony at San Nicolas Island and for preventing range expansion elsewhere south of Point Conception.

**Population Decline** — When the California sea otter population was listed as threatened in 1977, it was assumed that the population was increasing and would continue to increase at about 5 percent a year for the foreseeable future. As noted in previous Commission reports, however, subsequent studies indicated that substantial numbers of sea otters were being caught and killed incidentally in coastal gill and trammel net fisheries and that this incidental take was sufficient to stop and possibly reverse the population increase (see Bishop 1985, Henry 1986, and Hatfield 1991, Appendix B). In addition, thousands of seabirds and non-target fish, as well as sea otters and other marine mammals, were being caught and killed in these fisheries. In response, the state of California, beginning in 1982, enacted a series of regulations prohibiting the use of gill and trammel nets in areas where seabirds, sea otters, and other marine mammals were likely to be caught and killed. These prohibitions substantially reduced the incidental take of sea otters, and in the mid-1980s the population increase and range expansion both resumed. The expected range expansion was one of the factors that led to the zonal management plan implemented by the Fish and Wildlife Service in 1987.

As indicated in Table 8, surveys conducted by the Fish and Wildlife Service have indicated a recent decline in the California sea otter population. The number of adult animals has decreased about 11 percent in the past three years. In spring 1998 the number of sea otters counted was down 5.2 percent from 1998 to the lowest level observed since 1992.

This recent decline appears to coincide with the development of a finfish trap fishery in nearshore California waters, suggesting that the decline may be due to an incidental take in this fishery. Because of this possibility, the Commission wrote to the Fish and Wildlife Service on 6 January 1998 recommending that the Service undertake or contract for an observer program to determine whether, and to what extent, California sea otters are being taken incidentally in the developing trap fishery. Subsequently, the Commission learned that fishery observations conducted by the National Marine Fisheries Service indicated that there also has been an increase in gillnet fisheries in Monterey Bay since 1995, and that there may be a corresponding increase in the number of sea otters taken incidentally in this fishery.

The Fish and Wildlife Service did not provide a written response to the Commission's 6 January letter. However, at the Commission's annual meeting held on 10–12 November 1998 in Portland, Maine, Service representatives advised the Commission that it was considering several factors that may be contributing to the apparent increase in sea otter mortality, including an increase in the rate of infectious disease and an increase in the incidental take in fisheries.

With regard to incidental take, the Commission was advised that two efforts had been initiated in 1998 to investigate possible sea otter entrapment in the expanding finfish trap fishery. One was a study to observe sea otters in a controlled environment to see if they will enter lobster, crab, or finfish traps that contain known sea otter food items. The second study, supported in part by funding from The Otter Project, Inc., a non-profit research organization, is an at-sea observer program to monitor hauls of finfish traps along the coast to determine if sea otter are getting caught. The first phase of the study will be an analysis to determine the level of sampling that will be required to detect such mortality if it exists.

**Table 8. California sea otter population counts by the Fish and Wildlife Service and the California Department of Fish and Game, 1984-1998**

<u>Year</u>	<u>Independent Otters</u>	<u>Dependent Pups</u>	<u>Total</u>
1984 Spring	1,181	123	1,304
Fall	—	—	—
1985 Spring	1,124	236	1,360
Fall	1,066	155	1,221
1986 Spring	1,345	225	1,570
Fall	1,088	113	1,201
1987 Spring	1,430	220	1,650
Fall	1,263	104	1,367
1988 Spring	1,505	219	1,724
Fall	—	—	—
1989 Spring	1,574	290	1,864
Fall	1,484	115	1,599
1990 Spring	1,466	214	1,680
Fall	1,516	120	1,636
1991 Spring	1,700	241	1,941
Fall	1,523	138	1,661
1992 Spring	1,810	291	2,101
Fall	1,581	134	1,715
1993 Spring	2,022	217	2,239
Fall	1,662	143	1,805
1994 Spring	2,076	283	2,359
Fall	1,730	115	1,845
1995 Spring	2,095	282	2,377
Fall	2,053	137	2,190
1996 Spring	1,963	315	2,278
Fall	1,858	161	2,019
1997 Spring	1,919	310	2,229
Fall	2,008	197	2,205
1998 Spring	1,955	159	2,114
Fall	1,726	211	1,937

In light of the recent growth of the halibut gillnet fishery in Monterey Bay, the Service advised the Commission that it would be consulting with representatives of the California Department of Fish and Game to determine whether existing regulations to reduce sea otter mortalities in this fishery are adequate and,

if not, what steps need to be taken. The Service also noted that it plans to convene a meeting in spring 1999 to review and identify research priorities regarding sources of sea otter mortality. The meeting will involve members of the Sea Otter Recovery Team and invited participants with related expertise.

In light of the continuing decline of the California sea otter population, the Fish and Wildlife Service in 1998 reinitiated consultations under section 7 of the Endangered Species Act. At the Commission's annual meeting in November 1998, the Service indicated that a biological opinion was expected to be completed by the end of 1998. It is the Commission's understanding that, at year's end, the draft biological opinion was undergoing review by the Service's regional office. A second document evaluating proposed criteria to help determine if and when the sea otter translocation effort is a failure is also undergoing internal review.

**Sea Otter Range Expansion** — As noted above, the sea otter recovery plan adopted by the Fish and Wildlife Service in 1982 required that the area surrounding the translocation zone be designated as a management zone from which sea otters would be excluded by non-lethal means to protect fishery resources. Since the sea otter translocation program was initiated in 1987, sea otters observed residing in the management zone have been captured and removed from the area. In the spring of 1998, about 100 sea otters moved south of Point Conception, the northern boundary of the management zone, raising concerns that the animals would have devastating effects on shellfish fisheries in the management zone.

The Service decided to defer efforts to remove these otters from the management zone pending consultations with affected stakeholders. It did so because (1) the cause of the ongoing population decline is unknown, but could include new or previously unknown diseases, stress from environmental contaminants, and decreases in key prey species, in addition to possible incidental take in trap and gillnet fisheries; (2) it would not be possible to catch and move all or a large percentage of the sea otters in the management zone in a short period of time (*e.g.*, one to three months) at an affordable cost without killing some of the animals; (3) at least some of the sea otters

that are captured and moved back into the range of the parent population would die after release or would return to the management zone south of Point Conception; (4) returning all or a substantial portion of the animals to the parent range could deplete food resources available to breeding animals there and/or cause stress that would make the animals more vulnerable to disease and accelerate the population decline; (5) there are no suitable habitat areas outside the current sea otter range to which the animals from the management zone could be moved without affecting other fisheries; (6) the risk of one or more major oil spills occurring in or near the mainland California sea otter range has not declined substantially since the population was listed as threatened in 1977; (7) the *Exxon Valdez* oil spill in Prince William Sound, Alaska, in 1989 demonstrated that a single oil spill could affect an area larger than the current California sea otter range; and (8) as noted earlier, the Southern Sea Otter Recovery Team has recommended that the Service abandon the zonal management concept.

The Fish and Wildlife Service held public meetings in Santa Barbara and Monterey, California, on 12 and 18 August 1998, respectively, to seek public input on possible management options. At the meetings, the Service announced that it was reinitiating consultations pursuant to section 7 of the Endangered Species Act to reexamine the sea otter translocation program in light of new information.

As noted above, issues related to the conservation and management of the California sea otter population were reviewed during the Commission's meeting in Portland, Maine, on 10–12 November 1998. Representatives of the Fish and Wildlife Service, the Friends of the Sea Otter, the California Abalone Divers Association, and the California Sea Urchin Harvesters Association presented views regarding sea otter issues in California. The presentations indicated that there are substantially differing views as to what the Service could and should be doing to protect both sea otters and shellfish fisheries in California. In the view of the Friends of the Sea Otter, the San Nicolas translocation should be declared a failure, the animals remaining at San Nicolas Island should be left there, and range expansion both north and south of the current sea otter range in California should be encouraged. Conversely, the fisheries representatives

believed that the San Nicolas Island translocation should not be declared a failure and that the Service should meet its obligation to remove otters from the management zone south of Point Conception.

At the end of 1998 the Fish and Wildlife Service had not yet completed either its section 7 biological opinion or the revisions of the southern sea otter recovery plan. The Commission, in consultation with its Committee of Scientific Advisors, will review and, as appropriate, provide comments to the Fish and Wildlife Service on both the biological opinion and the revised recovery plan when they are made available.

### The Alaska Sea Otter Population

When commercial exploitation ended in 1911, small groups of sea otters survived in several remote areas of Alaska. Since that time, the species has repopulated most of its former range in Alaska. Because no sea otters survived in southeast Alaska, a program was initiated in the late 1960s and early 1970s to translocate otters to the area from Amchitka Island and Prince William Sound.

The best available data indicate that there currently are approximately 100,000 sea otters in Alaska. Although the population is large and is at or growing toward its carrying capacity in most areas, there are a number of threats and conservation issues. They include (1) conflicts with commercial, subsistence, and recreational shellfish fisheries that developed in the absence of sea otters; (2) incidental take in gillnet and other fisheries; (3) oil and gas development and transportation; (4) logging, mariculture, and other coastal development; (5) Native subsistence hunting; and (6) the increasing tourist industry. Threats related to the oil industry were illustrated by the 1989 *Exxon Valdez* oil spill, which directly killed an estimated 3,905 (range 1,904 to 11,157) sea otters and may have affected many others through contamination and destruction of food species.

**Revised Stock Assessments** — The 1994 amendments to the Marine Mammal Protection Act require that the Fish and Wildlife Service and the National Marine Fisheries Service periodically assess the status

of all marine mammal stocks for which they are responsible. The Fish and Wildlife Service's initial stock assessment for sea otters, completed in 1995, identified a single Alaska population. Based primarily on studies of population genetics, along with distribution data, a revised stock assessment was drafted in 1997. As discussed in the previous annual report, the draft revision identified three Alaska sea otter stocks: (1) the southeast stock, estimated at 9,000 animals, distributed from the U.S.-Canada border to Cape Yakataga, just north of Yakutat; (2) the south-central Alaska stock, estimated at 23,000 animals inhabiting Prince William Sound, the Kenai coast, and the eastern side of Cook Inlet; and (3) the southwest Alaska stock, estimated at 68,000 animals, whose range includes the Kodiak Archipelago, the Alaska Peninsula, and the Aleutian Islands. The revised draft stock assessment was made available for public review in 1998.

On 31 August 1998 the Alaska Sea Otter Commission requested that the Fish and Wildlife Service hold a formal hearing, as provided for in the 1994 amendments to the Marine Mammal Protection Act, to review the basis for the Service's decision to reclassify Alaska sea otters into three separate stocks. At the Marine Mammal Commission's meeting in Portland, Maine, on 10-12 November 1998, the Commission was advised that the Service was preparing briefing material for the administrative law judge and expected to announce a date for the requested hearing early in 1999.

**Adak Island** — In 1996 the Fish and Wildlife Service advised the Commission of a significant and unexplained decrease in the sea otter abundance in the vicinity of Adak Island, Alaska. Counts conducted under the Navy Legacy Program showed a decline from approximately 1,800 animals in 1994 to 400 in 1996. At the Commission's annual meeting in November 1997, the Service reported that recent surveys indicated a decline of approximately 25 percent per year from 1991 to 1997. A comparison of results from surveys conducted in 1980 and 1997 showed an overall decline of 70 percent at Adak Island during the period. The Service also compared counts conducted by the U.S. Geological Survey for three other islands — Kagalaska Island (adjacent to Adak Island) and Amchitka and Kiska in the Rat Islands. The data

showed a decline of approximately 65 percent in all three areas during the 1980–1997 time period, suggesting that the decline extends into the western and central Aleutians.

The Marine Mammal Commission wrote to the Fish and Wildlife Service on 23 December 1997 noting that it had been advised by Service representatives during its November 1997 meeting that (1) the cause or causes of the sea otter decline in the area around Adak Island are still unknown; (2) similar declines may have occurred, and may be occurring, in adjacent areas; and (3) researchers from the Biological Resources Division of the U.S. Geological Survey were seeking, but had not yet received, funding from various sources to investigate and document the cause or causes of the decline and to examine other areas for declines. The Commission requested that the Service provide the particulars of the studies believed necessary to document the cause(s) and extent of the decline, what was being done to obtain the funding to do the needed research, and when the needed research is expected to be initiated and completed.

The Service replied to the Commission by letter of 23 February 1998, noting that the staff of its Alaska regional office believed that the following research was needed to determine the cause and extent of the decline:

- aerial and small boat surveys to determine current abundance in the Aleutian Archipelago and, depending on the results of those surveys, surveys of the Alaska Peninsula;
- further studies to determine the presence, levels, and possible effects of environmental contaminants in sea otters in areas where the decline has occurred;
- further assessment of the possibility that increased killer whale predation may be the cause of the observed decline; and
- surveys of intertidal and shallow subtidal habitats to determine whether the decline may be due to declining food resources.

Information presented during the Marine Mammal Commission's meeting in Portland, Maine, on 10–12 November 1998 indicated that the Service had been able to undertake some of the contaminant and other

mortality-related research, but had not received the funding necessary to conduct abundance surveys in either the Aleutian Islands or the Alaska Peninsula.

Information also presented at the Commission's Portland meeting, and reported in the 16 October 1998 issue of *Science*, suggested that the sea otter decline may be due to increased killer whale predation brought about by decreases in Steller sea lions and harbor seals, the normal prey of killer whales in the Adak area. To investigate this possibility, the Service will spend \$15,000 in fiscal year 1999 for a killer whale photoidentification project and to obtain local knowledge on killer whale/sea otter interactions. The funding is part of the sea otter co-management program, discussed below.

**Marking, Tagging, and Reporting** — In 1981 the Marine Mammal Protection Act was amended to authorize the Fish and Wildlife Service and the National Marine Fisheries Service to promulgate regulations for the marking, tagging, and reporting of marine mammals taken by Alaska Natives. The purposes of the amendment were to help control illegal trade in products from those species and to obtain better information on the species and numbers of marine mammals taken for subsistence and handi-craft purposes.

Marking, tagging, and reporting regulations were issued by the Fish and Wildlife Service on 28 June 1988. They require that within 30 days of taking a polar bear, walrus, or sea otter, Native hunters must report the take to the Service and present specified parts, including sea otter pelts, to be marked or tagged. Since issuing its regulations, the Service has worked closely with Native groups and the State of Alaska to implement the marking, tagging, and reporting program. The number of sea otters tagged in the years 1990 through 1997 were 166, 231, 637, 1,248, 835, 629, 607, and 738, respectively. By the end of 1998, 721 sea otters had been presented for marking and tagging by Alaska Natives. This number may change as 1998 reports are completed.

**Co-Management of Sea Otters** — In December 1988 Alaska Natives formed the Alaska Sea Otter Commission to promote Native participation in the development of policies and programs affecting sea

otters and their use in Alaska. The commission is composed of representatives of Alaska Native communities in areas where sea otters occur.

In 1991 the Alaska Sea Otter Commission proposed a formal memorandum of understanding between itself, the Fish and Wildlife Service, and the Alaska Department of Fish and Game to specify their respective responsibilities for conserving sea otters in Alaska. Subsequently, the Marine Mammal Commission, in consultation with members of the Alaska Sea Otter Commission, the Fish and Wildlife Service, and the Alaska Department of Fish and Game, developed a draft sea otter conservation plan, which was provided to the Service on 5 May 1992. The Alaska Sea Otter Commission also began work on regional sea otter management plans to complement the statewide plan. The conservation plan for the sea otter in Alaska was completed by the Fish and Wildlife Service in June 1994.

A memorandum of agreement regarding cooperative work on Alaska sea otters was signed on 1 February 1994 by representatives of the Fish and Wildlife Service, the Alaska Department of Fish and Game, and the Alaska Sea Otter Commission. The 1994 amendments to the Marine Mammal Protection Act included a new section (section 119) that authorizes funding for the development of cooperative agreements between the Secretaries of Commerce and the Interior and Alaska Native organizations to conserve and provide for co-management of marine mammals used by Alaska Natives for subsistence and handicraft purposes. Under such agreements, the Secretary may make grants to Native organizations for, among other purposes, collecting and analyzing data on marine mammal populations, monitoring the taking of marine mammals for subsistence purposes, participating in marine mammal research, and developing marine mammal co-management programs with federal and state agencies.

In 1997 the Fish and Wildlife Service and the Alaska Sea Otter Commission signed a co-management agreement on Alaska sea otters. Under the agreement, the Service provided \$70,000 annually to the Alaska Sea Otter Commission in fiscal years 1997, 1998, and 1999 for co-management activities. Funds have been earmarked to support a U.S./Russia sea

otter workshop; to assess work needed to determine the range of sea otters in certain areas of Alaska based on local knowledge of Natives; to continue the sea otter harvest monitoring and sampling program; and to develop local sea otter management plans and ordinances. As noted above, co-management funds will also be used to investigate interactions between killer whales and sea otters.

As part of the co-management effort, the Fish and Wildlife Service, the Alaska Sea Otter Commission, and the U.S. Geological Survey have initiated a program to collect biological samples from sea otters harvested throughout Alaska by Native hunters for subsistence and handicraft uses. The purpose of the program is to assess and monitor the condition and health of sea otters in Alaska, and to collect ecological and life history information. A major goal of the program is to train Alaska Natives in the collection of biological samples from sea otters taken for subsistence and handicraft purposes.

By the end of 1998 more than 60 Alaska Natives from more than 50 villages throughout the range of the sea otter in Alaska had been trained and supplied with equipment necessary to necropsy sea otters and provide tissue samples to the Fish and Wildlife Service. Through this program, samples have been obtained from more than 236 sea otters taken during the Native harvest and from 51 beachcast animals.

### **Florida Manatee** *(Trichechus manatus latirostris)*

The Florida manatee, a subspecies of the West Indian manatee, is found only in the southeastern United States and principally in Florida. A second subspecies, the Antillean manatee (*T. m. manatus*), occupies the remainder of the species' range, which includes estuaries and rivers on islands in the Greater Antilles, and along the coast of the Caribbean Sea and South America from Mexico to northern Brazil.

Like the Antillean manatee, Florida manatees are herbivores that feed exclusively on aquatic and emergent plants, such as sea grasses and marsh grasses. Although they can grow to imposing lengths of 13 feet

(4 m) and weights of 3,500 pounds (1,588 kg), they are gentle, slow-moving animals with few natural predators. Numbering perhaps 2,800 animals (roughly the combined maximum winter counts along the east and west coasts of Florida), Florida manatees are one of the most endangered marine mammals in U.S. waters. Their principal habitat, estuaries and rivers in one of the nation's most populous states, places Florida manatees in particularly close association with human activity and development. A consequence of this has been that a third of their deaths are due to human causes, primarily collisions with watercraft.

Most Florida manatees, particularly calves, are unable to survive long periods in waters colder than about 65°F (20°C). As a result, their winter range is restricted principally to the southern tip of Florida and to waters near localized warm-water sources, such as power plant outfalls and natural thermal springs, in the southern two-thirds of the Florida peninsula. A small number of manatees also have wintered at artificial warm-water outfalls in northern Florida and Georgia. As water temperatures rise in spring, manatees disperse from wintering areas. By summer most of the population is scattered among rivers, canals, and estuaries throughout Florida. A few manatees also use estuaries along the Atlantic coast of Georgia and South Carolina. The northernmost record is an animal seen in Rhode Island in the summer of 1996. A similar summer dispersement pattern occurs along the Gulf of Mexico coast, where a few animals range as far west as Texas.

To improve information on the number of Florida manatees, the Florida Marine Research Institute, part of the Florida Department of Environmental Protection, began conducting statewide aerial surveys in 1991 during winter cold periods when most manatees aggregate at warm-water refuges in Florida. Because of uncertainty and likely variability in the number of manatees not present at warm-water refuges during cold periods, it has not been possible to extrapolate survey counts into a reliable population estimate; neither is it appropriate to compare individual counts to assess population trends. However, the counts have provided a better understanding of the minimum population size, which before 1991 was conservatively estimated at 1,200 animals.

Between 1991 and 1998 statewide surveys produced maximum counts ranging from 1,465 manatees in February 1991 to 2,639 in February 1996. In 1998, 2,022 manatees were counted during a 29–30 January survey. Photoidentification records and telemetry studies suggest that manatees rarely move between the east and west coasts of Florida, and the statewide surveys indicate that roughly the same number of animals occur on each coast. The highest count for the Atlantic coast is 1,457 manatees recorded in 1996; the highest count for the Gulf of Mexico coast is 1,329 manatees counted in 1997.

The record high single survey count of 2,639 animals in February 1996 was followed by a record death toll of 416 manatees in 1996, which included a die-off of unprecedented size during a spring red tide in southwestern Florida (*i.e.*, 149 deaths, the vast majority of which appear to have been caused by red tide-related toxins). Trends in population size over the long term are difficult to assess. Most scientists familiar with recent statewide counts and previous winter counts at selected warm-water refuges generally agree that the size of the Florida manatee population is now larger than 20 years ago, although how much larger is unknown. However, there also is serious doubt that recent mortality levels are sustainable over the long term; the 1996 mortality level of 416 almost certainly exceeds the population's recruitment potential. In addition, a recent study has found low adult survival rates along the east coast.

Although a good measure of overall abundance and long-term population trends has been elusive, manatee mortality has been well documented, thanks to a manatee salvage and necropsy program begun by the Fish and Wildlife Service late in the 1970s and transferred to the State of Florida in the mid-1980s. The results document a substantial increase in mortality since the late 1970s (see Table 9). Even excluding the 149 manatee deaths recorded during the spring 1996 red tide, annual death tolls for the past three years have risen to roughly twice the levels recorded early in the 1980s. Part of the increase probably reflects an increase in overall population size; however, there has been a disproportionate increase in vessel collisions (nearly three times greater than early in the 1980s) and perinatal deaths (nearly four times greater

**Table 9. Known manatee mortality in the southeastern United States (excluding Puerto Rico) reported through the manatee salvage and necropsy program, 1978–1998**

<u>Year</u>	<u>Vessel-Related Deaths No. (%)</u>	<u>Flood Gate and Lock Deaths No. (%)</u>	<u>Other Human-Related Deaths<sup>1</sup> No. (%)</u>	<u>Perinatal Deaths No. (%)</u>	<u>Other Deaths<sup>2</sup> No. (%)</u>	<u>Total Deaths in S.E. U.S.</u>
1978	21 (25)	9 (11)	1 (1)	10 (12)	43 (51)	84
1979	24 (31)	8 (10)	9 (12)	9 (12)	28 (36)	78
1980	16 (25)	8 (12)	2 (3)	13 (20)	26 (40)	65
1981	24 (21)	2 (2)	4 (3)	13 (11)	74 (63)	117
1982	20 (17)	3 (3)	2 (2)	14 (12)	78 (67) <sup>3</sup>	117
1983	15 (19)	7 (9)	5 (6)	18 (22)	36 (44)	81
1984	34 (26)	3 (2)	1 (1)	26 (20)	66 (51)	130
1985	35 (28)	3 (2)	3 (2)	23 (19)	59 (48)	123
1986	33 (26)	3 (2)	1 (1)	27 (22)	61 (49)	125
1987	39 (33)	5 (4)	4 (3)	30 (26)	39 (33)	117
1988	43 (32)	7 (5)	4 (3)	30 (22)	50 (37)	134
1989	51 (29)	3 (2)	5 (3)	39 (22)	78 (44)	176
1990	49 (23)	3 (1)	4 (2)	45 (21)	113 (53)	214
1991	53 (30)	9 (5)	6 (3)	53 (30)	54 (30)	175
1992	38 (23)	5 (3)	6 (4)	48 (29)	70 (42)	167
1993	35 (24)	5 (3)	7 (5)	39 (27)	61 (41)	147
1994	51 (26)	16 (8)	5 (3)	46 (24)	76 (39)	194
1995	43 (21)	8 (4)	5 (2)	56 (28)	91 (45)	203
1996	60 (14)	10 (2)	1 (0)	61 (15)	284 (68) <sup>4</sup>	416
1997	55 (22)	8 (3)	9 (4)	61 (25)	113 (46)	246
1998 <sup>5</sup>	67 (28)	9 (4)	7 (3)	52 (21)	108 (44)	243

1 Includes deaths due to entanglement and ingestion of marine debris, drowning in shrimp nets, poaching, vandalism, etc.

2 Includes deaths due to cold stress, other natural causes, and undetermined causes.

3 Includes 38 deaths attributed to a spring red-tide event in southwestern Florida.

4 Includes 149 deaths attributed to a spring red-tide event in southwestern Florida.

5 Data for 1998 are preliminary.

Source: Florida Department of Environmental Protection.

perinatal deaths (*i.e.*, the death of newborn animals) is unknown. Although there are many possible factors, one might be a northward shift in the winter distribution of the population over the past 20 years.

Increasing manatee mortality and the high proportion of human-related deaths have been a major source of concern with regard to the long-term survival of Florida manatees. However, destruction and alteration of essential manatee habitat caused by coastal

development may be a greater threat. Florida's human population, increasing at a rate of about 1,000 people per day for more than a decade, has spurred widespread development that has degraded many aquatic habitats. Among other things, sea grass beds that provide feeding areas for manatees have declined substantially in most areas of the state. Manatee protection therefore has focused on protecting essential manatee habitats as well as reducing direct causes of human-related manatee mortality and disturbance.

The Fish and Wildlife Service has lead responsibility for the recovery of Florida manatees under the Endangered Species Act and the Marine Mammal Protection Act. It began a manatee research program — the Sirenia Project — in the mid-1970s and, with assistance from the Commission, the Service developed a manatee recovery plan adopted in 1980. The manatee recovery plan, the first for any marine mammal in U.S. waters, has been a model for such plans to protect other marine mammals. The manatee plan has been updated twice since then. The most recent revision, adopted in 1996, identifies 126 recovery tasks. It was drafted by the Florida Manatee Recovery Team, a team of involved agencies and groups appointed by the Service to oversee and help coordinate manatee recovery work, through a subcommittee chaired by the Marine Mammal Commission's representative on the team.

A hallmark of the Service's program has been the cooperative involvement of other agencies and groups in carrying out needed manatee research and management tasks. Of particular note in this regard has been work by the state of Florida. The state, with assistance from the Commission and the Service, dramatically increased its manatee conservation efforts in the 1980s. Through establishment of a Manatee Trust Fund by the state legislature in 1989, the state has become the principal funding source for manatee recovery activities. This fund, supported by a small share of the state's annual boat registration fees, a state manatee license plate, voluntary donations, and other sources, has provided \$3 to 4 million annually in recent years for manatee recovery tasks. This has enabled the state to assume lead responsibility for the largest proportion of tasks identified in the recovery plan. Most work in this regard has been carried out by the Florida Department of Environmental Protection through its Bureau of Protected Species Management and the Florida Marine Research Institute.

Even with strong support from the Service and the Florida Department of Environmental Protection, the involvement of many other agencies and groups has been essential to address the many tasks in the recovery plan. In this regard, especially notable contributions have been made by the Sirenia Project, recently moved to the U.S. Geological Survey, to develop basic information on manatee life history and ecology;

the Army Corps of Engineers and the South Florida Water Management District to reduce manatee deaths in flood gates and navigation locks; the U.S. Coast Guard to help enforce boat speed regulations; the Save the Manatee Club to help organize public involvement in manatee recovery activities and to fund various research and management tasks; the Manatee Technical Advisory Council to overview and provide advice to the Department of Environmental Protection on its manatee recovery activities; county governments to help develop countywide boat speed regulations and to prepare county manatee protection plans; the Georgia Department of Natural Resources to carry out complementary research and management activities in Georgia; and the Florida Power & Light Company to support a long-term aerial survey program to count manatees at power plant outfalls and to develop public education materials.

As discussed below, major efforts during 1998 included strengthening enforcement and compliance with regard to boat speed zones and manatee harassment, reexamining long-term management strategies for warm-water refuges, completing a manatee die-off contingency plan, and continuing to develop and install new devices to prevent manatees from being killed in flood gates and navigation locks.

### **Boating Regulation**

Collisions with watercraft are the largest source of human-related manatee mortality. As indicated in Table 9, such collisions cause from one-fourth to one-third of all manatee deaths each year. In addition, perhaps half of all living manatees bear scars from boat strikes (Figure 11). Although some watercraft-related deaths are known to be caused by large ships, information on the nature of wounds and location of incidents indicates that a large majority are caused by recreational boats. Most collisions occur unbeknownst to vessel operators, who clearly are unable to reliably detect and avoid manatees. Therefore, to reduce watercraft injuries and deaths, managers have sought to slow or otherwise regulate vessel traffic in areas where manatees are most likely to occur to provide animals time to avoid oncoming boats.

The principal effort in this regard has been in response to a 1989 directive by the Florida Governor

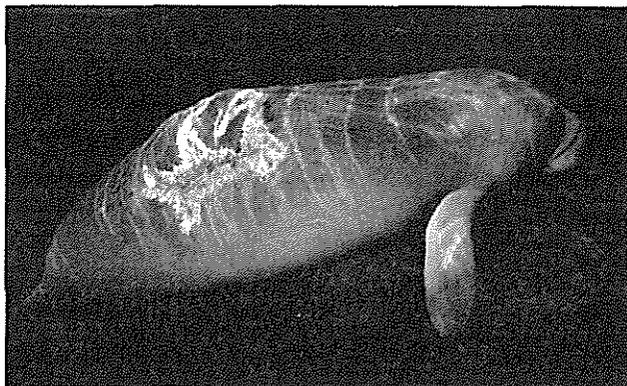


Figure 11. Manatee with healed propeller wounds.

and cabinet, which called on state and local governments to develop countywide boat speed regulations in 13 counties where watercraft-related deaths were most likely to occur. To do so, managers examined site-specific data on manatee habitat-use patterns and vessel traffic, and then evaluated and selected among various regulatory strategies, such as channel-inclusive, channel-exempt, or shoreline-only speed zones with differing speed limits; high-speed water sports zones; and in a few cases at major manatee aggregation sites, no-entry areas.

Rulemaking, which has advanced on a county-by-county basis, has required a lengthy process of negotiations, public review, and in many cases formal rule challenges. However, since 1989 countywide rules have been developed, adopted, and in some cases amended for 12 of the 13 counties. Rules for the last of the 13 counties, Lee County in southwestern Florida, have been subject to protracted negotiations, local and industry opposition, and several rule challenges, including two filed in September 1998.

Although rules are now in place for 12 counties, it is still too soon to assess their effectiveness in most areas because, in most cases, enforcement efforts have been limited and levels of boater compliance are unknown. In part, enforcement has evolved slowly because of the time required to resolve rule challenges, post regulatory signs, and allow boaters as well as enforcement agents to become familiar with the new rules. However, in one area, Crystal River, where boat speed rules have been in place, posted, and

enforced for several years by the Florida Marine Patrol, the Fish and Wildlife Service, and the Coast Guard, levels of compliance have been high and vessel-related manatee mortality has been very low considering the number of manatees and boat traffic. With regulations now established and posted in 12 counties, success in reducing vessel-related manatee mortality likely will rest on the success of efforts to ensure compliance with those rules. In this context, enforcement must be viewed as one of the highest priorities for the manatee recovery program.

The Florida Marine Patrol and the Florida Game and Freshwater Fish Commission have been the principal agencies enforcing new boat speed rules; however, in the past two years the Fish and Wildlife Service and the Coast Guard have taken steps to strengthen their enforcement efforts as well. In 1997 the Service designated a manatee law enforcement coordinator and established a special task force of Service enforcement officers to organize and carry out focused law enforcement in cooperation with Florida Marine Patrol, the Florida Game and Freshwater Fish Commission, and local law officers. The task force's initial efforts were carried out in late July and August 1997 in Brevard County, Florida, where watercraft-related manatee mortality has consistently been among the highest in the state. During the initiative, more than 1,000 boats exceeding posted speeds were stopped, and more than 300 citations carrying a fine of \$100 each were issued. Similar efforts were organized in 1998. Most effort again focused in Brevard County, but some effort also focused in Volusia County. With available funding and personnel, the Service was able to dedicate four to five officers to manatee enforcement during six summer weekend and holiday periods in 1998.

To further expand enforcement of manatee-related boat speed rules, the Coast Guard also offered to increase its efforts. After a series of meetings between representatives of the Service and Coast Guard officials at Coast Guard headquarters and Coast Guard stations throughout Florida, the Service assumed responsibility for processing manatee-related citations, and Coast Guard officers throughout Florida substantially increased their enforcement of the new county boat speed rules. In recognition of its particularly strong enforcement presence in southeastern Florida,

the Miami Beach Coast Guard Station received a special manatee enforcement award from the Service in March 1998.

In 1999 the Service plans to maintain a comparable level of enforcement effort, but in the future, the Service hopes to obtain funding to support four full-time manatee enforcement officers. Such support is urgently needed.

### **Warm-Water Manatee Refuges**

Over the past two decades, there has been a significant increase in the number of manatees wintering at both natural and artificial warm-water refuges. Natural refuges are formed by warm-water springs; artificial refuges are created by thermal outfalls from power plants, paper mills, and other industrial facilities. The most important warm-water refuges are located in the lower two-thirds of the state.

Among the natural warm-water refuges used most extensively by manatees are Blue Spring on the upper St. Johns River, Kings Bay at the head of the Crystal River on Florida's west coast, and Homosassa Springs located at the head of the Homosassa River a few miles south of Kings Bay. Maximum winter counts at these locations have increased severalfold: counts at Blue Spring have increased from about 25 early in the 1980s to more than 100 animals in 1998; counts in Kings Bay have increased from about 80 late in the 1970s to nearly 300 animals currently; and counts around Homosassa Springs have increased from about 40 in the early 1980s to more than 100 in 1998.

Winter counts also have increased at most major artificial warm-water refuges, the largest of which are power plant outfalls (Figure 12). Manatee counts made at five of the most important power plant outfalls during winter cold fronts over the past 20 years have produced maximum aggregate counts that have increased from a range of 270 to 614 manatees between 1978 to 1985 to a range of 587 to 1,068 between 1985 to 1997. At four of these plants maximum counts have exceeded 200 manatees, and at two adjacent power plants only a few miles apart in Brevard County, 585 were counted at one time in December 1997. As noted above, a small number of manatees also has been wintering at smaller industrial

outfalls in northeastern Florida and southern Georgia. Photoidentification and telemetry data show that some animals move between various winter refuges both within and between winters.

From these counts, it is apparent that the number of manatees, and probably the proportion of the manatee population, using localized warm-water refuges has increased significantly. Because of uncertainty about past and current population sizes and the number of animals wintering in southern Florida where water temperatures usually do not fall below species' tolerance limits, it is not known to what extent the increasing use of refuges in central Florida is due to population growth and/or redistribution of the manatees formerly wintering in southern Florida.

In either case, it is clear that water temperatures surrounding winter refuges in the middle third of the Florida peninsula can drop annually to potentially lethal levels. In addition, the concentration of animals within confined refuges increases the risk of large-scale die-offs due to the spread of disease, local red tides, pollution events, or exposure to cold. Perhaps the greatest risk in this regard is the possible loss of warm-water industrial outfalls due to (1) transient operational problems or economic conditions that force a temporary plant shutdown, and (2) permanent closures as plants reach the end of their operational life. If a shutdown were to occur at a site used by large numbers of manatees in winter and animals were unable to move to an alternative warm-water refuge, a substantial number of cold-related manatee deaths could ensue. The likelihood of deaths associated with a plant shutdown would probably increase the farther north the plant is located and the farther away it is from alternative warm-water sources.

To date, artificial refuges have proven to be very reliable. Under provisions of effluent discharge permits issued by the Environmental Protection Agency under the Clean Water Act, operators of facilities that attract manatees in winter have worked with the Fish and Wildlife Service and the state to develop contingency plans and procedures to prevent interruptions in warm-water discharges during the winter. As indicated above, the Florida manatee population now appears to be larger than it was 20 years ago and this increase occurred as more animals



Figure 12. Florida manatees in a thermal outfall at a power plant in Riviera Beach, Florida.  
(Photograph courtesy of John E. Reynolds, III)

Have come to use warm-water refuges north of the species historic winter range in southern Florida. These two trends may be related, in which case artificial refuges may have been an important factor in helping that growth occur.

Nevertheless, in the past two years the need for long-term policies and strategies with regard to managing warm-water refuges has taken on greater urgency. In part this is because of the increasing numbers of manatees that have become dependent on these areas. Another factor is the possible deregulation of Florida's electric utility industry to increase

industry competition and lower electric rates. Such deregulation could encourage the formation of small, local electric companies able to supply electricity at lower cost by purchasing it from remote locations, such as Georgia, or producing it at small, cost-efficient plants. Such competition could lead to the temporary or permanent shutdown of some existing power plants on which manatees have come to depend. As a related matter, most power plants used by manatees are now more than 30 years old and approaching the end of their planned operational life. As a result, operators of many plants are or soon will be facing decisions to either close or repower (*i.e.*,

replace aging equipment to extend the facility's life and make it more efficient) these plants. Also, even the long-term availability of natural warm-water springs is uncertain. That is, water flow rates at some natural springs have declined significantly over the past 20 years as regional water tables have been lowered by the removal of groundwater for domestic and agricultural use.

The possible deregulation of Florida's electric utilities first came to the Commission's attention at its 1996 annual meeting. At that time, the Fish and Wildlife Service, the Sirenia Project, the Florida Department of Environmental Protection, and the Georgia Department of Natural Resources advised that they were planning a cooperative study to track the movements of manatees using a small industrial outfall in northern Florida. The plant, a pulp mill near the Florida-Georgia border, was to begin discharging its effluent through a diffuser pipe late in 1997, thereby eliminating a warm-water area that has been the region's principal winter manatee refuge. The study was intended to help assess the effect on manatees of eliminating a warm-water refuge.

As the study proceeded, the Commission wrote to the Service on 23 December 1997 requesting information on other steps being taken to prepare for possible deregulation of Florida's electric utilities. In part, the Commission asked what was being done to identify alternative strategies to minimize impacts on manatees from power plant shutdowns and to ensure that relevant state and federal planning processes consider the possible effects on manatees. The Service's 22 January 1998 reply noted that it was helping fund the above-mentioned study in northeastern Florida and that it planned to convene a forum in 1998 to bring together agency and industry officials, as well as other organizations and individuals, to address critical questions, such as those raised by the Commission.

In light of the reply, the Commission wrote to the Service on 5 June 1998 endorsing the plan for the forum. Because of the importance of factoring possible effects on manatees into any action regarding deregulation, it was particularly pleased to learn of the Service's intent to hold the forum before the end of the year. The Commission also provided comments and recommendations on both the issue and plans for

organizing the forum. It noted that, given the limited number, size, and distribution of natural warm-water springs, it did not believe that the current manatee population could be supported by natural warm-water refuges and remaining undisturbed areas in southernmost Florida alone. If major artificial warm-water refuges were eliminated or became unreliable, it suggested that a significant number of manatees likely would die from exposure to cold.

To address such a possibility, the Commission suggested two possible approaches: (1) establishing an industry-supported contingency fund to ensure continued operation of selected plants important to manatees even if more cost-effective alternatives for providing electricity exist, or to help develop and operate backup systems to maintain warm-water discharges when generating units are shut down (*e.g.*, discharging solar-heated water), and (2) investigating the possibility of designing and constructing a network of new warm-water refuges for manatees that would not be dependent on industrial discharges (*e.g.*, creating embayments designed for manatees to retain warm water recirculated through solar heating systems or from other non-industry-dependent sources).

To organize the proposed forum, the Commission recommended that the Service ask the Florida Department of Environmental Protection and the U.S. Environmental Protection Agency to join the Service as co-conveners, because of their key responsibilities for managing manatees and/or issuing permits for thermal discharges. The Commission also recommended that the Service hold a preparatory meeting with other agencies and groups to help develop objectives, an agenda, and relevant background papers. Such background papers should summarize information on past and current abundance and distribution of manatees in Florida, the use of natural and artificial refuges by manatees, thermal tolerances of manatees, possible effects of deregulation on existing manatee refuges and manatees, legal authorities and cooperative agreements with power companies bearing on the protection of manatees, and alternative actions for mitigating potential adverse impacts of deregulation.

As an interim step, the Service convened a meeting limited to federal and state agency officials on 27-28

August 1998. Its purpose was to identify questions and research needs that should be addressed in order to make informed management decisions on warm-water refuges. Meeting participants reviewed results of the study to assess effects of eliminating the warm-water refuge in northeastern Florida late in 1997. An unusually large proportion of tagged manatees in northeast Florida died during the winter of 1997–1998 for reasons thought to be related to elimination of the warm-water refuge. Although a few animals moved south to power plant outfalls along the east central coast of Florida in Brevard County, most did not and attempted to use a small warm-water refuge at a paper mill in southern Georgia. Perhaps 10 to 20 animals were present in northeastern Florida and southern Georgia during the winter of 1997–1998.

The study also suggested that the increasing number of manatees wintering at artificial refuges in northeastern Florida and Georgia reflected a tendency of some manatees that range northward in summer to interrupt or halt their southward movement in early winter. Because of the risk of cold-related deaths in northern Florida and Georgia, meeting participants agreed it was important to discourage such behavior by means such as fencing off outfall areas to exclude manatees or altering the discharges. Participants agreed that such steps should be taken to prevent manatees from remaining at artificial refuges north of Brevard County, located midway along Florida's east coast. It was agreed that similar steps also should be taken for artificial refuges north of Crystal River on the west coast.

It was less clear what measures would be appropriate for areas south of Brevard County and Crystal River. Large and increasing numbers of manatees have been wintering at artificial refuges in Tampa Bay on Florida's west coast and particularly in Brevard County on the east coast where a winter count at outfalls from two power plants exceeded 600 manatees in 1997. These areas now constitute an important part of the species' core winter range even though they are more than 100 miles north of the historic winter range. Meeting participants reached no consensus on whether or what steps should be taken to limit or encourage manatee use of artificial refuges between these areas and the species' presumed historic winter range to the south. There was general agreement,

however, that steps to improve access to natural warm-water springs within this area should be considered. Some springs that might otherwise be used by manatees are not used or are used infrequently because spring runs are too shallow or are blocked.

With regard to future plans, it was agreed that a forum or technical workshop to review issues related to the management of warm-water refuges should be held during the summer of 1999. Co-conveners would include the Service, the Sirenia Project, the Florida Department of Environmental Protection, and perhaps the Florida Power Commission. Participants also identified a series of information needs to be summarized or developed for the meeting. These include summarizing recent and historic data on seasonal water temperatures in key areas of Florida and the location of natural springs, the history of artificial thermal discharges in Florida and Georgia and data on their effluent temperatures, cold-related manatee mortality, past and current winter distribution patterns of manatees, manatee movements in relation to warm-water refuges, and thermal tolerances of manatees. With regard to governmental and industry actions to protect manatees, participants identified a need for a review of planning and regulatory actions related to thermal outfalls, a risk assessment regarding manatee use of power plant outfalls, and a feasibility study regarding the availability and cost effectiveness of technology to develop non-industry-dependent thermal refuges.

In light of discussions at the meeting, the Service did not convene a forum with industry and agency officials in 1998. Instead, at the end of 1998, it had begun efforts to organize a technical workshop on future planning for both natural and artificial warm-water refuges to be convened in the summer of 1999. As discussed below, there were also related developments with regard to power plant outfalls at Fort Pierce, in Brevard County, and in Fort Myers.

**Fort Pierce Power Plant** — In 1996 a manatee education and viewing center opened adjacent to an artificial warm-water refuge formed by intermittent thermal discharges from a power plant in Fort Pierce about two-thirds of the way down the Florida peninsula on the east coast. Maximum winter counts of up to 99 manatees have been recorded at the site. To

enhance manatee viewing opportunities, the Manatee Observation Education Center, which operates the viewing area, developed a proposal to construct a solar water-heating system to discharge heated water into the outfall area when the power plant was not operating. The center circulated its proposal to the Fish and Wildlife Service, the Sirenia Project, the Florida Department of Environmental Protection, and the Marine Mammal Commission for comment.

On 31 July 1998 the Commission responded noting that, although use of such technology to enhance existing artificial warm-water refuges or create new ones merits serious consideration, decisions about where to do so need to be examined within a regional context. Noting that plans were being developed for a forum to examine long-term options for maintaining artificial warm-water refuges, the Commission therefore requested that the center defer action on its proposal until results of that meeting were available. Other agencies also asked that the center not act on its proposal. In response to this advice, the center took no action in 1998.

**Power Plants in Brevard County** — As noted above, maximum winter counts at two power plants in Brevard County have increased significantly. The two outfalls, located within a few miles of each other along the intracoastal waterway, have received no special protection to date. To help determine whether special management action may be warranted, because of the increasing number of manatees at the two sites, the Save the Manatee Club contracted for a study to monitor abundance and distribution of manatees at both locations during the winter of 1997-1998. The study provided information on the distribution of animals within the outfall area and documented several incidents in which manatees were harassed and sometimes hooked by recreational fishermen or disturbed by boaters.

In view of the findings, the club provided copies of study reports to the Fish and Wildlife Service on 12 June 1998 and requested that the Service establish manatee sanctuaries at both outfalls to restrict human access to the warm-water areas used most frequently by manatees. In response, the Service consulted with the Florida Department of Environmental Protection. The two agencies agreed that the request appeared

warranted, but they concluded that it would be more appropriate to implement rules under state, rather than federal, authority. Therefore the department proceeded to develop rules for no-entry areas at both outfalls. Final rules in this regard were adopted on 9 December 1998 and went into effect on 29 December 1998.

**Fort Myers Power Plant** — One of the most important artificial warm-water refuges in Florida is the Fort Myers power plant on the Caloosahatchee River in southwestern Florida. Maximum winter counts at this site reached a record level of more than 400 animals in 1996. Because of adverse effects from thermal effluent on marine life in coastal waters, the state has established thermal discharge limits that are substantially greater than those in adjacent waterways. Most power plants constructed before those limits went into effect exceed those levels at times. To continue discharging the thermal effluent, plant operators must therefore obtain a variance to the limits from the state. These variances are issued for five-year periods.

To extend the life of the Fort Myers power plant, which is over 30 years old, its owner and operator, the Florida Power & Light Company, recently began work to repower this power plant and renew its variance from the state's thermal discharge limits. The state decided to grant the variance request, but in February 1997 the Southwest Florida Marine Trade Association filed a lawsuit challenging issuance of the new variance. The suit maintained that the variance allowed continued adverse effects on marine life in the Caloosahatchee River and that it also may be detrimental to manatees by interrupting historic migratory patterns and encouraging large numbers of manatees to remain in areas where they are exposed to high levels of boat-related mortality and red tides. As part of a negotiated settlement reached on 25 February 1998, the state agreed to collect and analyze data on thermal effluent levels from the power plant and its possible effects on manatees and other marine life. It also agreed to convene a public workshop to discuss issues regarding manatees and thermal discharges in the Caloosahatchee River and related research needs. At the end of 1998 plans were being made to hold the workshop in early 1999.

## Protection of Manatees in the Crystal and Homosassa Rivers

The largest natural warm-water manatee refuge in Florida is Kings Bay at the head of the Crystal River on the northwestern coast of Florida. Roughly a mile in diameter, the bay is fed by scores of warm-water springs. In winter, more than 300 manatees aggregate in the bay's warm waters. A few miles south of Kings Bay is a second major winter refuge located at a site called the Blue Waters at the mouth of a spring run carrying water from a large natural warm-water spring, Homosassa Springs, to the head of the Homosassa River. These two natural warm-water refuges provide winter habitat for an important subgroup of the Florida manatees that, in summer, disperse along the relatively undeveloped coast of northwestern Florida.

As discussed in past annual reports, the Commission has focused particular attention on protecting the regional ecosystem that supports this relatively discrete group of manatees. In the 1980s it played a major role in developing a long-term federal-state land acquisition initiative that, to date, has resulted in the purchase of more than 100,000 acres (40,470 ha) for inclusion in various refuges, parks, and reserves along the northwestern Florida coast (see Appendix B, Marine Mammal Commission 1984). The Commission also was instrumental in developing a research and management plan for Crystal River manatees (see Appendix C, Packard 1984), which formed a basis for the Citrus County manatee protection plan adopted early in the 1990s. It includes provisions to protect manatees in the Crystal and Homosassa Rivers.

As noted above, the number of manatees using the two warm-water refuges on the Crystal and Homosassa Rivers has increased severalfold over the past two decades. During this period, the clear, warm water at both sites and the chance to view wild manatees at close range has attracted recreational divers whose numbers also have increased severalfold. Although some manatees are unperturbed by and will even approach non-aggressive divers, other manatees avoid divers and are easily displaced from resting areas. In some cases divers hoping to touch manatees or pose with them for underwater photographs chase

them from resting areas near warm-water spring discharges.

Such disturbance first became apparent in Kings Bay. To address the problem, the Fish and Wildlife Service adopted regulations in 1980 setting aside three small manatee sanctuaries covering about 10 acres (4.05 ha) near the bay's largest spring. The regulations prohibited the entry of divers and boats within the sanctuaries, and manatees soon learned to escape unwanted attention from divers by retreating into the sanctuaries. To further protect the animals, the Service purchased several small islands in the bay early in the 1980s and designated them as the Crystal River National Wildlife Refuge. In 1990 it purchased a site on the bay's shoreline for a refuge headquarters to help provide on-site public education and enforcement. As the number of manatees and divers continued to increase, the Service expanded the sanctuary area to 39 acres (15.8 ha) in 1991 by adding three new manatee sanctuaries and enlarging the original three areas.

The popularity of Kings Bay as a dive site has continued to increase, and in 1996 the Commission received information indicating that, on some days, hundreds of people were diving in Kings Bay, and that the incidence of manatee harassment was increasing, particularly at a small spring called Three Sisters Spring located in a canal off Kings Bay. The Commission also was advised that manatee harassment was becoming a problem at Blue Waters near Homosassa Springs. After reviewing the information, the Commission wrote to the Service on 9 May 1996, recommending, in part, that a new manatee sanctuary be established at Three Sisters Spring and that the Service, working with the state, increase enforcement at both Kings Bay and the Homosassa River.

During the winter of 1996–1997 the Service conducted a study to document harassment levels in Kings Bay. The results confirmed the need for protection at Three Sisters Spring, and on 26 November 1997 the Service published emergency rules in the *Federal Register* to establish a new manatee sanctuary at that site. At the same time it published a proposed rule to make the new sanctuary permanent. Although less than a half acre (0.2 ha) in size, the new sanctuary encompasses the immediate spring discharge area that

is sometimes used by several tens of animals. On 23 December 1997 the Commission wrote commending the Service for promulgating the emergency rule and recommending that it adopt the proposed rule to make the sanctuary permanent. The Service did so, publishing a final rule on 16 October 1998.

Following the Commission's May 1996 letter, the Service and the Florida Department of Environmental Protection also examined manatee protection at Blue Waters on the Homosassa River. Before the mid-1980s, land around the spring was used as a small privately owned wildlife park. The head of the spring run and waters around the main spring were fenced off and several captive manatees were held for public display. In 1986 the state purchased the site and continued to operate it as a state wildlife park featuring manatees. An educational exhibit on manatees was installed in cooperation with the Fish and Wildlife Service, and the captive manatee enclosure at the head of the spring run was retained.

Because the spring run below the fenced-off portion is shallow, most wild manatees stay in the deeper Blue Waters site near the mouth of the spring run. Blue Waters has become increasingly popular with divers and, as an initial step to assess management needs at this site, the state supported a study during the winter of 1997–1998 that documented numerous manatee harassment incidents. To address the situation, while also enhancing the spring's value as winter manatee habitat, the Service and the state discussed the possibility of deepening the spring run to improve manatee access, moving the barrier across the upper reach of the spring run closer to the main spring to allow manatees to move closer to the warm-water discharge, and prohibiting access by divers and boats to the upper spring run and perhaps a portion of the area near the mouth of the spring run.

Upon learning of the discussions, the Commission wrote to the Florida Department of Environmental Protection on 19 May 1998. Noting that Homosassa Springs was one of the few natural warm-water springs in Florida having the potential to support a large number of manatees in winter, it urged the department, in consultation with the Service, to act on the suggested approach. The department replied on 18 June, noting that a public hearing was scheduled

for 30 June 1998 to consider manatee protection options for the site and that it was pursuing steps with the Fish and Wildlife Service to fund an additional law enforcement officer for the area during the coming winter. The department provided further information on 9 July 1998. It noted that it planned to evaluate the environmental impact of deepening the spring run and expanding the restricted access area down the spring run. It noted that plans were being completed to increase enforcement at Blue Waters during the coming winter.

The Commission commented to the department on 21 July, noting that the approach was sensible and that improving enforcement during the coming winter, while developing a long-range plan to enhance manatee habitat and manatee protection at the site, was an important, responsive action. As of the end of 1998 enforcement at Blue Waters had been increased, boaters and divers were being asked to avoid preferred manatee resting areas during the coldest periods, and the Service, the U.S. Geological Survey, and the Florida Department of Environmental Protection were gathering additional data on water temperatures and the occurrence of manatees around the spring run.

### **Florida Manatee Die-Off Contingency Plan**

In the spring of 1996 about 150 dead manatees were recovered in southwestern Florida. The size of the die-off was unprecedented and, in consultation with the Fish and Wildlife Service, the Marine Mammal Commission, and other agencies and groups, the Florida Marine Research Institute launched an extensive response effort to identify its cause. The results suggested that a vast majority of the animals died as a result of toxins associated with a naturally occurring red tide. The event and the extensive resources required to respond to it underscored the need for advance planning to coordinate the many agencies and groups whose expertise and help are needed to respond quickly and efficiently to such large-scale manatee die-offs.

To address future needs in this regard, the Service began drafting a die-off contingency plan shortly after the 1996 die-off ended. In addition, the Marine Mammal Commission, in cooperation with the Service and the state, conducted a detailed review of the 1996

die-off response during its November 1996 annual meeting. Results of that review and related planning recommendations were provided to the Service on 31 December 1996, and in April 1997 the Service completed a manatee die-off contingency plan outlining responsibilities and needed actions by the Service, the state, and others in the event of another major manatee die-off.

To provide necessary details concerning operational response needs, particularly those for which the state was responsible, the Florida Department of Environmental Protection contracted early in 1997 for a more detailed plan to guide its response efforts. As described in its previous annual report, the Commission commented on the state's draft plan by letter of 29 October 1997 noting that it was thorough and well done. With further changes to address comments by the Commission and others, the state transmitted its plan to the Service on 26 December 1997 requesting that it be appended to the Service's plan.

The Service replied on 23 January 1998 noting that merging the two plans was an excellent idea and that it would revise and update the plan to do so, while working with the state to resolve any discrepancies or ambiguities that might exist with regard to agency responsibilities. In November 1998 the Service provided copies of the final plan to key officials in the Florida Department of Environmental Protection and other agencies and groups. The revised plan reflects information and guidance contained in the two plans as well as advice and provisions set forth in the "National Contingency Plan for Response to Unusual Marine Mammal Mortality Events" completed in 1996 to provide a general framework for marine mammal die-off responses. As of the end of 1998 the Service and the state were arranging a planning meeting early in 1999 to discuss steps that should be taken in advance of any future manatee die-off response needs.

### **Flood Gates and Navigation Locks**

After vessel collisions, the largest source of manatee mortality is entrapment in closing flood gates and navigation locks used to control water flow along Florida's extensive network of drainage canals and inland waterways. Since 1974 more than 150 manatees have been killed in these structures, most of

which are owned and operated by the South Florida Water Management District or the Army Corps of Engineers. To prevent this mortality, the two agencies began working cooperatively in 1992 to design a device, similar to an elevator door, that would automatically and immediately reverse the operation of a closing door if anything became caught in it. The District assumed responsibility for designing and testing mechanisms for flood gates, and the Corps took the lead for developing and testing a mechanism for navigation locks.

Flood gates open and close by raising and lowering a single door. As an initial approach for these structures, District engineers designed a mechanical plunger device to be installed along the edge of a gate door. If the plungers were depressed by the pressure of a trapped object caught beneath a closing door, the gate closing immediately reversed direction. Because of fouling by marine growth and clogging by debris, the devices proved difficult to maintain. Therefore, in 1994 the District began to investigate the possibility of using strips of piezoelectric film along the edge of gate doors, rather than mechanical plungers, to trigger gate reversals. The film, a tough plastic material that converts mechanical pressure into electric current, has no moving parts, and preliminary tests indicated that the new device would be an effective, low-maintenance solution. A prototype was therefore developed and installed for the first time on two of four gates at a flood control structure in Dade County in July 1997.

Based on the promising result of preliminary testing, the Army Corps of Engineers developed a two-part plan to contract for the installation of new devices at 20 flood-control structures and seven navigation locks. It estimated the cost to carry out this work at \$2.7 million. As noted in its 1997 annual report, the Commission commented to the Corps on the plan on 15 September 1997 urging that contractual arrangements be based on standardized designs developed as quickly as possible and with the benefit of any additional design modifications as may be indicated by further testing.

Based on successful operations at the two gates retrofitted in 1997, the District proceeded to install its new device on the two remaining gates at that structure and at three additional flood-control structures.

The four structures retrofitted to date, all of which are in Dade County, have been the source of nearly 60 percent of all flood gate-related manatee deaths since 1974. There have been no manatee deaths at these structures since the new mechanisms were installed. At the end of 1998 the District was planning to install the device at a fifth structure early in 1999, and the Corps was in the process of developing plans and construction specifications to contract with an appropriately qualified private company to retrofit the remaining 15 structures on its list. Each flood-control structure has one to four gates and, depending on the number of gates, the cost of retrofitting ranges roughly from about \$50,000 to \$200,000 per structure.

Progress also has been made by the Corps to develop and test a related device for navigation locks. Similar to barn doors, most navigation locks use paired doors that swing open and closed on hinges attached to each side of the lock. Because of the different design and water flow for navigation locks as compared with flood gates, the Corps has experimented with a mechanism that uses a vertical series of acoustic beams spaced at 8-inch intervals on one door, and a strip of piezoelectric sensors on the opposing door that converts sound energy from the beams into an electric current. When an object in a closing door breaks the acoustic beam, a closing door is automatically reversed.

Based on preliminary design and testing work in 1996 and 1997, the Corps developed a prototype device that was installed on one end of a navigation lock in southeastern Florida in late 1998. The device appears to be working properly and another will be installed at the other end of the lock early in 1999. At the end of 1998, the Corps was considering arrangements to add a navigation lock at Port Canaveral to its list of locks to be fitted with the new device. If arrangements can be worked out, it would

likely be the next structure to be retrofitted. During 1999 the Corps also expects to develop plans and specifications for use in contracting installation of the devices at the other navigation locks on its list. The estimated cost to retrofit lock doors with acoustic reversing mechanisms is approximately \$300,000 to \$400,000 per structure.

### **Florida Manatee Recovery Team**

To help coordinate and oversee implementation of the manatee recovery program, the Service established a recovery team in the 1980s composed of representatives of the key agencies and groups involved in carrying out tasks set forth in the recovery plan. After preparing the latest revised recovery plan in 1994, however, the Service decided that the team was not necessary to help implement the plan and it has taken no action since 1994 to reconvene the team. As noted in recent annual reports, the Commission believed the team provided a valuable means of strengthening and directing cooperative efforts by the many partner agencies and groups to identify and help carry out priority recovery tasks, and it therefore recommended on several occasions that the Service reactivate the team.

The Service has declined to do so, but it advised the Commission that it would reestablish a recovery team to help prepare a new recovery plan when the time came to update it. The most recent recovery plan revisions each cover five-year planning horizons. The current plan covers fiscal years 1995 through 1999. Therefore, to begin work on again updating the plan, the Service intends to reestablish the Florida Manatee Recovery Team early in 1999. At the end of 1998 the Service was preparing letters of invitation to new team members.

## Chapter III

# MARINE MAMMAL-FISHERIES INTERACTIONS

Marine mammals may be disturbed, harassed, injured, or killed either accidentally or deliberately during fishing operations. They, in turn, may take or damage bait and fish caught on lines, in traps, and in nets, damage or destroy fishing gear, or injure fishermen trying to remove them from fishing gear. Marine mammals and fishermen also may compete for the same fish and shellfish resources.

In 1994 the Marine Mammal Protection Act was amended to establish a new regime to govern the taking of marine mammals incidental to commercial fishing operations. As in the past, however, the incidental take of dolphins in the eastern tropical Pacific tuna fishery continues to be regulated under separate provisions of the Act. Implementation of the 1994 fisheries regime is discussed in this chapter. Also discussed are amendments to the Marine Mammal Protection Act enacted in 1997 pertaining to the eastern tropical Pacific tuna fishery and actions being taken to implement those amendments. In addition, this chapter provides information on efforts to address interactions between various species of pinnipeds and certain fish stocks. Fishery interactions affecting specific species, including Hawaiian monk seals, Steller sea lions, sea otters, harbor porpoises, and right whales, are discussed in Chapter II.

### Implementation of the Incidental-Take Regime for Commercial Fisheries

Since its enactment in 1972 the Marine Mammal Protection Act has contained provisions for authorizing the taking of marine mammals incidental to commercial fishing operations. The 1987 ruling in a lawsuit challenging an incidental-take permit issued to Japanese salmon fishermen operating in U.S. waters

(*Kokechik Fishermen's Association v. Secretary of Commerce*), however, threw into question whether such permits could continue to be issued under then-existing provisions to many other fisheries known to take marine mammals. In response, Congress passed a five-year interim exemption to govern incidental taking, during which time a new long-term incidental-take regime was to be developed.

As discussed in previous annual reports, the Marine Mammal Protection Act was amended in 1994 to establish a new regime to govern the taking of marine mammals incidental to commercial fishing operations. Three new sections were added to the Act to address interactions between commercial fisheries and marine mammals.

Section 117 requires the preparation of marine mammal stock assessments to provide a scientific basis for the new incidental-take regime. In part, the assessments are intended to identify strategic stocks for which take reduction plans must be prepared.

Section 118 sets forth the requirements of the 1994 incidental-take regime. It directs the National Marine Fisheries Service to publish a list of commercial fisheries classified according to the frequency with which they kill or seriously injure marine mammals. Certain requirements (*e.g.*, a registration requirement and a requirement to carry observers) are applicable, depending on a fishery's classification. The amendments focus resources on the most pressing problems — those involving strategic stocks. A take reduction plan is to be developed for each strategic stock subject to frequent or occasional mortality or serious injury.

Section 120 addresses interactions between pinnipeds and fishery resources. It provides a mechanism for states to apply to the National Marine Fisheries Service to obtain authorization to lethally take pinni-

ped in certain instances. Section 120 also directs the Service to investigate the impacts of growing sea lion and harbor seal populations on the recovery of salmonid stocks and on coastal ecosystems in Washington, Oregon, and California, and to establish a task force to examine problems involving pinnipeds and aquaculture projects in the Gulf of Maine.

The new regime includes a mechanism for authorizing a limited incidental take of marine mammals listed as endangered or threatened under the Endangered Species Act, something the original statute and the interim exemption did not provide. Such authorizations may be issued under section 101(a)(5)(E), provided the National Marine Fisheries Service (or the Fish and Wildlife Service for manatees and southern sea otters) determines that (1) the incidental mortality and serious injury will have a negligible impact on the species or stock, (2) a recovery plan has been or is being developed under the Endangered Species Act, and (3) if required, a monitoring program for relevant fisheries has been established under section 118.

Actions involving the preparation of stock assessments and take reduction plans are discussed in this section and, as they relate to specific marine mammal stocks, in Chapter II. Implementation of the other requirements of section 118 and provisions applicable to endangered and threatened species and deterring marine mammals from damaging fishing gear or catch are also discussed in this section. Actions taken under section 120 are discussed in the section on pinniped-fisheries interactions later in this chapter.

## Stock Assessments

Section 117 of the Marine Mammal Protection Act requires the Secretaries of Commerce and the Interior to prepare and periodically update stock assessment reports for each marine mammal stock that occurs in U.S. waters. This provision also requires that three regional scientific review groups be established to assist in the development of these reports. These groups were established in 1994 for Alaska, the Pacific coast, including Hawaii, and the Atlantic coast, including the Gulf of Mexico. They include experts in marine mammal biology, commercial fishing technology and practices, and, in the case of Alaska, Native subsistence uses. Among other things,

scientific review groups are to advise the Secretaries on (1) the estimated size, status, and trends of marine mammal stocks, (2) uncertainties and research needs regarding stock separation, abundance, and trends, (3) research on modifications in fishing gear and practices to reduce the incidental mortality and serious injury of marine mammals, and (4) potential impacts of habitat destruction on marine mammals and, for strategic stocks, conservation measures to reduce such impacts.

Based on the advice of the regional groups and public comment on draft stock assessments, the Secretaries are to publish a final assessment report for each stock. The Act directs that each assessment

- describe the geographic range of the stock;
- provide a minimum population estimate, the stock's current and maximum net productivity rates, and current population trend, including the basis for those findings;
- estimate the annual human-caused mortality and serious injury, by source, and, for stocks determined to be strategic stocks, describe other factors that may be causing a decline or impeding recovery;
- describe the commercial fisheries that interact with the stock, including estimates of fishery-specific mortality and serious injury levels and rates, a description of seasonal or area differences in incidental take, and an analysis of whether incidental-take levels are approaching a zero mortality and serious injury rate;
- assess whether the level of human-caused mortality and serious injury would cause the stock to be reduced below its optimum sustainable population or, alternatively, whether the stock should be categorized as a strategic stock; and
- estimate the potential biological removal level for the stock.

As defined in the Act, a stock's potential biological removal level is the maximum number of animals, not including natural mortality, that can be removed from the stock while allowing the stock to reach or remain at its optimum sustainable population level. The potential biological removal level is calculated by multiplying three variables — the minimum population estimate for the stock, one-half of the theoretical or estimated maximum net productivity rate of the stock

at a small population size, and a recovery factor of between 0.1 and 1.0. Strategic stocks are those that (a) have a level of direct human-caused mortality exceeding the calculated potential biological removal level, (b) are designated as depleted under the Marine Mammal Protection Act, (c) are listed as endangered or threatened under the Endangered Species Act, or (d) are likely to be listed as endangered or threatened in the foreseeable future.

**National Marine Fisheries Service** — As discussed in previous annual reports, the National Marine Fisheries Service published a *Federal Register* notice in August 1995 announcing the availability of its original stock assessments. The Service also published a separate report describing the guidelines used to identify stocks, determine minimum population sizes, estimate maximum net productivity rates, and select appropriate recovery factors. Of 145 stocks for which the Service originally prepared assessments, 47 were determined to be strategic stocks. The Service also designated as strategic 33 localized stocks of the bottlenose dolphin that inhabit bays, sounds, and estuaries in the Gulf of Mexico after concluding that the minimum abundance estimates were so low that the take of a single animal from most of these stocks would exceed the calculated potential biological removal level.

Assessments for strategic stocks are to be reviewed at least annually. For other stocks, assessments must be reviewed at least once every three years. The National Marine Fisheries Service began the process of revising its stock assessments in 1996. Final versions of these revised stock assessment reports were published by the Service at the end of 1997. The revised reports noted a changed status for seven marine mammal stocks. The stocks of Baird's beaked whales, Cuvier's beaked whales, and pygmy sperm whales that occur in waters off California, Oregon, and Washington, identified as strategic in the original stock assessments, were found to be non-strategic. The stock of minke whales inhabiting waters off California, Oregon, and Washington was reclassified as strategic as a result of a single observed fishery-related mortality. Three stocks of cetaceans that occur off the east coast of the United States, the western North Atlantic stock of white-sided dolphins, the western North Atlantic stock of bottlenose dol-

phins, and the western North Atlantic stock of long-finned pilot whales, were reclassified from strategic to non-strategic in the revised assessments.

The National Marine Fisheries Service published a *Federal Register* notice on 24 July 1998 announcing the availability of draft stock assessment reports for 1998. For stocks that occur in Alaska, the Service proposed revisions to 15 of 33 assessment reports, including all 10 strategic stocks. Although the revised reports included new information on marine mammal abundance and estimated mortality, no changes in the status of these stocks were proposed.

Two status changes were proposed for the 50 stocks that occur along the coasts of California, Oregon, Washington, and Hawaii. In light of revised abundance estimates resulting from a 1996 ship-based survey, the Service believed that the California-Oregon-Washington stocks of minke whales and mesoplodont beaked whales (*Mesoplodon* spp.) should be classified as non-strategic. Draft assessments for two stocks of harbor seals, two stocks of harbor porpoises, and the San Miguel stock of fur seals were also revised to reflect new information. None of the proposed changes, however, would change the status of these stocks from non-strategic.

Of the 57 stock assessments that had been prepared for marine mammals occurring in the Atlantic Ocean and Gulf of Mexico, the Service proposed revisions to 26. Based on new estimates of fishery-related incidental mortality, the Service proposed changing the status of the western North Atlantic stock of white-sided dolphins from non-strategic to strategic. The draft revised stock assessment for the western North Atlantic stock of pygmy sperm whales indicated that this stock should be reclassified as non-strategic because no fishery-related mortalities or serious injuries had been observed between 1992 and 1996.

The Marine Mammal Commission provided comments on the draft 1998 stock assessment reports by letter of 21 October 1998. In general, the Commission believed that the draft reports provided thorough descriptions and assessments of marine mammals stocks occurring in U.S. waters and information on the levels of human-caused mortality and serious injury affecting the stocks. The Commission

suggested that, given the extreme condition of the Hawaiian monk seal population and the continuing decline of this species at French Frigate Shoals, an updated assessment of this species was warranted even in the absence of dramatic new information. Similarly, the Commission believed that a revised assessment should be prepared for the western North Atlantic coastal stock of bottlenose dolphins. Specific comments on individual assessments were also provided.

The National Marine Fisheries Service expects to publish final revised stock assessments early in 1999.

**Fish and Wildlife Service** — The Fish and Wildlife Service published initial assessment reports for the eight stocks of marine mammals under its jurisdiction on 4 October 1995. Three stocks, the Florida and Antillean stocks of the endangered West Indian manatee and the threatened California stock of sea otters, were determined to be strategic stocks.

As discussed in the previous annual report, the Fish and Wildlife Service issued draft revised stock assessments for southern sea otters in California, northern sea otters in Washington, and the Florida and Antillean stocks of West Indian manatees in April 1997. Although the draft revisions incorporated information not available when the original assessment reports were prepared, no changes in the status of these stocks were proposed.

The Fish and Wildlife Service published a notice announcing the availability of draft revised stock assessment reports for the other marine mammal species under its jurisdiction, those occurring in Alaska, on 5 March 1998. The proposed revisions did not indicate that any of these polar bear, sea otter, or walrus stocks should be reclassified as strategic. The only significant change from the initial reports was the proposal to split Alaska sea otters, previously considered to be a single stock, into three separate stocks based on genetic studies and other information.

On 14 September 1998 the Service announced the availability of final assessment reports for the Alaska stock of the Pacific walrus and the two stocks of polar bears that occur in Alaska. All three stocks remain classified as non-strategic. Final stock assessments for Alaska sea otters, however, have yet to be issued.

A provision of section 117 of the Marine Mammal Protection Act requires that, if requested by an Alaska Native subsistence hunter, a proceeding on the record must be held before a final stock assessment can be published for any marine mammal stock taken in Alaska for subsistence or handicraft purposes. The Alaska Sea Otter Commission, which represents Alaska Natives who hunt sea otters, submitted comments taking issue with the proposed division of Alaska sea otters into three stocks. The Sea Otter Commission did not believe that the Service's proposal was based on the best available scientific information or supported by substantial evidence. The Sea Otter Commission therefore requested that, if the Service adhered to the proposed placement of Alaska sea otters into three stocks, a proceeding on the record be conducted. It was the Commission's understanding that at the end of 1998 the Fish and Wildlife Service was consulting with the Alaska Sea Otter Commission in an effort to resolve the issue of stock structure without resorting to a formal hearing.

### **The Incidental-Take Regime**

Section 118 of the Marine Mammal Protection Act sets forth the regime governing the take of marine mammals incidental to most commercial fishing operations. It requires the classification of fisheries according to the frequency with which marine mammals are taken, registration by fishermen participating in fisheries that frequently or occasionally take marine mammals, monitoring and reporting of incidental taking, and attainment of the goal of reducing incidental mortality and serious injury of marine mammals in commercial fisheries to insignificant levels approaching zero within seven years. The section also requires preparation of a take reduction plan for each strategic stock subject to frequent or occasional mortality or serious injury in fishing operations. Each plan is to include recommended regulatory or voluntary measures to reduce incidental mortality and serious injury and recommend dates for achieving specific objectives. The immediate goal of the plans is to reduce, within six months, incidental mortality and serious injury to levels less than the potential biological removal level calculated in the stock assessment. The long-term goal of the plans is to reduce incidental mortality and serious injury to insignificant levels approaching a zero rate within five years, taking into

account the economics of the fishery, existing technology, and applicable state or regional fishery management plans.

**Implementing Regulations** — As discussed in previous annual reports, the National Marine Fisheries Service published regulations implementing section 118 on 30 August 1995. Among other things, the regulations include procedures for vessel owners to register for an authorization certificate, observer and reporting requirements, and criteria for classifying fisheries. Although the Service had proposed a definition to be used to determine when the zero mortality and serious injury rate goal of the Act had been achieved, it did not include that element in the final regulations. As such, this issue remains unresolved.

The 1994 amendments require that commercial fisheries reduce incidental mortality and serious injury of marine mammals to insignificant levels approaching a zero mortality and serious injury rate by April 2001. Toward this end, the amendments require the National Marine Fisheries Service to review the progress of commercial fisheries in meeting this goal and to report its findings to Congress. The report was to have been submitted by 30 April 1998. As of the end of 1998, however, it was the Commission's understanding that completion of the report was awaiting a determination by the Service as how best to quantify the phrase "approaching a zero mortality and serious injury rate." The Service expects to resolve this issue and complete the report during the first half of 1999. Shortly after transmitting the report to Congress, the Service intends to publish proposed regulations that will govern when the zero mortality and serious injury rate goal has been met.

Several provisions of the incidental-take regime for commercial fisheries are geared toward reducing marine mammal mortalities and serious injuries to certain levels. As such, it is important that there is some mechanism for determining which injuries are to be considered serious. Regulations promulgated by the National Marine Fisheries Service in 1995 define serious injury as any injury that will likely result in mortality. However, it is not always apparent at the time a marine mammal is released from fishing gear whether its injuries are life-threatening. To address

this issue, the National Marine Fisheries Service convened a workshop in April 1997 to consider ways to differentiate between serious and non-serious injuries. Representatives of the Marine Mammal Commission participated in the workshop.

The workshop report was published by the Service in January 1998. It noted that workshop participants had considered the different ways in which marine mammals may be injured by a variety of types of fishing gear and assessed the likelihood that different types of marine mammals would survive interactions with fishing gear. The report also recognized that some marine mammals may succumb from the physiological effects of stress associated with entanglement in fishing gear. In addition, it summarized views as to the types of information that should be collected by observers to enable the Service to determine which injuries should be considered serious.

The workshop report noted that general guidelines had been developed for different types of marine mammals. Participants generally agreed that, for large whales, any entanglement that resulted in the animal trailing gear such that its mobility or ability to feed was impeded should be considered a serious injury. For small cetaceans, animals that ingest hooks, that are trailing gear when released, or that swim away abnormally after being released should be considered seriously injured. For pinnipeds, animals should be considered seriously injured if they are trailing gear or are hooked in the mouth. The Service intends to draw on the findings of the workshop to develop guidelines for determining what constitutes a serious injury. A draft version of the guidelines has been prepared and will be made available for public review and comment once agency review is complete.

**Take of Endangered and Threatened Species** — As noted above, the incidental-take regime enacted in 1994 includes a provision for authorizing the incidental taking of species listed as endangered or threatened, provided certain findings are made. In 1996 three-year permits were issued to participants in Alaska fisheries, authorizing the incidental taking of North Pacific humpback whales and Steller sea lions from both the eastern and western stocks. Those authorizations were to expire on 31 December 1998.

On 30 December 1998 the National Marine Fisheries Service published a *Federal Register* notice extending those permits through 30 June 1999. Rather than reissue the permits for a three-year period, the Service chose to extend them for six months while it reviewed its criteria for determining whether authorized taking will have a negligible impact on listed marine mammal stocks. Under existing criteria, the Service generally considers annual mortalities and serious injuries to be insignificant at the population level if they do not exceed 10 percent of the potential biological removal level calculated for a stock. The Service requested comment on other formulations, such as basing the determination on the recovery rate of the stock or tying the criteria to achievement of the zero mortality and serious injury rate goal. The Service also solicited comments on whether the permits should cover taking other than those involving mortalities or serious injuries and, if so, whether permits authorizing these less serious types of taking alone should be issued. The Commission expects to comment on these issues early in 1999.

**List of Fisheries** — A key feature of the incidental-take regime is annual publication of a list of fisheries placing each U.S. fishery into one of three categories based on the frequency with which marine mammals are killed or seriously injured. Vessel owners participating in category I or category II fisheries must register and are subject to certain other requirements. Those participating in category III fisheries need not register for an incidental-take authorization, but are required to report any marine mammal mortality or injury that occurs incidental to their operations.

Under regulations published by the National Marine Fisheries Service, a category I fishery is one in which annual mortality and serious injury of any marine mammal stock is equal to or greater than 50 percent of the stock's potential biological removal level. A category II fishery is one in which annual mortality and serious injury is between 1 and 50 percent of the stock's potential biological removal level, provided that the total mortality and serious injury of the stock from all fisheries combined is greater than 10 percent of its potential biological removal level. All other fisheries (*i.e.*, those which, combined with other fisheries, do not take more than

10 percent of a stock's potential biological removal level or that individually take less than 1 percent of any stock's potential biological removal level) are placed in category III.

The Service published its final list of fisheries for 1998 on 4 February 1998. Although the Service examined new data for several fisheries, the 1998 list included no changes in the classification of fisheries from the 1997 list. The Service noted that data on stranded bottlenose dolphins placed the mid-Atlantic coastal gillnet fishery on the borderline between category I and category II, but stated that it wanted to conduct a more thorough analysis of the data before proposing listing the fishery in category I. The Service considered including a new drift gillnet fishery for yellowfin and albacore tuna on the list of fisheries, but on further examination, included this fishery with the mid-Atlantic coastal gillnet fishery in category II. The Service also noted the existence of an offshore Atlantic herring trawl fishery. By analogy with the trawl fishery for squid, mackerel, and butterfish, and the potential of this fishery to interact with harbor porpoises, the Service believed that this fishery should be listed as a category II fishery. However, the Service deferred including the offshore trawl fishery for herring on the list of fisheries until the public had been given an opportunity to review and comment on the issue.

The National Marine Fisheries Service published the proposed list of fisheries for 1999 on 11 August 1998. The proposed list reflected the new estimates of incidental mortality and serious injury contained in the 1996 stock assessment reports and the 1998 draft stock assessment reports. As expected, the Service proposed listing the offshore component of the mid-water trawl fishery for Atlantic herring as a category II fishery. Rather than list this fishery separately, however, the Service proposed combining it with the mid-Atlantic coastal herring trawl fishery, which previously was listed as a category III fishery.

The Gulf of Mexico menhaden purse seine fishery was classified as a category III fishery on the 1998 list of fisheries. Estimated mortalities of bottlenose dolphins observed between 1992 and 1995 suggest that this fishery may warrant listing in category I. The Service, however, chose to propose placing this

fishery in category II, pending a revised analysis of the stock structure for bottlenose dolphins in the Gulf of Mexico.

In addition, the Service proposed name changes for the northeast multi-species sink gillnet fishery and the North Carolina haul seine fishery to reflect target species and geographical boundaries more accurately.

The Service also invited comment on certain fisheries for which no changes in classification were proposed. The Atlantic Scientific Review Group, established under section 117 of the Marine Mammal Protection Act, recommended that the Service consider reclassifying the Atlantic squid, mackerel, and butterfish trawl fishery as a category I fishery because estimated mortalities and serious injuries exceed the potential biological removal level for pilot whales and common dolphins. The Service, however, declined to adopt this recommendation, noting that there was substantial uncertainty with respect to those estimates. The Service indicated its intention to reevaluate the estimates of marine mammal mortality that occurs incidental to this fishery based on data from the 1997 season before proposing any listing change.

In April 1998 the Pacific Scientific Review Group recommended that the National Marine Fisheries Service reclassify the category III Hawaii swordfish, tuna, billfish, mahimahi, wahoo, and oceanic sharks longline-set line fishery as a category II fishery. This recommendation was based on the observed mortality and serious injury of several species of cetaceans. In declining to adopt the review group's recommendation, the Service noted that it had been unable to calculate the potential biological removal level for most of these stocks because their abundance in Hawaiian waters was unknown. The Service also noted that most of the marine mammals taken in this fishery had been released alive, albeit with injuries. The Service therefore believed that it was premature to include this fishery in category II until it had published guidelines for determining what constitutes a serious injury.

The Service also indicated that it was not proposing a change in the listing of the category III Atlantic Ocean, Gulf of Mexico blue crab trap/pot fishery despite evidence that bottlenose dolphins and manatees

are incidentally entangled in this gear. The Service explained that most manatees are disentangled and released alive. As for bottlenose dolphins taken in this fishery, the Service believed that the required analyses could not be done until the stock structure of this species is better understood.

In addition to proposing revisions to the list of fisheries for 1999, the 11 August 1998 *Federal Register* notice proposed several technical modifications to the regulations implementing section 118 of the Marine Mammal Protection Act.

**Take Reduction Plans** — As noted above, section 118 requires the National Marine Fisheries Service to develop a take reduction plan for each strategic stock that interacts with a fishery that frequently or occasionally kills or seriously injures marine mammals (*i.e.*, a category I or category II fishery). It directs the Service to establish take reduction teams to take the lead in developing take reduction plans. These teams are to include members representing federal agencies, affected coastal states, appropriate fishery management councils, interstate fishery commissions, academic and scientific organizations, environmental groups, the commercial and recreational fishermen that incidentally take the species or stock, and any affected Alaska Native or Indian tribal organizations.

Where human-caused mortality and serious injury of a stock are believed to be equal to or greater than the stock's potential biological removal level, a take reduction team is to prepare and submit to the Service a draft take reduction plan within six months of the team's establishment. For other strategic stocks, draft take reduction plans are to be submitted within 11 months of the team's establishment. Within 60 days of receiving a draft take reduction plan, the Service is to publish the plan in the *Federal Register*, along with any proposed changes and proposed regulations to implement the plan, for public review and comment. After a public comment period of no more than 90 days, the Service has 60 days in which to publish a final take reduction plan and implementing regulations. After publication of the final plan, take reduction teams are to continue to meet to monitor the plan's implementation.

As discussed in previous annual reports, the National Marine Fisheries Service has established five take reduction teams, the Gulf of Maine Harbor Porpoise Take Reduction Team, the Pacific Offshore Cetacean Take Reduction Team, the Atlantic Offshore Cetacean Take Reduction Team, the Atlantic Large Whale Take Reduction Team, and the Mid-Atlantic Coastal Gillnet Take Reduction Team. A representative of the Commission participated as a member of the Gulf of Maine harbor porpoise and Atlantic large whale teams.

Activities of the Gulf of Maine Harbor Porpoise Take Reduction Team and the Mid-Atlantic Coastal Gillnet Take Reduction Team are discussed in the Gulf of Maine harbor porpoise section of Chapter II. Actions to adopt and implement the draft take reduction plan developed by the Atlantic Large Whale Take Reduction Team to address the bycatch of northern right whales and humpback whales in coastal gillnet and lobster pot fisheries are discussed in the northern right whale section of Chapter II.

The Pacific Offshore Cetacean Take Reduction Team was constituted to address the incidental take of several species of beaked whales, short-finned pilot whales, pygmy sperm whales, sperm whales, and humpback whales in the category I drift gillnet fishery targeting thresher shark and swordfish in waters off California and Oregon. The team submitted its draft take reduction plan to the National Marine Fisheries Service in 1996. This plan formed the basis for implementing regulations published by the Service on 3 October 1997. The regulations require that the top of the nets be set a minimum of 36 feet (11 m) below the water surface because the majority of cetaceans incidentally taken in the drift gillnet fishery are taken in the upper one-third of the net. The regulations also require the use of low-intensity acoustic deterrent devices (pingers) on nets used in this fishery. The regulations further require operators in the fishery to attend a skipper education workshop before each fishing season. The notice indicated that the Service intended to reconvene the take reduction team annually until the long-term take reduction goals of the Act have been achieved.

The Pacific Offshore Cetacean Take Reduction Team met on 1–2 June 1998 to review the effective-

ness of the regulations in reducing marine mammal mortalities and serious injuries. During the 1997–1998 fishing season, overall mortalities were down approximately 65 percent and were below the potential biological removal level for all strategic stocks. Because of the effectiveness of setting nets deeper and using pingers in reducing mortalities, the team members recommended that the plan be maintained without modification during the 1998–1999 fishing season.

The Atlantic Offshore Cetacean Take Reduction Team was established in 1996 to address the take of several species of cetaceans, including right whales, humpback whales, sperm whales, beaked whales, long-finned and short-finned pilot whales, and common, spotted, and bottlenose dolphins, incidental to operation of the Atlantic pair trawl, longline, and drift gillnet fisheries for swordfish and other species. The team submitted a draft take reduction plan to the National Marine Fisheries Service in November 1996. Recognizing the threat that drift gillnets pose to right whales and the large numbers of other marine mammals taken as bycatch in these nets south of the New York Bight in winter and spring, the team recommended that drift gillnet fisheries for swordfish, tuna, and sharks south of the Hudson Canyon be closed seasonally from 1 December to 31 May. The plan also recommended that all drift gillnet vessels be required to carry marine mammal observers, that new entrants into the fishery be limited, and that the fishery catch limits be allocated to avoid the derby nature under which fishing now occurs.

As discussed in the right whale section of the Commission's previous annual report, the take reduction team's recommendations and the results of consultations under section 7 of the Endangered Species Act prompted the Service to implement closures of the offshore swordfish fishery for much of 1997. Action was also taken in late 1997 to close the mid-Atlantic and northeast segments of the offshore drift gillnet fisheries for tuna and sharks during the first half of 1998.

On 20 October 1998 the National Marine Fisheries Service published a proposed rule to prohibit the use of driftnets in the Atlantic swordfish fishery on a permanent basis. In making this proposal, the Service

noted that the measures recommended by the Atlantic Offshore Cetacean Take Reduction Team did not provide sufficient guarantees that marine mammal takes would be reduced to allowable levels and did not adequately address concerns about the bycatch of sea turtles in this fishery. The Service also noted that the cost of implementing the take reduction team's recommendations would exceed the net value of the swordfish that are landed. The comment period on the proposed rule closed on 14 December 1998 and it is expected that a final rule will be issued in early 1999.

Because of changes in circumstances that will occur if the swordfish fishery is closed permanently to driftnets, it is likely that the Service will reconstitute the Atlantic Offshore Cetacean Take Reduction Team to recommend additional actions to reduce marine mammal mortalities and serious injuries in the offshore fisheries for swordfish, tuna, and sharks.

**Intentional Taking** — Unlike the interim exemption that governed incidental taking between 1988 and 1995, the regime established under section 118 prohibits intentional lethal taking of marine mammals in commercial fishing operations. The only exception is if lethal taking is "imminently necessary in self-defense or to save the life of another person in immediate danger."

Although intentional lethal take is not allowed, fishermen and others may take marine mammals by non-lethal means to deter them from damaging gear, catch, or other property under certain circumstances. Section 101(a)(4) of the Marine Mammal Protection Act directs the National Marine Fisheries Service and the Fish and Wildlife Service to publish a list of guidelines to govern measures to be used in safely deterring marine mammals. In the case of marine mammals listed as endangered or threatened, the Services are to recommend specific measures that can be used to deter the animals non-lethally. The use of certain types of deterrence measures that have a significant adverse effect on marine mammals may be prohibited.

The National Marine Fisheries Service published proposed deterrence regulations on 5 May 1995. The Service offered guidance on passive, preventive, and reactive measures that could be taken to deter marine

mammals. The Service set forth four general principles regarding acceptable deterrence measures. In addition to a statutory directive that such measures not result in the death or serious injury of the animal, the measures should not (1) result in the separation of a female marine mammal from its unweaned offspring, (2) break the skin of a marine mammal, (3) be directed at a marine mammal's head or eyes, or (4) be used to deter pinnipeds hauled out on unimproved private property. The Service also proposed to prohibit the use of any firearm or other device to propel an object that could injure a marine mammal, the use of any explosive device to deter cetaceans or the use of explosives more powerful than seal bombs to deter seals or sea lions, translocation of any marine mammal, or the use of tainted food or bait or any other substance intended for consumption by the marine mammal. Deterrence of marine mammals listed as endangered or threatened under the Endangered Species Act would not be authorized under the proposed regulations. Rather, measures for safely deterring listed species would be subject to a separate rulemaking. The Commission's comments on the proposed regulations are discussed in the 1995 annual report.

As of the end of 1998 final deterrence regulations had yet to be published by the National Marine Fisheries Service. The Fish and Wildlife Service had not published any guidelines or proposed regulations with respect to deterrence of those species of marine mammals under its jurisdiction.

## The Tuna-Dolphin Issue

For reasons not fully understood, schools of large yellowfin tuna (those greater than 25 kg or 55 pounds) tend to associate with dolphin schools in the eastern tropical Pacific Ocean. This area covers more than 5 million square miles (18.1 million km<sup>2</sup>) stretching from southern California to Chile and westward to Hawaii. Late in the 1950s U.S. fishermen began to exploit this association by deploying large purse seine nets around dolphin schools to catch the tuna swimming below. Despite efforts by the fishermen to release the encircled dolphins unharmed, some animals become trapped in the nets and are killed or injured.

Efforts to reduce the incidental mortality of dolphins in this fishery have been a primary focus of the Marine Mammal Protection Act since it was enacted in 1972.

## Background

The eastern tropical Pacific tuna fishery was dominated by U.S. vessels during the 1960s and early 1970s. In the late 1970s and early 1980s the U.S. fleet declined and the number of foreign vessels participating in the fishery grew. Along with these shifts in the fishery came changes in the associated dolphin mortality. As reflected by mortality data presented in Table 10, progress made by the United States to reduce dolphin mortality under the Marine Mammal Protection Act was offset by increased mortality from growing foreign operations. This prompted Congress to amend the Marine Mammal Protection Act in 1984 and again in 1988 to establish comparability requirements for nations seeking to export tuna to the United States. Imports of yellowfin tuna caught in the eastern tropical Pacific were banned from countries that failed to adopt a tuna-dolphin program comparable to that of the United States or whose fleet exceeded the incidental-take rate of the U.S. fleet by a certain amount. In addition, imports of yellowfin tuna from intermediary nations that imported tuna from nations subject to a primary embargo were made subject to a secondary embargo. In an effort to reduce dolphin mortality further, additional requirements also were placed on U.S. tuna fishermen.

The requirements enacted in 1988 and the threat of tuna embargoes resulted in substantially reduced dolphin mortality by foreign fleets. Another factor contributing to the drop in dolphin mortality was the La Jolla Agreement, an agreement entered into voluntarily by the tuna-fishing nations in 1992, which, among other things, established vessel-specific mortality limits. Under these requirements, dolphin mortality declined by more than 95 percent between 1988 and 1993. Although part of this decline is attributable to a smaller number of sets being made on dolphins, the primary factor in reducing incidental dolphin mortality has been a marked reduction in the average number of dolphins killed per set.

**Table 10. Estimated incidental kill of dolphins in the tuna purse seine fishery in the eastern tropical Pacific Ocean, 1972–1998<sup>1</sup>**

<u>Year</u>	<u>U.S. Vessels</u>	<u>Non-U.S. Vessels</u>
1972	368,600	55,078
1973	206,697	58,276
1974	147,437	27,245
1975	166,645	27,812
1976	108,740	19,482
1977	25,452	25,901
1978	19,366	11,147
1979	17,938	3,488
1980	15,305	16,665
1981	18,780	17,199
1982	23,267	5,837
1983	8,513	4,980
1984	17,732	22,980
1985	19,205	39,642
1986	20,692	112,482
1987	13,992	85,185
1988	19,712	61,881
1989	12,643	84,403
1990	5,083	47,448
1991	1,002	26,290
1992	439	15,111
1993	115	3,601
1994	105	4,095
1995	0	3,274
1996	0	2,547
1997	0	3,005
1998	0	≈ 1,900 <sup>2</sup>

<sup>1</sup> These estimates, based on kill per set and fishing effort data, are provided by the National Marine Fisheries Service and the Inter-American Tropical Tuna Commission. They include some, but not all, seriously injured animals released alive.

<sup>2</sup> Preliminary estimate.

Preliminary data suggest that dolphin mortality incidental to the eastern tropical Pacific tuna fishery in 1998 declined to a record low level. Although the Inter-American Tropical Tuna Commission is still collecting and analyzing data from 1998, it expects that incidental dolphin mortality for the year will be

approximately 1,900 individuals, despite the fact that more dolphin sets were made in 1998 than in 1997.

Subsequent to enactment of the 1988 amendments, some environmental organizations began to push for a consumer boycott of tuna caught by encircling dolphins. In response, the three largest U.S. tuna canners announced in 1990 that they would no longer purchase tuna caught in association with dolphins. This announcement led to further shifts in the eastern tropical Pacific tuna fishery as more U.S. vessels relocated to the western Pacific. It also prompted Congress to pass the Dolphin Protection Consumer Information Act, which set standards for labeling tuna as being "dolphin-safe."

Although the Marine Mammal Protection Act's tuna embargo provisions appeared to be an effective means of compelling other nations to reduce dolphin mortality, they came under fire as possibly being inconsistent with U.S. obligations under the General Agreement on Tariffs and Trade (GATT). Mexico challenged an embargo of its tuna before a GATT panel in 1990. A second challenge was brought by the European Community and the Netherlands in 1992, claiming that the intermediary nation embargoes were not GATT-consistent. As discussed in previous annual reports, the dispute resolution panels in those cases found the unilaterally imposed U.S. embargo provisions to be inconsistent with the GATT. The panels suggested, however, that such trade sanctions may be permissible if designed to ensure compliance with a multi-lateral agreement. The panels' decisions were never formally adopted by the GATT Council and do not have the force of final decisions.

The Marine Mammal Protection Act's tuna-dolphin provisions were amended further by the International Dolphin Conservation Act of 1992. The amendments were, in part, designed to address GATT concerns and focused on ways to eliminate, rather than merely reduce, incidental dolphin mortality. The amendments established a framework for a global moratorium on the practice of setting on dolphins to catch tuna. Although no fishing nation agreed to the moratorium and, as a result, certain provisions of the Act never became effective, other provisions were not contingent on a moratorium. Changes included (1) revising the quotas applicable to the U.S. fleet, (2) modifying the

U.S. permit to proscribe setting on eastern spinner and coastal spotted dolphins, and (3) prohibiting, as of 1 June 1994, the sale, purchase, transport, or shipment in the United States of any tuna that is not dolphin-safe.

### **The 1992 La Jolla Agreement**

Rather than agreeing to the global moratorium on setting on dolphins called for by the International Dolphin Conservation Act of 1992, the governments of all nations participating in the eastern tropical Pacific tuna fishery opted for a different course. At a special meeting of the Inter-American Tropical Tuna Commission held in 1992 they adopted a resolution to establish a multi-lateral program to reduce incidental dolphin mortality in the eastern tropical Pacific. This non-binding agreement, called the La Jolla Agreement after the site of the meeting, established the International Dolphin Conservation Program under the auspices of the Tuna Commission. The agreement established a goal of reducing dolphin mortality to levels approaching zero and set annual limits on total incidental dolphin mortality as a means of achieving that goal. Under the agreement, dolphin mortality was capped at 19,500 in 1993, 15,500 in 1994, 12,000 in 1995, 9,000 in 1996, 7,500 in 1997, 6,500 in 1998, and less than 5,000 in 1999. Other aspects of the program adopted under the resolution were continuation of the requirement to place observers on board all large purse seiners, with the additional requirement that at least 50 percent of the observers be deployed under the Tuna Commission's observer program; establishment of a panel to monitor compliance by the international fleet with the annual dolphin mortality limits; expansion of existing research and educational programs, including increased efforts to find methods of catching large yellowfin tuna that do not involve encircling dolphins; and establishment of a scientific advisory board to assist the Tuna Commission in coordinating, facilitating, and guiding research directed at reducing dolphin mortality.

The parties subsequently agreed to a system whereby each vessel participating in the fishery would be given an individual dolphin mortality limit. Once that limit was reached, the vessel would have to stop setting on dolphins for the remainder of the year. Under that agreement, any vessel that leaves the

fishery or that does not use any of its quota by 1 June forfeits its quota for the remainder of the year. Unused quotas may be allocated to other vessels for the second half of the year. Any vessel that exceeds its dolphin limit will have the amount of the excess deducted from its quota for the following year.

As discussed in previous annual reports, once a vessel's fate was tied directly to its own performance under the La Jolla Agreement, dolphin mortality declined dramatically. In 1993, the first year under the new international program, dolphin mortality dropped below the level set for 1999. This prompted parties to the agreement to adopt resolutions to reduce the overall dolphin mortality limits for 1994 and 1995 to 9,300. In subsequent years, the mortality caps established under the agreement were not reduced.

Despite the success of the international tuna fleet in reducing incidental dolphin mortality, under the comparability requirements of the Marine Mammal Protection Act imports of yellowfin tuna caught in the eastern tropical Pacific from countries whose vessels continue to set on dolphins have been precluded since 1994. At the 1995 meeting of the Inter-American Tropical Tuna Commission, six parties to the La Jolla Agreement — Colombia, Costa Rica, Ecuador, Mexico, Panama, and Venezuela — issued a joint statement urging the United States to lift the embargoes then in effect. In their view, catching tuna in compliance with the International Dolphin Conservation Program was environmentally sound and should not be the basis for an embargo. They contended that increased use of dolphin-safe fishing methods would harm biodiversity by increasing the discard of juvenile tuna and the bycatch of non-target species other than dolphins. The nations therefore endorsed fishing for tuna by setting on dolphins as the most effective method for protecting the tuna stocks and other resources of the eastern tropical Pacific. The six nations believed that U.S. embargoes of all but dolphin-safe tuna were contrary to international law, lacked a scientific basis, were counterproductive to broader conservation goals, and were incompatible with the United States having signed the La Jolla Agreement. Concerned that the current situation was endangering their continued participation in the program established under the La Jolla Agreement, the tuna-fishing nations called on the United States to

allow importation of tuna caught in association with dolphins and to redefine the term dolphin-safe to include all tuna caught in compliance with the regulatory measures adopted under the La Jolla Agreement.

In response to the possibility that at least some fishing nations would abandon the program established under the La Jolla Agreement, Congress in mid-1995 began to consider whether changes were needed to the Marine Mammal Protection Act's tuna-dolphin provisions, particularly those on the tuna embargoes.

### **The Declaration of Panama**

Concerned that an opportunity to consolidate the gains in dolphin conservation made under the La Jolla Agreement was slipping away, five environmental groups began discussions with representatives of Mexico in September 1995 to explore the possibility of a multi-lateral agreement among tuna-fishing nations to formalize and strengthen the International Dolphin Conservation Program and lift U.S. tuna embargoes. These discussions led to a compromise supported by the tuna-fishing nations, some environmental groups, and the U.S. Administration.

This compromise ultimately formed the basis for the Declaration of Panama, an agreement signed by representatives of 12 nations on 4 October 1995. Signatories to the declaration included Belize, Colombia, Costa Rica, Ecuador, France, Honduras, Mexico, Panama, Spain, the United States, Vanuatu, and Venezuela. These nations reaffirmed their commitment to reducing dolphin mortality in the eastern tropical Pacific tuna fishery to levels approaching zero through the setting of annual mortality limits, with the goal of eliminating dolphin mortality by seeking a means of capturing large yellowfin tuna not in association with dolphins. Moreover, the nations declared their intention, contingent on the enactment of changes in U.S. law, to formalize by 31 January 1996 the La Jolla Agreement as a binding Inter-American Tropical Tuna Commission resolution or other binding legal instrument. The envisioned changes to U.S. law included (1) lifting the primary and secondary embargoes for tuna caught in compliance with the La Jolla Agreement, as it would be modified under the Declaration of Panama, (2) allowing access to the U.S. market for all tuna, whether dolphin-safe or not,

caught in compliance with the agreement by nations that are members of the Inter-American Tropical Tuna Commission or that have initiated steps to become members, and (3) redefining the term dolphin-safe to include any tuna caught in the eastern tropical Pacific by a purse seine vessel in a set in which no dolphin mortality was observed.

The signatories to the Declaration of Panama specified several provisions that would be included in the binding international instrument once the requisite changes to U.S. law had been enacted. These included commitments to (1) adopt conservation and management measures that ensure the long-term sustainability of tuna stocks and other living marine resources in the eastern tropical Pacific, (2) assess the catch and bycatch of juvenile yellowfin tuna and other living marine resources of the eastern tropical Pacific and adopt measures to reduce or eliminate such bycatch, (3) implement the international agreement through enactment of domestic legislation and/or adoption of regulations, (4) enhance existing mechanisms for reviewing compliance with the international program, (5) establish annual stock-specific quotas on dolphin mortality based on minimum population estimates, (6) limit overall dolphin mortality to no more than 5,000 per year, (7) establish a system that provides incentives to vessel captains to continue to reduce dolphin mortality, and (8) establish or strengthen national scientific advisory committees to advise their respective governments on research needs.

As provided for in the Declaration of Panama, until the year 2001, an annual quota for each stock would be set at between 0.1 and 0.2 percent of the minimum population estimate for the stock. Beginning in the year 2001, the annual per-stock quota would be set at 0.1 percent of the stock's minimum population estimate. If the annual quota for any stock were exceeded, all sets on that stock and any mixed schools containing individuals from that stock would cease for the remainder of the year. In addition, should the annual mortality for the eastern spinner or the northeastern offshore spotted dolphin exceed 0.1 percent of the minimum population estimate, the governments would conduct a scientific review to consider whether further action to reduce mortality was needed.

## **The International Dolphin Conservation Program Act**

Efforts to amend U.S. law as called for by the Declaration of Panama culminated in enactment of the International Dolphin Conservation Program Act on 15 August 1997. The new law made several changes to the U.S. tuna-dolphin program. Amendments to section 304 of the Marine Mammal Protection Act direct the Secretary of Commerce, in consultation with the Marine Mammal Commission and the Inter-American Tropical Tuna Commission, to conduct a study of the effects of chase and encirclement on dolphins and dolphin stocks taken in the course of purse seine fishing for yellowfin tuna in the eastern tropical Pacific. The amendments direct that the study commence on 1 October 1997 and consist of abundance surveys and stress studies designed to determine whether chase and encirclement are having a "significant adverse impact on any depleted dolphin stock in the eastern tropical Pacific Ocean." Specifically, the amendments require the National Marine Fisheries Service to survey the abundance of depleted dolphin stocks (northeastern offshore spotted dolphins and eastern spinner dolphins) during calendar years 1998, 1999, and 2000. The stress studies are to include (1) a review of relevant stress-related research and a three-year series of necropsy samples from dolphins obtained by commercial vessels, (2) a one-year review of relevant historical demographic and biological data related to dolphins and dolphin stocks, and (3) an experiment involving the repeated chasing and capturing of dolphins by means of intentional encirclement.

The Service is to make an initial finding in March 1999, based on the preliminary results of the research program and any other relevant information, as to whether the intentional encirclement of dolphins is having a significant adverse effect on any depleted dolphin stock. A final finding is to be made between 1 July 2001 and 31 December 2002 and a report of that finding submitted to Congress. Unless the Service determines that chase and encirclement are having a significant adverse effect on a depleted dolphin stock, the definition of dolphin-safe tuna will be changed to include all tuna harvested in sets in which no dolphin mortality was observed.

The amendments authorize the following appropriations to carry out the research program: \$4 million in fiscal year 1998, \$3 million in fiscal year 1999, \$4 million in fiscal year 2000, and \$1 million in fiscal year 2001. An additional \$3 million is authorized for each of these four fiscal years to carry out research related to the eastern tropical Pacific tuna fishery. Presumably, such appropriations could be used for the abundance surveys and stress studies or to conduct other research to further the goals of the International Dolphin Conservation Program, as discussed below.

Before the amendments take effect, two things must occur — (1) the Secretary of State must certify that a binding resolution of the Inter-American Tropical Tuna Commission (or some other legally binding international instrument) establishing the International Dolphin Conservation Program has been adopted and is in force and (2) the Secretary of Commerce must certify that sufficient funding is available to complete the first year of the abundance surveys and the stress studies and that the studies have begun.

The amendments also direct the National Marine Fisheries Service to engage in other research to further the goals of the International Dolphin Conservation Program. The Service, in consultation with the Marine Mammal Commission and with the cooperation of the nations participating in the International Dolphin Conservation Program and the Inter-American Tropical Tuna Commission, is to conduct such research, which may include projects to (1) devise cost-effective fishing methods and gear designed to reduce or eliminate incidental mortality and serious injury of dolphins; (2) develop cost-effective methods for catching mature yellowfin tuna that do not require setting on dolphins; (3) carry out assessments of dolphin stocks taken in the eastern tropical Pacific tuna fishery; and (4) determine the extent to which the incidental taking of non-target species, including juvenile tuna, occurs in the eastern tropical Pacific tuna fishery and assess the impact of such taking.

Although it will remain subject to the dolphin-safe labeling requirements, all tuna caught in the eastern tropical Pacific after the effective date of the amendments may be imported into the United States, provided it was caught in accordance with the requirements of the International Dolphin Conservation Program.

The amendments further require that the total dolphin mortality limits and the per-stock limits for nations importing tuna to the United States progressively decline from 1997 levels. Once the amendments become effective, the zero quota and stock-specific restrictions that have prevented U.S. fishermen from setting on dolphins will be lifted. They will be able to apply for a permit allowing them to take dolphins in accordance with the provisions of the International Dolphin Conservation Program. Unlike the multi-year, general permits issued to the American Tunaboat Association in the past, individual vessels will be required to obtain annual permits.

As of the end of 1998 most provisions of the International Dolphin Conservation Program Act were not yet in effect. On 27 July 1998 the Director of the National Marine Fisheries Service, on behalf of the Secretary of Commerce, certified that sufficient funding was available to complete the first year of the study on the effects of chase and encirclement on dolphins. However, although the parties to the Declaration of Panama signed the required binding international agreement, the Agreement on the International Dolphin Conservation Program, on 21 May 1998, it does not enter into force until it has been ratified by four parties. At the end of 1998 only the United States and Panama had ratified the agreement.

### **Implementation of the 1997 Amendments**

As noted above, the International Dolphin Conservation Program Act requires the National Marine Fisheries Service to consult with the Marine Mammal Commission regarding implementation of mandated research into the effects of chase and encirclement on dolphins. Other research in furtherance of the goals of the International Dolphin Conservation Program required under the Act is also to be conducted in consultation with the Commission. In addition, the Service is required to consult with the Commission in developing regulations to implement the new provisions governing the taking of marine mammals incidental to the eastern tropical Pacific tuna fishery.

The Commission established the groundwork for these consultations in a 9 September 1997 letter to the National Marine Fisheries Service in which it solicited the Service's ideas on how best to structure the

consultations and requested the Service to provide it with any proposals or draft plans that may have been developed. The Commission also sought information on the Service's plans for undertaking or supporting research to further the goals of the International Dolphin Conservation Program and for promulgating implementing regulations.

As discussed in the Commission's previous annual report, the Service responded by letter of 22 October 1997, summarizing its plans for, and describing progress it had made toward, implementing the amendments. The Service also indicated that it would be drafting regulations to implement the 1997 amendments in stages. Because development of the regulations would be dependent, in part, on the terms of the international agreement then being negotiated by the signatories to the Declaration of Panama, no firm schedule could be provided.

The Commission wrote to the Service on 27 March 1998 seeking additional information on the Service's plans for carrying out the research mandated by the International Dolphin Conservation Program Act. The Commission expressed concern that plans were being made and work proceeding without the required consultation with the Commission. The Commission noted, for example, that a Commission representative had participated in a 17–18 December 1997 meeting to consider the design of the 1998 dolphin abundance survey, but had received no further information on the Service's plans for this project. The Commission had been advised that work was under way on the review of stress-related literature, but had not been provided with terms of reference or consulted on the scope of the review. Similarly, the Commission noted that it had yet to be consulted on two other studies, the necropsy sampling project and the analyses of historical biological and demographic information, that, presumably, were scheduled to begin soon.

The Commission also commented on the proposed schedule for the planned field experiment in which dolphins will be repeatedly chased and captured to assess the immediate and cumulative effects of chase and encirclement. The Service had indicated that the study would be undertaken in calendar year 2000. The Commission agreed with the Service that thorough planning of the project was essential, but ques-

tioned the decision to delay the experiment until the third year of the research program.

On 15 May 1998 the Marine Mammal Commission received a draft research plan from the National Marine Fisheries Service's Southwest Fisheries Science Center covering the various projects being proposed to satisfy the requirements of the International Dolphin Conservation Program Act. The Service requested the Commission's comments before release of the plan to the public.

The Commission provided comments on the draft research plan by letter of 29 May 1998. The Commission noted that preparation of the draft plan was a positive step toward meeting the consultative and other requirements of the Act, but believed that, because most of plans for the proposed research were still being developed, the draft lacked sufficient detail to allow for a meaningful review. The Commission therefore voiced its expectation that, as comprehensive research plans are developed, the Commission would be given an opportunity to review and comment on them before work begins. The Commission believed that, to be reviewable, the plan for a particular research project should provide (1) a statement of its goals or objectives; (2) a description of the methodology to be used (*e.g.*, what will be sampled or measured and how, how many measurements will be made or samples collected, what analyses will be done, etc.); (3) a proposed schedule; (4) the proposed budget; and (5) as needed, an analysis showing the statistical power of the project to meet its objectives.

The Commission stressed the need to complete plans for and to begin certain research projects expeditiously so that the Service could collect sufficient information to make its initial finding in March 1999 as to whether chase and encirclement are having a significant adverse impact on any depleted dolphin stock. The Commission believed that the Service should make a concerted effort to obtain at least preliminary results not only from the dolphin abundance survey, but from the literature review and the necropsy study, in time to factor them into the initial determination. Further in this regard, the Commission expressed concern that, unless the necropsy program were initiated soon, the Service may not be able to collect and analyze a three-year series of

necropsy samples before making the final determination, as required by the 1997 amendments.

One study of particular interest to the Commission was the capture rate estimation study proposed by the Service in its draft research plan. The Commission requested additional information on this study, noting that it may be possible to design a study that would enable the Service to correlate the frequency of encirclement with unobserved dolphin mortality rates. If this could be done, it would provide an important means for supplementing the abundance surveys as a way of detecting possible population level effects of chase and encirclement.

The Commission also noted that the results of the required research are likely to be controversial and advised the Service that it would be useful at the outset to describe (1) what would be considered to be evidence of stress-related effects on the recovery of depleted dolphin stocks and/or (2) what steps, if any, need to be taken to establish generally agreed upon criteria that will be used to decide what would constitute evidence that chase and encirclement of dolphins is or is not impeding recovery of depleted stocks. The Commission also believed that, if the Service were to establish decision-making criteria at the outset, the Commission and other reviewers would be better able to comment on whether the proposed studies were likely to provide adequate information.

The Commission also inquired as to which dolphin stocks would be factored into the Service's findings on the effects of chase and encirclement on depleted stocks. Although the Commission agreed that the Service needed to look at the effects on northeastern offshore spotted dolphins and eastern spinner dolphins, the two stocks designated as depleted under section 115 of the Marine Mammal Protection Act, the Commission questioned whether the effects on coastal spotted dolphins also needed to be considered. This stock, although not formally designated as depleted under section 115 of the Act, was determined to be below its optimum sustainable population level in the last tuna-dolphin permit proceeding, held in 1980. Along with the eastern spinner dolphin, it has been treated in subsequent legislation as though it were depleted.

Other points raised by the Commission included the need for the Service to (1) estimate the magnitude of the changes in dolphin populations that would have had to occur in order to be detected within acceptable levels of statistical confidence by the planned surveys, (2) explain more clearly how planned ecological studies would be factored into determining whether the recovery of depleted dolphin stocks is being impaired by chase and encirclement, and (3) include studies on stress in humans as part of the review of stress-related literature.

The National Marine Fisheries Service responded by letter of 5 August 1998. The Service indicated that planning and implementing the various research projects was an ongoing effort and pledged to keep the Commission apprised of and involved in the process. The Service agreed that developing decision-making criteria for the March 1999 finding was desirable and noted that, because the initial determination would depend primarily on the results of the 1998 abundance survey, it was focusing on developing criteria related to these data. The Service recognized that the criteria would necessarily be based both on science and on policy. As a first step, the survey data would be compared statistically with expected results to identify any difference that may be attributable to chase and encirclement. The second step would be to determine whether any such difference is significant.

The Service characterized the necropsy sampling program as "a complicated endeavor" requiring extensive cooperation with other governments and with non-U.S. fishing vessels. Despite efforts to arrange for the placement of technicians on those vessels to collect materials, the Service did not believe that sampling would begin during fiscal year 1998. This being the case, the Service indicated its intent to increase sampling effort during subsequent years and to extend the program beyond fiscal year 2000. The Service also indicated that it was developing a comprehensive research plan for the necropsy study that would describe the research objectives, necropsy procedures, sampling and analytical design, and processing protocols.

With respect to the literature review, the Service stated that its primary utility would be to provide a context for the findings of other research projects by

describing what is known about physiological and behavioral stress and relating it to the chase and encirclement of dolphins. It was not expected that the results of the review would factor directly into making the initial finding on the effects of chase and encirclement. The Service also indicated that, although some relevant literature on humans would be included in the review, its focus was on investigations of marine mammals and non-human terrestrial mammals.

The Service noted that it intended to concentrate its efforts on determining the effects of chase and encirclement on northeastern offshore spotted dolphins and eastern spinner dolphins, the two stocks most frequently set on by tuna vessels. Nevertheless, the planned abundance surveys would provide some data on the abundance of coastal stocks, such as the coastal spotted dolphin. The Service did not, however, specifically address the question of whether it believed the coastal spotted dolphin to be depleted or whether this stock would factor into the initial finding on the effects of chase and encirclement.

The Service responded to the Commission noting that the ecological studies should contribute significantly to resolving what may be causing a lack of recovery of depleted dolphin stocks if the abundance surveys indicate that these stocks are not recovering as expected. To the extent that impeded dolphin recovery is not mirrored by changes in the physical environment or by reductions in other organisms, it is more likely that cryptic mortality or reduced productivity related to chase and encirclement is the cause.

The Service's letter also responded to other issues that had been raised by the Commission. The Service provided a summary of its \$3.8 million budget for the dolphin studies for fiscal year 1998. The Service also noted that it was in the process of calculating the power of the surveys to detect changes in dolphin abundance and determining whether existing tagging technology and sampling methodology were such that the proposed capture rate estimation study would be worth pursuing. The Service indicated that it would keep the Commission informed as to the progress of these and other activities.

The Service wrote again on 27 August 1998, advising the Commission that it was planning to

contract for the development of a framework for determining whether chase and encirclement in the purse seine tuna fishery are having a significant adverse impact on eastern tropical Pacific dolphin populations. The Service invited the Commission to comment on the lines of evidence that would be factored into the decision analysis framework.

The Commission sent a follow-up letter on 17 September 1998 providing additional comments on the Service's plans for conducting the research mandated by the International Dolphin Conservation Program Act and commenting on the decision analysis framework. The Commission noted that the Service's 5 August letter had been helpful in clarifying aspects of the proposed research, but that additional description and explanation were needed for some projects.

The Commission reiterated the importance of establishing at the outset of the research program the criteria that will be used to determine if chase and encirclement of dolphins are having significant adverse effects on any depleted dolphin stock. Toward this end, the Commission expressed support for the Service's decision to contract for the development of statistically based decision-making criteria. The Commission stressed the need for the Service to adopt such criteria before the 1998 abundance survey was completed so as to avoid potential claims that selection of the criteria was influenced by the survey results.

Noting its earlier comments on the need to begin the necropsy sampling as soon as possible, the Commission expressed concern that more than three months had passed and, not only had the sampling not begun, but the necessary agreements with the fishing nations to place technicians on board fishing vessels had yet to be concluded. The Commission noted the difficulty that the Service had had in obtaining permits from some of the tuna-fishing nations to conduct dolphin surveys in their waters and questioned whether necropsy sampling had also been delayed by a lack of cooperation of those nations with the Service's research efforts. The Commission speculated that some nations may be operating on the misguided belief that deferring the research is somehow to their advantage (*i.e.*, that the labeling requirements for dolphin-safe tuna will automatically change in March

1999 absent information indicating that chase and encirclement adversely affect dolphins).

In the Commission's view, the 1997 amendments are premised on the National Marine Fisheries Service developing a sufficient information base to enable it to make the required findings by carrying out the full research program on schedule. The Commission therefore recommended that a senior official within the Department of Commerce contact officials in Mexico and other nations whose vessels purse seine for tuna in the eastern tropical Pacific to inform them that failure to cooperate with U.S. researchers and technicians in a timely manner will be viewed as a sign of bad faith and may result in the Secretary declining to make a finding under the Dolphin Protection Consumer Information Act or deferring the effective date of any change in the definition of dolphin-safe tuna.

The 17 September letter also reiterated the need for the Service to clarify whether coastal spotted dolphins would be factored into the findings on the effects of chase and encirclement on depleted stocks. The Commission explained that the Service will be vulnerable to challenge unless it either articulates sufficient justification for determining that the coastal spotted dolphin is not depleted or collects adequate information for determining whether chase and encirclement are having a significant adverse effect on this stock. The Commission therefore again asked the Service provide its views on the current status of this stock.

The Commission also provided additional comments on the review of stress-related literature being prepared by the Service. Noting that the Service seemed to believe that the literature review would be useful primarily for planning the experiment involving the repeated chase and capture of dolphins, the Commission indicated that, by comparing how other taxa respond to similar stimuli, the review could also be used to infer possible stress-related impacts of chase and encirclement on dolphins. The Commission therefore recommended that the Service give further consideration to the possible ways in which the results of the literature review might be used in making the initial finding. The Commission also commented that more relevant studies probably have been done to investigate the effects of physiological and psychologi-

cal stress in humans than in other animals and again recommended that the review include all potentially relevant literature on stress in humans.

The National Marine Fisheries Service convened a meeting on 16–17 December 1998 in La Jolla, California, to review its progress in planning and conducting the research required under the International Dolphin Conservation Program Act and to seek views concerning the decision-making rules and criteria that would be used to make the initial finding on the effects of chase and encirclement in March 1999. Representatives of the Commission attended the meeting. Although the Service had hoped to satisfy, in part, the consultative requirements of the Act through the Commission's attendance, the representatives explained at the outset of the meeting that, because the Marine Mammal Protection Act requires the Commission to consult with its Committee of Scientific Advisors in formulating its recommendations, this was not possible.

The Service's scientists provided the meeting participants with an overview of each element of its dolphin research program. They noted that the first abundance survey had just been completed and that preliminary results would be available in mid-January 1999. They also noted that the Service, at least preliminarily, had decided to treat the coastal spotted dolphin as a depleted stock for purposes of making the initial finding. They noted, however, that this may present problems because the surveys conducted in the late 1980s and early 1990s had not provided abundance estimates for this stock. Thus, there was no baseline against which to compare the 1998 estimate.

The Commission representatives suggested that it might be possible to avoid this problem by looking qualitatively at the information regarding the frequency with which coastal stocks are chased and encircled. It may be that sets on these stocks are so infrequent that the Service might be able to conclude that, even if those dolphins that are chased and encircled are adversely affected, these effects are unlikely to be significant at the population level.

The Service noted that the review of stress-related literature was nearly complete and would be provided shortly to the Commission and others for review. As

for the necropsy study, the Service stated that it had reached agreement with Mexico for the placement of technicians to collect samples. The Service plans to train 10 observers from the Mexican and international observer program to serve as technicians. The Service indicated that a protocol for the necropsy study had yet to be completed, but work was under way on designing a pilot study to assess the feasibility of undertaking the full study envisioned by Congress.

The focus of the meeting was on the framework being developed for making the initial finding in March 1999. In general terms, the decision analysis represents an attempt to define what would constitute a significant adverse impact by quantifying the risk that chase and encirclement may prevent or retard recovery of a depleted dolphin stock.

At the end of 1998 the Commission was drafting a letter to the Service commenting on several issues raised at the La Jolla meeting. The Commission anticipates that it will recommend a process for consulting on the Service's proposed decision-making criteria, recommend that the decision-making criteria be published as a regulation or agency policy statement before March 1999, review the legislative intent as to what would constitute a significant adverse impact on a dolphin stock, and recommend that the National Marine Fisheries Service advise Congress of the status of its research program and what results will be available on which to base the March 1999 initial finding on the effect of chase and encirclement.

As noted above, the International Dolphin Conservation Program Act does not take effect until a binding international agreement to formalize the provisions of the Declaration of Panama is in place. The text of the required agreement was concluded at a negotiating session held in La Jolla, California, on 2-6 February 1998. Appended to the agreement are 10 annexes that, among other things, set forth (1) observer requirements, (2) the methodology for establishing annual stock-specific dolphin mortality limits, (3) procedures for allocating dolphin mortality limits, (4) operational requirements for vessels participating in the International Dolphin Conservation Program, and (5) the elements of an international program for tracking the origin of tuna caught in the eastern tropical Pacific.

The Agreement on the International Dolphin Conservation Program was signed by the United States, Colombia, Costa Rica, Ecuador, Mexico, Nicaragua, Panama, and Venezuela on 21 May 1998. The Agreement remains open to signature by 10 other countries and the European Union. As of the end of 1998, two additional countries, Honduras and Vanuatu, had signed the Agreement. The Agreement will enter into force once it has been ratified by four parties. As of the end of 1998, only the United States and Panama had deposited instruments of ratification.

### **Pinniped-Fisheries Interactions**

The 1994 amendments to the Marine Mammal Protection Act added a new section (section 120) to address interactions between pinnipeds and fishery resources. Under section 120, states may apply to the Secretary of Commerce for authorization to lethally remove individual pinnipeds known to be affecting certain salmonid stocks without obtaining a waiver of the Act's moratorium on taking, provided certain conditions are met. Section 120(f) directed the Secretary of Commerce to investigate and report to Congress by 1 October 1995 on the extent to which California sea lions and Pacific harbor seals are having a significant negative impact on the recovery of endangered or threatened salmonid fishery stocks or other components of the coastal ecosystems of Washington, Oregon, and California. Under section 120(h), the Secretary also was directed to establish a pinniped-fishery interaction task force to provide advice on possible measures to minimize interactions between pinnipeds and aquaculture operations in the Gulf of Maine.

A summary of past events and a discussion of actions taken by the Commission and others during 1998 on these provisions are provided below.

#### **Authorizations to Remove Pinnipeds**

As noted above, section 120 of the Marine Mammal Protection Act allows states to request authority to lethally take individually identifiable pinnipeds that "are having a significant negative impact on the decline or recovery" of certain salmonid stocks. To

date, only the state of Washington has requested authority to remove pinnipeds under this provision. Oregon is also monitoring an interaction problem, but is trying to address it using non-lethal means.

**Ballard Locks** — The number of winter-run steelhead salmon returning through the Chittenden, or Ballard, Locks in Seattle to spawn in streams emptying into Lake Washington declined from nearly 3,000 in the early 1980s to fewer than 100 in 1994. During that time, there was a substantial increase in the number of California sea lions congregating near the locks and preying on steelhead. Efforts by the State of Washington and the National Marine Fisheries Service to reduce sea lion predation (*e.g.*, capturing and moving sea lions to distant sites and using acoustic harassment devices) were largely unsuccessful.

Pursuant to section 120 of the Marine Mammal Protection Act, in 1994 the Washington Department of Fish and Wildlife sought authority from the Service to lethally take individually identifiable California sea lions preying upon winter-run steelhead migrating through the Ballard Locks. The state also asked that a pinniped-fishery interaction task force be established as required under section 120(c).

The Ballard Locks Pinniped-Fishery Interaction Task Force was established in September 1994 and on 22 November 1994 it forwarded its recommendations to the Service. As discussed in previous annual reports, it recommended, among other things, that sea lions preying on steelhead in the vicinity of the Ballard Locks be removed, preferably by non-lethal means. It also recommended that lethal removal be authorized if facilities were not available to hold depredating sea lions and if predation exceeded 10 percent of the returning steelhead in any consecutive seven-day period.

Based on the task force recommendations and comments received from the Marine Mammal Commission and others, the Service on 4 January 1995 authorized the Washington Department of Fish and Wildlife to lethally remove individual California sea lions observed preying on winter-run steelhead migrating through the Lake Washington ship canal in the vicinity of the locks.

The authorization, valid until 30 June 1997, also specified that the state must submit a report on its authorized activities by 1 September each year. The Washington Department of Fish and Wildlife submitted its first report to the National Marine Fisheries Service on 31 August 1995 describing actions taken during the 1994–1995 winter steelhead run. The report noted that no sea lions were killed during the run; however, three animals seen eating steelhead were captured, held in captivity until the end of the run, and then transported to the Strait of Juan de Fuca and released. One of the captured sea lions was held for more than four months before being released.

The Ballard Locks Pinniped-Fishery Interaction Task Force met to review the state's 1995 report and concluded that its 1994 assessment of the situation remained valid (*i.e.*, that "Lake Washington wild steelhead are near extinction for a number of reasons, one of which is their vulnerability to predation by sea lions at the Ballard Locks").

To avoid a "significant negative impact" on the steelhead population, the task force recommended that any individually identifiable sea lion observed killing salmon or steelhead in 1995 or previous years should be removed at the earliest opportunity if resighted in the Puget Sound area between Everett and Shilshole Bay. The task force recommended that such animals be permanently removed, either to captivity or by lethal means. The task force further recommended that animals observed preying upon steelhead for the first time after 1 October 1995 should be taken into captivity for the remainder of the run or be lethally removed if funding for captive maintenance were not available. The task force recommended that animals seen merely foraging in the area on three or more days should be removed to captivity but not killed.

Subsequently, the Service revised its letter of authorization to the Washington Department of Fish and Wildlife to redefine the term "predatory" as applied to sea lions, thus eliminating the predation rate "trigger" that had been included in the original letter of authorization. Under the new definition, a predatory sea lion is one that (1) is an identified animal bearing a brand, tag, or distinguishable natural mark; (2) has been observed by biologists preying on returning steelhead in the inner bay area of the Lake

Washington Ship Canal; (3) has penetrated the acoustic barrier and has been seen foraging in the ensonified zone during the steelhead run after 1 January 1994; and (4) was or is observed foraging in the inner bay area during the steelhead run between 1 January and 31 May 1996. The revisions also removed the requirement for captive holding of predatory sea lions.

No sea lions were lethally removed from the Ballard Locks area during the 1996 winter steelhead run; however, three animals thought to be the primary cause of the predation were captured and removed to permanent captivity at Sea World in Orlando, Florida.

The Ballard Locks task force next met in September 1996 to review information on the 1996 winter steelhead run and evaluate the effectiveness of permitted intentional lethal taking of individually identified sea lions. The task force concluded that, although no lethal takes had occurred, because of the long-term nature of fish stock recovery, it saw no reason to change its previous recommendations. The task force recommended, among other things, that, if requested, the Service should extend the authorization to the Washington Department of Fish and Wildlife to lethally take sea lions at the Ballard Locks. Further, the task force concluded that it saw little need for further deliberation until substantive new information and analyses are available.

As noted above, the State of Washington's authorization for lethal removal of sea lions at the Ballard Locks was to expire on 30 June 1997. By *Federal Register* notice of 19 June 1997 the National Marine Fisheries Service solicited comments on a request by the state to extend the authorization to 30 June 2005. An eight-year extension was sought to encompass two complete steelhead life cycles, thus giving the state time to determine whether efforts to promote recovery of the steelhead population had been successful.

In its notice, the Service stated that (1) no sea lions had been removed, either temporarily or permanently, from the Ballard Locks area during the authorized period (1 January to 30 May) in 1997; (2) it proposed to extend the state's letter of authorization for a period of four to eight years; and (3) pending a final decision on an extension, it had issued an interim extension of the current authorization through 30 September 1997.

On 29 September 1997 the Service announced in the *Federal Register* that, based on recommendations by a majority of the Ballard Locks task force, it was extending the State of Washington's letter of authorization for the lethal removal of sea lions for four years, until 30 June 2001. No other changes were made to the terms and conditions of the authorization.

During 1998 no incidents involving sea lion predation on steelhead were observed in the Ballard Locks area although one untagged animal was seen foraging on coho salmon. Steelhead salmon escapement has increased from 70 in 1994, to 126 in 1995, 234 in 1996, 620 in 1997, and 584 in 1998. This last number is significant because the run is the progeny of the 1994 year class. Pending new developments, the Ballard Locks task force has been suspended, and no further action is planned. The National Marine Fisheries Service continues to monitor the situation.

**Willamette River** — In recent years, California sea lions have been observed in the lower Willamette River in Oregon during the winter/spring months coinciding with the migration of chinook and steelhead salmon. In addition, observers from the Oregon Department of Fish and Wildlife have documented sea lions foraging on salmon near fishway entrances at Willamette Falls during the peak salmon runs. During this period, the river's spring chinook and winter steelhead populations — the only native salmonid populations above the falls — have declined, raising concern about the potential effects of sea lion predation on those stocks.

By *Federal Register* notice of 13 March 1997 the National Marine Fisheries Service requested comments on a draft environmental assessment concerning interactions between California sea lions and salmon at the Willamette Falls fish passage facility. The draft assessment addressed the potential consequences of a proposal by the Service and the Oregon Department of Fish and Wildlife for the non-lethal removal of sea lions at the Willamette Falls site. The joint proposal also included plans for a monitoring program to document the extent of predation and efforts to identify additional sea lion deterrence measures.

On 2 January 1998 the Service published a notice in the *Federal Register* announcing the availability of

an environmental assessment and finding of no significant impact on its proposal to take non-lethal measures to prevent sea lion predation on salmonid stocks at Willamette Falls. During 1998 the Service and the Oregon Department of Fish and Wildlife continued a joint monitoring program to document sea lion predation at the site. Installation of a barrier at an area referred to as the "cul-de-sac," previously the site of sea lion predation, appears to have alleviated the problem in that area. Subsequently, sea lions have been observed foraging for salmon in an area of the falls that is difficult to monitor and inaccessible for purposes of capture or harassment. It appears, however, that only one or two sea lions are present in the area at any one time, and three to five individuals are involved in the foraging behavior. Efforts to capture individual animals using a trap similar to one used at the Ballard Locks have not been successful.

### **Investigation of Possible Pinniped Impacts on Endangered West Coast Salmonid Stocks**

As noted above, section 120(f) of the Marine Mammal Protection Act directed the Secretary of Commerce to investigate whether California sea lions and Pacific harbor seals are having significant negative impacts on the recovery of salmonid stocks that are either listed or are candidates for listing under the Endangered Species Act. In addition, the Secretary is to determine whether these pinnipeds are having broad or adverse impacts on the coastal ecosystems of Washington, Oregon, and California. A report on the results of the investigation was to be completed by 1 October 1995.

As a first step, the Service constituted a working group to compile and evaluate existing information on the status and trends of California sea lions, Pacific harbor seals, and the seven species of salmonids found in Washington, Oregon, and California. Based on the results of the review, the working group prepared a report setting forth its findings and recommendations. The report and discussions with the Pacific States Marine Fisheries Commission on behalf of the states of Washington, Oregon, and California formed the basis for the Service's draft report to Congress addressing the impacts of sea lions and harbor seals on salmonids and west coast ecosystems.

A copy of the draft report, along with the working group's report, was forwarded to the Marine Mammal Commission and others for comment on 3 April 1997. Both reports noted that pinniped predation was not a significant cause of the decline of salmonid stocks. However, because of the depressed condition of those stocks and the documented sea lion predation at the Ballard Locks, the working group report concluded that available information clearly demonstrates that the combination of depressed fish stocks and high predator abundance in restricted areas where salmon are concentrated during migrations can result in significant negative impacts on local salmonid populations. Expanding on this conclusion, the draft report stated that there are a number of places in addition to the Ballard Locks where such conflicts exist. The Service therefore proposed to recommend that the Marine Mammal Protection Act be amended to authorize state and federal officials to kill California sea lions and harbor seals seen eating salmonids from stocks listed as endangered or threatened or from other depressed salmon stocks if non-lethal deterrence methods have been determined to be ineffective or impractical.

The Commission, in consultation with its Committee of Scientific Advisors, reviewed the draft report and provided comments to the Service on 9 July 1997. The Commission noted that the Service's draft report did not consider all relevant information and did not reflect the full range of views regarding the killing of pinnipeds to conserve salmon stocks or to reduce interactions with human activities. In addition, the Commission noted that, although it was reasonable to conclude that pinniped predation could be having a significant effect on some depressed salmon stocks, information provided in the working group report and in the draft report to Congress provided no evidence that such predation is actually affecting the recovery of any depressed salmonid stocks, other than the winter run of steelhead salmon that migrates through the Ballard Locks, where high predation appears to be due to a combination of specific factors including fish passage through a restricted area.

The Commission further noted that, although both reports indicated that the declines in west coast salmonid stocks were caused by factors other than pinniped predation (*e.g.*, habitat degradation and overfishing), they did not identify what has been or is

being done to address the causes of the declines. Consequently, it was not possible, except for the problem at the Ballard Locks, to judge the extent to which reduction in pinniped predation might promote recovery of depressed west coast salmonid stocks.

Based on that analysis, the Commission recommended that the report to Congress be expanded to indicate what had been and was being done to address the cause of the depletion (*i.e.*, to stop overfishing and habitat degradation) and the extent to which failure to reduce pinniped predation would prevent or impede recovery of the salmonid stocks of concern. The Commission pointed out that, although pinniped predation may be slowing or preventing recovery, reducing pinniped predation will not result in recovery if overfishing, habitat degradation, or other factors responsible for the decline have not been addressed adequately. Consequently, pinniped predation should be viewed and addressed within the context of a recovery plan designed to address all of the factors preventing or slowing recovery of depleted salmonid stocks. The Commission therefore recommended that the Service request that Congress authorize such steps as may be needed to reduce pinniped predation when (1) the proposed action is part of a comprehensive plan to restore one or more specific salmonid stocks, (2) the plan has been made available for public review and has been approved by the Service, and (3) there is an adequate monitoring program to verify that the management actions are contributing as expected to the recovery of the salmonid stocks.

The Marine Mammal Commission also recommended that the Service either (a) expand its report to explain the rationale for the criteria that would be used to identify problem pinnipeds and decide when non-lethal deterrents are ineffective, or (b) defer its proposal for authorizing fishermen and government officials to kill pinnipeds until it can be shown with greater certainty that pinniped predation cannot be addressed effectively by practical, non-lethal means.

As of the end of 1998 the Service had not yet submitted its report to Congress.

### **Gulf of Maine Task Force on Aquaculture-Pinniped Interactions**

As recognized by the 1994 amendments to the Marine Mammal Protection Act, marine mammals may have adverse effects on aquaculture operations. One area of particular concern is the northeastern United States, where both the salmon aquaculture industry and local populations of harbor seals and gray seals have increased in recent years. Operators of aquaculture facilities in the area have complained that there has been a corresponding increase in pinniped predation on penned fish. In response, Congress added section 120(h) to the Marine Mammal Protection Act. It directed the Secretary of Commerce to establish a task force to examine situations in which "pinnipeds interact in a dangerous or damaging manner with aquaculture resources in the Gulf of Maine." As noted above, the Secretary was directed to report to Congress no later than 30 April 1996 recommending measures to mitigate such interactions.

After consulting the Marine Mammal Commission and others, the National Marine Fisheries Service established a seven-member task force, including representatives of industry, state government, the scientific community, and conservation organizations. After a series of meetings and public hearings in 1995, the task force submitted a report of its findings to the Service on 7 February 1996. The report included recommendations for mitigating predation of pen-raised salmon by pinnipeds in New England.

With regard to the lethal taking of predatory seals, the task force did not endorse culling (*i.e.*, large-scale lethal removal of animals) as a means of reducing potential interactions between seals and aquaculture. There was general agreement among task force members that three criteria must be met to justify the lethal taking of individual seals: (1) the consequences of the depredation must be severe and demonstrable; (2) the lethal measures being considered must have been proven to be an effective means of solving the problem; and (3) no non-lethal alternatives are available. However, the task force did not reach consensus as to whether the current situation met these criteria.

Recommendations in the task force report addressed regulatory, technological, and financial issues relative to pinniped-fishery interactions in the Gulf of Maine. The report noted that in some cases federal and state regulations may be restricting efforts to reduce interactions by stifling the development of innovative approaches. It recommended that the Service and the Maine Department of Marine Resources review regulations and revisit those measures that may be limiting the ability of aquaculture operators to control seal predation by non-lethal means.

With respect to technological mitigation alternatives, the task force recommended that the State of Maine survey pen and predator net designs currently in use and compare salmon loss rates for various designs. It further recommended that the Service and the Maine Department of Marine Resources study new materials and net designs and, as appropriate, develop measures or netting to obscure or camouflage penned fish. The report also called on the Service to undertake research on the effects of acoustic deterrence devices, and to sponsor workshops to review the best available information on such devices and to foster communication between the industry and experts in acoustics and animal behavior.

By *Federal Register* notice of 17 March 1997, the National Marine Fisheries Service announced the availability of a draft report to Congress on pinniped-aquaculture interactions in the Gulf of Maine. The Commission, in consultation with its Committee of Scientific Advisors, reviewed the draft and provided comments to the Service on 21 April 1997. The Commission noted that both the *Federal Register* notice and draft report implied that the Service had concluded that it would be either impossible or impracticable to construct seal-proof aquaculture facilities. The Commission noted that such a conclusion did not appear justified.

The Commission further noted that the 17 March *Federal Register* notice had indicated that the Service was considering recommending that Congress reexamine the Marine Mammal Protection Act's prohibition on intentional lethal taking of pinnipeds so that the Service could authorize intentional lethal methods on a case-by-case basis, including the killing of pinnipeds found inside net-pens. In its letter, the Commission

concluded that such lethal taking would be justified provided that (1) it is in fact impossible or impracticable to construct aquaculture facilities that are seal-proof; (2) the use of high-output acoustic harassment devices have been shown to be ineffective, impractical, or harmful to target or non-target species; and (3) the necessary "taking" authority cannot be obtained through a waiver of the Act's moratorium on taking. The Commission recommended that the report to Congress be expanded to address each of these issues.

On 1 August 1997 the Secretary of Commerce submitted to Congress the Service's report on interactions between pinnipeds and salmon aquaculture resources in the Gulf of Maine. The report concluded, among other things, that (1) the salmon aquaculture industry in the Gulf of Maine should collect data on the extent of the impacts experienced by seal attacks on net-pens; (2) primary responsibility for preventing and mitigating the effects of seal attacks on aquaculture resources should rest with the industry itself; and (3) in the rare event that a seal enters a net-pen, a grower may be placed in an intolerable situation with no legal means of resolution; in such a case, lethal methods may be needed to resolve the situation.

At the Commission's annual meeting in Portland, Maine, on 10–12 November 1998, representatives from the National Marine Fisheries Service and the state of Maine addressed issues related to interactions between harbor seals and aquaculture operations. As noted, the August 1997 report prepared by the Service placed considerable responsibility for alleviating the problem on the aquaculture industry. It was apparent from the discussions in Portland, however, that the industry has taken little initiative to date. Thus, there remains a need to obtain information on the extent of the problem and its impact on aquaculture. To do so, Service officials indicated that they would contract with a consultant who has worked with the industry to compile existing data on the extent of seal predation and measures being used to prevent such predation.

The task force report recommended that growers be authorized to kill seals that enter a net-pen when there are no other means of resolving the problem. It is possible that this recommendation will be addressed during reauthorization of the Marine Mammal Protection Act in 1999.

## Chapter IV

# INTERNATIONAL ASPECTS OF MARINE MAMMAL PROTECTION AND CONSERVATION

Section 108 of the Marine Mammal Protection Act directs the Departments of Commerce, the Interior, and State, in consultation with the Marine Mammal Commission, to take such actions as may be appropriate or necessary to protect and conserve marine mammals under existing international agreements. It also directs them to negotiate additional agreements required to achieve the purposes of the Act. In addition, section 202 of the Act directs that the Marine Mammal Commission recommend to the Secretary of State and other federal officials appropriate policies regarding international arrangements for protecting and conserving marine mammals.

During 1998 the Commission continued efforts to update the compendium of international treaties and agreements bearing on the conservation of marine wildlife. The Commission also continued to devote attention to providing advice on the International Whaling Commission, conservation of marine mammals and marine ecosystems in the Arctic and the Southern Ocean, and regulation of international trade in marine mammals under the Convention on International Trade in Endangered Species of Wild Fauna and Flora. These activities are discussed below.

### The Compendium of Treaties and International Agreements

In 1994 the Marine Mammal Commission published *The Marine Mammal Commission Compendium of Selected Treaties, International Agreements, and Other Relevant Documents on Marine Resources, Wildlife, and the Environment*. The three-volume, 3,500-page *Compendium*, current through 1992, contains the complete texts of more than 400 international agreements, including more than 100 multi-

lateral and 90 bilateral treaties, agreements, accords, and memoranda of understanding. Also included are numerous amendments and protocols to these documents, several non-binding international documents, and a number of significant documents to which the United States is not a party.

The Compendium is divided into two sections comprising multi-lateral and bilateral documents, many of which are available for the first time. Subject areas include Antarctica, environment and natural resources, fisheries, marine mammals, marine pollution, marine science and exploration, and others. The Compendium also contains background information for each document, including primary source citations, the depositary nation or organization, the city in which the document was concluded, the date it was concluded, and, where applicable, the date it entered into force.

In 1998 the Commission published an update to the Compendium, which added documents that were concluded between 1 January 1993 and 31 December 1995, as well as a number of older documents not included in the original Compendium. The revised edition contains more than 25 additional multi-lateral and 50 additional bilateral documents in the above subject areas, many of which are available publicly for the first time. The updated edition was published by the U.S. Government Printing Office and is available from the Superintendent of Documents.

Also in 1998 the Commission began work on a second update, which will include documents concluded between 1 January 1996 and 31 December 1998. The volume is currently in production and is expected to be published by the U.S. Government Printing Office late in 1999.

## International Whaling Commission

The failure of the International Whaling Commission (IWC) to regulate commercial whaling effectively prior to the 1970s allowed many whale stocks to be reduced to levels approaching biological extinction. This was one of the factors that led to passage of the Marine Mammal Protection Act and establishment of the Marine Mammal Commission. Since it was established, the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, has continued to provide advice to the Department of Commerce and the Department of State on measures necessary to restore depleted whale stocks and to ensure that commercial and aboriginal subsistence whaling does not cause any whale stock to be reduced or maintained below its optimum sustainable level. Activities related to the 1998 annual meeting of the IWC are described below.

### Preparations for the 1998 IWC Meeting

Among the principal issues facing the IWC and its Scientific Committee at their 1998 meetings were the following:

- commercial whaling being conducted by Norway without IWC authorization;
- development of a Revised Management Scheme, particularly with respect to surveillance and control measures that are needed before commercial whaling might resume;
- a request by Japan for a catch authorization of 50 North Pacific minke whales to be taken by coastal community-based whalers;
- the future of the IWC;
- development of a new management regime for aboriginal subsistence whaling;
- the continued killing of minke whales by Japan in the Southern Ocean and the North Pacific Ocean for purposes of scientific research;
- comprehensive assessments of stocks of right whales, humpback whales, minke whales, Bryde's whales, and sperm whales;
- the effects of climate change on whale stocks; and
- the relationship between the IWC and other international organizations.

The Undersecretary of Commerce for Oceans and Atmosphere currently serves as the U.S. Commissioner to the IWC. The commissioner has lead responsibility for developing and pursuing U.S. positions on all matters related to the IWC. To assist in formulating policies that are both scientifically sound and supported by the American public, the National Oceanic and Atmospheric Administration holds a series of public/interagency meetings each year to seek the views of government agencies, non-governmental organizations, and members of the public.

Meetings of the public/interagency committee were held on 23 January, 6 March, and 1 May 1998 to review U.S. positions for the 1998 meeting of the IWC. In addition, a meeting of the committee was held on 4 December 1998 to review preparations for the 1999 meeting. A representative of the Marine Mammal Commission attended these meetings as part of the Commission's efforts to work with officials of the National Oceanic and Atmospheric Administration, the Department of State, and the Department of the Interior to develop agreed positions.

**Intersessional Meetings** — Although formal action by the IWC is generally confined to annual meetings, work goes on throughout the year to prepare for those meetings. In 1998 two intersessional meetings took place. Representatives of the United States participated in both meetings.

Commissioners from 17 member nations met in Antigua on 3–5 February 1998 to discuss an Irish proposal concerning the future of the IWC. As discussed below, Ireland introduced an initiative at the 1997 meeting to allow some whaling to resume in coastal areas, while prohibiting whaling in most other areas as a possible way of breaking an impasse that has developed between pro- and anti-whaling nations. Although the commissioners made little progress toward resolving differences over the Irish proposal, they agreed to continue discussing the issue at the IWC's 1998 meeting in Oman.

The IWC's Scientific Committee convened a special meeting in Cape Town, South Africa, on 19–25 March 1998 to prepare a comprehensive assessment of right whales worldwide. Meeting participants noted that right whale populations off Argentina,

Australia, and South Africa are increasing at annual rates of about 7 to 8 percent and now total about 7,000 animals. In contrast, right whale populations in the Northern Hemisphere remain severely depleted. The western North Atlantic population, consisting of about 300 individuals, may have been increasing at about 2.5 percent per year during the 1980s. However, the meeting participants were unable to conclude whether, since that time, the stock has increased, decreased, or remained at the same size.

Less is known about the right whale stocks that occur in the North Pacific. Scientists from Japan presented sighting data from research cruises conducted in the Okhotsk Sea, suggesting that the western North Pacific stock numbers about 900 individuals. However, the confidence interval around that estimate is quite large, and it may be that the size of the population is actually much smaller. Meeting participants recommended that additional surveys be undertaken and urged the Russian Federation to allow researchers to survey waters within 12 nautical miles of its coast. Information on the eastern North Pacific stock of right whales consists of only sporadic sightings of small groups of whales. (See the northern right whale section of Chapter II for further information on this stock.)

Meeting participants made several recommendations concerning research and management needs for right whales. They recommended that comparative studies be undertaken in an effort to determine the factors that may explain the differences in reproductive parameters between Northern and Southern Hemisphere right whales. The participants believed that high priority should be given to the continuation of demographic photoidentification studies and surveys designed to improve knowledge of right whale abundance and trends. They also identified an urgent need for research to identify measures for reducing mortality from ship strikes and fishing gear entanglements and to examine factors such as food limitation and pollution that may be contributing to low fecundity and high mortality rates. Genetic studies to delineate populations more accurately and to determine whether low genetic diversity is retarding recovery in some populations were also recommended.

With specific reference to the western North Atlantic stock, meeting participants expressed the view that any human-related mortality will be detrimental to the long-term survival of the population. They therefore concluded that, if the chances of this stock recovering are to be maximized, efforts to reduce human-induced mortality are urgently needed.

### **The 1998 Meetings of the IWC and Its Scientific Committee**

The 50th annual meeting of the IWC was held in Oman on 16–20 May 1998. The IWC's Scientific Committee met in Oman before the annual meeting. The principal issues considered are described below.

**The Moratorium on Commercial Whaling** — In 1982 the IWC adopted a moratorium on commercial whaling that entered into effect during the 1985 pelagic and 1986 coastal whaling seasons. Although several nations filed formal objections to the moratorium, only Norway and Russia continue to maintain their objections. Under the International Convention for the Regulation of Whaling, nations that file objections within a specified period after a measure is approved are not obligated to comply with the measure. As discussed below, the IWC is developing a Revised Management Scheme, which if adopted would provide a framework for lifting the moratorium.

As it has each year for the past decade, Japan submitted a proposal to the IWC requesting a quota of 50 minke whales for its small-type coastal whaling communities. Japan believes that whaling at this level would have no adverse impact on the stock and is needed to alleviate economic distress in these communities resulting from the moratorium on commercial whaling. Opponents point to the commercial aspects of the proposal and contend that the integrity of the moratorium should be sustained unless and until the Revised Management Scheme is adopted and the moratorium lifted. As with similar proposals put forth by Japan at past IWC meetings, the 1998 request for a minke whale quota was not adopted.

As noted in past reports, Norway resumed commercial whaling for minke whales in the eastern North Atlantic in 1993 under its objection to the whaling

moratorium. The quota adopted unilaterally by Norway for 1998 was 671 minke whales. Of these 624 were taken. In November 1998 Norway established a quota for 1999 of 753 minke whales, which included 140 unharvested whales carried over from previous years. As it has at the previous three meetings, the IWC adopted a resolution at the 1998 meeting calling on Norway to refrain from further whaling unless authorized by the IWC.

**The Revised Management Scheme** — Prior to adoption of the moratorium on commercial whaling, excessive catch quotas authorized by the IWC contributed to the overexploitation and depletion of whale stocks. At its 1986 meeting the IWC asked its Scientific Committee to develop a scientifically based method for determining commercial whaling catch quotas that would have a low probability of adversely affecting harvested whale stocks.

The committee subsequently did so, and the recommended revised management procedure was accepted in principle at the 1994 IWC meeting as part of a Revised Management Scheme to regulate commercial whaling. Determining catch limits with a low probability of adversely affecting exploited stocks, however, is only a part of an effective management program. Work is ongoing to develop other essential management components, including mechanisms for compliance monitoring and enforcement and requirements for conducting whale surveys and data analyses.

Before the 1998 IWC meeting, the Working Group on the Revised Management Scheme held a one-day meeting to discuss issues related to possible observer and inspection requirements. Some countries believe that DNA testing of whale meat and maintaining records of landings and transshipments are integral parts of an adequate monitoring and enforcement program. Other members argue that such matters relate to trade and are outside the competence of the IWC. Working group participants also discussed whether international observers are needed on all vessels engaged in whaling operations, but they did not reach a consensus. There were also divergent views as to whether the costs of an international observer program should be borne by the IWC or by the countries engaging in whaling.

The IWC at its meeting adopted one resolution pertaining to the Revised Management Scheme. The United States and nine other members proposed that catch limits established under the revised management procedure be reduced to account for other human-induced mortalities, such as those resulting from entanglement in fishing gear or ship strikes. This measure was adopted by a vote of 21 to 10.

**The Future of the IWC** — At the 1997 IWC meeting Ireland expressed the view that, unless progress was made to complete the Revised Management Scheme, there was a risk that the IWC could break up, with the result being that commercial whaling would take place outside its control. Noting that the revised management procedure had been adopted and that work was proceeding on the inspection and control schemes, Ireland offered a proposal to break the impasse that has developed between those nations that support a resumption of commercial whaling and those that oppose it. Under the Irish proposal, the IWC would complete and adopt the Revised Management Scheme and issue quotas for certain coastal whaling activities, such as those conducted by Norway and proposed by Japan. All other waters would be declared a global whale sanctuary. Products from the authorized whaling could be used only for local consumption, with no international trade allowed. In addition, lethal scientific research whaling would be phased out.

Discussions of the Irish proposal continued at the 1998 meeting, but with little progress. Although reaching consensus on this compromise measure is proving very difficult, several delegations expressed interest in continuing discussions and keeping this item on the agenda for the next IWC meeting.

**Aboriginal Subsistence Whaling** — The IWC Schedule of Regulations includes catch limits for aboriginal subsistence whaling. At its 1997 meeting the IWC adopted new quotas for subsistence whaling by Natives in the United States, Russia, and Greenland. Subsistence taking by U.S. and Russian Natives under these quotas is discussed in the sections on bowhead whales and gray whales in Chapter II.

The IWC took no action at its 1998 meeting to revise any of the existing catch limits for aboriginal

subsistence whaling. The IWC did, however, take note of the results of an assessment by the Scientific Committee that indicated that the stock of bowhead whales hunted by Alaska Natives is near its maximum sustainable yield level and would probably continue to increase even if catch levels were increased to 108 whales per year.

The Scientific Committee also reported on efforts, begun in 1995, to develop a new aboriginal subsistence whaling management scheme. Although there was general agreement that it was preferable to use a single algorithm for setting catch limits, given the diversity of situations, it was unlikely that a single, generic process could be developed. The Scientific Committee is expected to continue its work on the subsistence whaling scheme and report on its progress at the IWC's 1999 meeting.

As discussed in the bowhead whale section of Chapter II, the government of Canada, as it had in previous years, authorized the take of bowhead whales from two stocks, including the highly endangered Davis Strait/Hudson Bay stock(s). This prompted the IWC to adopt a resolution at its 1998 meeting calling on Canada to refrain from issuing licenses for whaling not conducted in accordance with the International Convention for the Regulation of Whaling and inviting Canada to rejoin the IWC. A similar resolution was adopted at the 1997 meeting.

**Research Whaling** — The International Convention for the Regulation of Whaling allows member nations to issue permits to its citizens to kill whales for scientific research purposes, provided that research plans are submitted to the IWC's Scientific Committee for review and comment before the permits are issued. Since 1988 Japan has issued permits for research whaling. The value of this research has been much debated, and the IWC has adopted a series of non-binding resolutions calling on Japan to refrain from issuing permits authorizing lethal research.

During its 1998 meeting the IWC again considered Japan's proposals to continue two research programs involving the killing of whales. One involves the catch of up to 440 minke whales in the Southern Hemisphere and the other involves the catch of 100 minke whales in the western North Pacific. As in

past years, the IWC adopted a resolution noting that the proposed research does not address critically important research needs and calling on Japan to refrain from issuing permits authorizing the lethal research. The resolution also directed the Scientific Committee to continue to identify non-lethal alternatives for meeting Japan's research objectives. The IWC also expressed concern that whale meat resulting from Japan's research program was being sold in commercial markets despite the moratorium on commercial whaling.

**Assessments of Whale Stocks** — As part of the comprehensive assessment of whale stocks called for under the moratorium on commercial whaling, the IWC's Scientific Committee has for the past several years focused attention on assessing the status of various stocks. As discussed above, the Scientific Committee conducted a comprehensive assessment of right whales in 1998. The Scientific Committee also took actions during 1998 with respect to assessing the stocks of humpback whales, minke whales, Bryde's whales, and sperm whales.

Before the IWC's 1999 annual meeting the Scientific Committee plans to focus its efforts on reviewing (1) Japanese research data on Southern Hemisphere minke whales, (2) abundance estimates for Southern Hemisphere blue whales and methods used to differentiate blue whale subspecies, (3) recent population trends of the western North Atlantic stock of right whales, and (4) intersessional work on a preliminary assessment of Southern Hemisphere humpback whales.

**Environmental Effects** — For more than a decade, the IWC has expressed concern about the potential effects of habitat degradation on whales. At its 1992 meeting the IWC asked its Scientific Committee to consider the impact of environmental changes on whale stocks on a regular basis. Since then, the IWC has sponsored workshops to examine the effects of chemical pollution and climate change on cetaceans.

At its meeting in Oman, the IWC adopted a further resolution directing the Scientific Committee to give high priority to implementing research planned to investigate climate/environmental change, ozone depletion and UV-B radiation, chemical pollution,

impacts of noise, physical and biological habitat degradation, effects of fisheries, Arctic issues, and disease and mortality events. The IWC also resolved to establish "environmental concerns" as a regular agenda item at its meetings under which the Scientific Committee would report annually on its progress in non-lethal research in this area. It is expected that a proposal to establish an environmental research fund will be considered by the IWC at its 1999 meeting.

**Small Cetaceans** — An ongoing debate within the IWC is whether the International Convention for the Regulation of Whaling confers jurisdiction over small cetaceans as well as large whales. Although this issue has never been resolved, the parties have been willing to take limited actions concerning small cetaceans. At its 1998 meeting the Scientific Committee conducted a review of small cetaceans in the Indian Ocean and Red Sea, with special reference to the Middle East. The Scientific Committee intends to focus on reviewing the status of freshwater cetaceans at its 1999 meeting and thereafter to examine the status of small cetaceans in the Caribbean region.

At its 1998 meeting the IWC adopted one resolution dealing with small cetaceans. That resolution expressed concern that some directed takes of beluga whales might not be sustainable. Of particular concern was the harvest of beluga whales from the west Greenland population. The IWC encouraged the Scientific Committee to review the status of beluga whales and narwhals at the 1999 meeting.

**Southern Ocean Sanctuary** — In 1994 the IWC established a whale sanctuary in the Southern Ocean. As discussed in previous annual reports, Japan filed an objection to this provision and continues to conduct scientific whaling in sanctuary waters. As in past years, Japan questioned the legal and scientific basis for the sanctuary at the IWC's 1998 meeting.

The IWC as a whole, however, adopted a resolution reiterating its commitment to the sanctuary. The resolution affirms the objectives of the sanctuary as providing for the recovery of whale stocks, allowing an assessment of the effects of the moratorium on commercial whaling, and enabling research on the effects of environmental change to be undertaken. The IWC's Scientific Committee is working with

other international organizations to develop a major cooperative research program in the Southern Ocean sanctuary during 2000 and 2001.

**Humane Killing Methods** — For many years, the IWC has sought to develop improved methods for killing whales, with the goal that death should be as quick and painless as possible. It was agreed that a workshop of specialists would be convened in 1999 to examine these issues. There was, however, considerable disagreement over whether the workshop should reference humaneness or simply refer to killing methods. In this regard, some members argued that the issue of humaneness is outside the competence of the IWC. A decision was made to defer naming the working group until the 1999 meeting.

**Cooperation with Other Organizations** — As discussed later in this chapter, the parties to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) considered proposals at their 1997 meeting to downlist four stocks of minke whales, the eastern North Pacific stock of gray whales, and the western North Pacific stock of Bryde's whales from Appendix I to Appendix II. Doing so could open commercial trade in whale meat internationally. In response to these proposals, the CITES parties affirmed an earlier resolution to consult with the IWC concerning proposals to amend the listing of whales on the CITES appendices.

This debate carried over to the 1997 IWC meeting and has prompted the IWC to examine its relationships with other international organizations. At its 1998 meeting the IWC adopted a resolution expressing appreciation for the decision by CITES to uphold prior actions to promote cooperation between the two organizations. The IWC reaffirmed the importance of continued cooperation and requested that the CITES Secretariat continue to consult with it concerning proposals to amend the listing of whales on the CITES appendices. The resolution also called on IWC members to observe fully past resolutions on trade in whale products.

**New Scientific Journal** — The IWC approved the establishment of a new scientific publication, the *Journal on Cetacean Research and Management*. Publication is expected to begin in April 1999.

**Future Meetings** — The 51st meeting of the IWC is scheduled to be held on 24–28 May 1999 in Grenada. Australia has offered to host the IWC meeting in the year 2000.

## Conservation Issues in the Southern Ocean

Many species of seals, whales, dolphins, and porpoises occur in the Southern Ocean (the seas surrounding Antarctica). The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, conducts a continuing review of activities in Antarctica and surrounding waters that could affect marine mammals directly or indirectly. As noted in previous reports, the Commission has provided numerous recommendations to the Department of State, the National Oceanic and Atmospheric Administration, the National Marine Fisheries Service, and the National Science Foundation regarding research and international agreements needed to effectively regulate sealing, whaling, fishery and mineral development, and other activities that could affect marine mammals and their habitats in the Southern Ocean.

Commission representatives participate in inter-agency meetings to develop U.S. policies regarding activities in Antarctica and the Southern Ocean. Commission representatives have served on U.S. delegations to most regular and special Antarctic Treaty Consultative Meetings in the last 20 years, and to most meetings of the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources. Information concerning activities carried out in 1998 are described below.

### The Antarctic Treaty

Seven countries — Argentina, Australia, Chile, France, New Zealand, Norway, and the United Kingdom — claim sovereignty to parts of Antarctica and, in some cases, to surrounding waters. Other countries, including the United States, do not recognize these claims. The Parties to the Antarctic Treaty, which was concluded in 1959 and entered into force in 1961, have agreed that no acts or activities taking place while the Treaty is in force shall consti-

tute a basis for asserting, supporting, or denying territorial claims in Antarctica.

The Treaty provides the international framework for governing activities in Antarctica. It applies to the lands and ice shelves south of 60°S latitude. Its principal objectives are to provide freedom for scientific research and to ensure that Antarctica is used for peaceful purposes only and does not become the scene or object of international discord.

Currently, 43 countries are Parties to the Treaty. Of these, 27 are Consultative Parties (countries that have established and maintained research programs in Antarctica and are entitled to participate in the taking of decisions under the Treaty) and 16 are Non-Consultative Parties (countries that have acceded to the Treaty but have not established or maintained research programs in Antarctica and are not entitled to participate in decision-making). The Treaty requires that representatives of the Consultative Parties meet periodically to consider and recommend to their governments measures necessary to give effect to the Treaty, including measures necessary to conserve living resources in the Treaty Area.

Since the Treaty came into effect in 1961, there have been 22 regular Consultative Meetings and 11 special Consultative Meetings. Special Consultative Meetings have been held to consider information submitted by countries seeking consultative party status and to conclude separate agreements, such as the Convention for the Conservation of Antarctic Seals, the Convention on the Conservation of Antarctic Marine Living Resources, the Convention on the Regulation of Antarctic Mineral Resource Activities, and the Protocol on Environmental Protection to the Antarctic Treaty (described below). The Antarctic Treaty and the related measures and independent agreements adopted by the Treaty Parties are known collectively as the Antarctic Treaty System.

Previous Commission reports provide more complete descriptions of the purposes, background, and provisions of the Antarctic Treaty System.

*[Each of the Antarctic Treaty Parties has designated a national contact point where information concerning the Treaty System can be obtained. The U.S. contact*

*point is the Director, Office of Ocean Affairs, Room 5805, U.S. Department of State, Washington, D.C. 20520-7818. The contact points for the other Treaty Parties are listed in the reports of recent Treaty meetings. A current list can be obtained from the U.S. national contact.]*

### **Protocol on Environmental Protection to the Antarctic Treaty**

The Antarctic Treaty contains no provisions for governing exploitation of either living or non-living resources in the Treaty Area. As noted in previous Commission reports, the possibility that commercial sealing might be resumed led the Consultative Parties to negotiate and adopt the 1972 Convention for the Conservation of Antarctic Seals. As discussed below, concern regarding the possible effects of developing fisheries on both target and non-target species led the Consultative Parties to adopt the Convention on the Conservation of Antarctic Marine Living Resources.

After adopting the Convention on the Conservation of Antarctic Marine Living Resources in 1981, the Consultative Parties initiated negotiation of a regime to govern possible mineral resource activities in Antarctica. The Convention on the Regulation of Antarctic Mineral Resource Activities was concluded in June 1988. It will not enter into force unless ratified by all 26 countries that were Consultative Parties when negotiations were concluded in 1988.

At the Consultative Meeting in 1989 several parties indicated that they were opposed to any mineral exploration or development in Antarctica and would not ratify the Convention. They proposed instead that consideration be given to the development of a regime to prohibit mineral exploration and development, and to afford added protection to the unique features and values of Antarctica. Recognizing that the minerals convention would not enter into force, the Consultative Parties agreed that a special Consultative Meeting should be held in 1990 to consider various proposals for protection of the Antarctic environment. This, the 11th Special Consultative Meeting, led to conclusion of the Protocol on Environmental Protection in October 1991. The Protocol entered into force in January 1998 following ratification by each of the 26

parties that had consultative status at the time it was concluded in October 1991. The basic intent of the Protocol is to improve the effectiveness of the Antarctic Treaty as a mechanism for protecting the Antarctic environment and for ensuring that Antarctica does not become the scene or object of international discord. It prohibits any activity, other than scientific research, relating to mineral resources in Antarctica.

When concluded in October 1991 the Protocol included four annexes. Those annexes specify obligations regarding (1) assessment in the planning stages of the possible environmental impacts of both government and non-government activities to be conducted in the Antarctic Treaty Area, (2) conservation of Antarctic fauna and flora, (3) waste disposal and management, and (4) prevention of marine pollution. A fifth annex, specifying obligations for protection and management of areas of particular historic, scientific, or environmental value, was adopted at the regular Consultative Meeting later in October 1991. Article 11 of the Protocol provides for the establishment of a group of scientific and technical experts — the Committee for Environmental Protection — to provide advice to the Treaty Parties on measures necessary to effectively implement the various provisions of the Protocol and its annexes.

**The United States Implementing Legislation —** The Antarctic Science, Tourism, and Conservation Act of 1996 (Public Law 104-227) provides the statutory authority necessary for the United States to implement the Protocol. Among other things, the Act requires that the Environmental Protection Agency, the Coast Guard, and the National Science Foundation promulgate regulations to implement certain provisions of the Act.

The Environmental Protection Agency is responsible for promulgating regulations to provide for the environmental impact assessment of non-governmental activities, including tourism, for which the United States is required to give advance notice under paragraph 5 of Article VII of the Antarctic Treaty; and coordination of the review of information regarding environmental impact assessments received from other Parties under the Protocol.

In 1996 the Environmental Protection Agency established an interagency working group to help identify legal, policy, and practical matters meriting consideration in the development of the regulations. This group also reviewed and provided comments to the agency on environmental impact assessments for non-governmental activities planned to be carried out in the Treaty Area during the 1997–1998 and 1998–1999 austral summers. A member of the Marine Mammal Commission's staff represented the Commission on this interagency working group.

Recognizing that final regulations could not be promulgated before the 1997–1998 Antarctic field season, the Environmental Protection Agency published interim final regulations in the *Federal Register* on 30 April 1997. The final regulations were expected to be completed by October 1998. However, representatives of the Antarctic tourist industry and non-governmental environmental organizations with related interests requested that promulgation of the final rule be delayed for at least one year to assess and determine how the interim rule should be revised to best meet the intent of the Protocol and the U.S. implementing legislation. The agency, in consultation with the other involved federal agencies, determined that the requested delay would be beneficial. On 15 April 1998 the agency published in the *Federal Register* an amendment extending the interim regulations through the 2000–2001 austral summer.

Pursuant to the regulations, non-governmental organizations planning activities in Antarctica during the 1998–1999 austral summer prepared and provided environmental assessments to the agency. The assessments addressed the following activities:

- ship-based tours planned to be conducted in the Antarctic Peninsula, South Orkney, and South Shetland Islands between November 1998 and March 1999 (submitted jointly by Ambercrombie & Kent/Explorer Shipping, Oak Brook, Illinois; Clipper Cruise Lines, St. Louis, Missouri; Mountain Travel-Sobek, El Cerreto, California; Quark Expeditions, Darien, Connecticut; Society Expeditions, Seattle, Washington; Special Expeditions, Seattle, Washington; and Zegrahm Expeditions, Seattle, Washington);
- the 1998–1999 Antarctic cruise programs for the Russian icebreaker *Kapitan Khlebnikov* (submitted by Quark Expeditions) and the *M/V Marco Polo* (submitted by Orient Lines, Fort Lauderdale, Florida); and
- research planned to be carried out in 1998–1999 to continue characterizing and monitoring selected tourist sites in the Antarctic Peninsula (submitted by Oceanites, Inc., Washington, D.C.).

In 1999 the Commission will continue to work with the Environmental Protection Agency, the Department of State, the National Science Foundation, other federal agencies, and affected non-governmental organizations to facilitate implementation of the provisions of the Protocol and the Antarctic Science, Tourism, and Conservation Act regarding prior assessment of the possible environmental impacts of activities in Antarctica.

**The First Meeting of the Committee for Environmental Protection** — As noted earlier, the Protocol on Environmental Protection provides for the establishment of a group of scientific and technical experts — the Committee for Environmental Protection — to provide advice to the Antarctic Treaty Consultative Parties on measures necessary to effectively implement the Protocol and its annexes. The first meeting of the Committee was held in conjunction with the 22nd Antarctic Treaty Consultative Meeting in Tromsø, Norway, on 25 May–5 June 1998 (see the next section for information regarding the Consultative Meeting). As its first order of business, the Committee established rules of procedure and elected a chair and two vice chairs.

The Committee provided advice to the Treaty Parties on a variety of issues, including submission of documents for consideration, development of management plans for Antarctic Specially Protected Areas, the protected areas system, development of a State of the Antarctic Environment Report, and future operation of the Committee. With respect to documents, the Committee agreed that papers to be considered at meetings should be forwarded to the host country at least 75 days before the meeting and be translated and circulated by the host country at least 60 days before the meeting. It also agreed that papers should be sent to the Committee Chairman at that time.

With respect to the protected area system, the Committee noted that all of the Consultative Parties had not yet approved Recommendation XVI-10 (Protocol Annex V regarding area protection and management) and that management plans have not been proposed or updated for many of the Specially Protected Areas and Sites of Special Scientific Interest designated under the system that will be replaced by Annex V. The Committee recommended that the Treaty Parties call upon those that have not approved the recommendation to do so as soon as possible and to request that those parties who proposed Specially Protected Areas and Sites of Special Scientific Interest designated under the previous system develop or update management plans for those areas as called for in Annex V and to provide a timetable for doing so at the Consultative Meeting in Lima, Peru, in 1999. The Committee also reviewed and recommended approval of management plans for several historic sites as described below.

Immediately before the Committee meeting, a workshop was held to review and determine steps that could be taken to improve the Antarctic Protected Areas System. The results of the workshop were reported to the Committee. Among other things, the workshop participants noted the following:

- there currently is no framework strategy or guidelines for identifying and affording special protection to areas representing the range of values set forth in Article 3 of Annex V; and
- there is a pressing need to develop or update management plans for existing Specially Protected Areas and Sites of Special Scientific Interest in accordance with Article 5 of Annex V.

The Committee considered the workshop findings and, as noted earlier, provided advice to the Consultative Parties on measures needed to effectively implement Protocol Annex V. The Committee also recommended that a second workshop be held immediately before the 1999 Treaty Meeting in Peru to develop guidelines for identifying additional areas meriting special protection in accordance with Article 3 of Protocol Annex V. The Committee also finalized and recommended that the Treaty Parties endorse and make their nationals aware of the availability of the

*Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas.*

At the prior Antarctic Treaty Consultative Meeting in Christchurch, New Zealand, in 1997 the New Zealand delegation noted that Article 12 of the Protocol on Environmental Protection calls upon the Committee for Environmental Protection to provide advice on the state of the Antarctic environment. To provide the basis for that advice, the New Zealand Delegation proposed that the Treaty Parties cooperatively support development of a status report on the Antarctic environment. The United States and others questioned whether the usefulness of such a report would justify the time, personnel, and financial investment that would be required to produce it. It was agreed that, during the intersessional period before the Consultative Meeting in 1998, New Zealand would organize and chair an open-ended correspondence group to prepare a "concept" paper that could be considered at the 1998 Consultative Meeting.

The concept paper developed by New Zealand during the intersessional period was tabled at the meeting of the Committee for Environmental Protection. It failed to address the range of questions that had been raised during the Consultative Meeting in New Zealand in 1997. Further, it did not clearly reflect points that had been raised by the United States during the intersessional correspondence. In this regard, the U.S. delegation pointed out that site-specific monitoring programs, such as those being developed to document the environmental impacts of U.S. stations in Antarctica, very well could be more useful and more cost-effective than a general state of the environment report. It was agreed that an open-ended correspondence group, chaired by Sweden, would consider the matter further and report back to the Committee in 1999.

The Committee also established an open-ended correspondence group to work during the intersessional period to develop guidelines for meeting the requirements of Protocol Annex I regarding environmental impact assessment. This group, chaired by Argentina, is to report to the Committee at its meeting in 1999. The Environmental Officer at the National Science Foundation's Office of Polar Programs provides U.S. input to both correspondence groups.

The most contentious issue at the meeting was the role of the Committee in providing advice on draft comprehensive environmental evaluations. The issue was precipitated by a draft environmental impact statement concerning modernization of the U.S. South Pole station forwarded by the State Department through diplomatic channels to the Treaty Parties on 23 January 1998. During the meeting, it became apparent that many individuals and organizations with related interests and responsibilities in the various countries had not received the document, or had received it after the deadline for comments had passed. Many also did not receive the accompanying diplomatic note indicating that the document was a draft comprehensive environmental evaluation being circulated for comment in accordance with articles 3(3) and 3(4) of Protocol Annex I.

Several delegations expressed the view that the Protocol requires the Committee to consider and provide advice on all such drafts and that providing the draft to Parties did not satisfy the requirement that it be forwarded to the Committee at the same time it was provided to Parties. The U.S. representatives noted that the Committee did not exist when the draft was circulated for comment. They also pointed out that the Committee is composed of representatives of Parties and that it is reasonable to assume that, when such documents are provided to the Parties, the Parties will ensure that copies are provided to their Committee representatives and others with related interests and responsibilities.

Most delegations believed that the Protocol requires the Committee to consider and provide advice on all draft comprehensive environmental evaluations and that the activity for which the evaluation is done should not be undertaken unless the Committee reviews and advises the Treaty Parties of the merits of both the activity and the environmental evaluation. The United States pointed out that the purpose of the environmental assessment is to ensure that the possible environmental impacts of activities are identified during the planning stages and that judgments concerning the acceptability of possible environmental impacts, and the decision whether or not to proceed with a particular activity, are to be made by the Party or Parties planning the activity, not by the Committee or collectively by the Consultative Parties.

During the negotiation of the Protocol, several of the Treaty Parties and non-governmental organizations advocated the creation of a scientific/technical body that would decide whether the potential environmental impacts of planned activities were acceptable. The United States and most other Consultative Parties believed it important to ensure that potential environmental impacts are identified and considered in the planning stages of activities that could have significant environmental impacts, but that the decision whether or not to proceed had to remain with the Party or Parties responsible for the activity. This approach tracks the provisions of the National Environmental Policy Act and, in the view of the Commission and other U.S. government agencies, is what the Protocol requires. It appears, however, that some Parties continue to believe that the Committee for Environmental Protection and/or the Antarctic Treaty Parties, collectively, should have a role in deciding what activities can be carried out in Antarctica. As noted in previous Commission reports, some Parties also appear to believe that liability for damage to the Antarctic environment should be linked to the environmental impact assessment process.

If the consensus of all Antarctic Treaty Consultative Parties is required before any Party or non-governmental organization can undertake activities in Antarctica, any Party or group of Parties would be able to block consensus and prohibit scientific or other activities, even if those activities would not have environmental impacts inconsistent with the goals and objectives of the Environmental Protocol. Such a possibility would be inconsistent with the freedom of access guaranteed by the Antarctic Treaty. The Commission will continue to work with the Department of State, the National Science Foundation, the Environmental Protection Agency, other government agencies, the Polar Research Board of the National Academy of Sciences, and potentially affected private sector organizations to ensure that provisions of the Environmental Protocol on environmental impact assessment are not used to block legitimate science or other activities in the Antarctic Treaty Area.

### **Antarctic Treaty Consultative Meetings**

The 22nd Antarctic Treaty Consultative Meeting took place in Tromsø, Norway, from 25 May to 5

June 1998. The 23rd Consultative Meeting will be held in Lima, Peru, from 24 May to 4 June 1999. A member of the Marine Mammal Commission's staff was a member of the U.S. delegation to the 1997 Consultative Meeting, including the meeting of the Committee for Environmental Protection and the Workshop on Specially Protected Areas described above. If requested by the Department of State, the Commission will continue to serve on U.S. delegations to the 1999 Treaty meeting and the meeting of the Committee for Environmental Protection.

A broad range of issues was considered at the 1998 Consultative Meeting, including the consequences of entry into force of the Environmental Protocol; the advice on related matters provided by the Committee for Environmental Protection; continuing efforts to develop an annex or annexes to the Environmental Protocol establishing procedures for determining damage and liability for damage to the Antarctic environment; ongoing efforts to assess and determine how best to minimize the possible adverse effects of tourism and other non-governmental activities on the Antarctic environment and other activities in Antarctica; and operation of the Antarctic Treaty System.

**Consequences of Entry into Force of the Environmental Protocol** — As noted earlier, the Protocol on Environmental Protection to the Antarctic Treaty entered into force on 14 January 1998. As of that date, the Antarctic Treaty Consultative Parties were obligated to implement the provisions of the Protocol, including those in the first four annexes (*i.e.*, the annexes on environmental impact assessment, conservation of Antarctic fauna and flora, waste disposal and management, and prevention of marine pollution).

As also noted earlier, the Committee for Environmental Protection considered a variety of matters related to environmental impact assessment during its first meeting. The Committee established an open-ended correspondence group, chaired by Argentina, to develop possible guidelines for environmental impact assessment to be considered at the meeting in 1999. Further, the Committee included environmental impact assessment on its agenda for priority consideration during its 1999 meeting in Lima, Peru. The Consultative Meeting endorsed these actions.

During the discussion of issues related to Antarctic fauna and flora, Australia advised the Committee and the Consultative Meeting that it would host a workshop in Hobart, Tasmania, on 25–28 August 1998 to consider threats posed by the possible introduction of exotic diseases to Antarctic fauna and flora, and means whereby such threats might be minimized. As noted in Chapter VIII, a member of the Commission's Committee of Scientific Advisors attended this workshop and presented a paper summarizing what is known about unusual marine mammal mortality events worldwide. The report from the workshop is expected to be provided for consideration at the 1999 meetings of the Committee and Antarctic Treaty Consultative Parties.

With regard to waste disposal and management (Annex III), the United States tabled a paper describing the pollution prevention measures and investment in pollution abatement carried out by the National Science Foundation at McMurdo Station since 1987. Among other things, the paper noted that the National Science Foundation has banned open burning, cleaned up and closed the waste dump, and developed and implemented programs to prevent and contain fuel spills at McMurdo Station. The paper illustrates actions other Treaty Parties can take to clean up and reduce the production of environmental contaminants at their stations in Antarctica.

Discussion regarding prevention of marine pollution (Annex IV) focused on contingency planning and emergency response. A resolution was adopted recommending that the Consultative Parties adopt guidelines developed by the Council of Managers of National Antarctic Programs (COMNAP) and its Standing Committee on Antarctic Logistics and Operations (SCALOP) regarding fuel oil handling at stations and bases in Antarctica; prevention and containment of fuel oil spills at stations and bases; oil spill contingency planning; and reporting of oil spill incidents in Antarctica. The Council and Standing Committee were requested to undertake an assessment of the risks of environmental emergencies arising from activities in Antarctica and to identify measures that should be taken to prevent and respond to incidents other than oil spills that could impact the Antarctic environment. Parties that had not already

done so were reminded of their obligation to develop contingency plans for environmental emergencies.

Although Annex V concerning protected areas has not yet come into force, the Consultative Meeting considered and, based on the advice of the Committee for Environmental Protection, adopted a measure recommending that historic sites at Cape Royds, Hut Point, and Cape Adare be designated Specially Protected Areas 27, 28, and 29 and that the proposed management plans for these areas be approved. The Parties also adopted a measure recommending to their governments that the part of Mensa Bay on the southwest coast of Elephant Island, where the remains of a wooden sailing ship have been found, be added to the list of historic monuments pending determination of the origin of the wreckage.

The Consultative Parties welcomed the *Guide to the Preparation of Management Plans for Antarctic Specially Protected Areas* forwarded by the Committee for Environmental Protection. They adopted a resolution recommending that the guide be used by those preparing or revising management plans for protected areas in accordance with Annex V of the Protocol. The guide is included as an attachment to the report of the Consultative Meeting. The Treaty Parties also endorsed the Committee's recommendation that a workshop be held immediately before the 1999 Consultative Meeting in Lima, Peru, to develop guidelines for identifying areas meriting special protection as outlined in Article 3 of Annex V.

**Liability for Damage to the Antarctic Environment** — Article 16 of the Environmental Protocol calls upon the Parties to elaborate rules and procedures relating to liability for environmental damage arising from activities taking place in the Antarctic Treaty Area and covered by the Protocol. As noted in previous Commission reports, a series of meetings of legal experts has been held to discuss and attempt to reach consensus on (1) what should be viewed as damage to the Antarctic environment and to dependent or associated ecosystems; (2) the types of damage for which Parties should be liable; (3) whether there should be any defenses or limits to liability; and (4) the mechanisms that might be used to determine damage and liability for damage.

As noted in the Commission's previous report, the group of experts met in Cape Town, South Africa, on 17–22 November 1997. The report of the meeting was considered at the Consultative Meeting in Tromsø. It was agreed that the Council of Managers of National Antarctic Programs, the Scientific Committee on Antarctic Research, the International Association of Antarctica Tour Operators, and the Committee for Environmental Protection should be asked to provide input to the 1999 Consultative Meeting on practical aspects of the liability issue. In this context, it was pointed out that any rules and regulations on liability should be consistent with the objective of the Environmental Protocol designating Antarctica as a natural reserve, devoted to peace and science, and that the liability regime should not undermine legitimate scientific and other activities in Antarctica. It was agreed that further negotiation of an annex or annexes on liability should be undertaken by a working group that meets during the Consultative Meetings with simultaneous interpretation in the four official treaty languages (English, Spanish, French, and Russian).

**Tourism and Other Non-Governmental Activities** — Until 1966 nearly all travel to Antarctica was for scientific purposes and was either organized or sponsored by the Antarctic Treaty Consultative Parties. Regular commercial tourist expeditions began in 1966. Since then, there has been a steady increase in tourism and other non-governmental activities (*e.g.*, yachting and mountain climbing).

In recent years, the number of tourists and adventurers visiting Antarctica has increased substantially. At the 1998 Consultative Meeting, the International Association of Antarctica Tour Operators advised the Treaty Parties that more than 9,000 people traveled to Antarctica on 14 commercial tour vessels from November 1997 to March 1998. All but one of these tour vessels were operated by members of the association. Six of the 14 vessels were of Russian registry. Ninety-eight of 108 voyages were to sites in the Antarctic Peninsula, the most accessible and biologically diverse region in Antarctica (Figure 13). The association estimated that, during the 1998–1999 austral summer, more than 11,000 tourists will visit Antarctica aboard tour ships. As noted earlier, U.S.-based tour operators have prepared and provided to the Environmental Protection Agency assessments of

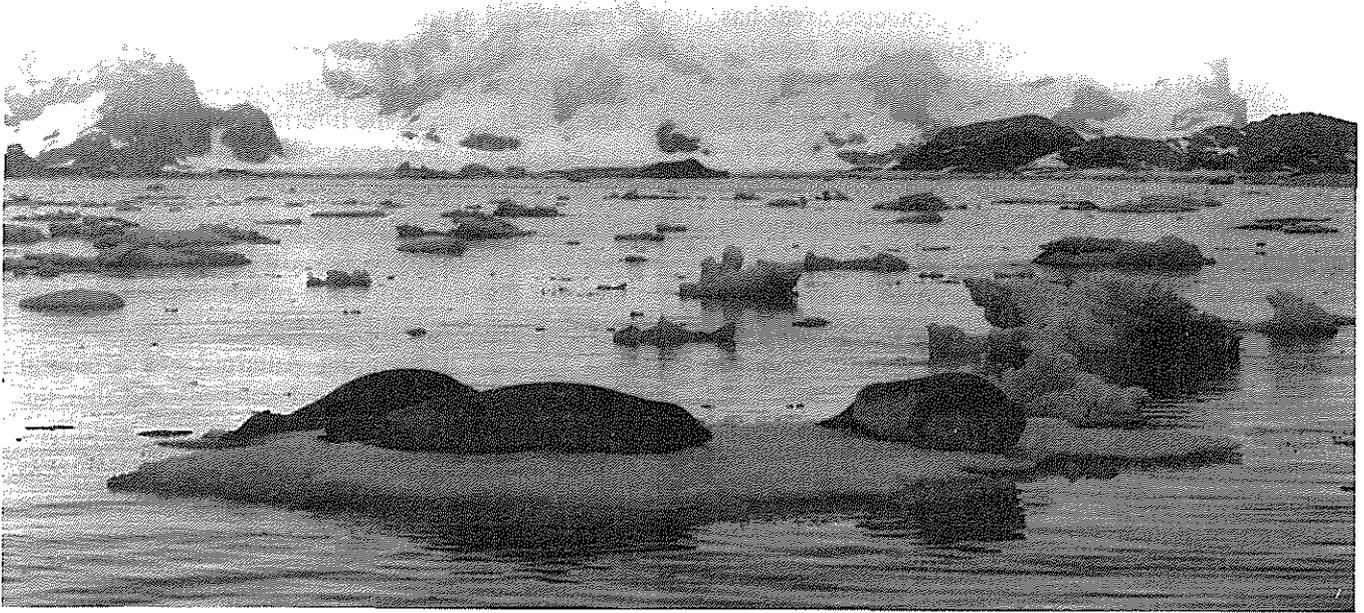


Figure 13. Crabeater seals, the most abundant marine mammal species in the world, rest on an Antarctic ice floes. (Photograph courtesy of Ron Naveen, Oceanites, Inc.)

the possible environmental impacts of their activities in 1998–1999 in accordance with regulations promulgated by the agency.

As noted in previous reports, the Antarctic Treaty Parties have adopted guidelines for visitors to Antarctica and for those individuals and companies organizing and conducting tours and other non-governmental activities in the Antarctic. If the tour industry and individual visitors comply with these guidelines, tourism is unlikely to have adverse impacts on marine mammals or other components of the Antarctic environment, at least in the short term. However, over time, repeated visits could possibly have adverse cumulative effects on the physical features and biota of some areas. Recognizing this, the Commission, in cooperation with the Department of State, contracted in 1994 for a study to determine whether the Antarctic tour industry was aware of, and complying with, the guidelines adopted by the Treaty Parties. In addition, the National Science Foundation provided funding in 1994 for a study to characterize the physical and biological features of representative sites in the Antarctic typically visited by shipborne tourists and to

determine whether periodic visits by trained observers aboard tour ships can be used to detect possible cumulative effects of tourism. Subsequently, logistic support, funding, and other assistance were provided by the Environmental Protection Agency, Argentina, Chile, Germany, and the United Kingdom.

The study results have been published in part in two documents: (1) *Compendium of Antarctic Visitor Sites: A Report to the Governments of the United States and the United Kingdom*; and (2) *The Oceanites Site Guide to the Antarctic Peninsula*. The compendium includes descriptions, data on fauna and flora, orientation maps, and photographs of representative sites in the Antarctic Peninsula being visited by tourists. The site guide provides a summary of this information for use by tourists, tour operators, and expedition staff. The compendium makes a number of recommendations for actions to help meet the impact assessment and monitoring requirements of the Environmental Protocol.

[The compendium can be obtained from the U.S. State Department, Office of Oceans and Polar Affairs, and

*the U.K. Foreign and Commonwealth Office, Polar Region Section. The site guide can be obtained from Oceanites, Inc., P.O. Box 15259, Chevy Chase, MD 20825.]*

At the Consultative Meeting in Tromsø, the United States, the United Kingdom, and the Federal Republic of Germany presented a joint paper describing the results of the site inventory project. The International Association of Antarctica Tour Operators noted that its efforts to meet obligations under the Environmental Protocol have been assisted by data and information compiled and made available by the project personnel. Australia informed the meeting that it was undertaking a similar site inventory in eastern Antarctica.

As noted in previous Commission reports, the Treaty Parties developed and in 1996 agreed to use standard forms for advance notification and post-season reporting of Antarctic tourist operations for a one-year trial period. These forms were revised at the 1997 Consultative Meeting, based on experience gained during the 1996–1997 tourist season. At the 1998 meeting the International Association of Antarctica Tour Operators proposed changes in the form to produce more reliable information on the level of tourist activity at various sites. The Treaty Parties agreed to the proposed changes. They also requested that the association include in future reports information on the flag state of tourist vessels and information on the number of tourists that visit the various sites each season.

**Operational Issues** — Antarctic Treaty Consultative Meetings are organized and hosted by the Consultative Parties on a rotating basis. Information concerning member states' activities in Antarctica is shared through an annual information exchange. The number of Treaty Parties and the level of international interest in Antarctica have both increased substantially since the Treaty was concluded in 1959. In recent years, there has been growing awareness that organization of Consultative Meetings, exchange of information, and implementation of the Protocol on Environmental Protection could be enhanced by establishment of a small, permanent secretariat. Agreement in principle was reached at the 17th Consultative Meeting in 1992 on the need for and the general functions of a small secretariat. Argentina subsequently pro-

posed that the secretariat be located in Buenos Aires. The United Kingdom opposed this proposal, and at the 1998 Consultative Meeting continued to do so. Several possible alternative sites have been offered, but no consensus has been reached.

On a related matter, the United States submitted a paper at the meeting in Tromsø suggesting ways that the annual exchange of information required by the Antarctic Treaty might be improved. The paper noted the additional information exchange requirements set forth in the Environmental Protocol and similar requirements that have been established by the Scientific Committee on Antarctic Research and the Council of Managers of National Antarctic Programs. It suggested that the information exchange might be made more useful by developing standard formats and transmitting the information by electronic means. Many Parties shared the views expressed in the paper. The topic was placed on the agenda for further discussion at the 1999 Consultative Meeting.

#### **Preparation for the 23rd Consultative Meeting**

— The next Consultative Meeting will be held in Lima, Peru, from 24 May to 4 June 1999. The Committee for Environmental Protection will meet during the first week of the meeting. Immediately prior to the meeting, a workshop will be held to develop a framework or guidelines for identifying areas meriting special protection to maintain the outstanding environmental, scientific, historic, aesthetic, and wilderness values of Antarctica.

The Marine Mammal Commission will work with the Department of State, the National Science Foundation, the Environmental Protection Agency, other federal agencies, and the private sector to prepare for these meetings.

#### **Activities Related to Marine Living Resources**

Fisheries for Antarctic krill (*Euphasia superba*) and a variety of finfish began to develop in the Southern Ocean in the 1960s. Concern that these fisheries, particularly the fishery for krill — a key component in the diets of many whale, seal, bird, and fish species — could adversely affect many non-target species as well as target species led the Antarctic Treaty Consultative Parties to negotiate and adopt the Convention on

the Conservation of Antarctic Marine Living Resources (CCAMLR). The Convention was concluded in May 1980 and entered into force in April 1982. Its objectives are to ensure that harvesting and activities associated with harvesting of marine living resources in the Convention Area — the marine areas south of the Antarctic Convergence — are carried out so as to (1) prevent harvested populations from being reduced or maintained below their maximum net productivity level; (2) maintain the ecological relationships among harvested, dependent, and related populations; and (3) minimize the risks of changes in the Antarctic marine ecosystem that are not potentially reversible in two or three decades (*i.e.*, to maintain the fullest possible range of management options for future generations).

The Convention established the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources. These bodies meet annually to identify and take such actions as are necessary to meet the Convention objectives. The Marine Mammal Commission's involvement in negotiating the Convention and the first 16 meetings of the Commission and Scientific Committee are described in previous annual reports. The 17th annual meetings of the Commission and Scientific Committee were held in Hobart, Tasmania, Australia, from 26 October to 6 November 1998. The principal results are described below.

*[Meeting reports and other information concerning the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources can be obtained from the Commission Secretariat, Post Office Box 213, North Hobart, Tasmania 7002, Australia.]*

**The Krill Fishery** — The total reported catch of krill in the Convention Area during the 1997–1998 fishing season (1 July 1997 to 30 June 1998) was 80,802 metric tons (mt), down slightly from the 82,508 mt reported caught in the 1996–1997 fishing season. The catch was taken principally in the South Atlantic sector by vessels from Japan, Poland, the Republic of Korea, and the United Kingdom.

**Finfish Fisheries** — The total reported catch of finfish in the Convention Area in 1997–1998 was 11,419 mt, up slightly from the reported catch of 10,562 mt in 1996–1997. Patagonian toothfish (*Dissostichus eleginoides*) accounted for nearly 98

percent of the catch and was taken in the southwest Atlantic sector by vessels from Chile, South Africa, and the United Kingdom, and in the South Pacific and Indian Ocean sectors by vessels from Australia, France, South Africa, and the Ukraine. Small quantities of Antarctic toothfish (*Dissostichus mawsoni*) were taken in the southwest Pacific sector by vessels from New Zealand. Small quantities of mackerel icefish (*Champsocephalus gunnari*) were taken in the southwest Atlantic and western Indian Ocean sectors by vessels from Chile and Australia, respectively.

**Illegal, Unreported, and Unregulated Fishing** — As the name implies, Patagonian toothfish occur and are harvested on the Patagonian Shelf (off Argentina and Chile) and in other Southern Hemisphere shelf areas, as well as in the Convention Area. The fish has high market value and is being targeted both in and outside the Convention Area.

As noted in the Marine Mammal Commission's previous report, the total reported catch of Patagonian toothfish in 1996–1997 was 32,991 mt. Data derived from reports of landings in southern Africa and Mauritius suggested that there was an additional unreported catch of 74,000 to 82,200 mt. The total catch inside the Convention Area was estimated to be five or six times greater than the reported catch. The unreported catch is by vessels from countries that are not parties to the Convention and by member-country vessels fishing illegally in the Convention Area.

Recognizing that the stocks in the Convention Area probably can not sustain the estimated level of take, the Commission for the Conservation of Antarctic Marine Living Resources adopted a number of measures at its 1997 meeting to address the problem. Among other things, the Commission called on members to identify where *Dissostichus* spp. are being landed, transhipped, and imported, and under what product names they are being marketed.

After the Living Resources Commission meeting in 1997 the National Marine Fisheries Service initiated a study, working with the Customs Service and the Foreign Trade Division of the Census Bureau, to determine the quantities of *Dissostichus* spp. being imported into the United States and under what names the fish are being marketed. The study found that

these are being imported and marketed in the United States as sea bass and Chilean sea bass and that imports increased in the mid- and late 1990s concurrent with the development of the toothfish fishery in the Convention Area. The countries of origin included Argentina, Australia, Chile, and South Africa, which are Parties to the Convention, and Belize, Mauritius, Namibia, and Panama, which are not Parties to the Convention.

During the 1997–1998 fishing season, there were 45 reported sightings of vessels from non-contracting parties fishing in the Convention Area. The unreported catch of toothfish was estimated to be more than 22,000 mt during the 1997–1998 fishing season. Market information indicated that at least 60,000 mt of toothfish were traded, most of which was exported to the United States and Japan. Less than half of this trade could be attributed to fisheries operating legally within the Convention Area and in adjacent areas under national jurisdiction.

The illegal, unreported, and unregulated fishing for toothfish in the Convention Area is of great concern. To try to address the problem, the Living Resources Commission at its meeting in 1997 adopted measures that (1) require Parties to the Convention to prohibit fishing by their flag vessels in the Convention Area except in accordance with a license or permit that specifies when and where fishing is allowed, the gear that can be used, reporting requirements, etc.; (2) establish precautionary catch limits for all areas in the Convention Area where fishing for toothfish is known to be occurring; (3) require all Party vessels fishing for toothfish in the Convention Area to carry observers designated in accordance with the CCAMLR System of Observation and Inspection; (4) call upon Parties to inspect and prohibit landings of toothfish in their ports by vessels from non-contracting parties sighted fishing in the Convention Area; and (5) urge Parties to use automated, satellite-based systems to monitor the locations of their flag vessels licensed to fish in the Convention Area. These measures were continued and, in the last case, strengthened by the Commission in 1998. In particular, the conservation measure regarding use of automated vessel-monitoring systems was changed to require that by 31 December 2000 each contracting party must establish and use an automated satellite-linked vessel monitoring system to

monitor the positions of its fishing vessels licensed to harvest marine living resources in the Convention Area and for which catch limits, fishing seasons, or area restrictions have been set by the Commission. In addition, the Commission adopted a measure requiring that all contracting parties ensure that their vessels licensed to fish in the Convention Area are marked in such a way that they can be readily identified.

The United States proposed establishment of a catch certification system for toothfish. The proposed system would require that toothfish landed in the ports of contracting parties, transhipped to their vessels or through their ports, or imported into their territories be documented so as to determine where and by whom they were caught. Most but not all Living Resources Commission members supported the U.S. proposal. It was agreed that some type of catch certification system is a necessary element in the range of measures required to solve the problem of illegal, unregulated, and unreported fishing for toothfish. It also was agreed that the Parties should meet during the intersessional period to try to draft a measure that can be adopted by the Commission at its meeting in 1999. The European Union offered to host the intersessional meeting in Brussels in April 1999.

**Avoidance of Incidental Mortality** — Many species of marine mammals, seabirds, turtles, and non-target fish species are caught and killed incidental to commercial fisheries throughout the world. Many also are caught and killed in lost and discarded fishing gear or die from eating plastics and other non-digestible items discarded at sea.

As noted in previous reports, the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources have recognized this problem and, since the early 1980s, have taken a number of steps to assess and prevent such fishery-related mortality in the Convention Area. Operators of fishing vessels are required to report lost fishing gear and incidental catches of marine mammals, seabirds, and other non-target species. Placards and information brochures have been developed and provided to vessel operators to ensure that they are aware of hazards posed by lost and discarded fishing gear and other potentially hazardous materials, and to advise them of what they can do to prevent such materials

from being lost and discarded at sea. To prevent seabirds from being attracted to and caught on baited hooks, the Commission, acting on the advice of its Scientific Committee, has adopted measures requiring that longlines be set only at night, that the use of lights be kept to a minimum when setting and retrieving longlines, that streamers be towed above longlines as they are set to discourage birds from attempting to take bait, and that the offal from fish processing be discarded from the opposite side of vessels from which longlines are being set or retrieved. In 1997 the Scientific Committee recommended that the start of the 1998 longline fishing season be delayed until 1 May to minimize longline fishing during the seabird breeding season in the Convention Area. Some members of the Commission believed that such a delay would adversely affect the fisheries. As a compromise, it was agreed to delay the start of the longline fisheries only to 1 April and to consider the matter further in 1998.

Data provided to and analyzed by the Scientific Committee in 1998 indicated a substantial reduction in the bycatch of seabirds, mostly white-chinned petrels and black-browed albatrosses, in longline fisheries around the Antarctic Peninsula (640 birds observed killed during the 1997–1998 fishing season, compared with 5,755 birds in the 1996–1997 season). There also was a reduction in the observed seabird bycatch in the western Indian Ocean (498 seabirds killed in 1997–1998 compared with 834 in 1996–1997).

Overall, there was a reduction in the observed seabird mortality in the regulated fisheries in the Convention Area in 1997–1998. This was due in part to the delay of the beginning of the longline fishing season until 1 April. The Scientific Committee again advised that the level of bycatch of some seabird species is not sustainable and could be reduced by delaying the start of the longline fishing season to 1 May as recommended in 1997. The European Union and several other contracting parties noted that delaying the start of the fishing season until 1 May would limit the legal fishing season to four winter months and require that vessels fishing legally take the catch quotas in 20 percent less time and fish in poor weather conditions. They also noted that the presence of vessels fishing legally provided the only means for sighting and estimating catches of vessels fishing

illegally. After reviewing the relative costs and benefits, the Commission agreed to delay until 15 April the start of the 1999 longline fishing season in areas where seabirds are most likely to be present.

Between 50,000 to 89,000 seabirds were estimated to have been killed incidental to unregulated fishing in the Convention Area in 1998. Similar numbers were estimated to have been killed in the unregulated fisheries in 1997. These levels are more than an order of magnitude greater than those in the regulated fisheries and are due to lack of compliance with the mitigation measures adopted by the Living Resources Commission. In this regard, the Commission noted, and called on members to support, the efforts of the Food and Agriculture Organization of the United Nations to develop an international plan of action on the reduction of incidental catch of seabirds in longline fisheries. This plan reflects the types of measures that have been instituted in the Southern Ocean and would lead to the reduction of Antarctic seabird bycatch in adjacent areas.

### **The U.S. Antarctic Marine Living Resources Research Program**

The Antarctic Marine Living Resources Convention Act of 1984 provides the domestic legislative authority necessary for the United States to implement the Convention on the Conservation of Antarctic Marine Living Resources. Among other things, the Act directs the Secretary of Commerce, in consultation with the Secretary of State, the Director of the National Science Foundation, and appropriate officials of other federal agencies, such as the Marine Mammal Commission, to prepare, implement, and annually update a plan for directed research necessary to effectively implement the Convention. The Secretary of Commerce has delegated responsibility for this program to the National Marine Fisheries Service. The Service in turn has assigned program responsibility to the Southwest Fisheries Science Center in La Jolla, California.

*[Information concerning this program and related matters can be obtained from the Chief, Antarctic Ecosystem Research Group, Southwest Fisheries Science Center, P.O. Box 271, La Jolla, California 92038.]*

The principal elements of the National Marine Fisheries Service's directed research program are (1) shipboard studies to document and monitor changes in krill distribution, abundance, and age structure, and related oceanographic conditions in the South Shetland Islands area (Elephant, King George, and Livingston Islands); (2) bottom trawl surveys to assess and monitor the distribution and abundance of bottom fish in the area; and (3) land-based studies of penguins and pinnipeds that could be affected indirectly by krill harvesting. Additional land-based studies of penguins are carried out cooperatively with National Science Foundation grantees on Torgersen Island, adjacent to Palmer Station on Anvers Island.

As in 1996 and 1997 the ship-based studies were conducted in 1998 aboard the Russian research vessel R/V *Yuzhmorgeologiya*, chartered by the Service. The studies were done between early January and early April. Krill density estimates in the Elephant Island area have been derived from the survey data for the 1992–1998 austral summers, excluding 1993. This time series suggests a six-year periodicity in krill density around Elephant Island and indicates rapid declines in density in 1992 and 1998 and gradual increases from 1994 through 1997. The krill population reached a seven-year low in 1994 and a seven-year high in 1997. Additional data will be required to corroborate the apparent cycle.

Forty-five fish species were caught and processed in 1998 from 74 bottom trawls. The trawls were done at stations around Elephant Island and the lower South Shetland Islands. Species caught in substantial numbers included *Gobinotothen gibberifrons*, *Champscephalus gunnari*, *Notothenia coriiceps*, *Chaenoccephalus aceratus*, *Chionodraco rastrospinosus*, *Lepidonotothen squamifrons*, *Gymnoscopelus nicholsi*, *Lepidonotothen larseni*, *Lepidonotothen nudifrons*, and *Electrona antarctica*.

The land-based studies of penguins and pinnipeds were done in 1998 at Cape Shirreff on Livingston Island. Previously, the program included land-based studies at Seal Island, a small island off the northwest coast of Elephant Island. Except for short-term site visits, research at Seal Island was discontinued in 1997 because of the possibility of landslides destroying the support facilities.

Studies of penguins and pinnipeds were conducted at Cape Shirreff from 28 November 1997 to 28 February 1998. This was the first full season of penguin research at the Cape and comparisons with prior years thus are not possible. Based on mean breeding success at Admiralty Bay, approximately 140 km (87 miles) northeast on King George Island, the chinstrap penguin population at Cape Shirreff had average breeding success and the gentoo penguin population above average breeding success during the 1997–1998 breeding season. Both chinstrap and gentoo penguins ate primarily krill 31–45 mm in length. Fish were noted in about one-third of all chinstrap penguins and nearly all gentoo penguin stomach samples. Chinstrap penguin foraging trip durations were bimodals with 8- to 10-hour trips alternating with 20- to 24-hour trips.

A total of 7,748 Antarctic fur seal pups was born at Cape Shirreff and the adjacent San Telmo Islands during the 1997–1998 breeding season. This was a 14.1 percent decrease from the 9,015 counted in 1996–1997. At-sea foraging trips of lactating female fur seals averaged 4.6 days. The mean distance traveled was 98 km (61 miles) (s.d. = 24.9 km [15.5 miles]). A total of 53 scat and enema samples was collected from fur seals for diet studies: 42 of these samples contained identifiable hard parts (fish bone, krill chitin, or squid beaks). Fish, krill, and squid composed 61.9 percent, 57.2 percent, and 14.3 percent of the samples, respectively. Milk samples were collected from 68 lactating females for fatty-acid signature analysis to infer diet. Two fur seals tagged at other sites were observed during the season at Cape Shirreff; both were females tagged at Seal Island.

Studies of Adelie penguins were conducted at Torgersen Island, near Palmer Station, from 1 October 1997 through 4 April 1998. The number of breeding pairs was essentially the same as the number in 1996–1997. Breeding success was up slightly, with an average of 1.58 chicks creched per pair, compared with 1.47 in 1996–1997. Conversely, there was a slight decrease in the proportion of two-chick broods. The average fledgling weight of chicks was unchanged from the previous year.

## Basic Marine Research in the Antarctic

The Antarctic Marine Living Resources Convention Act of 1984 directs the National Science Foundation to continue to support basic marine research in the Antarctic. It also directs the Secretary of Commerce to design and implement a directed research program to support implementation of the Convention on the Conservation of Antarctic Marine Living Resources. As noted earlier, the National Science Foundation and the National Marine Fisheries Service have cooperatively supported several long-term research programs. Also, some logistic resources are shared through a memorandum of agreement between the two agencies.

The complementary research being supported by the National Science Foundation includes (1) the multi-disciplinary, long-term ecological research program focused in the area around Palmer Station on Anvers Island; and (2) individual research projects in diverse subject areas including population biology, community ecology, and adaptation of seals, penguins, and other marine species. The long-term ecological research program focuses on the inter-annual variation in the extent of sea ice formation as a physical determinant of spatial and temporal changes in the structure and dynamics of key components of the Antarctic marine food web, including microbes, phytoplankton, krill, and Adelie penguins.

The sixth annual oceanographic cruise in support of the long-term ecological research program was conducted in January 1998 in a grid extending from Palmer Station south to Rothera Station. Studies conducted between 1993 and 1997 showed that the age and size at which krill reach maturity are highly variable. The percentage of mature females that reproduce in any year varies from about 10 percent to more than 95 percent, with the highest percentage reproducing the summer after springs with above-average sea ice extent. The study results suggest that reproduction in the relatively long-lived Antarctic krill is flexible, with possible delays of one to several years in the age of first reproduction and the potential for skipping a year if environmental conditions are not favorable. Studies of krill growth rates show correlation with food quantity and quality, with diatoms being preferred over other types of phytoplankton. Data on both physical and biological oceanographic

parameters are being collected and made available to other researchers, including those involved in the National Marine Fisheries Service's Antarctic Marine Living Resources Research Program.

Individual research projects providing complementary data include studies of the buoyancy and morphology of Antarctic notothenoid fishes, the metabolism of Antarctic fur seals, and the paleontology of abandoned Adelie penguin rookeries.

*[Information concerning these programs can be obtained from the Manager, Antarctic Biology and Medicine Program, National Science Foundation, Office of Polar Programs, 4201 Wilson Boulevard, Arlington, VA 22230.]*

## Conservation Issues in the Arctic

Many species of marine mammals live seasonally or year-round in the Arctic Ocean and adjacent seas and coastal areas. They include polar bears; walrus; ringed, bearded, harp, hooded, ribbon, and spotted seals; narwhals; and bowhead, minke, fin, gray, and beluga whales. The ranges of most of these species include international waters and the territorial waters of more than one country. Consequently, effective conservation of these species and their habitats requires cooperation among the Arctic nations.

Some species of marine mammals are important components of the cultures and diets of Alaska Natives and other Arctic residents. Congress recognized the importance of marine mammals to Alaska Natives when it enacted the Marine Mammal Protection Act of 1972. Section 101(b) of the Act exempts Alaska Natives from the Act's moratorium on the taking of marine mammals as long as the taking is not wasteful and is done for subsistence purposes or to create and sell authentic articles of Native handicraft or clothing. In 1994 Congress added section 119 to the Act, explicitly authorizing and encouraging the Secretaries of Commerce and the Interior to develop agreements with Alaska Native groups to cooperatively manage species and populations of marine mammals that are important to Native subsistence and cultures.

Some species of marine mammals that occur in the Arctic, such as polar bears, walrus, harp seals, and bowhead whales, have been hunted commercially as well as for subsistence. Commercial hunting was poorly regulated and resulted in overexploitation and depletion of many stocks.

Other human activities, such as coastal and offshore oil and gas development, also may have adverse effects on marine mammals and their habitats. In addition, marine mammals and other components of Arctic food webs, including people who rely on fish and wildlife for subsistence purposes, may be affected by human activities outside the Arctic. For example, recent studies indicate that persistent organic compounds and other pollutants originating from human activities in the middle latitudes are being transported by air and water currents to the Arctic. These may be adversely affecting humans, marine mammals, and other components of Arctic ecosystems.

This section provides background information and describes the Commission's efforts in 1998 to facilitate the work of the Arctic Council, established by the Arctic countries in 1996 as a successor to the Arctic Environmental Protection Strategy adopted by those countries in 1991.

## The Arctic Council

In September 1989 representatives of the eight Arctic countries — Canada, Denmark (for Greenland), Finland, Iceland, Norway, the Soviet Union, Sweden, and the United States — met in Rovaniemi, Finland, to discuss cooperative measures to protect the Arctic environment. The principal impetus for this meeting was the Chernobyl nuclear accident and pollution from Russian mining activities near the Finnish border, both of which created a desire to help the Soviet Union (later the Russian Federation) address a number of environmental problems that had become evident in the *glasnost* era.

In June 1991 ministers from the eight Arctic countries signed the Declaration on the Protection of the Arctic Environment. At the same time, they adopted the Arctic Environmental Protection Strategy. The goals of the strategy were to preserve environmental quality and natural resources of the Arctic,

monitor and reduce pollution affecting the Arctic environment, and accommodate traditional and cultural needs and practices of indigenous people insofar as these relate to the environment and natural resources of the Arctic.

The strategy called for cooperation in four program areas: assessment and monitoring of environmental pollutants; conservation of Arctic flora and fauna; emergency prevention, preparedness, and response; and protection of the Arctic marine environment. Working groups were established to plan and oversee cooperative activities in these four program areas. In 1994 a task force was established to address issues of sustainable development and utilization of Arctic natural resources.

Senior government officials from the eight Arctic countries have met periodically to review the work being done by the working groups and to identify additional cooperative efforts necessary to effectively implement the Arctic Environmental Protection Strategy. Ministerial-level meetings were held in 1993, 1996, and 1997 to receive reports from the working groups and the senior Arctic officials and to provide direction to these groups.

As noted in previous Commission reports, some of the Arctic countries believed that a more formal intergovernmental organization was needed to effectively implement the Arctic Environmental Protection Strategy and to provide a forum for addressing other issues of regional concern, such as health, education, and economic development. In March 1995 Canada proposed establishing an intergovernmental Arctic Council. The other Arctic countries agreed that a high-level intergovernmental forum would help to implement the Arctic Environmental Protection Strategy and to address other issues of mutual interest, but there was not consensus that a formal intergovernmental organization was necessary.

Representatives of the Arctic countries met in 1995 and 1996 to draft a declaration establishing the council, as has been described in previous Commission reports. The Declaration on the Establishment of the Arctic Council was concluded and signed in September 1996. The declaration states that the Arctic Council is established as a high-level forum to

(a) provide a means for promoting cooperation, coordination, and interaction among the Arctic states, with the involvement of Arctic indigenous people and other Arctic residents on Arctic issues of common interest and concern, in particular issues related to environmental protection and sustainable development in the Arctic; (b) oversee and coordinate the programs established under the Arctic Environmental Protection Strategy; (c) adopt terms of reference for and oversee and coordinate a sustainable development program; and (d) disseminate information, encourage education, and promote interest in Arctic-related issues. Among other things, the declaration specifies that:

- the council should normally meet biennially, with meetings of senior officials taking place more frequently to provide for liaison and coordination;
- responsibility for hosting meetings of the Arctic Council, including provision of secretarial support, should rotate sequentially among the Arctic countries;
- as its first order of business, the council should adopt rules of procedure for its meetings and those of its working groups; and
- the decisions of the council are to be made by consensus of its members (*i.e.*, the eight Arctic countries).

Three organizations representing Arctic indigenous people were afforded permanent participant status under the Arctic Environmental Protection Strategy and were entitled to send representatives to all ministerial, senior official, and working group meetings. They are given the same status by the Arctic Council declaration. These organizations are the Inuit Circumpolar Conference, the Saami Council, and the Association of Indigenous Peoples of the North, Siberia, and the Far East of the Russian Federation. The council also provides for other organizations to be granted the same status, and at the first ministerial meeting of the council, held in Canada in September 1998, the council adopted a U.S. proposal to recognize the Aleut International Association as a permanent participant.

### **The 1998 Arctic Council Meeting**

The first ministerial meeting of the Arctic Council was held in Iqaluit, Northwest Territories, Canada, on

18–19 September 1998. Preparations for that meeting began in 1996 under the chairmanship of Canada. At Iqaluit, the United States became chair of the Arctic Council for the following two-year period.

The ministers at the Iqaluit meeting adopted new mandates for working groups of the Arctic Council (formerly working groups under the Arctic Environmental Protection Strategy), established a new sustainable development working group, and adopted rules of procedure for the Arctic Council and terms of reference for a sustainable development program. On the pivotal issue of observers, the rules of procedure provide that there must be consensus among the eight Arctic nations to grant observer status and that this status shall continue “for such time as consensus exists at the Ministerial meeting.”

The terms of reference take a procedural approach to consideration of projects related to sustainable development, specifying issues that must be considered before the Arctic Council approves a sustainable development project. Thus, proposals for sustainable development projects must clearly outline issues to be addressed and any anticipated financial needs and implications, suggest ways of dealing with those needs and implications, and describe the benefits to be realized from the project.

Meetings of senior Arctic officials were held in Canada in February and May, in London in August, and again in Canada in September 1998, immediately before the Arctic Council meeting. The Marine Mammal Commission worked with the Department of State, other federal agencies, and the Alaska Governor’s office to develop U.S. positions for these meetings. The Commission contracted with an independent scientist familiar with the work of the Arctic Environmental Protection Strategy and the Arctic Council to represent the Commission on the U.S. delegations to the May and September meetings of the senior Arctic officials as well as the Arctic Council meeting itself. The contractor’s reports (see Huntington 1998a,b,c,d in Appendix B) noted that the Arctic Council is in its formative stages and that several matters related to the efficiency and effectiveness of the Arctic Council’s work will take time to resolve.

The ministerial declaration signed by the Arctic Council in Iqaluit, among other things,

- called for the four working groups established under the Arctic Environmental Protection Strategy to continue their work and provided additional direction to each group;
- adopted rules of procedure for the Arctic Council and terms of reference for the sustainable development program;
- approved for further work four projects under the sustainable development program, including one on telemedicine proposed by the United States, one on children and youth of the Arctic proposed by Canada, and two on fisheries proposed by the Saami Council;
- established a sustainable development working group to develop a range of other proposals by Arctic nations and permanent participants;
- welcomed the creation of the University of the Arctic as a means of linking educational institutions and opportunities throughout the region; and
- accepted the U.S. offer to host the Arctic Council meeting in 2000 and to provide secretarial support through the conclusion of that meeting.

As host of the Arctic Council in the next two years the United States has an opportunity to make its activities more productive while adhering to the more rigorous procedures called for in the rules of procedure. The United States also has an opportunity to strengthen its contributions to work undertaken within the Arctic Council and its working groups. To this end, the U.S. senior Arctic official sent a letter on 30 November 1998 to his counterparts in the other Arctic countries outlining U.S. plans. The letter was prepared with extensive interagency review and input and describes three main areas of activity. First, in the sustainable development program, the United States will emphasize public health issues, including humanitarian aid to northern Russia. Second, the United States remains committed to the environmental protection work of the Arctic Council and will work to improve coordination among the four working groups in this area. Third, the United States will consider a public affairs strategy to improve education and awareness about the Arctic Council and its activities and areas of concern.

## The Arctic Monitoring and Assessment Program

The Arctic Monitoring and Assessment Program Working Group under the Arctic Council is charged with reporting on sources, levels, and effects of environmental pollutants in the Arctic. The National Oceanic and Atmospheric Administration has lead responsibility for U.S. participation in the working group.

In 1997 the working group delivered a report on Arctic pollution issues to the ministers of the Arctic Environmental Protection Strategy at their meeting in Alta, Norway. This was a non-technical report describing what is currently known about a wide range of pollutants and their effects on the environment and on human health. The full scientific report, which provides referenced substantiation for the non-technical report, was delivered to the Arctic Council in Iqaluit in September 1998. This report, *The AMAP Assessment Report: Arctic Pollution Issues*, is a comprehensive summary of available knowledge through 1997 about pollution issues in the Arctic.

In response to recommendations contained in the published reports, the working group was instructed by the Arctic Council to produce assessments on a variety of specific subjects. The assessments will update information on topics covered in the initial reports and will also address emerging topics, such as the anti-fouling paint additive tributyltin, that were not covered in the initial reports. To plan for these assessments and to develop its overall strategic plan for the next five-year period, the working group met twice in 1998. The first meeting was held in April in Girdwood, Alaska, and served as preparation for the Arctic Council meeting in Iqaluit. The second meeting, held in Helsinki, Finland, in December, allowed working group members to focus on the direction provided by the Arctic Council.

The Marine Mammal Commission contractor noted earlier attended both of these meetings. The contractor's final report on the Helsinki meeting will be available early in 1999. Both reports noted that coordination among the working groups under the Arctic Council remains problematic and that United

States participation in future work under this program appears likely to be a substantial improvement over its participation in the production of the initial reports.

The work and findings of the Arctic Monitoring and Assessment Program Working Group are of interest and concern to the Commission because pollutant levels in several marine mammal species found in the Arctic are high and may be affecting both the animals and the Alaska Natives who rely on them for subsistence purposes. This subject is discussed in greater detail in Chapter VI.

Another topic of great concern to the Commission is climate change and its possible effects on the Arctic environment. Alaska Natives have expressed concerns about observed changes in sea ice cover and structure and in the condition of marine mammals. The Arctic Council expects the Arctic Monitoring and Assessment Program Working Group to work with the Conservation of Arctic Flora and Fauna Working Group to assess the effects of climate change on Arctic ecosystems. Coordination between the two groups was discussed at several meetings in 1998 and, at its meeting in Helsinki, the Arctic Monitoring and Assessment Program Working Group proposed a mechanism for the joint production of assessments of climate change and of ultraviolet radiation and their impacts in the Arctic. The Conservation of Arctic Flora and Fauna Working Group is expected to agree to the proposed approach.

### **Conservation of Arctic Flora and Fauna**

The Conservation of Arctic Flora and Fauna Working Group provides a distinct forum for scientists, indigenous people, and conservation managers to exchange data and information on issues such as shared species and habitats and to collaborate, as appropriate, for more effective research, sustainable utilization, and conservation. The Alaska Office of the Fish and Wildlife Service has lead responsibility for U.S. participation in the working group.

As noted in previous Commission reports, the working group has made significant progress in a number of areas. Although the working group did not meet in 1998, the Arctic Council in its Iqaluit Declaration endorsed the "Strategic Plan for the Conserva-

tion of Arctic Biological Diversity" prepared by the group and provided to the Arctic Council for consideration. The plan is intended to implement the "Cooperative Strategy for the Conservation of Biological Diversity in the Arctic Region" presented to and adopted in concept by the ministers of the Arctic Environmental Protection Strategy at their meeting in Alta, Norway, in June 1997. The plan emphasizes five objectives: enhancing efforts to monitor Arctic biodiversity; conservation of Arctic genetic resources, species, and their habitats; establishing protected areas as needed; managing activities outside protected areas; and providing conservation information to those making socioeconomic decisions.

The working group intends to use the plan to develop a more focused approach to its work. To this end, the Arctic Council in Iqaluit asked the working group to prepare a report on the status and trends of Arctic biodiversity. The report will highlight key issues and provide background information to be used in identifying conservation needs and formulating and assessing the effectiveness of conservation measures. Plans for producing the report are expected to be discussed in detail at the working group meeting in Yellowknife, Northwest Territories, Canada, in April 1999.

As noted in the Commission's report in 1997, the efforts of the Conservation of Arctic Flora and Fauna Working Group to date have focused largely on the terrestrial environment. On 23 December 1997 the Commission wrote to the National Marine Fisheries Service recommending that it consider asking the working group to develop a plan for assessing and monitoring the status and trends of ringed and bearded seals throughout the Arctic. In its reply of 26 January 1998 the Service acknowledged the importance of ice seals to the indigenous people of the Arctic and indicated its intent to commence discussions within the Service, and with Conservation of Arctic Flora and Fauna and Arctic Monitoring and Assessment Program representatives to develop such a plan.

Coordination with other programs of the Arctic Council will be a significant challenge for the Conservation of Arctic Flora and Fauna Working Group over the next few years. As noted above, the Conservation of Arctic Flora and Fauna and Arctic Monitoring and

Assessment Program Working Groups are both charged by the council to examine climate change and ultraviolet radiation and their impacts, and plans are under way to establish a mechanism for cooperation on these topics.

The Conservation of Arctic Flora and Fauna Working Group also will need to consider its relationship with the sustainable development program, and in particular to avoid consideration of economic and other policy-related issues that should be taken up by the senior Arctic officials or the Arctic Council itself. As the Commission noted in its previous report, differences of opinion among the eight Arctic nations on whether and how the Conservation of Arctic Flora and Fauna Working Group should address such topics related to sustainable development led to disagreements concerning the working group's responsibilities, if any, with regard to sustainable development.

### **Coordinating U.S. Involvement in Arctic Activities**

In the United States, the Department of State has lead responsibility for developing and overseeing implementation of U.S. policy regarding the Arctic. To help meet this responsibility, the positions of the United States regarding policy-related matters to be considered at working group, senior official, and ministerial meetings are developed through a federal interagency Arctic Policy Group chaired by the Department of State. This group includes representatives of the Marine Mammal Commission, the Arctic Research Commission, the Environmental Protection Agency, the National Science Foundation, and the Departments of Commerce, Defense, Energy, the Interior, and Transportation. Representatives of the state of Alaska, Alaska Native organizations, industry, and public interest groups are consulted to help develop policies regarding issues that affect them.

As noted in the Commission's previous report, the Department of State undertook in 1997 to develop a statement of U.S. goals for the Arctic Council. This was initiated following a recommendation made by the Commission in a letter dated 3 June 1997. In 1998 the Department of State circulated a draft goals statement to solicit comments from federal agencies

and others. These comments were incorporated into a final draft agreed to by the agencies and is being used by the State Department as a working document.

Domestic coordination on Arctic Council matters appears to be improving through more focused discussions in the Arctic Policy Group and through additional meetings between the U.S. senior Arctic official and the U.S. lead representatives to each working group. To this end, the Department of State's Undersecretary for Global Affairs convened a high-level interagency meeting on 5 November 1998, in which Commission representatives took part, to discuss U.S. responsibilities and agency commitments for hosting the Arctic Council through 2000. It appears that agency interest in contributing to the work of the council has increased, in large part because of the increased visibility achieved by United States' hosting the council.

The Commission will continue to take part in domestic discussions of Arctic Council issues, to send representatives to appropriate meetings, and to make recommendations as appropriate concerning the organization and content of work by the Arctic Council and its subsidiary bodies.

### **Convention on International Trade in Endangered Species of Wild Fauna and Flora**

The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) provides an international framework for regulating trade in animals and plants that are or may become threatened with extinction. The Convention entered into force in 1975 and at the beginning of 1998 had been signed by 143 parties. During 1998 Mauritania became a signatory, and Azerbaijan acceded to the Convention on 23 November 1998 with an effective date of 21 February 1999. This will bring the number of CITES members to 145. Within the United States, the Fish and Wildlife Service is the lead agency for federal actions under the Convention.

The Convention provides for three levels of trade control. Depending on the extent to which a species

is endangered, it may be included in one of three appendices to the Convention. Appendix I includes those species considered to be threatened with extinction and that are or may be affected by trade. Appendix II includes species that are not necessarily threatened with extinction but could become so unless trade in them is strictly controlled. Species may also be included on Appendix II if they are so similar in appearance to a protected species that the two could be confused. Appendix III includes species that any Party identifies as being subject to regulation within its jurisdiction for the purpose of preventing or restricting exploitation and for which the Party needs the cooperation of other Parties to control trade. Additions and deletions of species listed on Appendices I and II require concurrence by two-thirds of the Parties voting on a listing proposal. Species may be placed on Appendix III unilaterally by any Party.

Parties to the Convention meet every two and a half years to consider, among other things, additions and deletions to the appendices. The 10th and most recent meeting of the Conference of Parties took place in June 1997 in Zimbabwe. The 11th Conference of Parties had been scheduled for November 1999 in Indonesia, but the economic crisis in that country compelled it to withdraw its invitation. The meeting, to be hosted by the CITES Secretariat, has been rescheduled for 10–20 April 2000 at the United Nations Environment Programme headquarters in Nairobi, Kenya.

### Proposed Changes to the Appendices

Prior to a meeting of the CITES Parties, any Party may propose adding or deleting species to the appendices or transferring species from one appendix to another. As discussed in the previous annual report, before the 1997 CITES meeting, Japan and Norway submitted proposals to downlist certain stocks of minke whales, gray whales, and Bryde's whales from Appendix I to Appendix II. Such a move, if approved, could be significant in that it would open the door for commercial import of these species, provided that the necessary permits have been obtained.

CITES members considered the five downlisting proposals at the 1997 meeting, and, by secret ballot, rejected four proposals involving minke and gray

whales. After this defeat, Japan withdrew its fifth proposal to downlist Bryde's whales.

With the postponement of the 11th Conference of Parties, CITES members now have until 12 November 1999 to propose amendments to the appendices. It is expected that Japan will resubmit its proposals to downlist the eastern Pacific stock of gray whales (*Eschrichtius robustus*), the Okhotsk Sea/west Pacific and Southern Hemisphere stocks of minke whales (*Balaenoptera acutorostrata*), and the western North Pacific stock of Bryde's whales (*Balaenoptera edeni*). Norway also has indicated that it will resubmit a proposal to downlist the northeast Atlantic and North Atlantic central stocks of minke whales.

It is the opinion of the United States and several other nations that all species and stocks of whales covered by the IWC's moratorium on commercial whaling should be included on Appendix I of CITES and should remain there until the IWC sets commercial quotas for these whales.

### Consolidation of CITES Resolutions

As part of a general streamlining of procedures, the CITES Parties at the eighth meeting in Kyoto, Japan, in 1992 agreed to a process of consolidating resolutions on a single subject into a single document in order to provide a more "user-friendly" product. At the 10th CITES meeting in Zimbabwe, Parties considered a draft consolidated resolution on cetaceans. At the request of Japan, it was agreed that the draft would be circulated to all Parties for comment and possible revision.

On 17 December 1998 the U.S. Fish and Wildlife Service wrote to the CITES Secretariat commenting on the draft consolidated resolution. In its letter, the Service noted that the United States supports the continuing effort to consolidate resolutions, provided that the resulting product does not impinge on the validity of resolutions that are still sound. In this regard, the Service noted that Resolution Conf. 2.9, "Trade in Certain Species and Stocks of Whales Protected by the International Whaling Commission from Commercial Whaling," was overwhelmingly reaffirmed by the 10th meeting of CITES Parties. The Service urged that any consolidated resolution

include the full retention of Resolution Conf. 2.9 without modification or amendment.

The Service also noted that, subsequent to the action taken at the 10th CITES meeting, the IWC passed a resolution expressing its appreciation for the reaffirmation of the link between the two organizations. The Service requested that the IWC resolution be circulated to the CITES Parties, particularly if the draft consolidation goes forward for consideration at the April 2000 meeting. The matter will be taken up by the CITES Standing Committee when it meets in February 1999, and a revised consolidated resolution is expected to be considered at the next Conference of Parties in April 2000.

### **CITES Relationship to the IWC**

During consideration of the proposals by Norway and Japan to downlist whale stocks at the June 1997 CITES meeting, lengthy debate focused on the relationship between CITES and the IWC. Many CITES Parties stated their opposition to changing appendix designations for whales before the IWC's Revised Management Scheme has been completed. Other Parties saw a need for independent action under CITES using the Convention's own criteria when listing species on the appendices.

A similar discussion ensued following the submission by Japan of a draft resolution intended to redefine the relationship between CITES and the IWC. The resolution called for repealing a resolution adopted in 1979 that recommends that Parties not issue permits for harvest or trade for primarily commercial purposes of any species or stock protected from commercial whaling by the IWC. Japan argued that the CITES decision to list certain whale stocks on Appendix I had been taken in response to the IWC moratorium, but that the moratorium itself had been established without adequate scientific grounds. The Japanese delegation therefore suggested that the CITES Parties repeal the pertinent resolution and instead rely on their own listing criteria. Following

a lengthy debate, the draft resolution was defeated by a vote of 51 to 27. The discussion, however, resulted in a clarification from the CITES Secretariat stating that, although consultation was essential under CITES and other conventions such as that implementing the IWC, this did not mean that it was obligatory for there to be strict adherence in one convention to decisions made within another.

### **Illegal Trade in Whale Meat**

Since 1979 CITES Parties have cooperated with the IWC to prevent trade in whale meat from any species or stock protected from commercial whaling by the IWC. As discussed in previous annual reports, in 1994 CITES Parties adopted a resolution recognizing the need for the IWC and the CITES Secretariat to cooperate and exchange information on international trade in whale products. The resolution urged countries to report any incidents of illegal trade in whale products to the CITES Secretariat.

Despite the cooperation that has resulted from the resolutions adopted by both CITES Parties and the IWC, illegal trade in meat from Appendix I whale species remains a significant problem. At the June 1997 CITES meeting, a consensus document was adopted as a formal decision addressing cooperation in monitoring illegal trade in whale meat. The decision encourages CITES Parties to inventory frozen whale products possessed in commercial quantities and to collect samples for DNA identification from all inventoried stocks, as well as from baleen whales taken in indirect harvests and, where practicable, from aboriginal and incidental takes. It further invites all concerned countries to cooperate in determining sources of whale meat in cases of smuggling, or unknown identity, and to make relevant information available to the CITES Secretariat for dissemination to interested Parties.

It is anticipated that the subject will be reviewed at the next CITES meeting in April 2000.



## Chapter V

# MARINE MAMMAL STRANDINGS AND DIE-OFFS

There appears to have been an increase in the incidence of unusual marine mammal mortalities in the past 15 to 20 years. There also appears to have been an increase in unexplained marine mammal population declines, such as those involving sea otters off Adak Island, Alaska, where numbers dropped from approximately 1,800 animals in 1994 to about 400 in 1996, and along the California coast, where the resumption of sea otter population growth that followed the ban on coastal gillnet fisheries in the mid-1980s has now stopped. (See the discussions in Chapter II on the continuing declines of sea otters, Hawaiian monk seals, and Steller sea lions.) Further, there appears to have been a general increase in the number of marine mammal strandings in some coastal areas. For example, the number of dead marine mammals found on beaches in the southeastern United States has doubled since the mid-1980s although this may merely reflect better reporting (see Figure 14).

Unusual marine mammal mortality events in the United States over the past two decades have involved a broad range of species in widely separated geographic areas. They include monk seals in the Northwestern Hawaiian Islands, harbor seals and humpback whales in New England, sea lions in California, bottlenose dolphins along the east and Gulf coasts of the United States, and manatees in Florida. Worldwide, the largest and most publicized events in the past decade were the deaths of more than 700 bottlenose dolphins along the U.S. mid-Atlantic coast in 1987–1988, more than 17,000 harbor seals in the North Sea late in 1988, more than 1,000 striped dolphins in the Mediterranean Sea in 1990–1991, about 150 manatees along the southwestern coast of Florida in 1996, perhaps as many as 200 Mediterranean monk seals off the northwestern coast of Africa in 1997, and more than 1,600 New Zealand (Hooker's) sea lion pups on Auckland Island rookeries in 1998 (see below). The Florida manatee, Mediterranean monk seal, and New Zealand sea lion die-offs

demonstrate the devastating impact that unusual mortality events can have on marine mammal species threatened with extinction.

Several of these mass mortality events appear to have been caused by a morbillivirus, congeners of which cause distemper in dogs and measles in humans. It is not known whether cetaceans and pinnipeds have only recently been exposed to the virus, and thus have no acquired immunity to it, or whether more virulent forms of the virus have evolved.

Furthermore, it is not known whether animals in affected populations had been stressed in ways that could compromise their immune systems or whether there are simply better means now for detecting both viruses and unusual mortality events than in the past. Morbillivirus infections are now recognized to be common in a wide range of marine mammal species and populations in many areas although there is little or no evidence of associated serious illness in most instances.

High levels of certain environmental contaminants were found in the blubber, livers, and other tissues of some of the bottlenose dolphins and striped dolphins that died during the unusual mortality events noted above. These contaminants may have affected the animals' immune systems and made them more vulnerable to the virus. Available information is insufficient, however, to determine how, at what levels, or in what combinations, environmental contaminants may compromise the immune systems or otherwise affect marine mammals. As described in Chapter VI, the Commission, the National Marine Fisheries Service, the Environmental Protection Agency, and the National Fish and Wildlife Foundation jointly sponsored a workshop on contaminants in marine mammals in October 1998 to better document and determine how to resolve the most critical uncertainties.

At least two of the unusual events listed above were caused by natural toxins. Humpback whales in Cape Cod Bay (Massachusetts) died after ingesting mackerel containing saxitoxin, a neurotoxin produced by the dinoflagellate that causes paralytic shellfish poisoning in humans. The deaths of Florida manatees in 1996 resulted from exposure to brevetoxin, a toxin produced by the red tide organism *Gymnodinium breve*. Toxic algal blooms appear to be occurring more frequently in many parts of the world, perhaps spurred by pollution and other environmental changes.

### Unusual Mortality Events in 1998

Relatively few events involving unusually high levels of marine mammal mortality occurred during 1998. As discussed below, however, events were recorded for New Zealand sea lions in the Auckland Islands, California sea lions in central California, pinniped species along the California coast, and beaked whales along the southeastern U.S. coast.

#### New Zealand Sea Lions

The most serious event in 1998 involved New Zealand (Hooker's) sea lions, a species numbering some 12,000 to 14,000 animals that is restricted to the Auckland Islands south of New Zealand. More than 1,600 pups and an unknown number of adults died between mid-January and early February 1998. A scientific team from the Massey University Cetacean Investigation Centre and the New Zealand Department of Conservation conducted an investigation. Sample collection and transport were hampered by the site's remote location and severe weather, but tissue and blood samples were collected opportunistically — mostly from animals examined in the later stages of the event. Preliminary results of the investigation failed to confirm a cause for the die-off. Studies revealed neither consistent lesions nor pathogenic agents known to cause epidemics among marine mammals. Investigators concluded that the event may have been caused by a natural toxin acting alone or in combination with opportunistic pathogens and perhaps El Niño-related alterations in prey availability. Although no biotoxins were detected in tissues, concurrent toxic algal blooms at other sites around the New

Zealand mainland caused clinical illness in humans and were considered the likely cause of death of fishes, seabirds, and other pinnipeds in affected areas.

#### California Sea Lions

More than 70 adult and subadult California sea lions in physical distress were recovered from central California beaches in May 1998. Symptoms included seizures, loss of coordination, and vomiting; most animals were in good body condition. More than half of the sea lions died or were euthanized; some survivors appeared to recover quickly, but others required intensive medical care and prolonged rehabilitation. The cause of the event was thought to be domoic acid, a toxin produced by the diatom *Pseudo-nitzschia australis*. Evidence to support this conclusion included a coincident algal bloom involving a number of species of *Pseudo-nitzschia*, with cell counts reaching 200,000 per liter in Monterey Bay; symptoms indicative of a neurological disorder; high levels of domoic acid in prey species; bird kills in the affected area; lesions consistent with domoic acid poisoning; and detection of the toxin in serum samples.

#### Other Pinnipeds Off California

Unusual numbers of pinniped deaths and strandings along the California coast, as in other areas of the eastern Pacific Ocean, continued through the winter of 1997–1998 in conjunction with the strongest El Niño on record. As in previous events, the greatest impacts were on pup production and first-year survival. In late 1997 the numbers of dead or stranded northern fur seals and California sea lions found along the California coast rose dramatically as El Niño conditions continued to develop; the number of weaned northern fur seal pups stranded along the central and northern coast of California during October and November 1997 was at least four times the normal number for that time of year. On San Miguel Island, about 1,500 northern fur seal pups — or 75 percent of the cohort — died before weaning. Mortality of northern elephant seal pups at the Point Reyes colony in late February 1998 approached 90 percent after pups and adults were washed off beaches in a series of El Niño-related storms.

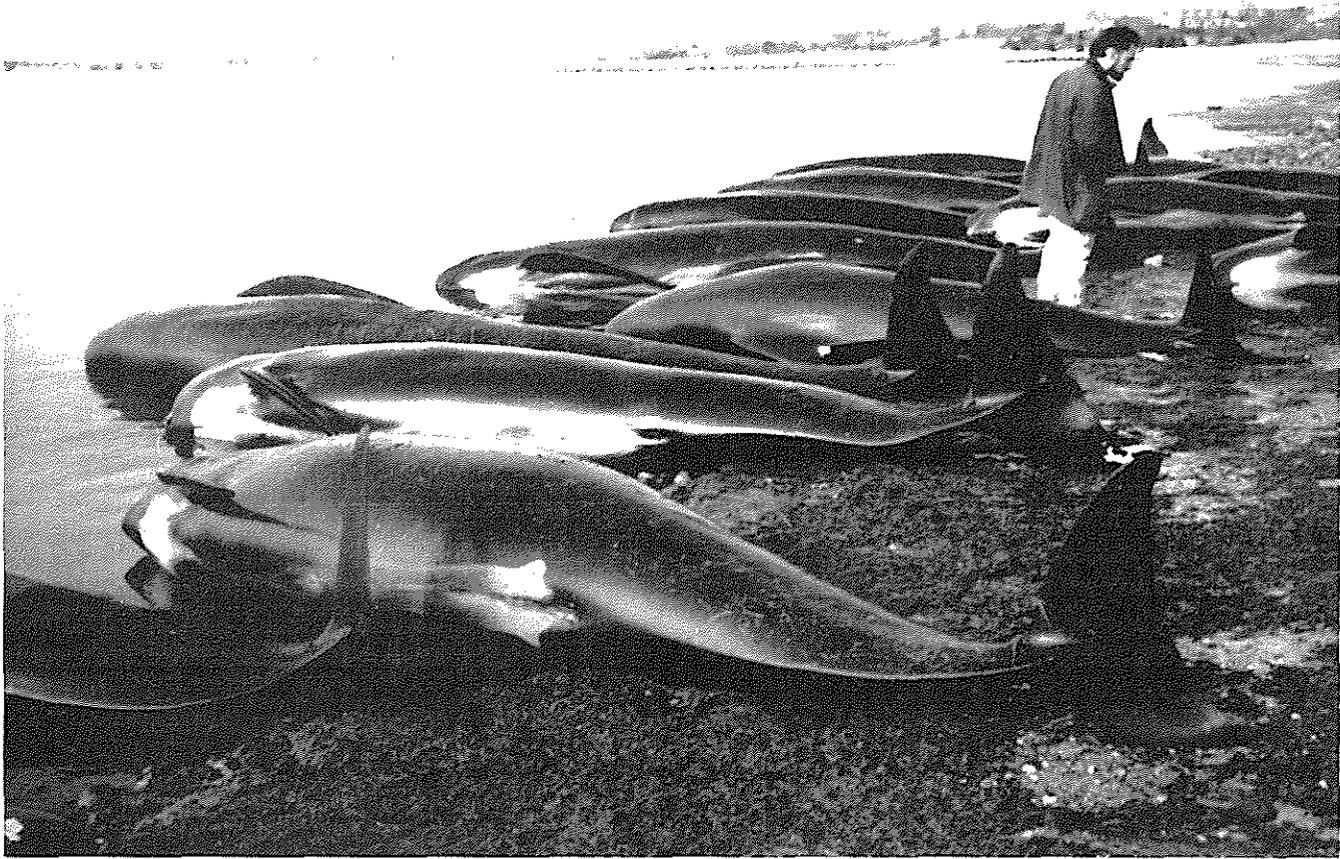


Figure 14. Mass stranding of long-finned pilot whales on Cape Cod in 1990. Stranded marine mammals provide an important source of tissue samples for scientific research. (Photograph courtesy of Valerie Lounsbury)

Biologists from the National Marine Mammal Laboratory reported that similar impacts were seen during the 1983 and 1992 El Niño events. In 1983 northern fur seal pup production on San Miguel Island declined by 60 percent and first-year mortality was close to 100 percent; pup production by California sea lions in the Channel Islands also declined by about 30 to 70 percent, and northern elephant seal pup mortality due to storms was high (70 percent on Año Nuevo Island). In spite of the impacts of these events, U.S. west coast populations of northern elephant seals, northern fur seals, harbor seals, and California sea lions have increased dramatically since the 1970s.

### **Beaked Whale Strandings in the Southeastern United States**

Strandings of beaked whales of the genus *Mesoplodon* are normally rare in U.S. waters. Between late August and mid-October 1998, twelve single strandings (including one mother-calf pair) were reported in the southeastern United States. The strandings occurred on both the Atlantic and Gulf of Mexico coasts. Investigations revealed no consistent patterns suggestive of a single cause. Antibodies to morbillivirus were found in one individual; several whales

that stranded in North Carolina showed possible evidence of fisheries interactions.

## Response to Unusual Mortality Events

As noted in previous Commission reports, the deaths of hundreds of bottlenose dolphins along the U.S. mid-Atlantic coast in 1987–1988 led Congress to add Title IV — Marine Mammal Health and Stranding Response — to the Marine Mammal Protection Act in 1992. Among other things, the new title directed the Secretary of Commerce to (1) establish an expert working group to provide advice on measures necessary to better detect and respond appropriately to future unusual marine mammal mortality events; (2) develop a contingency plan for guiding response to such events; (3) establish a fund to compensate persons for certain costs incurred in responding to unusual mortality events; (4) develop objective criteria for determining when rehabilitated marine mammals can be returned to the wild; (5) continue development of the National Marine Mammal Tissue Bank (described in previous Marine Mammal Commission annual reports); and (6) establish and maintain a central database for tracking and accessing data concerning marine mammal strandings.

The Secretary of Commerce delegated responsibility for these directives to the National Marine Fisheries Service. In response, the Service, in consultation with the Marine Mammal Commission and the Fish and Wildlife Service, established a working group in 1993 to advise on measures necessary to better detect and respond to unusual marine mammal mortality events. The group held its first meeting in April 1993 and has met annually since then. Representatives of the Marine Mammal Commission have served on the working group since it was established.

An external program review of the Marine Mammal Health and Stranding Response Program was held on 23–25 April 1997 in Silver Spring, Maryland. Participating were representatives of federal and state agencies, international organizations, the academic community, and non-governmental organizations. Participants were divided into two panels: one to consider operations of the regional stranding networks

and the other to review the biomonitoring component of the program. The results of the review were used to improve both the stranding response and biomonitoring programs.

A follow-up workshop was held at the Southeast Fisheries Science Center in Miami on 30–31 July 1998 to seek the views of scientists, operators, and others concerning minimum quarantine, food handling, and other standards for facilities that rescue and rehabilitate sick and injured marine mammals. At the end of 1998 no decision had been made concerning the need for or content of possible standards.

## National Marine Mammal Tissue Bank

As described in previous Commission reports, the National Marine Mammal Tissue Bank was established in 1989 by the National Marine Fisheries Service's Office of Protected Resources to archive tissues from marine mammals in different geographic areas as a resource for future research. The contaminants present in the tissues may be good indicators of the types and levels of pollutants present in coastal marine ecosystems. As noted earlier, there is insufficient information to determine how, at what levels, or in what combinations environmental contaminants may affect marine mammals. Archived tissues provide a source of data for comparison with data to be collected during future unusual events.

Early in the development of the tissue bank, the National Marine Fisheries Service established an independent team of scientists to provide advice on the types of tissues that should be archived and how the tissues should be collected, stored, and made available for study. The Service also began a quality assurance and contaminant monitoring program. A Commission representative serves on the team.

The Marine Mammal Health and Stranding Response Act also required that the Secretary of Commerce provide information to stranding networks on procedures for dealing with stranded marine mammals. In response, the National Marine Fisheries Service in 1990 contracted for a field manual to guide the responses of stranding network participants.

*Marine Mammals Ashore: A Field Guide for Strandings* was published in 1993 (see Appendix C, Geraci and Lounsbury). The Marine Mammal Commission provided funds to help illustrate this manual.

By 1997 the field guide was out of print. In response to continuing demand for the manual and the desire to (1) encourage development of stranding networks in other countries, (2) promote adherence to standardized methods of sample and data collection, and (3) increase international communication and cooperation during investigation of unusual marine mammal mortality events, the National Marine Fisheries Service, National Ocean Service, and National Aquarium in Baltimore jointly developed an updated CD-ROM version of *Marine Mammals Ashore*. The National Sea Grant College Program and the Marine Mammal Commission provided additional support. The CD-ROM version was released in late 1998 and may be obtained from the National Aquarium in Baltimore, Biological Programs, Marine Mammals Ashore Project, Pier 3, 501 E. Pratt Street, Baltimore MD 21202, or by contacting the aquarium on the World Wide Web at [www:aqua.org](http://www:aqua.org).

### **Serum/Blood Banking for Marine Mammals**

In order to better understand the causes of population declines and the impacts of human activities on marine mammal populations and to investigate the causes of marine mammal mortalities, it is important to know what diseases are endemic in the affected population and whether a new pathogen may have been introduced to an immunologically naive population. The value of banked sera for retrospective studies has been clearly demonstrated for pathogens including morbillivirus and *Brucella*. Thus, the National Marine Fisheries Service is developing a catalog of the marine animal serum samples being banked in the United States. In conjunction with the Department of Agriculture's National Veterinary Services Laboratory, the Service has designed a quality assurance program for serological testing, which involves development of standard reference materials and interlaboratory comparisons for six pathogens. The Service is working with three established sera banks to integrate banking programs.

## **The National Contingency Plan**

In response to directives in Title IV of the Marine Mammal Protection Act, the National Marine Fisheries Service developed a contingency plan to guide responses to unusual marine mammal mortality events in U.S. waters. The Commission, in consultation with its Committee of Scientific Advisors, reviewed and provided comments on draft plans in September 1994 and March 1995. The final plan, done in consultation with the Marine Mammal Unusual Mortality Event Working Group, was published by the Service in September 1996.

The plan, titled the "National Contingency Plan for Response to Unusual Marine Mammal Mortality Events," notes that Title IV of the Marine Mammal Protection Act specifies that responses to unusual mortality events are to be directed by an on-site coordinator, who is to be the appropriate regional director of the National Marine Fisheries Service or the Fish and Wildlife Service or his or her designee. The plan's primary purpose is to provide guidance to the regional directors of the two Services on such things as (1) criteria to determine when an unusual event is occurring; (2) steps to protect public health and welfare in cases where dead or dying animals, or the agents killing them, could pose a threat; (3) planning to respond to unusual events; (4) depending on the nature of the event, steps to determine the cause and biological significance of the event; and (5) steps to document the collection and disposition of tissue and other samples, especially in cases where the mortality event may be a consequence of a toxic chemical spill or other human-related action.

In April 1997 the Fish and Wildlife Service completed its "Contingency Plan for Catastrophic Manatee Rescue and Mortality Events," intended for use in conjunction with the national plan. Later in 1997 the Florida Department of Environmental Protection, involved in routine manatee rescue and salvage efforts as well as in responses to the 1996 red tide-related die-off, developed a substantially more detailed plan to guide state response efforts and to effectively utilize existing and potential sources of logistic support, expertise, and funding. In November 1998 the Fish and Wildlife Service released the a revision of its

“Contingency Plan for Catastrophic Manatee Rescue and Mortality Events” to correspond with the detail contained in the state plan (see also the manatee discussion in Chapter II).

The Commission recognizes the global nature of unusual mortality events and the growing need for international cooperation for contingency planning and scientific investigation. A Commission representative attended the Workshop on Antarctic Diseases in Hobart, Tasmania, in August 1998 to discuss risks of die-offs and assist the Australian Antarctic Division with preliminary steps to develop contingency plans for environmental disasters in the Southern Ocean.

### Development of Release Criteria

For marine mammals that strand because they are sick, returning them to the wild before they are fully recovered could risk transmitting disease-causing organisms to healthy animals. Further, such premature returns could lead to an animal's death from starvation or injury if it is not sufficiently healthy to capture prey, avoid predators, or defend itself from other animals. Animals that have been maintained in captivity for relatively long periods of time could face similar problems if they are not healthy or have not been properly conditioned to survive in the wild.

Title IV of the Marine Mammal Protection Act directs the Secretary of Commerce to develop objective criteria for use in determining the point at which a rehabilitated marine mammal can be released to the wild. In doing so, the Secretary is directed to consult

with the Secretary of the Interior, the Marine Mammal Commission, and individuals with knowledge and experience in marine science, marine mammal science, marine mammal veterinary and husbandry practices, and marine conservation, including stranding network participants. An opportunity for public review and comment on the proposed criteria will be provided.

Recognizing the importance of this issue, the Marine Mammal Commission and the National Marine Fisheries Service jointly sponsored a workshop in December 1991 to obtain expert advice on rescue, rehabilitation, and release of stranded marine mammals. The workshop participants included representatives of public display facilities and marine mammal rehabilitation centers, state and federal agencies with jurisdiction over marine mammals and marine mammal display and rehabilitation facilities, and scientists with related expertise. The workshop report, “Rescue, Rehabilitation, and Release of Marine Mammals: An Analysis of Current Views and Practices,” was published by the National Marine Fisheries Service in July 1996 (see Appendix C, St. Aubin *et al.* 1996).

The Marine Mammal Unusual Mortality Event Working Group has been charged with developing criteria for determining when it is appropriate to return stranded marine mammals to the wild. Possible criteria were discussed at the working group's meetings in 1994, 1995, 1996, and 1997. A preliminary draft paper setting forth possible release standards was provided to the working group for review and comment in May 1996. The document is scheduled for completion in 1999.

## Chapter VI

# EFFECTS OF POLLUTION ON MARINE MAMMALS

Marine mammals can be affected directly and indirectly by a variety of environmental contaminants of human origin. These include persistent organic compounds and toxic metals from point and non-point sources, lost and discarded fishing gear and other marine debris, and noise from a variety of anthropogenic sources. Direct effects include mortality from toxic chemical spills, entanglement in lost and discarded fishing gear, and hearing loss caused by loud noises. Indirect effects include decreased survival and productivity due to contaminant-caused decreases in essential prey species.

Actions taken by the Commission and others with regard to marine debris are described in the Commission's previous report and in the sections of this report concerning Hawaiian monk seals and conservation of marine mammals and their habitats in the Southern Ocean. The following sections of this chapter provide background information and describe efforts by the Commission, in consultation with its Committee of Scientific Advisors, to identify and precipitate actions necessary to minimize threats posed by chemical pollution and noise from various sources.

### Effects of Chemical Contaminants

Virtually all marine mammals alive today have been exposed to a variety of chemical compounds and trace elements introduced into the marine environment by human activities. Many of these substances enter the marine environment directly as a result of runoff, leakage, dumping, or atmospheric transport. They are also dispersed in the environment via food webs. As high-order predators, marine mammals (except the sirenians and some baleen whales) can experience the effects of biomagnification. They can acquire relatively large burdens of foreign substances by ingesting contaminated prey. Like other air-breathers, marine mammals also are exposed to contaminants via atmo-

spheric gas exchange. The physiological processes involved in storage, metabolism, and elimination of contaminant burdens are poorly understood. Also, there is great uncertainty about the mechanisms and pathways of contaminant flux in marine environments and food webs.

The possible effects of chemical contaminants on the health of individual marine mammals and on the welfare of marine mammal populations have received increasing attention over the past three decades, and especially during the last few years. Among the concerns are (1) the apparently increasing incidence of disease outbreaks involving many animals with apparently high burdens of organochlorines or other contaminants; and (2) the growing experimental and other evidence that contaminants often found in marine mammal tissues have deleterious effects on reproduction. Recognizing the growing importance of the problem, the Marine Mammal Commission, the Environmental Protection Agency, the National Marine Fisheries Service, and the National Fish and Wildlife Foundation jointly sponsored a Workshop on Marine Mammals and Persistent Ocean Contaminants.

The workshop, held in Keystone, Colorado, on 12-15 October 1998, was attended by more than 50 scientists from seven countries. Their expertise spanned the disciplines of environmental toxicology, environmental chemistry, marine mammal health and husbandry, pathology and disease, physiology, immunotoxicology, marine mammal population dynamics and ecology, experimental design, and environmental risk assessment. The workshop focused on science rather than policy and was organized by a steering committee with representatives of the Commission, the Biological Resources Division of the U.S. Geological Survey, the National Marine Fisheries Service, the Environmental Protection Agency, and the academic community. Its objectives were as follows:

- (1) to provide a succinct summary of what is known about the types and levels of potentially harmful persistent contaminants that have been found in marine mammals throughout the world, and the known and potential effects of those contaminants on marine mammal health and population dynamics;
  - (2) to identify and rank by relative importance the critical gaps in knowledge concerning the presence, levels, sources, fates, and effects of organochlorines, toxic elements, and other persistent contaminants in marine mammals;
  - (3) to determine and describe the types of research and monitoring programs, including new and innovative approaches, that would be required to resolve the most critical uncertainties as quickly as possible; and
  - (4) to assess how ongoing and planned research and monitoring programs might be restructured or augmented to better meet the identified information needs.
- a combination of laboratory and field studies likely will be required to document adverse effects and determine how to mitigate them. Some effects probably can be inferred from *in vitro* studies; others probably can be inferred from *in vivo* studies of rodents and other laboratory animals; still others may be inferred from postmortem examination of marine mammals found dead on beaches, killed for subsistence purposes, or taken incidentally in fisheries or as a result of other human activities. In some instances, detailed field studies or controlled studies with captive animals may be required; and
  - cellular and biochemical markers have been found to be useful indicators of contaminant exposure and effects in humans, laboratory animals, and certain other organisms including some marine mammals. More effort is required to identify such biomarkers and determine how they may be used to infer and monitor the exposure levels and effects of various chemical contaminants in marine mammals.

The workshop involved plenary presentations and discussions and smaller working group meetings to address four topic areas: endocrinology and reproduction; immunotoxicity, pathology, and disease; risk assessment; and likely future trends. Although the workshop report had not been completed by the end of 1998, the following findings were evident:

- there is good reason to be concerned that, in some parts of the world, the survival and productivity of marine mammals are being affected by chemical contaminants;
- new chemicals and chemical combinations being developed for use as pesticides, herbicides, fertilizers, etc., could be hazardous to marine mammals and other marine organisms and should be carefully evaluated before they are marketed;
- the effects of many contaminants may vary depending on exposure level; the species, age, sex, and general condition of the affected animals; and the presence of other contaminants. Effects may include toxicity, endocrine disruption, immunosuppression, and reproductive failure. In some cases, there may be no physiological or other response until a threshold level is reached. Studies to assess possible effects must factor in all the relevant variables;

The final workshop report is expected to be completed early in 1999. It will be distributed to the workshop participants and to relevant government agencies, laboratories, and scientists throughout the world. It will be reviewed by the Commission, in consultation with its Committee of Scientific Advisors, to identify and recommend to the responsible regulatory agencies actions necessary to assess chemical contaminants and to ensure that they are not jeopardizing marine mammals or the ecosystems of which they are a part.

## Effects of Noise

Many species of marine mammals use sound to communicate, sense their environment, navigate, and capture prey. Both natural and anthropogenic sounds may mask the sounds used for such purposes and interfere with these and other vital functions. If the interference occurs frequently or for long periods of time, it may cause animals to abandon or avoid important feeding, breeding, or resting areas and alter migratory routes. This can make animals more vulnerable to predation and disease and cause them to concentrate in undisturbed areas, which in turn may

result in crowding, overexploited food resources, increased mortality, and decreased productivity. Certain sounds also may affect the distribution, density, movements, or productivity of important prey species, making it more difficult for marine mammals to find suitable prey. Certain sounds also may cause physiological or psychological stress and make animals more vulnerable to parasites, diseases, and predation. Also, some sounds may attract marine mammals and make them more vulnerable to hunting, harassment, entanglement in fishing gear, and collision with boats. Further, high-intensity sounds and pressure waves, such as those produced by underwater explosions or acoustic harassment devices used to keep marine mammals away from fishing pens, can cause temporary or permanent hearing loss and, in some cases, seriously injure or kill marine mammals.

How and to what extent sounds affect marine mammals depends on a number of variables. The variables include the nature and intensity (loudness) of the sound, whether the source is stationary or moving, and the species, age, sex, reproductive status, activity, and previous experience of the animals exposed to the sound. Blue whales, for example, produce and apparently use low-frequency sounds for long-distance communications and therefore are more likely to be affected by low-frequency sounds from anthropogenic sources than species that produce and use higher-frequency sounds.

The distribution, diet, and behavior of some marine mammal species differ between sexes and age groups, and responses to sound likewise may differ. For example, female northern fur seals that pup and breed on the Pribilof Islands migrate to waters off central California during the winter while most adult males migrate only as far south as the Gulf of Alaska. Further, newly weaned pups and possibly yearlings are not able to dive as deep or as long as adults and therefore may have a more restricted diet and be affected more by sound-caused changes in prey availability. Also, pregnant females and females with dependent young may have habitat-use patterns, food preferences, feeding behaviors, and response thresholds that make them more or less sensitive to anthropogenic sounds than are juveniles, males, or females that are not pregnant or nursing.

In some cases, responses to anthropogenic sounds may be accentuated or dampened by prior exposure. If a sound is associated with a painful experience (*e.g.*, hearing and then being hit by a boat), exposure to that sound may evoke a more rapid or greater response in “experienced” animals than in “naive” animals. Conversely, if a sound evokes a startle response because it is unusual, repeated exposure may evoke less and less response (*i.e.*, animals may become so used to the sound that they no longer respond to it).

Response may also vary depending on the environment. For example, animals may respond differently in deep water than in shallow water, in murky water than in clear water, and in embayments than in the open ocean. In some cases, differences in response may be due to differences in ambient noise levels, which in turn are affected by vessel traffic, wind, weather, the presence of ice, and other variables. In other cases, the differences may be due to the animal itself (*e.g.*, an animal in an unfamiliar environment may respond to a sound differently than it would in a familiar environment). Similarly, response to a particular sound may depend on the activity in which the animal is involved at the time. For example, some species and individuals may be nearly oblivious to external stimuli when engaged in activities such as feeding and courtship, but other species and individuals may be particularly sensitive to disturbance when engaged in such activities.

There is growing awareness that sounds from various anthropogenic sources could be having adverse effects on marine mammals and other marine species. There also is growing awareness that certain types of sound can be used to help elucidate geologic resources beneath the ocean, the structure and dynamics of ocean water masses, and how ocean processes affect and reflect weather and climatic conditions. There also is increasing interest in using sound to influence marine mammal behavior (*e.g.*, keep them away from fishing gear) or to detect vessels and marine life, particularly fish. As this interest has increased, so too have the sources and pervasiveness of anthropogenic sound throughout the marine environment.

Available information often is insufficient to identify and make well-reasoned judgments concerning the relative costs and benefits of human activities that use and produce sounds that could affect marine mammals and other marine species. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviews sound-producing activities that may adversely affect marine mammals or other components of the ecosystems of which they are a part and provides recommendations to the responsible regulatory agencies on measures needed to resolve uncertainties and to ensure that the activities do not have significant adverse effects on marine mammals or their habitats. The Commission's recommendations with regard to requests for small-take authorizations and assessment of the possible effects of seismic surveys and other activities associated with offshore oil and gas exploration and development are described in Chapter IX. Background information and Commission actions in 1998 regarding other sound-producing activities that could affect marine mammals are described below.

### **Acoustic Thermometry of Ocean Climate Program**

In 1993 the Defense Department's Advanced Research Projects Agency provided funds to Scripps Institution of Oceanography for a proof-of-concept study titled the "Acoustic Thermometry of Ocean Climate (ATOC) Program." The intent of the program was to determine if transmission times of low-frequency sounds across ocean basins could be measured accurately and used to detect changes in ocean temperature possibly indicative of global warming. The project involved installing and periodically operating 260-watt low-frequency sound generators in deep water 15 km (9.3 miles) north of Kauai, Hawaii, and 40 km (24.9 miles) off Point Sur, California, and monitoring the sounds at distant sites.

As noted in previous Commission reports, available information was insufficient to determine how ATOC sound transmissions might affect marine mammals. Consequently, the ATOC program was expanded to include a marine mammal research program, and an advisory board of scientists not associated with the program was established to pro-

vide advice on study design. Several scientists and environmental groups questioned whether the proposed research would resolve the uncertainties concerning the possible effects of the ATOC program on marine mammals and other marine organisms. They urged that the proposed marine mammal research program and related environmental impact statements be revised and expanded to ensure that the possible environmental impacts of the planned ATOC sound transmissions in both California and Hawaii were identified and objectively evaluated.

In response, the Advanced Research Projects Agency prepared environmental impact statements for both the California and Hawaii components of the ATOC program. In addition, the ATOC principal investigator applied for and received permits from the National Marine Fisheries Service authorizing the taking of marine mammals in the course of the planned ATOC marine mammal studies. The Marine Mammal Commission's comments and recommendations on the environmental impact statements and the scientific research permits are described in previous Commission reports.

The ATOC sound source on the Pioneer Seamount, off central California, was installed in October 1995. The source off Kauai was installed in October 1996. The marine mammal studies were expected to be completed by December 1997. However, both sound generators failed to work properly and had to be repaired. Consequently, some aspects of the marine mammal research program could not be completed in 1997, and the permits authorizing the studies were extended through December 1998. No additional funding was provided and the data collection aspects of this program were terminated in 1998. The study results are expected to be reviewed by the marine mammal program advisory board in the spring of 1999 and to be made public shortly thereafter.

Reports submitted to the National Marine Fisheries Service, as required by the scientific research permits issued by the Service, indicate that the ATOC sound transmissions have had few detectable effects on marine mammals and that the effects appear biologically insignificant. A paper by the ATOC Consortium — titled "Ocean Climate Change: Comparison of Acoustic Tomography, Satellite Altimetry and Model-

ing” — published in the 28 August 1998 edition of *Science* suggests that the program could provide insight into ocean changes caused by global warming. At the end of 1998 the Commission knew of no plans or funding requests to continue the ATOC program.

### Low-Frequency Active Sonar

On 18 July 1996 the Department of the Navy published a *Federal Register* notice announcing its intent to prepare environmental impact statements on operational deployment of a surveillance towed array sonar system (SURTASS) low-frequency active (LFA) sonar. The notice indicated that the system used propagated low-frequency sound (<1000 Hz) to detect objects on and under the sea and that the Navy proposed to make the system available to fleet commanders “for world-wide employment to enhance antisubmarine capability.” The *Federal Register* notice requested information and views on issues to be addressed in the environmental impact statements.

As noted in its previous report, the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, advised the Navy by letter of 4 September 1996 of issues that it believed should be addressed. The Commission concurred with the view expressed in the *Federal Register* notice that many of the possible adverse effects on marine mammals might be avoided or minimized by combinations of measures, such as identifying and avoiding particularly sensitive species and areas. The Commission pointed out that, in some cases, available information may be insufficient to make reasoned judgments concerning possible adverse effects. For example, if the hearing ranges and thresholds of potentially affected species are unknown, it would not be possible, except by analogy with similar species whose hearing ability is known, to make reasonable judgments as to the distances at which the species might detect and possibly be affected by the LFA sonar transmission. In this regard, the Commission pointed out that the environmental impact statements should clearly identify any uncertainties and assumptions about the possible impacts of the proposed action and alternative actions on marine mammals and other biota.

On 8 January 1997 the Navy held a meeting to review comments provided by the Commission and

others. Many of the meeting participants expressed the view that available information was insufficient to accurately assess the possible environmental impacts of the proposed action, and they suggested that the Navy consult scientists not associated with the Navy to identify the information needs and how best to meet those needs. In response, the Navy constituted a scientific working group composed of government and non-government scientists to provide advice on needed research and to help evaluate the results of that research. Representatives of the Commission serve on this working group.

As noted in the Commission’s previous annual report, the Navy, based on input from the scientific review group, developed and in 1997 began implementing a three-phase research program to determine how representative marine mammal species respond to the LFA sonar transmissions. The studies have been done by a team led by scientists from Cornell University and Woods Hole Oceanographic Institution. Phase I of the experimental program, conducted off San Nicolas Island in southern California in September and October 1997, focused on blue and fin whales feeding in the area at that time of year. Phase II, undertaken in December 1997, focused on gray whales migrating along the coast of central California. Phase III was done in February and March 1998 and focused on humpback whales that mate and raise calves in waters around the main Hawaiian Islands during winter.

The Navy held a meeting on 30 June 1998 to advise the public and interested government and non-government organizations of the results of the research program and plans to prepare an environmental impact statement on the proposed deployment of the SURTASS LFA sonar. On 15–16 September 1998 the Navy convened the scientific review group to assess the usefulness of research results and ongoing efforts to analyze and report the resulting data. Commission representatives attended both meetings.

The results of the meetings and related information were reviewed by the Commission and its Committee of Scientific Advisors during their annual meeting in Portland, Maine, on 10–12 November 1998. Information presented at the meeting indicated that the experiments detected few effects on marine mammals,

that they appeared to be biologically insignificant, and that the study results, combined with available information on the distributions and critical habitats of marine mammals in potential operating areas, should enable the Navy to develop an operational strategy that poses minimal risks to marine mammals. By letter of 8 October 1998 the Commission commended the Navy for these and other efforts to ensure that Navy activities do not adversely affect marine mammals or their habitats.

### **Shock Testing the SEAWOLF Submarine**

The National Defense Authorization Act requires that new designs for the hulls and other critical components of Navy ships and submarines undergo shock tests before service in the fleet. The purpose of the tests is to evaluate the reliability of structural and electronic systems vital to the performance of the vessel and crew under combat conditions. To approximate combat conditions, shock tests are conducted by exploding charges of up to 10,000 pounds near vessel prototypes and evaluating the effects of explosions on the hull and other critical vessel components.

In June 1996 the Navy issued for public review and comment a draft environmental impact statement for shock testing the SEAWOLF submarine. At the same time, the Navy submitted a request to the National Marine Fisheries Service for authorization, pursuant to section 101 (a)(5)(A) of the Marine Mammal Protection Act, to take small numbers of marine mammals incidental to the required tests, which were planned to be carried out in 1997. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed these two documents and commented to the Navy and the National Marine Fisheries Service on 12 August and 16 September 1996, respectively.

The Navy was unable to carry out the required tests in 1997 and on 11 March 1997 petitioned the Service for an extension of the requested small-take authorization through 1999. Subsequently, the Navy advised the Service that the shock tests would be delayed until the year 2000 or beyond.

The Navy forwarded its final environmental impact statement for shock testing the SEAWOLF submarine

to the Commission and others for comment on 5 June 1998. The National Marine Fisheries Service published in the *Federal Register* on 1 December 1998 its final rule regarding the incidental harassment authorization requested by the Navy. Both the environmental impact statement and the incidental harassment authorization addressed the previously noted comments provided by the Commission.

### **Acoustic Deterrence of Harmful Marine Mammal-Fishery Interactions**

Many species of marine mammals interact with commercial fisheries and aquaculture operations in ways that kill and injure marine mammals and cause the loss of fish and damage to fishing gear and aquaculture facilities. Because many marine mammals use sound to communicate, navigate, and capture prey, both the fishing industry and the scientific community have experimented with a variety of sound reflectors and sound generators to try to prevent or reduce interactions.

As described in previous Commission reports, the National Marine Fisheries Service provided funds to the Commission in October 1995 for a workshop to identify critical uncertainties concerning the effectiveness and possible environmental impacts of acoustic devices used to prevent or reduce interactions. The workshop was held in Seattle, Washington, on 20–22 March 1996. The workshop report (see Reeves *et al.* 1996, Appendix C) was provided to the National Marine Fisheries Service on 11 October 1996.

The workshop report noted that attaching small, low-intensity sound generators (pingers) to sink gillnets may substantially reduce the number of harbor porpoises caught incidentally in gillnets in the northeastern United States and elsewhere. It concluded that, although it is uncertain as to why pingers apparently prevent the bycatch of harbor porpoises in at least some circumstances, it would be appropriate to proceed with full-scale integration of pingers into the management regime for the New England sink gillnet fishery and to experimentally assess the potential effectiveness of pingers in other gillnet fisheries, provided the regimes include (1) observer programs adequate to verify that marine mammal bycatch does

not increase over time, and (2) monitoring programs adequate to verify that neither the target marine mammals nor any non-target species are affected adversely. Actions taken by the National Marine Fisheries Service to incorporate and assess the effectiveness of pingers in the management regime for gillnet fisheries in the northeastern United States are described in the Gulf of Maine harbor porpoise section of Chapter II.

The workshop report also noted that high-intensity sound generators — referred to as acoustic harassment devices or AHDs — were being used in the United States and elsewhere to try to keep seals and sea lions away from salmon aquaculture facilities. It pointed out that these devices appear to work because they produce sounds that are painful or frightening to pinnipeds. It also pointed out that it is not known whether seals and sea lions will approach these devices close enough to have their hearing temporarily or permanently damaged or whether the sound produced by the devices will affect other species adversely. With respect to the latter point, it was noted that there were unpublished reports of harbor porpoises apparently responding to sounds produced by AHDs at distances in excess of 1 km (0.62 mile). Because of such uncertainties, the workshop participants concluded that (a) use of high-intensity AHDs should be considered only when other less aversive measures (*e.g.*, locating fish farms as far away as possible from pinniped rookeries and constructing physical barriers to keep seals and sea lions out of fish pens) have been tried and found to be inadequate; (b) studies should be done both to verify the effectiveness of AHDs and to assess the risks to target and non-target species; and (c) some form of licensing or prior authorization should be required for both operational and experimental use of these devices until the risks have been assessed and determined to be negligible.

As noted in its previous report, the Commission does not believe that the National Marine Fisheries Service has appropriately considered the workshop's conclusions regarding the use and possible adverse effects of high-intensity AHDs. In particular, the Commission believes that the Service has neither undertaken nor required the aquaculture industry to undertake studies to determine whether such devices could cause serious injury to marine mammals or

other marine species. Neither has it restricted the use of such devices pending resolution of uncertainties.

### **High-Energy Seismic Surveys**

The oil and gas industry uses towed arrays of airguns and other devices to generate high-energy sounds that penetrate the ocean floor to delineate possible geological formations bearing oil and gas resources. Such sounds can travel long distances and have been found to affect the movements and behavior of certain marine mammals, sometimes at distances of 10 km (6.2 miles) or more.

Available information often is insufficient to determine *a priori* how different marine mammals may be affected by seismic profiling. As noted in the Commission's previous report, the Pacific Office of the Minerals Management Service held a workshop on 12–13 June 1997 to review available information and identify research and monitoring needed to better document the possible effects of high-energy seismic surveys on marine mammals. The meeting participants included a panel of acoustic and marine mammal experts. A final report of the workshop was expected to be completed early in 1998. However, at the end of 1998 it had not yet been completed.

### **Related Minerals Management Service Actions**

In the past 20 years, the Minerals Management Service has funded a broad range of studies to determine the possible effects of offshore oil and gas exploration and development on marine mammals (see, for example, Waring 1981–1998, Appendix B). One such study was an assessment of the species, numbers, and environmental factors affecting the distribution of cetaceans in areas of the northern Gulf of Mexico where they could be affected by offshore oil- and gas-related activities. This program, known as the GulfCet Program, was funded by the Service in response to information needs identified by participants in a Service-sponsored workshop on sea turtles and marine mammals in the Gulf of Mexico held in August 1989. The fieldwork was completed in 1998 and the program report is expected to be submitted to the Service in the first half of 1999.

Preliminary results of the GulfCet Program were reviewed at an information transfer meeting held by the Minerals Management Service on 8–10 December 1998 in New Orleans. During the meeting, information on the effects of seismic operations and drill rig removal on marine mammals and sea turtles also was reviewed. A representative of the Marine Mammal Commission attended the meeting and participated on a panel of agency and industry representatives that was asked to comment on information provided.

During the panel discussions, it was noted that the GulfCet Program had documented both high species diversity and high abundance of marine mammals in the northern Gulf, particularly in offshore areas. It also was noted that the distribution of most species, including sperm whales, appears to be associated with cold water rings that produce upwellings and have high primary and secondary productivity. In this regard, the GulfCet Program is one of the few marine mammal programs that has attempted to identify the distribution patterns and environmental factors affecting marine mammal distribution and behavior, as well as the composition and abundance of marine mammals in an area of interest.

Oil and gas exploration and development have been ongoing in the northern Gulf of Mexico since the early 1960s. Thus, there has been and continues to be much seismic profiling and other development-related activities that produce noise that may affect marine mammals and other marine organisms. Currently, for example, an average of three or four seismic surveys are conducted in the northern Gulf every day, and more than 100 exploration and development wells are drilled every year. In addition, an average of more than 1,000 boat trips and 2,000 helicopter trips are made every day to transport personnel and equipment. (See Chapter VII for additional information regarding oil and gas exploration and development in the Gulf.)

From experience in Alaska and California, there is reason to believe that such noise can have at least short-term effects on the distribution and behavior of some marine mammals (for examples, see W. J. Richardson, C. R. Greene, Jr., C. I. Malme, and D. H. Thomson. 1995. *Marine Mammals and Noise*. Academic Press. San Diego, California. 575 pp.). However, nothing has been done since the Marine

Mammal Protection Act was enacted in 1972 to (a) identify, model, and verify the transmission characteristics of the types of sound produced by seismic profiling and other noise-generating activities in the northern Gulf; (b) determine the likely species-specific zones of influence of the various sources; (c) determine whether and how the distribution, abundance, or productivity of any resident species or populations may have been affected by the sound fields; or (d) assure that any effects on survival or productivity of marine mammals in the northern Gulf are negligible.

Because exploration and development have been ongoing in the northern Gulf for nearly 40 years, it is possible that many or all of the potentially affected marine mammal species have become accustomed to the noise and no longer are affected by it. It also is possible that some or all of the potentially affected species have altered their habitat-use patterns to avoid noisy areas. Such effects could be species-specific, age-specific, or area-specific. The biological significance of such effects likely would depend on factors such as whether the habitats to which animals are displaced are less productive or otherwise less suitable than those previously occupied.

The Minerals Management Service is planning to hold a workshop in June 1999 to more clearly define such uncertainties and determine what can be done to resolve them. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, will help in any way that it can to help structure the workshop to ensure its success.

### **Workshop on the Effects of Anthropogenic Noise in the Marine Environment**

The Office of Naval Research held a workshop on 10–12 February 1998 to identify critical research needs regarding the effects of anthropogenic noise on marine mammals and other marine organisms, including fish and sea turtles. Participants, including representatives of the Marine Mammal Commission, had expertise in the fields of ocean acoustics; the effects of sound on the physiology and hearing of marine mammals, fish, terrestrial vertebrates, and humans; and mitigating noise effects on marine mammals. The workshop report, expected to be

completed early in 1999, will be used by the Navy, the Commission, the National Marine Fisheries Service, the Minerals Management Service, and others to identify critical research needs and determine actions needed to ensure that anthropogenic noise does not have significant adverse effects on marine mammals or other components of the marine environment.

### **Workshop on Criteria to Assess the Effects of Anthropogenic Noise**

The Marine Mammal Protection Act prohibits the taking of marine mammals unless certain conditions are met. The Act defines “take” to include “harassment,” which in turn is defined as “any act of pursuit, torment, or annoyance which . . . has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.” However, noise-producing activities that may disrupt behavioral patterns can be authorized under Section 101 (a)(5) of the Act if they are unintentional, have a negligible effect on the survival and productivity of the affected species or populations, have no unmitigable adverse impact on the availability of affected stocks taken by Alaska Natives for subsistence purposes, and, if there is uncertainty as to the possible effects, monitoring is undertaken to ensure that any effects are negligible.

The National Marine Fisheries Service and the Fish and Wildlife Service are responsible for determining when taking of species under their respective jurisdictions can be authorized. The National Marine Fisheries Service is attempting to develop criteria that can be used to help make these determinations. Toward this end, the Service held a workshop on 9–11 September 1998 to review relevant information and seek the views of scientists with related expertise. The workshop participants included experts in animal bioacoustics, underwater propagation of sound, and animal behavior. They considered and provided views as to whether different criteria are needed for different types of anthropogenic noise, the preferred units for reporting source and received sound levels, and other matters related to assessing the effects of anthropogenic sound on marine mammals.

Information gathered at the workshop will form the basis for new guidelines or regulations to govern the taking of marine mammals by sound from human sources. The Service expects to make known the results of its deliberations in the latter half of 1999.

### **Workshop on the Possible Use of Active Sonar to Reduce Right Whale Mortalities and Injuries from Ship Strikes**

As noted in the northern right whale section in Chapter II, the Navy provided support during the winter of 1996–1997 for research to determine if passive acoustic technology could detect and help Navy ships avoid right whales in the species’ calving grounds off Florida and Georgia. The research was designed to determine whether fixed and towed hydrophone arrays could be used to detect and, by triangulation, locate the position of vocalizing whales. Although some whales were located, they vocalized too infrequently to make the approach useful.

By letter of 10 July 1997 the Commission commended the Navy for its initiative. Noting the importance of minimizing right whale mortalities from ship strikes and the apparently limited application of passive acoustic technology, the Commission asked the Navy to consider further testing to determine whether placement of a network of active sonar buoys along ship channels could be used to detect and enable ships to avoid whales in the channel.

Navy representatives subsequently advised the Commission that they were willing to consider such research and had recently received several related research proposals for funding consideration. Recognizing that sounds generated by active sonars could affect marine mammals and other marine organisms, the Navy believed that, before proceeding, steps should be taken to ensure that any research that would be supported is directed toward cost-effective applications and would not have unacceptable side effects.

The Commission shared the Navy’s concern and, by letter of 12 November 1997, suggested that the Navy consult with relevant experts to determine minimum performance standards that would have to be met for a sonar system to be judged practical and

effective for reducing right whale mortalities and injuries caused by ship strikes. The Commission noted that, to be judged cost-effective, the system would have to be capable of detecting whales (1) when they are at or near the surface, particularly in shallow coastal waters; (2) at distances that would allow the ships adequate time to alter course or speed to avoid whales that are detected; (3) under the range of environmental conditions in which whales are likely to be present; (4) without adversely affecting the whales, other biota, or other uses of the sea; and (5) at a cost that would be considered by the Navy and commercial shippers as a cost of doing business. Along with the letter, the Commission provided a draft scope of work for a workshop or study to develop performance standards that could be used to evaluate research proposals.

The Navy responded by letter of 13 February 1998. It suggested that the matter be considered at the next meeting of the Interagency Coordinating Group on Ocean Noise, established in 1997 as described in the Commission's previous report. The matter was considered by the interagency group at a meeting hosted by the Commission on 11 May 1998. Representatives of the Commission, the Navy, the National Marine Fisheries Service, the Minerals Management Service, and the U.S. Geological Survey attended the meeting. They concurred that it would be advisable to develop minimum performance standards that would have to be met for an active acoustic system to be judged cost-effective before soliciting, considering, or providing support for related research proposals. They also agreed that the expert advice could best be obtained by a workshop involving a small number of experts from relevant disciplines (*i.e.*, individuals with expert knowledge of commercial and military sonars, sound transmission in different ocean environments, areas in which ships are known to have hit right whales, the number and types of ships that transit these high-risk areas when right whales are likely to be present, and relevant ocean law and practices).

The Commission conveyed this information to the Navy on 20 May 1998. Subsequently, the Navy agreed to organize and host the recommended workshop. Suggestions regarding possible participants and organization of the workshop were provided to the

Navy representatives at subsequent meetings of the interagency coordinating group. The workshop was scheduled to be held in Jacksonville, Florida, on 8–9 October 1998. For technical reasons, it could not be held when scheduled.

At the end of 1998 it was the Commission's understanding that the Navy plans to reschedule the workshop sometime in the first half of 1999.

### **Possible Effects of Increasing Ambient Noise in the World's Oceans**

As noted above, there appears to have been a substantial increase in anthropogenic noise in the world's oceans in recent years. Much time, effort, and money are being devoted to assessing the possible effects of these sounds on marine mammals and other marine organisms. However, little has been done to determine how anthropogenic sounds may have affected the frequency characteristics or levels of background noise in the world's oceans, or how ambient noise levels and characteristics may have changed in different areas over time. If the levels or characteristics of ambient background noise have changed gradually over time, the changes in some areas may be accentuating the effects of new and novel sounds, but in other areas animals may have become accustomed to and be less likely to respond to new and novel sounds.

The Navy and other organizations may have routinely collected information on the characteristics and levels of ambient noise in many parts of the world's oceans as part of their missions. If so, it might be possible to compile and analyze this information to look for changes and trends in ambient noise that have occurred in different parts of the world in the past three, four, or five decades. Among other things, such information could assist the Navy in determining where best to further test the LFA sonar and how operational deployment of the system could be structured to minimize possible effects on marine mammals and other marine organisms.

On 30 July 1998 the Commission wrote to the Oceanographer of the Navy asking that he have his staff investigate and let the Commission know (1)

whether the Navy and others have routinely collected information on the characteristics and levels of ambient noise; (2) whether the information is unclassified and, if not, whether it might be made available in some unclassified, synthesized form; (3) whether the Navy believed it would be possible and useful to analyze the information to document changes and trends in ambient noise in representative ocean areas and marine mammal habitats; and (4) whether the Navy would be willing to undertake such a project.

The Navy responded on 28 October 1998, noting that, for many years, it has collected information on

ambient noise in the world's oceans. It outlined the available databases and noted that, because they rely more on estimations and modeling than actual measurements, they likely would be of limited use in quantifying long-term changes in levels and frequencies of ambient noise. The letter noted that efforts were under way to improve the databases to support operational requirements. It indicated that the Navy would be happy to provide a detailed briefing on its ambient noise databases to more fully assess their potential usefulness for the purposes outlined in the Commission's letter of 30 July 1998. The Commission plans to accept this offer early in 1999.



## Chapter VII

# OUTER CONTINENTAL SHELF OIL AND GAS EXPLORATION AND DEVELOPMENT

Exploration and development of coastal and offshore oil, gas, and hard mineral resources may adversely affect marine mammals and their habitat. Under the Outer Continental Shelf Lands Act, the Department of the Interior's Minerals Management Service is responsible for assessing, detecting, and preventing or mitigating the adverse effects of these activities in offshore waters beyond state jurisdiction. Under the Marine Mammal Protection Act and the Endangered Species Act, the National Marine Fisheries Service and the Fish and Wildlife Service are responsible for reviewing proposed actions and advising the Minerals Management Service and other agencies on measures needed to ensure that those actions will not have adverse effects on marine mammals or endangered or threatened species. The Army Corps of Engineers also has related regulatory authority over oil and gas development projects that require certain permits under the Clean Water Act.

The Marine Mammal Commission reviews relevant policies and activities of these agencies and recommends actions that appear necessary to protect marine mammals and their habitats. The Commission's activities in this regard in 1998 are discussed below.

The Marine Mammal Protection Act directs the Secretaries of the Interior and Commerce to authorize, in certain instances, the unintentional taking of small numbers of marine mammals by U.S. citizens incidental to activities other than commercial fishing operations. Such authorizations related to offshore oil and gas activities are discussed in Chapter IX.

### Beaufort Sea/Northstar Project

As discussed in previous annual reports, BP Exploration (Alaska) Inc. is undertaking oil and gas

development and production in an area of the southern Beaufort Sea off Alaska known as the Northstar Unit. The project includes construction of an artificial island, subsea pipelines, and associated ice roads connecting the island to existing infrastructure in Prudhoe Bay. Among other things, these facilities require a permit from the Army Corps of Engineers under section 404 of the Clean Water Act. As a related matter, requests by BP for authorization to take small numbers of marine mammals incidental to seismic testing in the Northstar area have been discussed in previous reports. BP's request for a small-take authorization relative to construction of the offshore structure and related activities is discussed in Chapter IX of this report.

On 1 June 1998 the Army Corps of Engineers issued a draft environmental impact statement for the issuance of a section 404 permit for construction of an artificial island and buried pipeline as part of the Beaufort Sea/Northstar Project. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed the draft statement and on 30 June 1998 provided comments to the Corps.

In its letter, the Commission noted that the draft statement provided a succinct summary of the environmental and socioeconomic impacts of the proposed development and the potential effects of construction and daily operation of the Northstar Unit on marine mammals and other biota. The Commission commended the preparers of the draft statement for the extensive consideration given the endangered bowhead whale. However, less consideration had been given other marine mammal species that could be affected by the proposed construction. For instance, the Commission noted that the project could adversely affect polar bears and ringed seals and recommended that these species be given greater consideration.

The Commission further noted that the proposed Northstar Unit is to be constructed in an area where there currently are 76 active leases for offshore oil and gas activities. In the Commission's opinion, available information is insufficient to be confident that development of the Northstar Unit, by itself and in combination with other ongoing and future activities in the southern Beaufort Sea, will not adversely affect any marine mammal species or stock. Therefore, it recommended that the final environmental impact statement be expanded to describe the research and short- and long-term monitoring activities that are planned to ensure that oil production does not have significant adverse impacts on any marine mammal species or population or any unmitigable adverse impact on the availability of marine mammals for taking by Alaska Natives for subsistence uses. The final environmental impact statement is expected to be completed early in 1999.

### **Gulf of Mexico Information Transfer Meeting**

As noted in its previous annual report, the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, on 8 October 1997 provided comments to the Minerals Management Service on a draft environmental impact statement concerning oil and gas lease sales to be held over the next four years in the western Gulf of Mexico. The Commission pointed out that the draft statement provided a thorough and well-documented summary of information on marine mammals in the western Gulf and a well-documented assessment of the ways that marine mammals in general could be affected by seismic surveys, drilling, waste discharges, oil spills, etc. However, the draft statement provided little information on the distribution patterns or abundance of the individual marine mammal species and populations that inhabit the northwestern Gulf or how they likely would be affected.

With regard to the last point, the Commission noted that the Minerals Management Service and the National Marine Fisheries Service had cooperatively funded a research program, known as the GulfCet Program, that was providing much new information

concerning the distribution, abundance, habitat-use patterns, and possible essential habitats of the marine mammal species found most commonly in the northern Gulf. The Commission suggested expanding the final environmental impact statement to indicate specific areas where seismic surveys, drilling, helicopter and vessel support activities, etc., might overlap with important marine mammal feeding, breeding, calving, nursing, or migratory areas. Further, the Commission noted that, if available data are insufficient to determine how individual species and populations could be affected by the proposed action, the final environmental impact statement should describe the uncertainties and the research or monitoring programs needed to resolve them.

The final environmental impact statement was published by the Minerals Management Service in May 1998. It referenced and, in most cases, addressed the Commission's comments on the draft. Among other things, it noted that the Minerals Management Service concurred with the Commission regarding the need for post-sale monitoring and that the Service planned to hold a workshop within the next two years to identify the critical uncertainties and how they might best be resolved.

On 8–10 December 1998 the Minerals Management Service held a meeting in New Orleans to review information on oil and gas exploration and development in the northern Gulf and its socioeconomic and environmental impacts. The meeting was attended by scientists who have conducted or are conducting related research, representatives of the oil and gas industry, and officials with the Minerals Management Service and other involved federal and state agencies. A representative of the Commission participated in the meeting.

The meeting included reviews of the GulfCet Program and information on the effects of seismic surveys and the removal of drilling rigs on marine mammals and sea turtles in the northern Gulf. Information presented indicated the following:

- the GulfCet Program field work has been completed and the final report is expected to be submitted to the Minerals Management Service early in 1999;
- the program has been very productive and is one

of the few marine mammal programs that has attempted to identify distribution patterns and environmental factors affecting distribution and behavior of marine mammals as well as the species present and their abundance;

- the program has documented that there is both high species diversity and large numbers of marine mammals in the northern Gulf, particularly in offshore pelagic areas;
- the distribution of most species, including endangered sperm whales, appears to be associated with cold water rings that produce upwellings and have high primary and secondary productivity; and
- the cold water rings can be tracked by satellite, which will allow future marine mammal surveys to be designed so that shiptime and other costs can be minimized.

During the review of information regarding the effects of seismic surveys and explosive removal of drilling platforms, it was pointed out that the Service's environmental impact statement indicates that currently an average of three or four seismic surveys are conducted in the northern Gulf every day and that

more than 100 exploration and development wells are drilled every year. In addition, an average of more than 1,000 boat trips and 2,000 helicopter trips are being made every day to transport personnel and otherwise service drilling rigs. It also was pointed out that, based on observations of similar activities in Alaska and California, it is likely that such activities have had, and may be having, at least short-term effects on the distribution and behavior of some marine mammal species. It also is possible that some or all of the potentially affected species have become accustomed to the activities and no longer are affected by them. However, nothing has been done since the Marine Mammal Protection Act was passed in 1972 to document whether oil and gas exploration and development in the northern Gulf have had any long-term effects on the resident marine mammal species.

As noted in Chapter VI, the Minerals Management Service is planning to hold a workshop in June 1999 to better determine what can be done to resolve these uncertainties. The Commission, in consultation with its Committee of Scientific Advisors, will offer its assistance to help ensure the success of the workshop.



## Chapter VIII

### RESEARCH AND STUDIES PROGRAM

The Marine Mammal Protection Act requires that the Marine Mammal Commission maintain a continuing review of research programs conducted or proposed under authority of the Act. It also requires the Commission to undertake or facilitate other studies it deems necessary or desirable to conserve marine mammals and to take every step feasible to prevent wasteful duplication of research.

To accomplish these tasks, the Commission conducts an annual survey of federally funded research on marine mammals and recommends steps to prevent unnecessary duplication and improve the quality of research conducted or supported by the National Marine Fisheries Service, the Fish and Wildlife Service, the Minerals Management Service, and other federal agencies. The Commission also convenes meetings and workshops to review, plan, and coordinate marine mammal research and contracts for studies to help identify, define, and develop solutions to domestic and international problems affecting marine mammals and their habitats so as to facilitate and complement activities of other agencies.

#### **Survey of Federally Funded Marine Mammal Research**

Research on marine mammals and their habitats is conducted or supported by a number of federal departments and agencies. To determine the nature of this research, and to assess ways in which it can best be coordinated to facilitate marine mammal conservation, each year the Commission requests information on the marine mammal and related research being conducted, supported, and planned by these departments and agencies.

For the 1998 survey, the Commission requested information from 20 federal agencies, departments,

and offices. They were the Department of Agriculture; the Department of the Air Force; the Department of the Army; the Department of Commerce's Coastal Ocean Office, National Marine Fisheries Service, National Sea Grant College Program, Office of Ocean Resources Conservation and Assessment, and Sanctuaries and Reserves Division; the Department of Energy; the Department of the Interior's Fish and Wildlife Service, Minerals Management Service, the Biological Resources Division of the U.S. Geological Survey, and the National Park Service; the Department of the Navy; the Department of State; the Department of Transportation; the Environmental Protection Agency; the National Aeronautics and Space Administration; the National Institutes of Health; and the National Science Foundation. The Commission also requested information from the Smithsonian Institution, a trust instrumentality of the United States.

The information obtained will be summarized in the Commission-sponsored report "Survey of Federally Funded Marine Mammal Research and Studies FY74 - FY98," which will be available from the National Technical Information Service in 1999 (see Waring 1981-1998, Appendix B, for reports of previous surveys).

#### **Marine Mammal Workshops and Planning Meetings**

In 1998 the Marine Mammal Commission provided comments and recommendations to other federal agencies on a broad range of issues affecting the conservation and protection of marine mammals and their habitats. The issues included protection and recovery of endangered, threatened, and depleted species; interactions between marine mammals and fisheries; possible direct and indirect effects of coastal

and offshore development on marine mammals; response to marine mammal strandings and unusual mortality events; public display of marine mammals; applications for scientific research permits; and requests for authorization to take small numbers of marine mammals incidental to a variety of industrial, military, and scientific activities.

Members of the Commission, its Committee of Scientific Advisors, and staff also were involved in organizing or participated in meetings to:

- review and recommend actions to update or implement recovery plans for Hawaiian monk seals, Florida manatees, Steller sea lions, right whales, humpback whales, and the California population of sea otters;
- review and further develop take reduction plans for the east coast gillnet fishery and other fisheries that incidentally catch harbor porpoises, right whales, and other large and small cetaceans;
- prepare for and participate in the 1998 meetings of the International Whaling Commission, the Antarctic Treaty Consultative Parties, and the Commission and Scientific Committee for the Conservation of Antarctic Marine Living Resources;
- determine steps that the United States should take to improve operations of the Arctic Council and help implement the Arctic Environmental Protection Strategy;
- identify and coordinate federal agency efforts to resolve uncertainties concerning the possible effects of anthropogenic noise on marine mammals;
- review the results of research funded by the Minerals Management Service on marine mammals that could be affected by oil and gas exploration and development in the northern Gulf of Mexico;
- identify uncertainties concerning the effects of chemical contaminants on marine mammals and actions necessary to resolve them;
- review research plans to determine whether dolphin populations depleted by the tuna purse seine fishery in the eastern tropical Pacific Ocean are recovering and, if not, whether chase and capture by tuna purse seiners is a factor;
- prepare for and participate in the 1998 World Marine Mammal Science Conference; and
- develop a U.S.-Russia polar bear conservation agreement for the Chukotka-Alaska region.

## Commission-Sponsored Research and Study Projects

As noted above, the Marine Mammal Commission supports research to further the purposes and policies of the Marine Mammal Protection Act. In particular, it convenes workshops and contracts for studies to help identify and determine how best to minimize threats to marine mammals and their habitats. Since it was established in 1972, the Commission has contracted for more than 1,085 projects ranging in amounts from several hundred dollars to \$150,000.

Occasionally Commission investments in research involve the transfer of funds to and from other federal agencies, particularly the National Marine Fisheries Service, the Fish and Wildlife Service, and the Department of State. When funds are transferred from the Commission to another agency, the Commission provides detailed scopes of work describing precisely what must be done, including requirements for reporting progress to the Commission. In many instances, this has made it possible for agencies to start needed research sooner than might otherwise have been possible or to undertake projects they might not otherwise have been able to support.

Research and studies supported by the Commission in 1998 are described below. Final reports of most Commission-sponsored studies are available from the National Technical Information Service (NTIS) or from the Commission. These are listed in Appendix B. Papers and reports resulting entirely or in part from Commission-sponsored activities and that have been published elsewhere are listed in Appendix C.

### WORKSHOPS, REVIEWS, AND ANALYSES

#### **Analysis of Population Trends of Florida Manatees Using Warm-Water Discharges as Winter Refuges (Bruce A. Craig, Ph.D., Purdue University, West Lafayette, Indiana)**

Over the years, manatees have learned to rely on areas of warm water created by the discharge of heated water from electrical power plants located along the Florida coast north of their historic winter

range. During winter, water temperatures outside the warm-water discharge areas can fall to levels too cold for manatees to survive. During periods of cold weather, some plants have attracted more than 400 manatees to their warm-water outfalls. In the future, deregulation of the electric power industry in Florida may promote greater competition among electric utilities, which could result in intermittent or permanent shutdowns of some plants on which manatees have come to depend (see Florida manatees in Chapter II). To help assess the impact of such shutdowns on manatees, this contract provided for an analysis of data collected since 1982 on the numbers of manatees using warm-water refuges at power plants in winter. The contract report will be used by the Fish and Wildlife Service, the Florida power industry, the Marine Mammal Commission, and other involved organizations and agencies to assess possible ways of avoiding possible manatee mortality brought about by the loss of power plant refuges.

**Pilot Study of Interactions between Humans and Wild Bottlenose Dolphins near Panama City, Florida (Amy Samuels, Ph.D., Woods Hole Oceanographic Institution, Woods Hole, Massachusetts)**

The National Marine Fisheries Service has promulgated regulations specifying that feeding marine mammals in the wild constitutes harassment. There exists within the Service a diversity of opinion as to what other types of human-marine mammal interactions also may constitute harassment and that therefore may warrant inclusion in the regulatory definition of take. Of particular relevance is the growing interest in swimming with wild marine mammals, particularly bottlenose dolphins. Commercial operations that feature opportunities to swim with wild dolphins have been established in several locales; some of these apparently use food to attract and habituate marine mammals to the presence of humans. These programs put both humans and dolphins at risk of injury. Such interactions also may result in changes to the marine mammals' social behavior and foraging patterns that can adversely affect their well-being. This contract supported a pilot study to assess interactions between humans and bottlenose dolphins at a beach near Panama City, Florida, where such interactions have regularly occurred. The contractor observed many

instances of boaters and others attracting dolphins with food, even though such action contravenes the Marine Mammal Protection Act and constitutes harassment. Documented interactions between humans and dolphins, likely brought about or encouraged by feeding, included physical contact between animals and humans, abrupt movements by dolphins in close proximity to swimmers, the placement of a swimmer's face within touching distance of a dolphin's face, and swimmers simultaneously feeding and petting dolphins. Some individually identified dolphins regularly begged for food, while others ignored humans. Acting on the information from this study (see Samuels and Bejder 1998, Appendix B), the Commission, with funding from the National Marine Fisheries Service, contracted for a review of interactions between wild mammals and humans, discussed below.

**Review and Analysis of Information on Interactions between Humans and Marine Mammals and Humans and Other Wild Mammal Species (Amy Samuels, Ph.D., Chicago Zoological Society, Brookfield, Illinois)**

During assessment of the results of the human-bottlenose dolphin interactions study described above, it became clear that humans interact in possibly harmful ways with a variety of other wild animals, but that there is no single source of information on such interactions. Considering the growing importance of this issue and the potential threats to the safety and well-being of both swimmers and marine mammals, the National Marine Fisheries Service provided funds to the Commission to contract for a review of relevant information concerning human-animal interactions across a range of species. The report will summarize available information and (a) describe the likely effects of swim programs on wild marine mammals; (b) discuss whether and, if so, how these programs may injure or disturb marine mammals or marine mammal stocks; and (c) identify additional research as may be needed to ascertain whether adverse effects are occurring and, if so, to document such effects as they pertain to the statutory definition of harassment. The report will help guide the Service and other agencies in determining further management actions that may be required to ensure the safety and well-being of marine mammals and humans.

**Establishment of the National Whale Conservation Fund (Robbin Peach, Mattapoissett, Massachusetts)**

Some populations of great whales were driven to near-extinction through indiscriminate overexploitation by commercial whalers during the nineteenth and early twentieth centuries. Although some stocks, such as the gray whale in the eastern North Pacific Ocean, have recovered substantially, many others remain endangered or threatened. On 21 October 1998 Congress passed the Omnibus Consolidated and Emergency Supplemental Appropriations Act for FY 1999. The Act amended section 4 of the National Fish and Wildlife Foundation Establishment Act of 1984 by establishing "a national whale conservation endowment fund, to be used by the foundation to support research, management activities, and educational programs that contribute to the protection, conservation, and recovery of whale populations in waters of the United States." The fund is to be a joint project of the National Fish and Wildlife Foundation, the Marine Mammal Commission, and the National Oceanic and Atmospheric Administration. The contractor prepared a report providing recommendations for the organizational groundwork and protocols for the establishment and operation of the National Whale Conservation Fund. The fund will reside within the National Fish and Wildlife Foundation, which will be responsible for fiscal administration. The primary source of revenue will be through sponsorships and endowments from foundations, corporations, and individuals. It will provide a private, non-government funding source for research essential to conserve whales, as well as a source of current, scientifically accurate educational material.

**Workshop on the Introduction of Disease to Antarctic Wildlife (Joseph R. Geraci, V.M.D., Ph.D., National Aquarium in Baltimore, Baltimore, Maryland)**

The increasing number of people visiting the sub-Antarctic region and Antarctic continent brings with it an increasing potential for introducing disease to the indigenous wildlife. At the 21st Antarctic Treaty Consultative Meeting held in 1997, Australia presented an information paper on the introduction of disease to indigenous birds in the Antarctic. To further

address this issue, Australia announced that it would convene a workshop on this topic. The workshop reviewed the status and epidemiology of disease in birds and seals in Antarctica, the risks of introducing disease through such mechanisms as tourism and global climate change, and the means of controlling the introduction and spread of diseases, including the development of preparedness and response plans. Workshop participants also reviewed national Antarctic research plans that address the issue of disease introduction, and the international treaties and the legal framework for controlling the introduction and spread of disease in Antarctica. The workshop was held on 25–28 August 1998 at the headquarters of the Australian Antarctic Division in Hobart, Tasmania. The contractor, representing the Marine Mammal Commission, presented a paper co-authored by Valerie J. Lounsbury entitled "Risks of Marine Mammal Die-Offs in the Southern Ocean" in which they summarized all known mass mortalities and described the evolution of technology that allows for more precise diagnoses and more effective investigative approaches. The workshop report is expected to be published and presented for consideration at the Antarctic Treaty Consultative Meeting to be held in Peru in May 1999.

**Support of the Marine Mammal Council of the Russian Federation (Professor Viatcheslav A. Zemsky, Marine Mammal Council of the Russian Federation, Moscow, Russia)**

With the breakup of the former Soviet Union and the concomitant changes within its scientific infrastructure, there is a risk that many years of data on marine mammals collected under the old Soviet regime will be lost. To maintain continuity within the Russian marine mammal research community and to prevent the loss of these data, the Marine Mammal Council of the Russian Federation was formed. This contract provides support to the Council to (1) develop a computerized database of all scientific papers on marine mammals published in the former Soviet Union and the Russian Federation from 1946 through 1998; (2) develop a computerized database on all pinniped harvests from 1960 through 1990, including biological data collected from harvested animals; (3) prepare monographs on ice seals and fur seals that

summarize what is known about these species within Russia; (4) produce a report on studies of Steller sea lions by Russian researchers from 1991 through 1997; (5) create a database of all information and research results collected by the Soviet research organization TINRO from 1930 through 1990 on Steller sea lions; and (6) purchase books, reprints, journals, etc., for use by members of the Russian marine mammal scientific community. The funding provided will help assure that relevant data are appropriately archived, analyzed, and made available to the world scientific community.

## GENERAL

### **Survey of Federally Funded Marine Mammal Research (George H. Waring, Ph.D., Southern Illinois University, Carbondale, Illinois)**

The Marine Mammal Protection Act requires that the Marine Mammal Commission conduct a continuing review of marine mammal research conducted or supported by federal agencies. As noted above, information concerning marine mammal research conducted or supported by other federal agencies in fiscal year 1998 has been requested and will be forwarded to the contractor, who will prepare a draft report synthesizing the information provided. The draft will be sent to the responding agencies to verify the accuracy of the information. The final report is expected to be completed by mid-1999. It will be reviewed by the Commission, in consultation with its Committee of Scientific Advisors, to identify possible duplicative research and how research might be planned and carried out cooperatively to avoid duplication. The report will be provided to the responding agencies and will be available through the National Technical Information Service.

### **Assessment of Activities by the Arctic Council and Its Subsidiary Working Groups (Henry P. Huntington, Ph.D., Huntington Consulting, Eagle River, Alaska)**

As described in Chapter IV, in 1991 the eight Arctic nations (Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden, and the United States)

adopted the Arctic Environmental Protection Strategy to address pollution and conservation issues on a circumpolar basis. In 1996 the Arctic Council was established by the eight Arctic nations as a high-level forum to supersede the Arctic Environmental Protection Strategy and to address issues of common concern in the Arctic, particularly those concerning environmental protection and sustainable development. When the Council was created, four working groups established to help implement the Arctic Environmental Protection Strategy were placed under the Council's leadership. The four working groups are identified by their areas of responsibility, as follows: the Arctic Monitoring and Assessment Program (AMAP); Conservation of Arctic Flora and Fauna (CAFF); Emergency Prevention, Preparedness, and Response (EPPR); and Protection of the Arctic Marine Environment (PAME). The Council also is to establish a sustainable development program. Persons designated by each nation as senior Arctic officials provide liaison and coordination between the biennial meetings of the Council. The contractor represented the Commission at the first meeting of the Arctic Council and meetings of several of its subsidiary groups as discussed below.

**Eleventh Meeting of the Arctic Monitoring and Assessment Program Working Group:** This working group assesses the levels of anthropogenic pollutants in the Arctic and their effects on the Arctic environment. Climate change, ozone depletion, petroleum hydrocarbons, and acidification are included in the topics covered by the group. The work undertaken during phase one of the program is discussed in Chapter IV. At its 11th meeting, held in Girdwood, Alaska, in April 1998, the group considered specific topics it would propose to the Arctic Council for attention during phase two. In his report on the meeting, the contractor noted the low level of U.S. involvement in most areas during phase one of the program, and emphasized the need for strong U.S. leadership during phase two. Copies of the contractor's report (see Huntington 1998a, Appendix B) were sent to the Department of State, which oversees U.S. involvement in the Arctic Council, and to the National Oceanic and Atmospheric Administration, Department of Commerce, which is the lead U.S. agency in the working group.

**Meeting of the Senior Arctic Officials:** The senior Arctic officials met in Whitehorse, Yukon Territory, Canada, on 9–11 May 1998 to prepare for the first Arctic Council meeting held in September 1998. Reports on recent activities and future plans from each of the four working groups were presented. The United States submitted proposals under the heading of sustainable development on Arctic culture and ecotourism, technology transfer to improve Arctic sanitation and energy systems, and Arctic telemedicine. The contractor's report (Huntington 1998b, Appendix B) noted that, although the Arctic Council is still in its formative period, there were differences in perception of the Council's role and in what the Council will be able to deliver. Differences of opinion among the senior Arctic officials as to the role of the Arctic Council were not fully resolved. Points the United States should consider with regard to its involvement in the Arctic Council were outlined in the report, which was forwarded to the U.S. Department of State for consideration.

**Conference on Sustainable Development in the Arctic:** Following the meeting of senior Arctic officials discussed above, a conference entitled "Sustainable Development in the Arctic: Lessons Learned and the Way Ahead" was sponsored by Canada. A series of workshops was held under three themes: Living in Communities in the Circumpolar North; Making a Living, Training, Trade and Investment in

the Circumpolar North; and Decision Making and Priority Setting in the Circumpolar North. Although there were extensive discussions on many aspects of the three theme topics, no concrete recommendations resulted. According to the contractor's report (Huntington 1998c, Appendix B), it was clear, however, that some participants view the U.S. Marine Mammal Protection Act as a barrier to trade and believe that it should be amended accordingly.

**First Ministerial Meeting of the Arctic Council:** The first meeting of the Arctic Council was held in Iqaluit, Canada, on 17–18 September 1998. Senior Arctic officials met on 14–16 September to complete their report to the Council and draft an Arctic Council declaration for consideration by the Council. The declaration was adopted and signed at the ministerial meeting. The term of the then-chair of the Council, Canada, expired after the meeting. The United States has accepted the chair of the Arctic Council and will serve in this role until the next ministerial meeting in 2000. The contractor, who represented the Marine Mammal Commission on the U.S. delegation, provided a series of observations and considerations that the United States should be aware of during its tenure as chair to the Arctic Council. The contractor's report (Huntington 1998d, Appendix B) was provided to the Department of State, which oversees U.S. participation in the Arctic Council.

## Chapter IX

# PERMITS AND AUTHORIZATIONS TO TAKE MARINE MAMMALS

The Marine Mammal Protection Act places a moratorium, subject to certain exceptions, on the taking and importing of marine mammals and marine mammal products. The Act defines taking to mean "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal." One exception to the moratorium provides for the issuance of permits by either the Secretary of Commerce or the Secretary of the Interior, depending on the species of marine mammal involved, for the taking or importation of marine mammals for purposes of scientific research, public display, or enhancing the survival or recovery of a species or stock.

Amendments enacted in 1994 allow the issuance of permits to authorize the taking of marine mammals in the course of educational or commercial photography and the importation of polar bear trophies from sport hunts conducted in Canada. Permit-related activities other than those involving polar bear trophies are discussed in this chapter. Activities with respect to authorizing imports of polar bear trophies are discussed in Chapter II. The export of marine mammals to foreign facilities, is discussed in Chapter X.

Also discussed in this chapter are recreational interactions between wild marine mammals and members of the public who seek to approach, swim with, photograph, or feed wild marine mammals. Such direct interactions have become increasingly common in recent years. In many cases, the activities clearly constitute harassment as defined under the Marine Mammal Protection Act and its implementing regulations. In other instances the responsible agencies must determine on a case-by-case basis whether marine mammals have been harassed. Steps to address interactions involving the feeding of wild bottlenose dolphins and approaching elephant seals on beaches are discussed.

Other provisions of the Marine Mammal Protection Act allow the Secretaries of Commerce and the Interior to authorize the take of small numbers of marine mammals incidental to activities other than commercial fisheries, provided the taking will have only a negligible impact on the affected stocks. Small-take authorizations for several activities are discussed later in this chapter.

### Permit-Related Regulations

As noted in previous annual reports, the National Marine Fisheries Service published a proposed rule in 1993 that would have made extensive revisions to its permit regulations. However, some of the Service's proposals, particularly those with respect to public display permits, were nullified by the 1994 amendments to the Marine Mammal Protection Act. Other parts of the proposed rule were either unaffected by the 1994 amendments or affected only to a minor extent. The Service therefore determined that it could issue final regulations for some elements of its permit program based on the 1993 proposal, but that it would need to publish a new proposed rule for others.

The Service issued a final rule on 10 May 1996 instituting several changes to its permit regulations, including some of the provisions of the 1994 amendments. These regulations are discussed in the Commission 1997 annual report. The 1996 rule did not include requirements specific to permits for educational and commercial photography; neither did it reflect many of the 1994 amendments pertaining to public display. The Service expects to publish proposed public display regulations in the spring of 1999. It also is planning a separate rulemaking late in 1999 for educational and commercial photography permits. Pending new regulations, the Service intends to

process applications for public display and photography permits and implement public display provisions using existing regulations, interim guidelines, and the applicable statutory provisions.

In addition to authorizing permits for scientific research, public display, enhancement, and educational and commercial photography, the Marine Mammal Protection Act, as amended in 1994, establishes a general authorization for scientific research that involves taking only by Level B harassment (*i.e.*, any act of pursuit, torment, or annoyance that may disturb but not injure a marine mammal or marine mammal stock in the wild). Researchers conducting aerial surveys, photoidentification studies, or other activities likely to cause no more than simple disturbance typically are covered by this general authorization and are no longer required to obtain a permit. However, researchers conducting such activities involving marine mammals listed as endangered or threatened still must obtain permits. Interim regulations implementing the general authorization for Level B harassment were issued by the National Marine Fisheries Service on 3 October 1994. As discussed in previous annual reports, the Commission submitted comments on 1 December 1994. In part, the Commission noted several areas in which the regulations deviate from the statutory requirements and need to be clarified. The Service has indicated that final regulations, taking into account comments submitted by the Commission and others on the 1994 interim regulations, will be published in 1999.

Since enactment of the general authorization, several researchers have availed themselves of this streamlined authorization process. Two researchers in 1994, 16 researchers in 1995, 15 researchers in 1996, 7 researchers in 1997, and 9 researchers in 1998 have been issued letters confirming that their activities comply with the general authorization. It appears that the general authorization for certain types of research has alleviated delays associated with issuing permits for such activities.

As discussed in previous annual reports, the Commission wrote to the Fish and Wildlife Service in 1990 recommending that it work with the National Marine Fisheries Service to ensure consistent interpretation and implementation of the permit provisions of

the Marine Mammal Protection Act and related legislation. The Fish and Wildlife Service subsequently informed the Commission that it intended to defer adoption of revised permit regulations until the National Marine Fisheries Service had published its revised regulations. The Fish and Wildlife Service expected to propose its own regulations at that time, drawing on the National Marine Fisheries Service's regulations as appropriate. As of the end of 1998, the Fish and Wildlife Service had yet to propose revisions to its Marine Mammal Protection Act permit regulations or publish regulations implementing the general authorization for scientific research.

### Permit Application Review

Whether for a scientific research, public display, species enhancement, or photography, the application review process involves the same four stages: (1) receipt and initial review of the application by either the Department of Commerce or the Department of the Interior; (2) publication in the *Federal Register* of a notice of receipt of the application, inviting public review and comment, and transmittal to the Marine Mammal Commission; (3) review of the application by the Commission, in consultation with its Committee of Scientific Advisors, and transmittal of its recommendation to the department; and (4) final departmental action after consideration of comments and recommendations by the Commission and the public. If captive maintenance of animals is involved, the views of the Animal and Plant Health Inspection Service on the adequacy of facilities and transportation arrangements also must be considered. Figure 15 illustrates this process.

Once a permit has been issued, it can be amended by the responsible agency, provided the proposed amendment meets statutory and regulatory requirements. In some cases, an amendment is subject to the same notice, review, and comment procedures as a permit application. A major amendment of an existing permit, including a request for an extension of more than 12 months beyond its original term, a request for authorization to take additional animals, or a request for authorization to continue activities under a permit is subject to review by the Commission.

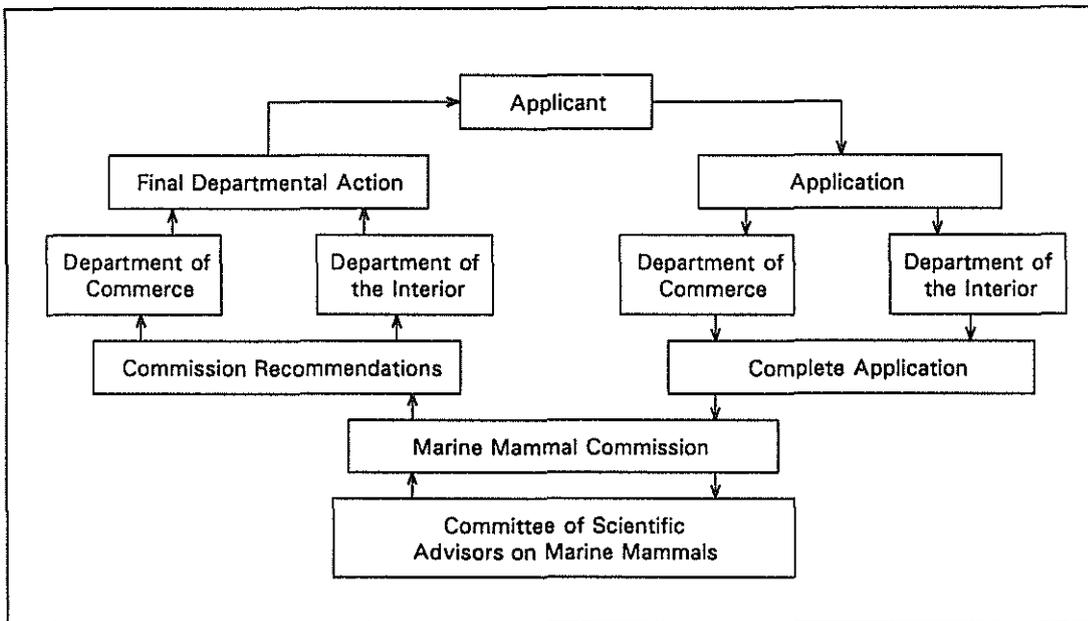


Figure 15. Process by which permit applications to take marine mammals are reviewed.

The total review time for a permit (from initial receipt of an application at the Service until final departmental action is taken) depends on many factors, including the completeness of the information provided by the applicant, any special requirements that must be satisfied before the application can be processed, and the efficiency of the agencies.

During 1998 the Commission, in consultation with its Committee of Scientific Advisors, provided recommendations on 27 permit applications submitted to the Department of Commerce and 16 applications submitted to the Department of the Interior. Of these, six awaited final action by the Department of Commerce at the end of 1998; none were pending final action at the Department of the Interior. The Commission's average review time — from the point at which the application was considered complete to the submission of the Commission's final letter of recommendation — for the 43 applications on which it commented in 1998 was 29 days (range: 9–47 days). The Commission also made recommendations on 43 requests to amend permits in 1998. The average time for Commission review of these requests was 28 days.

The Department of Commerce issued 21 permits during 1998, including five permit applications that had been received in 1997. The average processing time, from the date the application was received by the Department until final action was taken, was 112 days (range: 56–270 days). The Department of the Interior issued 16 permits during 1998, including six applications that had been received in 1997. The average processing time, from the date the application was received by the Department of the Interior until final action was taken, was 139 days (range: 53–489 days). If calculated from the date the department considered an application to be complete, the average processing times for the Departments of Commerce and the Interior in 1998 were 94 and 125 days, respectively, compared with 99 and 75 days in 1997.

## Recreational Interactions with Marine Mammals in the Wild

In recent years, there has been a widely recognized, but largely unquantified, increase in activities involving direct interactions between members of the

public and wild marine mammals. These activities typically involve approaching animals as closely as possible to observe, photograph, pose with, or touch them. Other cases have involved feeding animals. These latter cases include instances in which entrepreneurs regularly fed particular groups of wild marine mammals to encourage them to approach their vessels. Passengers then pay a fee to view, feed, or swim with the marine mammals (see Figure 16).

Although such activities are not motivated by a desire to harm animals, they can pose substantial risks to both humans and wild marine mammals. Among other things, people may not fully appreciate the danger of injury from being bitten or rammed by animals. In addition, animals may be driven from preferred habitat, injured by people wishing to touch or prod them, poisoned by inappropriate or contaminated food, or have their behavior changed in ways that cause them to interact with other human activities and become pests. Because such interactions may disrupt or injure wild marine mammals, they may constitute harassment under the Marine Mammal Protection Act. In fact, the regulatory definition of the term "take" includes feeding marine mammals in the wild.

Two instances in which such concerns have arisen are discussed below. One involves commercial tours that feature swimming with and feeding wild bottlenose dolphins and the other involves close approaches to elephant seals on certain California beaches. A third instance, harassment of Florida manatees by swimmers and divers, is discussed in Chapter II.

A fourth instance, not discussed below, involves commercial and recreational swim programs with spinner dolphins in the wild in Hawaii. The National Marine Fisheries Service is in the process of developing educational materials that address harassment of these dolphins, and Service representatives met with Hawaii state representatives in 1998 to discuss the issue. The Commission is concerned that swim programs are disrupting the natural behavior of spinner dolphins and could displace them from their inshore, daytime resting areas. The Commission has requested that the Service keep it informed of any actions it takes to protect the species from commercial and recreational activities.

### **Interactions with Bottlenose Dolphins in the Southeastern United States**

In recent years, a growing number of commercial operators have begun offering tours that feature opportunities to swim with or feed marine mammals in the wild. The most prevalent of these operations involve bottlenose dolphins in nearshore waters off the southeastern United States. Such encounters that involve feeding or that otherwise harass or take marine mammals are prohibited under the Marine Mammal Protection Act.

Swimming with, feeding, and otherwise directly interacting with marine mammals in the wild can be dangerous for both people and the animals involved. Even when no immediate injury results, marine mammals may become habituated to people and boats. This can embolden the animals and expose them to risks they might not otherwise face.

In light of this concern, on 20 December 1996 the Commission wrote to the National Marine Fisheries Service about the proliferation of recreational and commercial ventures featuring such interactions in the southeastern United States. The Commission recommended that the Service take steps to advise both the public and tour operators that such direct interactions constitute a taking of marine mammals without proper authorization and are against the law. The Commission noted that the regulatory definition of "take" includes feeding marine mammals in the wild and, as such, feeding bottlenose dolphins as part of a tour clearly violates the Marine Mammal Protection Act.

In response to the Commission's letters, the Service instructed its enforcement personnel to heighten attention to these violations. In addition, in May 1997 representatives of the Service visited the southeastern United States to meet with members of the general public and private tour operators to explain what constitutes harmful human-marine mammal interactions. The Service also contracted with the Florida Marine Patrol to provide additional enforcement presence through the end of 1997. On 14 July 1997 the Commission wrote to commend the Service for these efforts and requested information on the status of the enforcement contract with the Florida

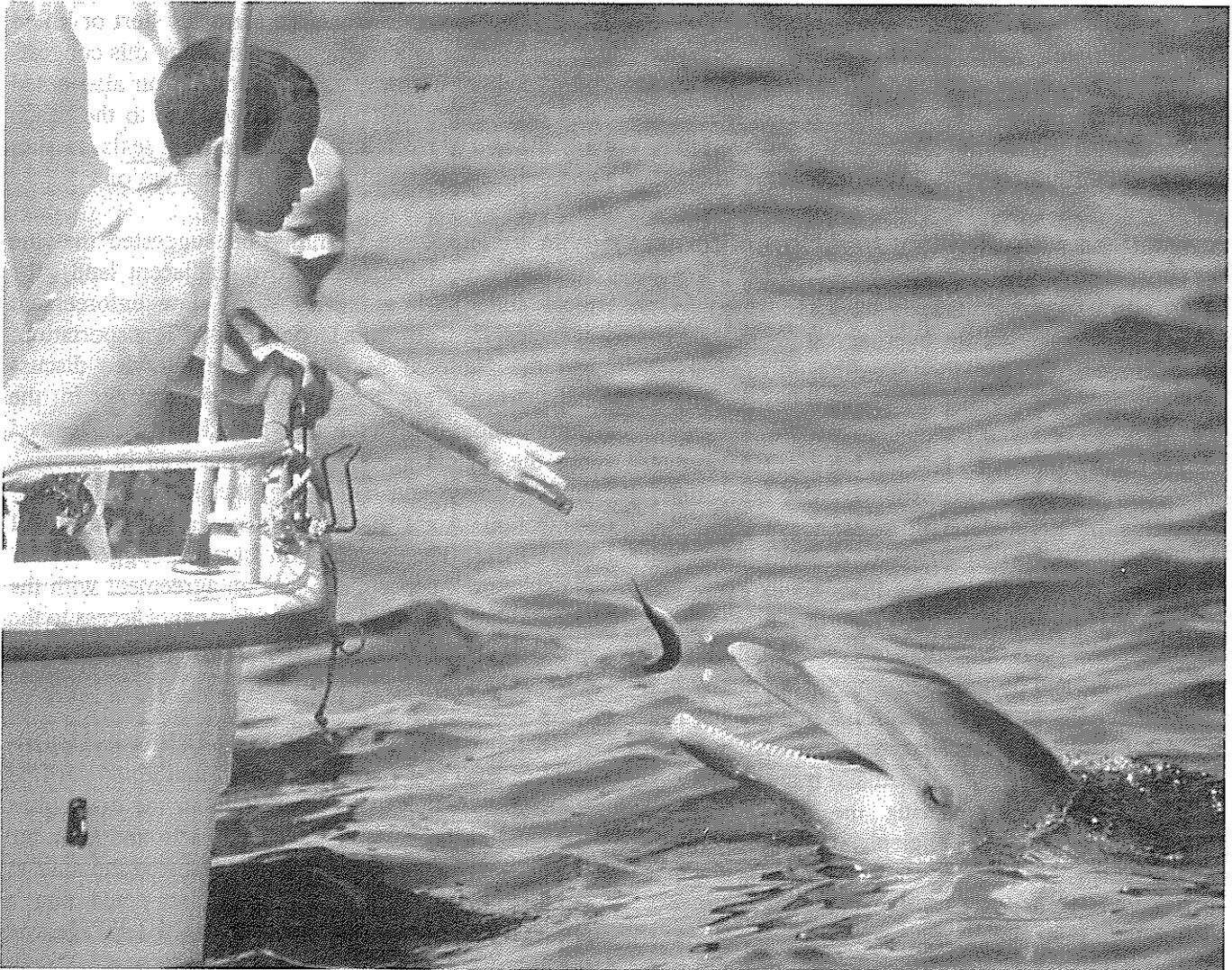


Figure 16. Illegal and risky feeding of a wild bottlenose dolphin off Florida.

Marine Patrol. The Commission was pleased to learn that in 1998 the Service provided federal enforcement officers who concentrated efforts on preventing feeding and other activities that result in the harassment of dolphins.

Despite efforts by the Service to address the situation in the southeastern United States, swimming and feeding activities do not appear to have abated. As indicated in Chapter VIII, the Commission, in cooperation with the Service, contracted with researchers to conduct a pilot study of interactions

between humans and bottlenose dolphins near Panama City Beach, Florida. The objectives were to assess interactions between humans and dolphins and to design a study to evaluate how habitual in-water interactions with humans affect the behavior of wild bottlenose dolphins. In a 28 August 1998 report, the contractor noted that numerous encounters between humans and dolphins were observed and that it seems likely that virtually all interactions between dolphins and humans in the region are based on attracting dolphins with food. One outcome of the pilot study was a decision to undertake a literature review to

compile information regarding human interactions with both marine and terrestrial animals in the wild. The Commission entered into a contract with the Brookfield Zoo to conduct the review and produce a database summarizing the results. The literature review and accompanying database are expected to be submitted in 1999.

### **Interactions with Elephant Seals in California**

As northern elephant seals have recovered from near-extinction caused by overharvesting in the late 1800s and early 1900s, they have begun to establish colonies on beaches along the California mainland at sites that are easily accessible to people. As their presence and numbers on beaches have increased, they have become major seasonal tourist attractions. Beginning in 1978 elephant seals began appearing infrequently at Piedras Blancas, California. Until 1990 their numbers remained low, never exceeding more than two or three individuals at any one time. In December 1990, however, more than 170 seals were present, and by the following spring nearly 400 animals hauled out at that location. In 1992 the first birth at Piedras Blancas was reported and by 1994 almost 300 births were recorded and more than 3,000 animals were present during the spring molting season. As many as 5,000 elephant seals now arrive during the spring molt, and more than 1,600 elephant seals gave birth in 1998.

Before 1992 most elephant seals used haul-out sites on beaches at Piedras Blancas owned by the federal government. However, that spring hundreds of seals began using a beach south of Piedras Blancas where control of beach access was substantially more difficult. In the spring of 1993, 150 seals began to use a beach known as Campers Cove, which is visible and readily accessible from the coastal highway. By spring 1994 more than 1,100 animals were present, and the beach quickly became a major seasonal tourist attraction. Large numbers of cars were parked on the shoulder of the road while people hiked down to the beach to walk among the seals.

Elephant seals can weigh more than 2,500 kg (5,500 pounds) and move with surprising speed on land as well as at sea. Therefore, by letter of 16 December 1994 to the California Department of Fish

and Game, the Commission noted that it appeared likely that someone would be seriously hurt or killed by the seals or in a traffic accident along this congested stretch of highway. The Commission also noted that dogs that accompany some visitors to the beach are allowed to roam among the elephant seals, raising concerns about possible disease transmission.

In its letter, the Commission suggested that the Hearst Corporation (which owns adjacent land), the local state park authority, local law enforcement agencies, the California Department of Transportation, and the National Marine Fisheries Service discuss steps to address the growing problem. In the Commission's view, the state park department seemed like the logical agency to take the lead in ensuring public safety and enforcing the Marine Mammal Protection Act's prohibition on marine mammal harassment. The Commission therefore suggested that the state park department seek an agreement with the Hearst Corporation to allow park rangers access to the bluffs on the Hearst property above the beaches for interpretive tours.

By letter of 11 January 1995 the California Department of Fish and Game responded that it had verified a problem with traffic congestion in the area when elephant seals were using the beach and that the Department of Transportation had posted the area as a no-parking zone. The letter also noted that a possible solution would be to station a federal agent in the area when elephant seals are on the beach.

Also in January 1995 the National Biological Service's Piedras Blancas Research Station completed a report indicating that motorists routinely park illegally and walk along the beach among the seals. The report noted significant potential for human injury because large numbers of pregnant elephant seals, female seals with pups, and large males occupy the area. The danger of the situation was further substantiated by Monterey Bay National Marine Sanctuary staff, who also reported motorists disregarding posted signs and stopping to walk among elephant seals. According to the report, one tourist who approached an elephant seal was bitten.

In February 1995 representatives of the Hearst Corporation expressed an interest in leasing portions

of the property adjacent to the beaches used by elephant seals to another party to oversee public access, provided that the state agreed to handle necessary enforcement activities. The California Highway Patrol subsequently agreed in May 1995 to patrol the area fulltime on weekends and on an enhanced weekday schedule, and to change signs from No Parking to No Stopping — Tow-Away Zone. Before the agreement could take effect, however, the Hearst Corporation withdrew its offer because of concern over possible liability claims arising from lease of its property.

In April 1997 the Commission received a videotape from Earth Island Institute showing people wandering among the seals, petting and poking the seals, surrounding and teasing lone pups, and allowing dogs to roam freely among the seals. It also showed seals lunging at people. The film clearly indicated that interactions between people and the seals are not being adequately managed.

Occasionally, elephant seals wander inland of the beach onto Highway 1, and several accidents between automobiles and elephant seals have occurred. The California Department of Transportation installed a fence in 1997 between the highway and one of the beaches used by the seals. During the 1998 breeding season, the fence effectively kept elephant seals from reaching the highway; however, on nearby beaches with no fencing, three subadult males were killed by vehicles and two people were hospitalized with injuries from these accidents. In December 1998 the Marine Mammal Commission worked with the California Department of Transportation and the U.S. Geological Survey to install additional fencing to protect the seals, motorists, and the viewing public from risk of injury. As of the end of 1998, the Commission had provided funding to install approximately 0.65 km (0.4 mile) of fencing in two separate spots north of Piedras Blancas. Construction is scheduled to start during the first week of 1999.

### Small-Take Authorizations

Section 101(a)(5) of the Marine Mammal Protection Act directs the Secretaries of the Interior and

Commerce to authorize the unintentional taking of small numbers of marine mammals by U.S. citizens incidental to activities other than commercial fishing when certain conditions are met. This provision was added to the Act in 1981 to eliminate the need to obtain a procedurally burdensome waiver of the Act's moratorium on taking of marine mammals when the number of animals likely to be affected is small and the impacts on the size and productivity of the affected species or populations are likely to be negligible. The provision was amended in 1986 to allow authorizing the taking of small numbers of depleted, as well as non-depleted, marine mammals. All forms of incidental taking, including lethal taking, may be authorized under section 101(a)(5)(A). A new provision, section 101(a)(5)(D), was added to the Act in 1994 to provide a streamlined mechanism for authorizing small takes of marine mammals when the taking is by harassment only.

Authorizations under section 101(a)(5)(A) involve a two-step process: (1) promulgation of a finding that the incidental taking will have negligible effects and regulations setting forth permissible methods of taking and requirements for monitoring and reporting the taking; and (2) issuance of letters of authorization for particular activities in accordance with the regulations. Authorization of incidental harassment under section 101(a)(5)(D) does not require the issuance of regulations. Rather, the Secretary, within 45 days of receiving an application that makes the required showings, is to publish a proposed authorization and notice of availability for public comment in the *Federal Register* and in newspapers and appropriate electronic media in communities in the area where the taking would occur. After a 30-day comment period, the Secretary has 45 days to make a final determination on the application. Authorizations under section 101(a)(5)(A) may be issued for up to five years. Authorizations under section 101(a)(5)(D) may be issued for up to one year, but may be renewed. Requests for small-take authorizations considered in 1998 are described below.

### Authorizations under Section 101(a)(5)(A)

**Incidental Take of Walruses and Polar Bears —** Regulations governing the issuance of letters of authorization to take walruses and polar bears inciden-

tal to oil and gas activities in the southern Beaufort Sea and adjacent areas were promulgated by the Fish and Wildlife Service in November 1993; in August 1995 they were modified and extended to apply through 15 December 1998. On 17 November 1998 the Service published in the *Federal Register* a proposed finding of negligible impact and regulations proposed to govern the authorization and monitoring of the incidental take of walruses and polar bears in the course of oil and gas exploration and development off the North Slope of Alaska during the next five years. Although anticipated, final regulations were not promulgated by 15 December 1998 when the earlier regulations expired. They are expected to be promulgated early in 1999.

From November 1997 through October 1998 the Fish and Wildlife Service issued 22 letters of authorization to take polar bears and/or walruses incidental to oil and gas exploration and development activities in the southern Beaufort Sea. The authorizations were issued to ARCO Alaska Inc., Northern Geophysical, Western Geophysical, BP Exploration (Alaska) Inc., Exxon U.S.A., and Western Atlas International. Notice of the authorizations were published in the *Federal Register* on 6 and 9 January, 27 February, 16 April, 9 and 23 June, and 28 December 1998.

The regulations proposed by the Service to govern incidental taking of polar bears and walruses during the next five years (16 December 1998 through 15 December 2003) specify permissible methods of taking and requirements for monitoring to ensure that taking occurs only as authorized. Background information provided in the 17 November 1998 *Federal Register* notice supports the proposed finding of "negligible impact."

**Taking of Ringed Seals Incidental to On-ice Seismic Activities** — The National Marine Fisheries Service issued regulations in 1982, 1987, and 1993 to authorize the taking of small numbers of ringed seals incidental to on-ice seismic activities associated with oil and gas exploration activities in the Beaufort Sea. On 11 July 1997 the Service received an application from BP Exploration (Alaska) Inc. on behalf of itself, ARCO Alaska Inc., Northern Geophysical of America Inc., and Western Geophysical Co. to extend the regulations for five years. The Service published the

application notice and a proposed rule in the 27 October 1997 *Federal Register*.

As noted in its previous report, the Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed the proposed rule and forwarded comments to the National Marine Fisheries Service on 1 December 1997. Although it concurred with the conclusion that the seismic surveys likely would have negligible impacts, the Commission questioned whether measures proposed to detect and avoid ringed seal lairs under the ice would minimize the number of animals taken. The Commission recommended that the Service promulgate regulations as requested subject to the following requirements:

- (1) surveys sufficient to detect the locations of ringed seals and ringed seal lairs that could be affected by the seismic operations be conducted before finalizing the tracklines and initiating such operations;
- (2) the tracklines for these seismic operations reflect the results of those surveys so as to avoid active ringed seal lairs to the maximum extent practicable, thereby minimizing the possible effects on ringed seals; and
- (3) the monitoring programs required are sufficient to provide accurate estimates of the number of seals and lairs affected and the biological significance of the effects.

On 2 February 1998 the National Marine Fisheries Service published notice of its final regulations in the *Federal Register*. With regard to the Commission's recommendations, the *Federal Register* notice indicated that currently trained dogs provide the only reliable means to locate ringed seal lairs and that participants in a peer review workshop held in 1993 had concluded that "the use of dogs to locate ringed seal lairs and breathing holes resulted in an increased harassment of ringed seals and in a potential increase in interactions between humans and polar bears (which apparently are attracted by the dogs)." Thus, the Service did not modify the regulations to require the conduct of surveys sufficient to locate and orient tracklines to avoid ringed seal lairs. The Service did modify the regulations to require that the crews conducting on-ice seismic surveys include either a marine mammal

biologist with expertise in ice seal behavior or an Inuit familiar with ice seal behavior.

On 23 March 1998 the National Marine Fisheries Service published notice in the *Federal Register* that it had issued letters of authorization to take ringed and bearded seals incidental to on-ice seismic operations in the southern Beaufort Sea to BP Exploration, Western Geophysical, and Northern Geophysical of America. These authorizations were effective from 16 March through 31 May 1998.

**Taking of Bottlenose and Spotted Dolphins Incidental to Oil and Gas Structure Removal in the Gulf of Mexico** — As noted in previous Commission reports, the American Petroleum Institute, representing companies that remove structures used for oil and gas exploration, development, and production in the Gulf of Mexico, requested a small-take authorization from the National Marine Fisheries Service in 1989 to take bottlenose dolphins and spotted dolphins incidental to structure removal. Notice of the final rule authorizing the incidental taking was published in the *Federal Register* on 12 October 1995. The rule remains valid through 13 November 2000 and authorizes the issuance of letters of authorization allowing the taking by harassment of up to 200 dolphins per year. The rule limits the types and amounts of explosives, requires that explosives be detonated only during daylight hours when weather conditions are such that dolphins can be seen within the area where they could be killed or injured by the detonations, and specifies monitoring that must be done to minimize the possibility that dolphins could be within the possible zone of influence when the detonations occur.

One letter of authorization was issued pursuant to these regulations in 1995, 17 in 1996, and 18 in 1997. On 4 May 1998 the National Marine Fisheries Service published in the *Federal Register* notice that one-year letters of authorization had been issued to Progo Producing Co. on 12 February 1998, to Burlington Resources Offshore Inc. and Apache Corp. on 1 April 1998, and to Chevron U.S.A. on 24 April 1998. To date, no dolphins are known to have been killed or injured incidental to the authorized removals.

**Taking Incidental to Rocket Launches from Vandenberg Air Force Base** — Since the addition of

section 101(a)(5)(D) to the Marine Mammal Protection Act in 1994, the U.S. Air Force has requested a series of one-year authorizations to take harbor seals and possibly other marine mammals incidental to launches of Delta II, Titan II, Titan IV, Taurus, and Lockheed Martin rockets at Vandenberg Air Force Base on the central California coast. As noted in previous reports, the Commission believes that, if launches of these and other rockets from Vandenberg Air Force Base are expected to continue in the foreseeable future, it would be more appropriate to obtain a five-year authorization under section 101(a)(5)(A) of the Marine Mammal Protection Act, rather than seek annual authorizations for each type of vehicle launched from the base. The Commission also has questioned whether the monitoring programs required by the National Marine Fisheries Service have been sufficient to detect cumulative adverse effects.

The Air Force has recognized the uncertainty concerning possible cumulative effects and, as noted in the Commission's previous report, submitted an application to the National Marine Fisheries Service in April 1997 for a scientific research permit to authorize the taking of California sea lions, Pacific harbor seals, and northern elephant seals in the course of studies to determine the possible cumulative effects of noise from rocket launches on these species. The permit, which is effective until 30 January 2002, was issued on 26 June 1997.

On 30 September 1997 the Air Force applied to the National Marine Fisheries Service for a five-year small-take authorization under section 101(a)(5)(A) of the Marine Mammal Protection Act. Notice of receipt of the application and proposed regulations to authorize the requested incidental taking were published in the *Federal Register* on 21 July 1998. The *Federal Register* notice and an environmental assessment provided by the Air Force indicated that noise associated with rocket launches and associated activities at Vandenberg Air Force Base have been documented, in some cases, to cause seals hauled out on beaches near the launch sites and on the northern Channel Islands to flee into the water. They also indicated that temporary hearing threshold shifts had been documented experimentally. They concluded that only small proportions of the regional seal populations

were likely to be affected by the launches and associated activities and that the effects would be negligible.

The Commission, in consultation with its Committee of Scientific Advisors, reviewed and by letter of 2 September 1998 provided comments to the National Marine Fisheries Service on the proposed rule and the environmental assessment. The Commission concurred with the determination that data and analyses provided in the *Federal Register* notice and in the environmental assessment provided reasonable justification for the conclusion that only small proportions of the regional seal populations were likely to be affected and that the short-term effects would be negligible (*i.e.*, not result in the mortality or injury of individual animals or have effects on the distribution, size, or productivity of the potentially affected populations). However, the Commission questioned whether there was reasonable justification for concluding that the activities for which taking authorization was requested would not have significant adverse cumulative effects. Further, the Commission noted that it was not clear whether (a) the Air Force intended, or would be required as a condition of the requested authorization, to continue the research program begun in 1997 to assess possible cumulative effects; or (b) the research program was capable of detecting changes in the distribution patterns, abundance, survival, or productivity of seals that inhabit areas where they could be affected by the activities for which taking authorization was requested.

The Commission recommended that the requested five-year taking authorization be issued provided (1) continuation of the research program begun in 1997 was made a condition of the authorization; (2) the Service was satisfied that the research and the site-specific monitoring required are capable of detecting possible cumulative effects on the hearing of individual seals and on the distribution, size, and productivity of the potentially affected populations; and (3) the authorized taking be suspended, pending review, if there are indications that the activities covered by the authorization are causing mortality or injuries or are affecting the distribution, size, or productivity of the potentially affected populations.

With respect to point 2, the Commission noted that available data support the conclusion that noise from

rocket launches and aircraft overflights can cause seals to flee into the water in certain circumstances and that most if not all of the affected animals resume normal behavior within several hours after the disturbance. Given that these effects have been well documented, the Commission questioned whether it was necessary to continue to require the type of site-specific monitoring that had documented this short-term effect. As noted earlier, the Commission questioned whether the research and monitoring programs currently being conducted or proposed would be capable of detecting possible long-term cumulative effects. The Commission recommended that the Service, if it had not already done so, consult with scientists familiar with the demography and dynamics of harbor seals in and around Vandenberg Air Force Base to ensure that the final rule includes provisions for research and monitoring capable of detecting possible cumulative adverse effects.

At the end of 1998 final regulations had not been issued.

**Taking Incidental to Shock Testing the SEAWOLF Submarine** — On 7 June 1996 the Navy applied to the National Marine Fisheries Service for authorization under section 101(a)(5)(A) of the Marine Mammal Protection Act to take small numbers of marine mammals incidental to shock testing the SEAWOLF submarine. At the same time, the Navy issued for public review and comment a draft environmental impact statement for shock testing the SEAWOLF submarine. The Commission's comments and recommendations regarding the environmental impact statement and the requested small-take authorization are described in previous Commission reports.

The National Marine Fisheries Service published in the *Federal Register* on 1 December 1998 its final rule regarding the requested authorization. The *Federal Register* notice notes, and the final rule reflects, the Commission's comments and recommendations. The rule specifies both monitoring requirements and measures that must be taken to minimize the number of animals affected. It is effective through 2004, and specifies that the activities must be conducted from 1 May to 30 September to avoid possibly affecting right whales. Additional information concerning right

whales and shock testing the SEAWOLF submarine is provided in Chapter and VI.

**Taking Incidental to Operation of the Nuclear Power Plant in Seabrook, New Hampshire** — As noted in the Commission's previous report, the National Marine Fisheries Service received an application on 16 June 1997 from the North Atlantic Energy Service Corporation for a five-year authorization to take small numbers of harbor, gray, harp, and hooded seals incidental to routine operation of the nuclear power plant in Seabrook, New Hampshire. The application indicated that cooling water for the plant is drawn through tunnels from three intake structures located about one mile (1.6 km) offshore and that, since 1993, the remains of 27 to 33 seals had been found in holding bays at the terminus of the intake tunnels. The letter transmitting the application noted that studies were being done to determine steps that might be taken to minimize entrapment of seals.

Notice of receipt of the application and a request for comments were published in the *Federal Register* on 24 July 1997. The Commission, in consultation with its Committee of Scientific Advisors, provided comments to the Service on 13 August 1997. Notice of proposed regulations and a request for comments and related information were published in the *Federal Register* on 25 August 1998. The Service proposed to allow entrapment of up to 34 seals (2 percent of the estimated potential biological removal level for harbor seals) each year for the next five years. It proposed to require the applicant to report on possible measures to minimize taking within six months after issuance of the final rule and to implement such measures as the Service may specify within 42 months after issuance of the final rule.

The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed and on 8 October 1998 provided comments on the application to the Service. The Commission noted that the Service's proposal appeared to meet the spirit of the Marine Mammal Protection Act. However, it was not clear why the Service proposed to delay implementing mitigation measures for 36 months after submission of the required report on possible mitigation measures. The Commission recommended that the final rule require that appropriate mitigation

measures be implemented as soon as practicable following submission of the report. The Commission requested that it be provided a copy of the report when it is submitted.

At the end of 1998 the National Marine Fisheries Service had not yet published the final rule.

#### **Authorizations under Section 101(a)(5)(D)**

**The Northstar Project** — As noted in previous Commission reports, BP Exploration (Alaska) Inc. received authorization in 1996 and 1997 to take six species of marine mammals (bowhead, gray, and beluga whales and ringed, spotted, and bearded seals) by harassment incidental to seismic surveys conducted during the open-water season (about 20 July to 20 October) at its Northstar site in the Beaufort Sea. On 14 August 1998 BP Exploration (Alaska) Inc. submitted an application to the National Marine Fisheries Service requesting a one-year authorization to take by harassment small numbers of these six species incidental to construction of an offshore oil platform and subsea pipeline at its Northstar Unit. Notice of receipt of the application and the Service's proposed incidental take authorization were published in the *Federal Register* on 26 October 1998. The Commission, in consultation with its Committee of Scientific Advisors, reviewed the *Federal Register* notice and provided comments to the National Marine Fisheries Service on 25 November 1998. The Commission concurred with the Service's preliminary determination that the planned construction could have short-term effects on the behavior of certain cetaceans and pinnipeds and that any such behavioral effects would be negligible in terms of population survival and productivity. The Commission recommended that the requested authorization be granted, provided the Service was satisfied that the marine mammal monitoring program proposed for 1999 was adequate to verify that only small numbers of marine mammals are taken, that the taking is by harassment only, and that the impacts on the affected species and stocks are in fact negligible.

The Commission noted that the activities for which the applicant requested incidental harassment authorization for a one-year period were part of a long-term development project. The Commission recommended

that it be made clear to the applicant that future authorizations will need to consider possible cumulative long-term effects that may not be negligible and thus cannot be authorized under section 101(a)(5)(A) of the Act.

Comments on the proposed incidental harassment authorization also were submitted to the National Marine Fisheries Service by Greenpeace on behalf of itself, the Northern Alaska Environmental Center, the Alaska Community Action on Toxics, the Alaska Conservation Alliance (representing 31 Alaska-based conservation groups and businesses), and the Alaska Center for the Environment. These organizations questioned the preliminary finding that the planned construction would have negligible effects and argued that there was insufficient justification for granting the requested incidental harassment authorization.

At the end of the year, the National Marine Fisheries Service was considering the comments provided by the Commission, Greenpeace, and others.

**Request from BP Exploration (Alaska) Inc. to Renew Its Authorization to Harass Marine Mammals Incidental to Seismic Surveys in the Southern Beaufort Sea** — On 26 March 1998 BP Exploration (Alaska) Inc. applied to the National Marine Fisheries Service for renewal of its previous one-year authorization to allow taking of small numbers of marine mammals by harassment incidental to seismic surveys to be conducted in the southern Beaufort Sea between 20 July and 20 October 1998. Notice of receipt of the application and proposed issuance of the requested authorization were published in the *Federal Register* on 6 May 1998. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed and on 5 June 1998 provided comments on the application and a marine mammal and acoustic monitoring plan submitted with it.

The seismic surveys were to be done when ice conditions permit between 20 July and 20 October 1998. They would involve up to four vessels deploying and retrieving cable containing seismic sensors; two or possibly three vessels towing airgun arrays; a large barge with 26 modular buildings housing generators and other equipment; and one or more utility vessels to handle crew changes, support boat-based

acoustic measurements, and conduct shallow-water bathymetric surveys. The planned marine mammal monitoring program included observations by trained biologists aboard the seismic source vessels to detect marine mammals that may be present in or near designated safety or shutdown zones; daily aerial surveys, weather permitting, from 1 September until three days after the end of the seismic surveys to document the distributions, movements, and general activities of bowhead whales and other marine mammals in and near the area in which they potentially could be affected by the surveys; deployment of autonomous sea floor acoustic recorders to monitor bowhead whale vocalizations from mid-August to mid- or late September and to document the transmission characteristics and levels of pulsed seismic sounds received by marine mammals in and near the planned survey area.

The Commission concurred with most of the determinations concerning the possible effects of the planned seismic surveys on marine mammals. However, it noted that the rationale for some conclusions was not explained clearly and that several of the determinations appeared to be based on unstated assumptions that might not be valid. The Commission noted, for example, that the applicant had received authorization to take small numbers of marine mammals incidental to seismic and related logistic support activities in the same general area in 1996 and 1997, and that none of the applications had indicated how much seismic work would be required to delineate possible oil- and gas-bearing structures in the area or the type and level of further exploratory and development activities that may follow. The Commission recommended that the Service, if it had not already done so, consult with the applicant, the Alaska Department of Fish and Game, and Alaska Native communities whose subsistence hunting could be affected by exploration and development activities, to determine the long-term monitoring that would be required to confirm that the proposed seismic surveys and possible future exploration and development activities do not cause changes in the seasonal distribution patterns, abundance, or productivity of marine mammal populations in the area.

The Commission also noted that the *Federal Register* notice, the request for incidental harassment

authorization, and the proposed marine mammal and acoustic monitoring plan all appeared to assume that the pulsed sounds from the airguns would be the only potential source of harassment. That is, they appeared to assume that the propulsion systems, generators, and other equipment aboard the cable, seismic source, and related support vessels would have no effect on marine mammals. The Commission recommended that, before issuing the requested authorization, the Service take such steps as necessary to (1) verify that the various vessels involved in the operations are unlikely to have any effect on marine mammals; and (2) require that the marine mammal and acoustic monitoring plan be augmented to measure the levels and characteristics of sounds produced by the various vessels and to confirm that those sounds have no effect on marine mammals.

On 6 July 1998 BP Exploration (Alaska) Inc. notified the National Marine Fisheries Service that it would not be conducting the planned seismic surveys in 1998 and that it therefore was withdrawing its application for an incidental harassment authorization. Notice of the withdrawal was published in the *Federal Register* on 29 July 1998.

**Request from Western Geophysical for Authorization to Harass Marine Mammals Incidental to Seismic Surveys in the Southern Beaufort Sea** — On 15 April 1998 the National Marine Fisheries Service received an application from Western Geophysical/Western Atlas International of Houston, Texas (Western Geophysical) for authorization to take small numbers of bowhead whales and other marine mammals by harassment incidental to seismic surveys to be conducted in federal and state waters in the south-central Beaufort Sea between 1 July and 20 October 1998. Notice of receipt of the application and proposed authorization of the requested harassment were published in the *Federal Register* on 20 May 1998. The Commission, in consultation with its Committee of Scientific Advisors, reviewed and on 19 June 1998 provided comments to the Service on the application and the marine mammal and acoustic monitoring plan submitted with it.

In its comments, the Commission noted that the type, time, and location of the planned seismic surveys were nearly identical to those of BP Exploration

(Alaska) Inc. described above. The Commission therefore referred the Service to the recommendations contained in its 5 June 1998 letter regarding the application from BP Exploration (Alaska) Inc. Because both companies planned to conduct surveys in the same general area at the same time, the Commission recommended that the Service carefully consider the possible cumulative effects, particularly the possibility that the surveys could affect the migration of bowhead whales and the availability of the whales to Alaska Natives for subsistence purposes.

Comments on the proposed incidental harassment authorization were also provided to the Service by Greenpeace and the Alaska Eskimo Whaling Commission. All of the comments were summarized and addressed in a notice published in the *Federal Register* on 29 July 1998 indicating that the requested incidental harassment authorization had been issued. With regard to the Commission's recommendation that steps be taken to detect and avoid possible long-term cumulative effects, the Service noted that it agreed that possible cumulative effects were of concern, but that the actions recommended by the Commission extended beyond the monitoring requirements for Western Geophysical's 1998 seismic surveys. The Service indicated that, to the extent practicable, it intended to use the peer-review process required by the Marine Mammal Protection Act for small-take authorizations in Arctic waters to address these cumulative impact monitoring concerns in the future.

The Commission believes that, if seismic surveys are expected to be conducted in a particular area for more than one year or the surveys are likely to lead to additional activities that could have harmful cumulative effects, incidental harassment authorization should be requested and provided under section 101(a)(5)(A) of the Act, rather than under section 101(a)(5)(D). The Commission will continue to convey this view to the Service in all cases where long-term cumulative adverse effects seem possible.

**Request for Authorization to Harass Small Numbers of Pinnipeds Incidental to the Removal of Storage Tanks at the Cape Flattery Light Station** — On 27 April 1998 the National Marine Fisheries Service received a request from the Coast Guard for authorization to take small numbers of California sea

lions, Pacific harbor seals, and Steller sea lions incidental to the removal of three underground and two aboveground storage tanks at the Cape Flattery Light Station on Tatoosh Island in Washington State. Notice of receipt of the application and the Service's intent to issue the incidental harassment authorization were published in the *Federal Register* on 4 June 1998. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors, reviewed the request and provided comments to the Service by letter of 1 July 1998.

From the information provided in the application and the *Federal Register* notice, it appeared likely that the removal of the storage tanks would result, at most, in taking a small number of pinnipeds by harassment, provided the Coast Guard scheduled the work to avoid the pupping and molting seasons and that no accidents occur (e.g., if the contents of the storage tanks are hazardous, no contents are accidentally released into the environment). The Commission recommended that the Service ensure that (1) the work is conducted as scheduled to avoid the pupping and molting seasons; and (2) a sufficient number of qualified observers is used to verify that no more than the authorized number of seals is harassed and that the effects are in fact negligible.

Notice of issuance of the requested authorization was published in the *Federal Register* on 24 August 1998. The *Federal Register* notice indicated that the incidental harassment authorization required the work to be completed before the beginning of the harbor seal pupping season. It noted that a single observer should be able to monitor the haul-out sites that could be affected and explained the rationale for that conclusion. The Commission concurs with the Service's determinations.

**Request for Authorization to Harass Small Numbers of Marine Mammals Incidental to Explosive Testing at Eglin Air Force Base, Florida** — On 20 July 1998 the National Marine Fisheries Service received an application from the Air Force Development Test Center at Eglin Air Force Base for authorization to harass small numbers of bottlenose dolphins, spotted dolphins, and possibly other cetaceans incidental to explosive testing of obstacle and mine clearance systems in waters off Eglin Air Force Base. Notice

of receipt of the application and proposed incidental harassment authorization were published in the *Federal Register* on 13 October 1998. The Commission, in consultation with its Committee of Scientific Advisors, reviewed and on 13 November 1998 commented on the application and a related environmental assessment provided by the applicant.

The Commission concurred with the Service's determination that the planned testing would have no more than short-term negligible effects on the potentially affected marine mammals, provided the mitigation measures described in the application were carried out. The Commission noted that the Air Force, if it had not already done so, should consult with the Fish and Wildlife Service to confirm that manatees were unlikely to be present in or near the test site at the time the tests were scheduled to be conducted.

Notice of issuance of the requested incidental harassment authorization was published in the *Federal Register* on 8 December 1998. Among other things, the notice indicated that the Air Force had consulted with the Fish and Wildlife Service to confirm that manatees were unlikely to be present in the test area at the time of the year that the tests are authorized.

**Request for Authorization to Harass Small Numbers of Harbor Seals Incidental to Replacement of Dock Facilities on McNeil Island** — On 18 September 1998 the National Marine Fisheries Service received an application from the Washington State Department of Corrections for authorization to harass small numbers of harbor seals incidental to demolition and reconstruction of a dock at its Corrections Center on McNeil Island in Puget Sound, Washington. The Commission, in consultation with its Committee of Scientific Advisors, had reviewed and on 8 December 1994 provided comments on an earlier request for authorization to take small numbers of harbor seals incidental to this project. The incidental harassment authorization had been issued in January 1995, but that one-year authorization expired before the dock facility could be removed and reconstructed.

The Commission's staff reviewed the 29 October 1998 *Federal Register* notice and, by letter of 1 December 1998, advised the Service that some of the

concerns expressed in the Commission's 8 December 1994 letter commenting on the original request appeared not to have been addressed fully. In particular, it was not clear whether the monitoring program to be carried out by the applicant would be sufficient to detect any possible harmful effects on the local harbor seal population.

Notice of issuance of the requested incidental harassment authorization was published in the *Federal Register* on 23 December 1998. The notice referenced the Commission's 1994 recommendation concerning the monitoring requirements, but did not specify the requirements as had been recommended by the Commission.

would be better off being euthanized than being transferred to a foreign facility that was ill-equipped to maintain animals in captivity.

After its November 1996 annual meeting, the Commission again wrote to the Animal and Plant Health Inspection Service about the export of marine mammals from the United States. In its 18 December 1996 letter, the Commission noted that the Service was continuing to base comparability determinations solely on written submissions and it reiterated the views expressed in its 8 September 1994 letter that a foreign facility could and should be required to accept and pay for an inspection as a condition of obtaining marine mammals from the United States.

The Animal and Plant Health Inspection Service responded to the Commission on 8 January 1997. The Service stated that, although it does not have authority under the Animal Welfare Act to inspect facilities outside the United States and its territories officially, it would be willing to consider sending inspectors to foreign facilities for purposes of determining comparability with Animal Welfare Act standards if it is invited to do so by the foreign government and if the expenses associated with the inspection are covered. The Service noted that if a deficiency is found, it does not have authority to compel correction. The Service also questioned the need for on-site inspections of foreign facilities because it is unaware of any problems associated with the care of marine mammals exported in the past.

The Commission also wrote to the National Marine Fisheries Service on 18 December 1996 about the export of marine mammals. The Commission noted that, because of the current requirements of section 104 of the Marine Mammal Protection Act, the Service has little choice but to require a comity statement or to implement some other mechanism to ensure continuing jurisdiction over foreign facilities that receive marine mammals from the United States. Nevertheless, the Commission noted that, given existing funding, it is unrealistic to assume that the National Marine Fisheries Service will be able to adequately monitor compliance by foreign facilities or take remedial actions if problems are detected. The Commission therefore suggested that it might make sense if the Marine Mammal Protection Act were

amended to eliminate continuing jurisdiction over marine mammals once they are exported but to strengthen the mechanisms for ensuring comparability before authorizing an export.

The National Marine Fisheries Service responded to the Commission on 19 August 1997. The Service provided strong support for requiring on-site inspections of foreign facilities and agreed that the issue might best be addressed through amendment of the Animal Welfare Act or the Marine Mammal Protection Act. Until this occurs, however, the Service noted that requiring a comity statement and a certification of accuracy from the foreign government, combined with a comparability recommendation from the Animal and Plant Health Inspection Service, remained reasonable requirements consistent with the export provisions of the Marine Mammal Protection Act. The Service is working to draft a proposed rule regarding public display permits, including transfer/transport requirements. These will cover both foreign and domestic facilities. The Service intends to publish the proposed rule in 1999.

### **Release of Captive Marine Mammals to the Wild**

Over the past few years, there has been increased debate over the return of long-term captive marine mammals to the wild. Whether such releases are in the best interests of the animal is questionable, and the procedures for preparing animals for release are still experimental. It is generally thought that release of long-term captive animals should be pursued only with adequate monitoring and in accordance with an appropriate research protocol, pursuant to a scientific research permit.

The Commission on 30 November 1994 wrote to the National Marine Fisheries Service, recommending that the Service refrain from considering any permit application seeking authority to release marine mammals to the wild until objective, generally accepted criteria had been developed for judging when release is appropriate. The Commission reiterated this recommendation in a letter to the Service on 6 December 1996. The Commission further recommended

that the Service publish an unequivocal policy statement or, if necessary, regulations specifying that the release of captive marine mammals to the wild without proper authorization has the potential to injure marine mammals and is considered an illegal taking. The Commission further recommended that, if the Service does not believe it has sufficient authority to prevent unauthorized releases, it seek amendment of the Marine Mammal Protection Act to obtain such authority (*e.g.*, by specifically prohibiting unauthorized releases, allowing recovery of costs for recapture efforts, and giving the Service clearer authority to obtain an injunction against those intending to release animals or otherwise violate the Act).

As discussed in the previous annual report, one effort to release long-term captive marine mammals involved bottlenose dolphins held at a facility in Florida. The facility, which acquired the dolphins in 1994 under a public display permit, intended to seek a scientific research permit under which preparation for release, release, and post-release monitoring would occur. Before submitting a permit application, however, the facility operators took matters into their own hands. On 23 May 1996, despite warnings from the National Marine Fisheries Service that such action would constitute a violation of the Marine Mammal Protection Act, two of the dolphins were transported to open waters off Key West and released without authorization. The facility contended that this was not a violation of the Act.

Without sufficient preparation for the release, one of the dolphins appeared in a Key West marina with lacerations, begging for food. The second dolphin had sustained deep lacerations and was emaciated. The animals likely would have died, had they not been rescued by the National Marine Fisheries Service. As demonstrated by this experience, releasing marine mammals before they are properly prepared clearly has the potential to injure the released animals. It also exposes the released and wild marine mammals to potential risks of contracting diseases. Therefore, the Commission believes the unauthorized release of captive marine mammals constitutes a form of taking as defined under the 1994 amendments to the Marine Mammal Protection Act.

The National Marine Fisheries Service and the Animal and Plant Health Inspection Service have both pursued enforcement actions against the facility. The Animal and Plant Health Inspection Service suspended the facility's Animal Welfare Act license, which provided a partial basis for the National Marine Fisheries Service to seize a third dolphin maintained at the facility. The Animal and Plant Health Inspection Service concluded its enforcement action in 1996 by imposing a \$10,000 fine. The fine was suspended, however, when the licensee agreed to surrender its license voluntarily and cease participating in regulated activities. By the end of 1998 the National Marine Fisheries Service had filed charges against four individuals involved in the unauthorized release. All four were charged with an illegal take by harassment and illegal transportation of each dolphin. The case is expected to be heard by an administrative law judge in February 1999.

On 6 December 1996 the Commission also wrote the Animal and Plant Health Inspection Service regarding the issue of release. The Commission noted that Animal Welfare Act regulations require that facilities maintaining marine mammals be structurally sound and in good repair to protect and constrain the animals and to restrict entry of unwanted animals. The Commission noted that despite the clear requirement that marine mammals be contained in an enclosure, some facilities have been allowed to permit animals to venture outside the primary enclosure. Although this may be appropriate in certain situations (*e.g.*, open-water training of marine mammals by the Navy), such exceptions should be authorized only if necessary and only if safeguards are in place to ensure that the animals will be returned to their primary enclosure. The Commission further recommended that the Animal and Plant Health Inspection Service work with the National Marine Fisheries Service and the Fish and Wildlife Service to review their respective authorities and consider the need for more decisive enforcement of existing statutory provisions and regulations, issuance of policy statements, and regulatory amendments. If the agencies determine that they have authority to respond to, but not prevent, unauthorized releases, the Commission recommended that the agencies seek statutory authority to do so.

Another marine mammal that was being considered for possible release to the wild is Keiko, the male killer whale featured in the movie *Free Willy*. Keiko, captured in Icelandic waters in 1979 at the age of two, lived in an Icelandic aquarium for three years before being moved to a facility in Ontario, Canada. In 1985 the animal was sold to a facility in Mexico City. In 1996 he was moved to the Oregon Coast Aquarium where the Free Willy/Keiko Foundation assumed responsibility for him. The foundation took steps to improve the health of the animal and developed a plan to return Keiko to Iceland for further rehabilitation and possible release to the wild.

Before the whale was exported, a panel of experts assessed his health and in January 1998 submitted a report stating that, although Keiko was not ill at the time of the review, given the animal's history of poor health, it "need[ed] to be studied for a much longer period of time." As plans were being made to return Keiko to Iceland, the Commission on 11 August 1998 wrote the Animal and Plant Health Inspection Service recommending that, before the move was authorized, the Animal and Plant Health Inspection Service and the National Marine Fisheries Service should be satisfied that the whale is in good health and will be able to withstand the stress and rigors involved with the transport. In this regard, the Commission suggested that, because seven months had elapsed since the meeting of the review panel, the Service may find it useful to convene another panel of independent experts to evaluate the health of the animal. The Service responded by letter of 17 August 1998 stating, among other things, that the original panel, which was

established at the request of the Free Willy/Keiko Foundation, was uncomfortable with the idea of reconvening and that requiring the formation of such a panel was beyond the Service's authority under the Animal Welfare Act.

The Free Willy/Keiko Foundation sought concurrence from the National Marine Fisheries Service and the Animal and Plant Health Inspection Service that export of Keiko to Iceland for purposes of public display was allowable under the Marine Mammal Protection Act. On 17 August 1998 the National Marine Fisheries Service advised the foundation's director that the foundation had satisfied the necessary requirements for both the National Marine Fisheries Service and the Animal and Plant Health Inspection Service. To minimize the transport time, the foundation contracted with the U.S. Air Force to airlift Keiko to Iceland in a military cargo plane on 9 September 1998.

Both before and after Keiko's export, the National Marine Fisheries Service made it clear to the Free Willy/Keiko Foundation that it must apply for a scientific research permit if release of Keiko to the wild is deemed a desirable option. In this regard, the Service has advised the foundation and the Icelandic government of the need to develop a sound, scientific approach to any release that may eventually be considered, comparable with what would be required for a scientific research permit under the Marine Mammal Protection Act. To date, the foundation has chosen to hold Keiko for public display purposes only, while continuing to evaluate him for possible future release.

## APPENDIX A

### MARINE MAMMAL COMMISSION RECOMMENDATIONS IN 1998

- 6 January Interior, commenting to the Fish and Wildlife Service on the decline of California sea otters; recommending that the Service undertake or contract for an observer program to determine whether, and to what extent, California sea otters are being taken incidental to the developing trap fishery.
- 9 January Commerce, scientific research permit, Brendan P. Kelly.
- 14 January Agriculture, commenting to the Animal and Plant Health Inspection Service on revisions of the marine mammal care and maintenance standards; noting the Service's progress in developing the standards; and requesting a summary report of the data on existing pool sizes and related information.
- 15 January Interior, commenting to the U.S. Fish and Wildlife Service and recommending approval of a request by Monterey Bay Aquarium for incidental public display of sea otters during rehabilitation.
- 15 January Agriculture, commenting to the Animal and Plant Health Inspection Service on its authority to regulate traveling cetacean exhibits, and requesting additional justification for its belief that it is without legal authority to issue a general rule precluding it from licensing a facility with a traveling cetacean exhibit.
- 15 January Commerce, amendment of scientific research permit, Alaska Department of Fish and Game.
- 20 January Interior, public display permit, WyoBraska Natural History Museum.
- 20 January Commerce, amendment of scientific research permit, Christopher W. Clark.
- 29 January Commerce, amendment of scientific research permit, James T. Harvey, Moss Landing Marine Laboratories.
- 29 January Commerce, amendment of scientific research permit, Robin W. Baird.
- 29 January Commerce, amendment of scientific research permit, Deborah A. Glockner-Ferrari and Mark J. Ferrari.
- 30 January Commerce, amendment of scientific research permit, Norihisa Baba.
- 6 February Commerce, scientific research permit, Robert L. Brownell, Jr.
- 12 February Commerce, scientific research permit, Douglas P. DeMaster, National Marine Mammal Laboratory.

- 12 February Commerce, scientific research permit, Robert L. Brownell, Southwest Fisheries Science Center.
- 13 February State of Florida, commenting to the Bureau of Protected Species Management on the Proposed Amendments to General Provisions Sections of the Florida Manatee Sanctuary Act; noting concern that the proposed rules will weaken the protection of endangered Florida manatees.
- 19 February Interior, scientific research permit, Gordon B. Bauer, New College of the University of South Florida.
- 19 February Commerce, amendment of scientific research permit, Daniel P. Costa, J. Burney Le Boeuf, Charles L. Ortiz.
- 20 February Commerce, scientific research permit, Bruce R. Mate.
- 26 February Commerce, scientific research permit, Salvatore Cerchio.
- 27 February Commerce, amendment of scientific research permit, Robin W. Baird.
- 27 February Commerce, scientific research permit, Michael Castellini, Alaska SeaLife Center.
- 2 March Interior, scientific research permit, David Liberles, University of Florida.
- 4 March Commerce, amendment of general authorization for scientific research, Bernd Wursig.
- 4 March Interior, scientific research permit, Kumar Mahadevan, Mote Marine Laboratory.
- 4 March Commerce, scientific research permit, University of Alaska Museum.
- 6 March Transportation, commenting to the U.S. Coast Guard in support of a draft National Oceanic and Atmospheric Administration action paper to establish mandatory reporting systems for commercial ships more than 300 gross tons operating off the northeastern and southeastern U.S. coast.
- 10 March Commerce, amendment of scientific research permit, Lloyd F. Lowry, Alaska Department of Fish and Game.
- 10 March Commerce, scientific research permit, Alaska Fisheries Science Center, National Marine Mammal Laboratory.
- 10 March Commerce, amendment of scientific research permit, National Marine Mammal Laboratory.
- 13 March Commerce, amendment of scientific research permit, University of Hawaii at Manoa.
- 20 March Commerce, commenting to the National Marine Fisheries Service on the need to investigate instances of ship strikes in which whales become caught on the bow of

ships so as to gather information on factors contributing to ship strikes; recommending that the Service, in consultation with the Coast Guard, regional stranding program coordinators, and other appropriate groups, take steps to ensure prompt, coordinated efforts to investigate such events.

- 24 March Interior, scientific research permit, Jennifer M. Burns, University of California, Institute of Marine Sciences.
- 24 March Interior, amendment of scientific research permit, James A. Estes.
- 25 March Commerce, amendment of general authorization for scientific research, Michael V. deGruy.
- 27 March Commerce, commenting to the National Marine Fisheries Service on the implementation of the International Dolphin Conservation Program Act; noting the preliminary plans for abundance surveys and stress studies; and requesting additional information on a schedule for consultation with the Commission.
- 1 April Interior, commenting to the Fish and Wildlife Service on the proposed rule to amend polar bear import regulations to allow imports of sport-hunted polar bear trophies taken in Canada from the Lancaster Sound and Norwegian Bay management areas; recommending that the Service closely track the implementation of the new system to ensure that it works as expected and that the quotas established continue to meet the statutory requirements; further recommending that the discussion accompanying the final rule provide a clear explanation of the Service's rationale for concluding that past take levels have been sustainable; and recommending that the final rule explain the rationale for allowing the import of polar bear trophies between the date of the 1994 amendments and the effective date of the rule.
- 7 April State, providing general and specific comments to the Office of Oceans and Polar Affairs on the draft Strategic Plan for the Conservation of Arctic Biological Diversity.
- 8 April Commerce, amendment of scientific research permit, D. Ann Pabst.
- 13 April Interior, commenting to the Fish and Wildlife Service on a permit request to take Alaskan sea otters by lethal means for research purposes, urging the Service to prepare an environmental assessment of the value of the data that might be obtained and the potential to obtain the data by non-lethal means.
- 20 April Commerce, enhancement permit, Bruce Carlson, Waikiki Aquarium.
- 20 April Commerce, scientific research permit, Shannon Atkinson, University of Hawaii at Manoa.
- 22 April Commerce, scientific research permit, Douglas P. DeMaster.
- 22 April Interior, amendment of scientific research permit, Robert O. Turner.

- 28 April State, commenting to the Office of Oceans and Polar Affairs on four proposals for Arctic sustainable development projects developed by the State of Alaska, noting that the proposals are of direct relevance to the well-being of people living in rural Alaska and elsewhere in the Arctic; recommending that the proposals be expanded to provide clearer indications of (1) what the U.S. and other Arctic countries are being asked to do; (2) what the financial implications would be; and (3) how residents of the various Arctic states could be expected to benefit from the proposed cooperative activities.
- 28 April State, commenting to the Deputy Secretary of State on draft "US Goals for the Arctic Council" and the advisability of the United States serving as the chair of the Arctic Council; noting that it would be desirable and appropriate for the United States to do so; further noting that the projected cost estimate for the government to host the meeting seemed unrealistic.
- 29 April Commerce, amendment of scientific research permit, J. M. Brady , Glacier Bay National Park.
- 4 May Commerce, amendment of scientific research permit, D. Ann Pabst.
- 4 May Commerce, amendment of scientific research permit, William G. Gilmartin, Hawaii Wildlife Fund.
- 5 May Commerce, scientific research permit, Rachel Cartwright.
- 14 May Commerce, amendment of general authorization for scientific research, Paul H. Forestell.
- 15 May Commerce, amendment of scientific research permit, R. Michael Laurs, Southwest Fisheries Science Center.
- 26 May Interior, amendment of scientific research permit, Chadwick V. Jay.
- 26 May Interior, general authorization for scientific research, Adam Ravetch, National Geographic.
- 26 May Commerce, amendment of scientific research permit, Southwest Fisheries Science Center.
- 26 May Commerce, amendment of scientific research permit, Mason Weinrich, Cetacean Research Unit.
- 27 May Interior, public display and enhancement permit, Long Beach Aquarium of the Pacific.
- 3 June Interior, public display and enhancement permit, Victor C. Aderholt, Alaska SeaLife Center.
- 8 June Commerce, scientific research permit, Douglas P. DeMaster, National Marine Mammal Laboratory.

---

8 June	Commerce, providing general and specific comments to the National Marine Fisheries Service on the “Draft Release of Stranded Marine Mammals to the Wild: Background, Preparation, and Release Criteria;”.
8 June	Commerce, scientific research permit, Carole Conway.
8 June	Commerce, scientific research permit, Fred A. Sharpe, Simon Fraser University.
10 June	Commerce, scientific research permit, George Paka Nishimura, Sea Life Park.
19 June	Commerce, commenting to the National Marine Fisheries Service on a request by Western Geophysical/Western Atlas International of Houston Texas for authorization to take small numbers of marine mammals by harassment incidental to seismic surveys to be conducted in State and Federal waters in the south-central Beaufort Sea between 1 July and 20 October 1998; referring to Commission recommendations on a similar request by British Petroleum Exploration (Alaska); and further recommending that the Service carefully consider possible cumulative impacts of the proposed activities, particularly the possibility that the surveys could affect migrating bowhead whales and the availability of whales to Alaska Natives for subsistence purposes.
23 June	Commerce, amendment of scientific research permit, Peter Worcester, Acoustic Thermometry of Ocean Climate Project.
26 June	Commerce, amendment of scientific research permit, Douglas P. DeMaster, National Marine Mammal Laboratory.
26 June	Interior, scientific research permit, James A. Estes, USGS, Biological Resources Division.
26 June	Commerce, amendment of scientific research permit, Alaska Department of Fish and Game.
26 June	Interior, scientific research permit, Randall S. Wells, Mote Marine Laboratory.
26 June	Commerce, amendment of general authorization for scientific research, Moana Productions, Inc.
1 July	Commerce, commenting to the National Marine Fisheries Service on a request from the U.S. Coast Guard for authorization to take by harassment small numbers of California sea lions, Pacific harbor seals, and Steller sea lions incidental to the removal of three underground and two above-ground storage tanks at the Cape Flattery Light Station on Tatoosh Island; recommending that the Service ensure that (1) a sufficient number of qualified observers are used to verify that no more than the authorized number of animals are harassed and that the effects are negligible, and (2) the work is conducted as scheduled to avoid the pupping and molting seasons; and recommending that the Service advise the applicant that any activities that result in the taking of species listed under the Endangered Species Act requires separate authorization under that statute.

- 2 July Interior, amendment of scientific research permit, James A. Powell, Florida Department of Environmental Protection.
- 10 July Commerce, commenting to the National Marine Fisheries Service on a draft report concerning preliminary findings of a study contracted by Bay Ferries Limited to assess the possible effects on whales of the high-speed ferry between Bar Harbor, Maine, and Yarmouth, Nova Scotia; recommending that the National Marine Fisheries Service consult with the Navy, the Coast Guard, Bay Ferries Limited, LGL Limited, and representatives of the commercial shipping industry to design and cooperatively fund a study or studies to determine sound levels likely to reach whales at different distances and depths in front of various classes of commercial and military vessels, and the responses to those sounds of representative species of whales; recommending that the Service consult with the ferry operator, LGL Limited, the Canadian Department of Fisheries and Oceans, and other interested parties to design, and carry out aerial survey and/or radio-tagging program in conjunction with a ship-based observer program currently being conducted by LGL Limited; and recommending that the Service, if it has not already done so, consult with Bay Ferries Limited and the Canadian Department of Fisheries and Oceans to determine and agree on procedures for reporting and subsequently searching for any whales possibly hit by the new ferry.
- 15 July Transportation, requesting that the U.S. Coast Guard apply its Sea Partners Program to (1) engender public awareness and support for restrictions on discharging garbage, including the prohibition on discharging any trash that includes plastic materials, into the marine environment, (2) educate boaters in Florida about the importance of complying with boat speed regulations established by the State of Florida and the Fish and Wildlife Service to protect Florida manatees, and (3) increase awareness of the highly endangered status of northern right whales along the U.S. east coast and the recent regulations adopted by the National Marine Fisheries Service restricting approaches to these whales to closer than 500 yards.
- 17 July Commerce, commenting to the National Marine Fisheries Service on the need for a precautionary approach to the management of lobster fishing at French Frigate Shoals; repeating previous recommendations that the Service immediately prohibit lobster fishing at French Frigate Shoals pending development of information sufficient to assess the relative importance of lobsters in the diet of juvenile monk seals, monk seal foraging patterns, and the impact of lobster fishing on the availability of monk seal prey species; and repeating a request for information on the steps and criteria to be used to determine the point at which any lobster fishing at French Frigate Shoals adversely affects Hawaiian monk seals.
- 29 July Commerce, scientific research permit, Donald B. Siniff.
- 30 July Defense, requesting that the Navy provide information on (1) whether the Navy and others have routinely collected information on the characteristics and levels of ambient ocean noise, (2) whether the information is unclassified and, if not, whether it might be made available in some synthesized form, (3) whether the Navy believes it would be possible and useful to analyze that information to document changes and trends in ambient noise in representative ocean areas and marine mammal habitats,

and (4) whether the Navy would be willing and able to undertake such a project.

30 July	Defense, providing general and specific comments to the U.S. Army Corps of Engineers on the Draft Environmental Impact Statement for the Beaufort Sea Oil and Gas Development/ Northstar Project.
31 July	Commerce, amendment of scientific research permit, James T. Harvey, Moss Landing Marine Laboratories.
5 August	Commerce, scientific research permit, Kimberlee Beckmen.
7 August	Commerce, amendment of scientific research permit, Douglas P. DeMaster, National Marine Mammal Laboratory.
7 August	Commerce, scientific research permit, John Richardson.
7 August	Interior, amendment of scientific research permit, Graham A. J. Worthy.
10 August	Interior, public display permit, Kagoshima City Aquarium.
10 August	Interior, public display permit, Ishikawa Zoo Foundation.
10 August	Commerce, scientific research permit, Daniel P. Costa.
10 August	Interior, public display permit, Suma Aqualife Park.
11 August	Agriculture, commenting to the Animal and Plant Health Inspection Service on the plans to transfer a killer whale from Newport, Oregon to Vestmannaeyjar, Iceland; recommending that, if the Service has not already done so, it obtain the relevant records from the Free Willy Keiko Foundation and undertake a review to ascertain what they indicate about the long-term health status of the whale and its ability to successfully withstand the stress associated with transport and acclimation to the facility in Iceland.
12 August	Commerce, amendment of scientific research permit, Robin W. Baird.
13 August	Commerce, amendment of scientific research permit, Randall W. Davis.
31 August	State, commenting to the Office of Ocean Affairs on the draft Senior Arctic Officials Report to Ministers, the draft Iqaluit Declaration, and the Outline for Background Papers distributed at the Arctic Policy Group.
2 September	Commerce, scientific research permit, Jeffrey D. Goodyear.
2 September	Commerce, amendment of scientific research permit, Bradford E. Brown, Southeast Fisheries Science Center.
2 September	Commerce, commenting to the National Marine Fisheries Service on a proposed rule to authorize the U.S. Air Force to take small numbers of marine mammals incidental

to missile and rocket launches, aircraft test flight operations, and helicopter operations at Vandenberg Air Force Base, California, for up to five years; recommending that the proposed rule be issued provided (1) continuation of the research program being carried out under Permit No. 859-1373 is made a condition of the rule, (2) the Service is satisfied that the research being conducted under the permit and the site-specific monitoring that will be required by letters of authorization issued in accordance with the rule are capable of detecting possible cumulative effects on the hearing of individual seals and on the distribution, size and productivity of the potentially affected populations, and (3) the authorized activities will be suspended, pending review, if there are any indications that the activities covered by the rule are causing injuries or mortality or are affecting the distribution, size, or productivity of the potentially affected populations; further recommending that the Service consult with scientists familiar with the demography and dynamics of harbor seals in and around Vandenberg Air Force Base to ensure that the final rule includes provisions for research and monitoring capable of detecting possible cumulative adverse effects; and recommending that the Service advise the Air Force that, if it has not already done so, it consult with the Fish and Wildlife Service to ensure that missile and rocket launches and other activities at Vandenberg Air Force Base will not affect sea otters or critical components of their habitat in the Vandenberg area.

- 2 September Interior, scientific research permit, Mote Marine Laboratory.
- 3 September Commerce, scientific research permit, Dan Engelhaupt.
- 4 September Commerce, scientific research permit, A.W. Trites.
- 4 September Commerce, amendment of scientific research permit, Michael Castellini, Alaska SeaLife Center.
- 15 September Commerce, amendment of scientific research permit, Sarah Allen.
- 17 September Commerce, commenting to the National Marine Fisheries Service on a draft plan for conducting research mandated by section 304 (a) of the Marine Mammal Protection Act, as amended by the International Dolphin Conservation Program Act; recommending that an appropriately senior official within the Department of Commerce contact his or her counterparts in Mexico and those other nations whose vessels purse seine for tuna in the eastern tropical Pacific and whose cooperation is essential for carrying out the research program to inform them that failure to cooperate with U.S. researchers and technicians in a timely manner will be viewed as a sign of bad faith and may result in the Secretary declining to make a finding under subsection (g) of the Dolphin Protection Consumer Information Act or deferring the effective date of any change in the definition of dolphin safe tuna; recommending that the Service give further consideration to the possible ways in which the results of the stress-related literature review might be used in making the initial finding; and recommending that the Service include in the review all potentially relevant literature on stress in humans.
- 18 September Defense, commenting to the Ballistic Missile Defense Organization on a Finding of No Significant Impact and associated Final Programmatic Environmental Assessment

for the Short Range Air Drop Target System Program; commending the Department of Defense for exploring target missile launch systems that would not require land-based launch platforms and for identifying the need to carry out site-specific analyses regarding their possible biological impacts; and recommending that the Department initiate consultations with the National Marine Fisheries Service pursuant to Section 7 of the Endangered Species Act to identify such measures as may be needed to avoid significant adverse impacts on endangered or threatened populations of marine mammals and habitat essential for their survival.

- 24 September Commerce, providing general and specific comments to the National Marine Fisheries Service on a draft 1997 Marine Mammal Protection Act of 1972 Annual Report to Congress.
- 8 October Commerce, amendment of scientific research permit, Southwest Fisheries Science Center.
- 8 October Commerce, amendment of scientific research permit, Louis M. Herman, University of Hawaii.
- 8 October Commerce, commenting to the National Marine Fisheries Service on an application from the North Atlantic Energy Service Corporation requesting a five-year authorization to take small numbers of seals incidental to routine operations of the Seabrook Station nuclear power plant in Seabrook, New Hampshire; recommending that the final rule require that appropriate mitigation measures be implemented as soon as possible following submission of the report on possible mitigation measures.
- 8 October Commerce, scientific research permit, Georgia Department of Natural Resources.
- 13 October Commerce, providing comments to the National Marine Fisheries Service on the proposed rule and the accompanying Environmental Assessment prepared by the Service on actions to implement a Harbor Porpoise Take Reduction Plan for gillnet fisheries off New England and Mid-Atlantic coastal states; recommending that the Service (1) use a more conservative estimate of the effectiveness of acoustic deterrent devices to keep porpoises away from nets given the experience to date, (2) reexamine the accuracy of harbor porpoise bycatch estimates for the mid-Atlantic region in light of questionable assumptions and more recent data, (3) consider additional fishery closure areas for the mid-Atlantic and New England areas given what are likely low estimates of past porpoise bycatch levels and overly optimistic expectations regarding the effectiveness of acoustic deterrents, (4) consider the need to modify the gillnet fishery observer program given new management measures, (5) reexamine research plans to detect possible effects of sound from acoustic deterrents on harbor porpoises and other marine species.
- 19 October Commerce, scientific research permit, University of South Mississippi.
- 19 October Interior, public display permit, Oregon Coast Aquarium.
- 19 October Interior, public display permit, Northeastern Nevada Historical Society and Museum.
- 21 October Commerce, providing general and specific comments to the National Marine

Fisheries Service on 48 draft revised marine mammal stock assessment reports for the marine mammal stocks in the Alaska, Pacific, and Atlantic regions.

- 29 October Commerce, commenting to the National Marine Fisheries Service on proposed regulations to modify restrictions on Atka mackerel fishing areas and seasons in the Aleutian Islands; recommending that the Service adopt the regulations as described in the proposed rule; further recommending that the Service implement vessel monitoring system requirements for the Atka mackerel fishery as soon as possible; and recommending that the Service consult with representatives of the commercial fishing industry and other appropriate individuals and agencies to design and implement a program to determine the effect of these proposed regulations on the availability of Atka mackerel to Steller sea lions, and on Steller sea lion recovery.
- 4 November Commerce, amendment of scientific research permit, Alaska Department of Fish and Game.
- 6 November Commerce, scientific research permit, Dan R. Salden, Hawaii Whale Research Foundation.
- 13 November Interior, public display permit, Dallas World Aquarium.
- 13 November Commerce, commenting to the National Marine Fisheries Service on a request from the U.S. Air Force for authorization to take small numbers of marine mammals by harassment incidental to testing of obstacle and mine clearance systems at Eglin Air Force Base in Florida; suggesting that the Air Force, if it has not already done so, consult with the Fish and Wildlife Service to confirm that manatees are unlikely to occur in or near the vicinity of the test site when the tests are scheduled to be conducted.
- 25 November Commerce, amendment of scientific research permit, Robin W. Baird.
- 25 November Commerce, commenting to the National Marine Fisheries Service on a request from BP Exploration Inc. for authorization to take by harassment small numbers of bowhead whales, gray whales, beluga whales, ringed seals, bearded seals, and spotted seals incidental to construction of an offshore oil platform and subsea pipeline at its Northstar Unit in the Beaufort Sea in Alaska State waters; recommending that the Service grant the requested authorization provided it is satisfied that the proposed marine mammal monitoring program for 1999 is adequate to verify that only small numbers of marine mammals are taken, that the taking is by harassment only, and that the impacts on the affected species and stocks are negligible.
- 1 December Commerce, commenting to the National Marine Fisheries Service on a proposed authorization for the incidental take by harassment of small numbers of harbor seals during the demolition and reconstruction of the Still Harbor Dock Facility on McNeil Island in Puget Sound, Washington; noting that a small-take exemption should not be granted unless the uncertainties and the details of the monitoring program have been worked out and the Service is able to reasonably conclude that the program is adequate to detect any possible harmful effects on the local harbor seal population.

- 3 December Transportation, commenting to the U.S. Coast Guard on its participation in the northern right whale recovery program; commending the Coast Guard on its various efforts to reduce northern right whale mortality; and recommending that the Coast Guard, as a matter of highest priority, seek approval from the International Maritime Organization for a U.S. proposed mandatory ship reporting system.
- 8 December Commerce, commenting to the National Marine Fisheries Service on the incidental take of harbor porpoise in gillnet fisheries along the east coast; commending the Service for taking measures to reduce bycatch; recommending that it undertake additional research on pingers to improve understanding of factors such as the sound frequencies, frequency variations, and/or the harmonics of acoustic deterrent devices that are most important for deterring harbor porpoise, and how sound characteristics and bycatch rates change over time as battery power declines; recommending that the Service immediately (1) consult with fishermen and scientists experienced with using pingers to identify ways of making pingers more reliable and easier to use, and (2) as warranted, contract with an appropriately qualified engineer to design an improved prototype pinger incorporating the desired features; further recommending that the Service announce that it will proceed with listing the Gulf of Maine harbor porpoise stock as threatened under the Endangered Species Act if measures adopted under the take reduction plan do not successfully reduce bycatch levels to less than the calculated potential biological removal level; and recommending that the Service keep the population's status under close review and continue research to monitor status and trends.
- 8 December Canadian Department of Fisheries and Oceans, commenting to the Canadian Department of Fisheries and Oceans on joint U.S.- Canadian efforts to aid in the recovery of endangered northern right whales and to reduce the bycatch of harbor porpoise; requesting that the Department seek increased funding for Canada's right whale recovery program while maintaining support for efforts to assess and minimize the incidental take of harbor porpoise in gillnets.
- 9 December Interior, providing general and specific comments the U.S. Fish and Wildlife Service on the Draft Environmental Assessment and the Draft Conceptual Management Plan for the proposed Palmyra Atoll National Wildlife Refuge.
- 10 December Defense, commending the Navy on its continued effort to create a safer environment for marine mammals and other living marine organisms; specifically commending its efforts to protect right whales, conserve Hawaiian monk seals, and assess the effects of anthropogenic ocean noise on marine mammals.
- 18 December Commerce, scientific research permit, Brad F. Andrews, Sea World.
- 21 December Commerce, commenting to the National Marine Fisheries Service; commending the National Marine Fisheries Service, the Coast Guard, and the Navy for a variety of cooperative actions to protect the western North Atlantic Ocean population of northern right whales; recommending that the Service increase its base level funding request for the program from \$200,000 requested for 1999 to \$1.3 million to reflect ongoing program needs for operating a mandatory ship reporting system, monitoring right whales in critical right whale habitats, developing and maintaining a geographic information system of data on right whales and their habitat, continuing efforts to

disentangle right whales and develop fishing gear less likely to entangle whales, and implementing a long term satellite tracking program to better identify right whale distribution and movements; further recommending that the Service ask the National Oceanic and Atmospheric Administration to provide \$250,000 to cover start up costs for the National Whale Conservation Fund and seek supplemental funding to carry out certain urgent unbudgeted research tasks during 1999.

- 22 December Commerce, public display permit, Gabriel J. Kerschner, Wild Things, Inc.
- 22 December Commerce, amendment of scientific research permit, Deborah A. Glockner-Ferrari.
- 22 December Commerce, amendment of scientific research permit, James Darling.
- 31 December Commerce, commenting to the National Marine Fisheries Service on the status of the Hawaiian monk seal; recommending that the Service (1) reinstate Section 7 consultations on the possible effects of lobster fishing in the Northwestern Hawaiian Islands on Hawaiian monk seals, (2) close French Frigate Shoals to lobster fishing pending availability of further information, (3) prohibit lobster fishing at reefs surrounding Kure Atoll, Pearl and Hermes Reef, and Lisianski Island until such time as there is better information on the importance of lobster and other species taken in the fishery on the diet of Hawaiian monk seals, the status of those stocks at those atolls, and the effect of lobster fishing on the abundance of those stocks, (4) provide funding to expedite development of a comprehensive research program on fatty acid signatures of prey in Hawaiian monk seal blubber, (5) process the backlog of scat samples collected since 1994, (6) continue efforts to consult with other agencies to secure assistance to remove remains and associated debris of the *Paradise Queen II*, (7) not proceed with the translocation of weaned pups until uncertainties regarding the risk of introducing morbillivirus or other significant disease agents has been thoroughly reviewed by marine mammal veterinarians and epidemiologists, (8) redirect funding for translocation work to a head-start program at French Frigate Shoals, and (9) assess the effectiveness and feasibility of carrying out a program to inoculate Hawaiian monk seals with a vaccine against morbillivirus.

## APPENDIX B

### REPORTS OF COMMISSION-SPONSORED ACTIVITIES AVAILABLE FROM THE MARINE MAMMAL COMMISSION<sup>1</sup> OR THE NATIONAL TECHNICAL INFORMATION SERVICE (NTIS)<sup>2</sup>

- Ainley, D.G., H.R. Huber, R.P. Henderson, and T.J. Lewis. 1977. Studies of marine mammals at the Farallon Islands, California, 1970-1975. Final report for MMC contract MM4AC002. NTIS PB-274 046. 42 pp. (A03)
- Ainley, D.G., H.R. Huber, R.P. Henderson, T.J. Lewis, and S.H. Morrell. 1977. Studies of marine mammals at the Farallon Islands, California, 1975-1976. Final report for MMC contract MM5AC020. NTIS PB-266 249. 32 pp. (A03)
- Ainley, D.G., H.R. Huber, S.H. Morrell, and R.R. LeValley. 1978. Studies of marine mammals at the Farallon Islands, California, 1976-1977. Final report for MMC contract MM6AC027. NTIS PB-286 603. 44 pp. (A03)
- Allen, S.G. 1991. Harbor seal habitat restoration at Strawberry Spit, San Francisco Bay. Final report for MMC contract MM2910890-9. NTIS PB91-212332. 44 pp. (A03)
- Allen, S.G., D.G. Ainley, and G.W. Page. 1980. Haul out patterns of harbor seals in Bolinas Lagoon, California. Final report for MMC contract MM8AC012. NTIS PB80-176910. 31 pp. (A03)
- Anderson, D.M., and A.W. White. 1989. Toxic dinoflagellates and marine mammal mortality: Proceedings of an expert consultation held at Woods Hole Oceanographic Institution. Final report for MMC contract T6810848-1. NTIS PB90-160755. 71 pp. (A04)
- Baker, C.S., J.M. Straley, and A. Perry. 1990. Population characteristics of humpback whales in southeastern Alaska: summer and late-season, 1986. Final report for MMC contract MM3309822-5. NTIS PB90-252487. 23 pp. (A03)
- Balcomb, K.C., J.R. Boran, R.W. Osborne, and N.J. Haenel. 1980. Observations of killer whales (*Orcinus orca*) in greater Puget Sound, State of Washington. Final report for MMC contract MM1300731-7. NTIS PB80-224728. 42 pp. (A03)
- Baur, D.C. 1995. Reconciling the legal mechanisms to protect and manage polar bears under United States laws and the international agreement for the conservation of polar bears. Final report for MMC contract T94071388. NTIS PB95-272092. 103 pp. (A07)
- Baur, D.C. 1996. Legal ramifications of the GATT panel reports on the United States' ban on the importation of yellowfin tuna products. Final report for MMC contract T94071375. NTIS PB97-104756. 102 pp. (A06)
- Bean, M.J. 1984. United States and international authorities applicable to entanglement of marine mammals and other organisms in lost or discarded fishing gear and other debris. Final report for MMC contract MM2629994-7. NTIS PB85-160471. 56 pp. (A04)
- Beddington, J.R., and H.A. Williams. 1980. The status and management of the harp seal in the north-west Atlantic. A review and evaluation. Final report for MMC contract MM1301062-1. NTIS PB80-206105. 127 pp. (A07)
- Bengtson, J.L. 1978. Review of information regarding the conservation of living resources of the Antarctic marine ecosystem. Final report for MMC contract MM8AD055. NTIS PB-289 496. 148 pp. (A08)
- Bishop, J.B. 1985. Summary report of gill and trammel net (set-net) observations in the vicinity of Morro Bay, California, 1 November 1983 - 31 August 1984. Final report for MMC contract MM2629900-2. NTIS PB85-150076. 14 pp. (A02)
- Bockstoce, J. 1978. A preliminary estimate of the reduction of the western Arctic bowhead whale (*Balaena mysticetus*) population by the pelagic whaling industry: 1848-1915. Final report for MMC contract MM7AD111. NTIS PB-286 797. 32 pp. (A08)
- Brownell, R.L., Jr., C. Schonewald, and R.R. Reeves. 1978. Preliminary report on world catches of marine mammals 1966-1975. Final report for MMC contract MM6AC002. NTIS PB-290 713. 353 pp. (A16)
- Buckland, S.T., and K.L. Cattanch. 1990. Review of current population abundance estimates of small cetaceans in the Black Sea. Final report for MMC contract T75133135. NTIS PB91-137257. 5 pp. (A02)
- Carr, T. 1994. The manatees and dolphins of the Miskito Coast Protected Area, Nicaragua. Final report for MMC contract T94070376. NTIS PB94-170354. 19 pp. (A03)
- Chapman, D.G., L.L. Eberhardt, and J.R. Gilbert. 1977. A review of marine mammal census methods. Final report for MMC contract MM4AC014. NTIS PB-265 547. 55 pp. (A04)
- Contos, S.M. 1982. Workshop on marine mammal-fisheries interactions. Final report for MMC contract MM207934-1-0. NTIS PB82-189507. 64 pp. (A04)
- Cornell, L.H., E.D. Asper, K.N. Osborn, and M.J. White, Jr. 1979. Investigations on cryogenic marking procedures for marine mammals. Final report for MMC contract MM6AC003. NTIS PB 291 570. 24 pp. (A03)
- Dayton, P.K., B.D. Keller, and D.A. Ven Tresca. 1980. Studies of a nearshore community inhabited by sea otters. Final report for MMC contracts MM6AC026 and MM13-00702-9. NTIS PB81-109860. 91 pp. (A06)

<sup>1</sup> Single copies of designated reports are available on request from the Marine Mammal Commission, 4340 East-West Highway, Room 905, Bethesda, Maryland 20814; telephone: (301) 504-0087; fax: (301) 504-0099.

<sup>2</sup> Price codes for reports available from NTIS are shown in parentheses at the end of each citation. The key to the codes and ordering information can be found at the end of Appendix B.

- DeBeer, J. 1980. Cooperative dedicated vessel research program on the tuna-porpoise problem: overview and final report. Final report for MMC contract MM8AC006. NTIS PB80-150097. 43 pp. (A03)
- Dedina, S., and E. Young. 1995. Conservation and development in the gray whale lagoons of Baja California Sur, Mexico. Final report for MMC contract T10155592. NTIS PB96-113154. 56 pp. (A04)
- Dohl, T.P. 1981. Remote laser branding of marine mammals. Final report for MMC contract MM4AC011. NTIS PB81-213449. 34 pp. (A03)
- Dowling, T.E., and W.M. Brown. 1992. Population structure of the Atlantic bottlenose dolphin as determined by restriction endonuclease analysis of mitochondrial DNA. Final report for MMC contract MM3309818-6. NTIS PB93-128411. 46 pp. (A03)
- Erickson, A.W. 1978. Population studies of killer whales (*Orcinus orca*) in the Pacific Northwest: a radio-marking and tracking study of killer whales. Final report for MMC contract MM5AC012. NTIS PB-285 615. 34 pp. (A03)
- Fay, F.H., H.M. Feder, and S.W. Stoker. 1977. An estimation of the impact of the Pacific walrus population on its food resources in the Bering Sea. Final report for MMC contracts MM4AC006 and MM5AC024. NTIS PB-273 505. 38 pp. (A03)
- Fay, F.H., B.P. Kelly, and B.A. Fay (eds). 1990. The ecology and management of walrus populations — report of an international workshop. Final report for MMC contract T68108850. NTIS PB91-100479. 186 pp. (A09)
- Forestell, P.H. 1989. Assessment and verification of abundance estimates, seasonal trends, and population characteristics of the humpback whale in Hawaii. Final report for MMC contract MM2911014-6. NTIS PB90-190273. 66 pp. (A04)
- Foster, M.A. 1981. Identification of ongoing and planned fisheries in the Northwestern Hawaiian Islands. Final report for MMC contract MM1801069-7. NTIS PB81-207 516. 90 pp. (A05)
- Foster, M.S., C.R. Agegian, R.K. Cowen, R.F. Van Wagenen, D.K. Rose, and A.C. Hurley. 1979. Toward an understanding of the effects of sea otter foraging on kelp forest communities in central California. Final report for MMC contract MM7AC023. NTIS PB-293 891. 60 pp. (A04)
- Fowler, C.W., W.T. Bunderson, M.B. Cherry, R.J. Ryel, and B.B. Steele. 1980. Comparative population dynamics of large mammals: a search for management criteria. Final report for MMC contract MM7AC013. NTIS PB80-178 627. 330 pp. (A15)
- Fowler, C.W., R.J. Ryel, and L.J. Nelson. 1982. Sperm whale population analysis. Final report for MMC contract MM8AC009. NTIS PB82-174335. 35 pp. (A03)
- Fox, W.W., Jr., et al. 1990. Statement of concerned scientists on the reauthorization of the Magnuson Fishery Conservation and Management Act. NTIS PB91-127647. 6 pp. (A02)
- Fraker, M.A. 1994. California sea lions and steelhead trout at the Chittenden Locks, Seattle, Washington. Final report for MMC contract T10156766. NTIS PB94-188059. 42 pp. (A05)
- Freeman, J., and H. Quintero. 1990. The distribution of West Indian manatees (*Trichechus manatus*) in Puerto Rico: 1988-1989. Final report for MMC contract T5360348-3. NTIS PB91-137240. 38 pp. (A03)
- Gaines, S.E., and D. Schmidt. 1978. Laws and treaties of the United States relevant to marine mammal protection policy. Final report for MMC contract MM5AC029. NTIS PB-281 024. 668 pp. (A99)
- Gard, R. 1978. Aerial census, behavior, and population dynamics study of gray whales in Mexico during the 1974-75 calving and mating season. Final report for MMC contract MM5AC006. NTIS PB-275 295. 18 pp. (A02)
- Gard, R. 1978. Aerial census and population dynamics study of gray whales in Baja California during the 1976 calving and mating season. Final report for MMC contract MM6AC014. NTIS PB-275 297. 20 pp. (A03)
- Geraci, J.R., and D.J. St. Aubin. 1979. Biology of marine mammals: insights through strandings. Final report for MMC contract MM7AC020. NTIS PB-293 890. 343 pp. (A16)
- Geraci, J.R., S.A. Testaverde, D.J. St. Aubin, and T.H. Loop. 1978. A mass stranding of the Atlantic white-sided dolphin, *Lagenorhynchus acutus*: a study into pathobiology and life history. Final report for MMC contract MM5AC008. NTIS PB-289 361. 141 pp. (A08)
- Gerrodette, T. 1983. Review of the California sea otter salvage program. Final report for MMC contract MM2629677-5. NTIS PB83-262949. 23 pp. (A03)
- Gilbert, J.R., V.R. Schurman, and D.T. Richardson. 1979. Grey seals in New England: present status and management alternatives. Final report for MMC contract MM7AC002. NTIS PB-295 599. 40 pp. (A03)
- Glockner-Ferrari, D.A., and M.J. Ferrari. 1985. Individual identification, behavior, reproduction, and distribution of humpback whales, *Megaptera novaeangliae*, in Hawaii. Final report for MMC contract MM262975-5. NTIS PB85-200772. 36 pp. (A03)
- Gold, J. 1981. Marine mammals: a selected bibliography. Final report for MMC contract MM1801254-3. NTIS PB 82-104282. 91 pp. (A05)
- Gonsalves, J.T. 1977. Improved method and device to prevent porpoise mortality: application of polyvinyl panels to purse seine nets. Final report for MMC contract MM6AC007. NTIS PB-274 088. 28 pp. (A03)
- Goodman, D. 1978. Management implications of the mathematical demography of long lived animals. Final report for MMC contract MM8AD008. NTIS PB-289 678. 80 pp. (A05)
- Green, K.A. 1977. Antarctic marine ecosystem modeling revised Ross Sea model, general Southern Ocean budget, and seal model. Final report for MMC contract MM6AC032. NTIS PB-270 375. 111 pp. (A06)
- Green-Hammond, K.A. 1980. Fisheries management under the Fishery Conservation and Management Act, the Marine Mammal Protection Act, and the Endangered Species Act. Final report for MMC contract MM1300885-3. NTIS PB80-180 599. 186 pp. (A09)
- Green-Hammond, K.A. 1981. Requirements for effective implementation of the Convention on the Conservation of Antarctic Marine Living Resources. Final report for MMC contract MM2079173-9. NTIS PB82-123571. 36 pp. (A03)
- Green-Hammond, K.A. 1982. Environmental aspects of potential petroleum exploration and exploitation in Antarctica: forecasting and evaluating risks. Final report for MMC contract MM2079173-9. NTIS PB82-169772. 28 pp. (A03)
- Green-Hammond, K.A., D.G. Ainley, D.B. Siniff, and N.S. Urquhart. 1983. Selection criteria and monitoring requirements for indirect indicators of changes in the availability of Antarctic krill applied to some pinniped and seabird information. Final report for MMC contract MM2324753-6. NTIS PB83-263 293. 37 pp. (A03)
- Hain, J.H.W. 1992. Airships for marine mammal research: evaluation and recommendations. Final report for MMC contract T68108863. NTIS PB92-128271. 37 pp. (A03)

- Hain, J.H.W., S.L. Ellis, and P.E. Seward. 1994. Characterization of vessel traffic at the St. Johns and St. Marys channel entrances, northeast Florida, January 1993. Final report for MMC contract T94070460. NTIS PB94-204229. 56 pp. (A04)
- Hatfield, B.B. 1991. Summary report of observations of coastal gill and trammel net fisheries in central California - October 1, 1984 - March 31, 1985. Final report for MMC contract MM2910891-2. NTIS PB91-191908. 17 pp. (A03)
- Heneman, B., and Center for Environmental Education. 1988. Persistent marine debris in the North Sea, northwest Atlantic Ocean, wider Caribbean area, and the west coast of Baja California. Final report for MMC contract MM3309598-5. NTIS PB89-109938. 161 pp. (A08)
- Henry, M.E. 1987. Observations of gill and trammel net fishing activity between Pt. Buchon and Pt. Sur, California, June-October 1985. Final report for MMC contract MM3309511-8. NTIS PB87-184024. 30 pp. (A03)
- Herman, L.M., P.H. Forestell, and R.C. Antinaja. 1980. The 1976/77 migration of humpback whales into Hawaiian waters: composite description. Final report for MMC contracts MM7AC014 and MM1300907-2. NTIS PB80-162332. 55 pp. (A04)
- Hofman, R.J. (ed). 1979. A workshop to identify new research that might contribute to the solution of the tuna-porpoise problem. Proceedings of a Marine Mammal Commission-sponsored workshop held on 8-9 December 1975 at the University of California, Santa Cruz. NTIS PB-290 158. 17 pp. (A02)
- Hofman, R.J. 1982. Identification and assessment of possible alternative methods for catching yellowfin tuna. NTIS PB83-138 993. 243 pp. (A11)
- Hofman, R.J. (ed). 1985. Workshop to assess methods for regulating the distribution and movements of sea otters. Report of a Marine Mammal Commission-sponsored workshop held 25-26 October 1984 in San Francisco, California. NTIS PB85-229250. 39 pp. (A03)
- Hoover-Miller, A. 1992. Assessment of the possible use of a cooperative/coordinated geographic information system (GIS) to facilitate access to, and integration and analysis of, data bearing upon the conservation of marine mammals in Alaska. Final report for MMC contract T75136297. NTIS PB93-128429. 59 pp. (A04)
- Hoover-Miller, A.A. 1994. Harbor seal (*Phoca vitulina*) biology and management in Alaska. Final report for MMC contract T75134749. NTIS PB95-166195. 45 pp. (A03)
- Hoover-Miller, A. 1995. Report of the workshop on enhancing methods for locating, accessing, and integrating population and environmental data related to marine resources in Alaska. Final report for MMC contract T10155550. NTIS PB95-199097. 93 pp. (A06)
- Huber, H.R., D.G. Ainley, R.J. Boekelheide, R.P. Henderson, and B. Bainbridge. 1981. Studies of marine mammals at the Farallon Islands, California, 1979-1980. Final report for MMC contract MM1533599-3. NTIS PB81-167082. 51 pp. (A04)
- Huber, H.R., D.G. Ainley, S.H. Morrell, R.J. Boekelheide, and R.P. Henderson. 1980. Studies of marine mammals at the Farallon Islands, California, 1978-1979. Final report for MMC contract MM1300888-2. NTIS PB80-178197. 46 pp. (A04)
- Huber, H.R., D.G. Ainley, S.H. Morrell, R.R. LeValley, and C.S. Strong. 1979. Studies of marine mammals at the Farallon Islands, California, 1977-1978. Final report for MMC contract MM7AC025. NTIS PB80-111602. 50 pp. (A04)
- Hui, C.A. 1978. Reliability of using dentin layers for age determination in *Tursiops truncatus*. Final report for MMC contract MM7AC021. NTIS PB-288444. 25 pp. (A03)
- Huntington, H.P. 1997a. The Arctic Environmental Protection Strategy and the Arctic Council: A review of United States participation and suggestions for future involvement. Final report for MMC contract T53698333. NTIS PB97-174437. 35 pp. (A04)
- Huntington, H.P. 1997b. A report of the sixth working group meeting for the program for the Conservation of Arctic Flora and Fauna (CAFF). Final report for MMC contract T53699196. NTIS PB98-114168. 229 pp. (A12)
- Huntington, H.P. 1998a. A report of the experts meeting and the eleventh working group meeting of the Arctic Monitoring and Assessment Program (AMAP). Final report for MMC contract T53700292. Available from the Marine Mammal Commission.
- Huntington, H.P. 1998b. A report of the meeting of senior Arctic officials under the Arctic Council, Whitehorse, Yukon Territory, Canada, May 9-11, 1998. Final report for MMC contract T53700292. Available from the Marine Mammal Commission.
- Huntington, H.P. 1998c. A report of the conference, "Sustainable Development in the Arctic: Lessons Learned and the Way Ahead," Whitehorse, Yukon Territory, Canada, May 12-14, 1998. Final report for MMC contract T53700292. Available from the Marine Mammal Commission.
- Huntington, H.P. 1998d. A report of the meeting of senior Arctic officials under the Arctic Council and the first ministerial meeting of the Arctic Council, Iqaluit, Northwest Territories, Canada, September 14-18, 1998. Final report for MMC contract T53700292. Available from the Marine Mammal Commission.
- Irvine, A.B., M.D. Scott, R.S. Wells, J.H. Kaufmann, and W.E. Evans. 1979. A study of the activities and movements of the Atlantic bottlenose dolphin, *Tursiops truncatus*, including an evaluation of tagging techniques. Final report for MMC contracts MM4AC004 and MM5AC018. NTIS PB-298 042. 54 pp. (A04)
- Jameson, G.L. 1986. Trial systematic salvage of beach-cast sea otter, *Enhydra lutris*, carcasses in the central and southern portion of the sea otter range in California: one year summary of results: October 1983-September 1984. Final report for MMC contract MM2629849-8. NTIS PB87-108288. 60 pp. (A04)
- Jefferson, T.A., and B.E. Curry. 1994. Review and evaluation of potential acoustic methods of reducing or eliminating marine mammal-fishery interactions. Final report for MMC contract T10155628. NTIS PB95-100384. 59 pp. (A05)
- Jeffries, S.J. 1986. Seasonal movement and population trends of harbor seals (*Phoca vitulina richardsi*) in the Columbia River and adjacent waters of Washington and Oregon, 1976-1982. Final report for MMC contract MM2079357-5. NTIS PB86-200243. 41 pp. (A03)
- Jeffries, S.J., and M.L. Johnson. 1990. Population status and condition of the harbor seal, *Phoca vitulina richardsi*, in the waters of the State of Washington: 1975-1980. Final report for MMC contract MM7AC030. NTIS PB90-219197. 70 pp. (A05)
- Johnson, B.W., and P.A. Johnson. 1978. The Hawaiian monk seal on Laysan Island: 1977. Final report for MMC contract MM7AC009. NTIS PB-285 428. 38 pp. (A03)
- Johnson, B.W., and P.A. Johnson. 1981. Estimating the Hawaiian monk seal population on Laysan Island. Final report for MMC contract MM1533701-4. NTIS PB82-106 113. 29 pp. (A05)

- Johnson, B.W., and P.A. Johnson. 1981. The Hawaiian monk seal on Laysan Island: 1978. Final report for MMC contract MM8AC008. NTIS PB82-109661. 17 pp. (A02)
- Johnson, M.L., and S.J. Jeffries. 1977. Population evaluation of the harbor seal (*Phoca vitulina richardi*) in the waters of the State of Washington. Final report for MMC contract MM5AC019. NTIS PB-270 376. 27 pp. (A03)
- Johnson, M.L., and S.J. Jeffries. 1983. Population biology of the harbor seal (*Phoca vitulina richardsi*) in the waters of the State of Washington: 1976-1977. Final report for MMC contract MM6AC025. NTIS PB83-159715. 53 pp. (A04)
- Jones, M.L., and S.L. Swartz. 1986. Demography and phenology of gray whales and evaluation of human activities in Laguna San Ignacio, Baja California Sur, Mexico, 1978-1982. Final report for MMC contract MM2324713-8. NTIS PB86-219078. 69 pp. (A05)
- Jones, M.L., S.L. Swartz, and M.E. Dahlheim. 1994. Census of gray whale abundance in San Ignacio lagoon: a follow-up study in response to low whale counts recorded during an acoustic playback study of noise-effects on gray whales. Final report for MMC contract MM2911023-0. NTIS PB94-195062. 32 pp. (A03)
- Kasuya, T., and Y. Izumizawa. 1981. The fishery-dolphin conflict in the Iki Island area of Japan. Final report for MMC contract MM1533791-7. NTIS PB81-171357. 31 pp. (A03)
- Katona, S.K. 1983. The Gulf of Maine whale sighting network: 1976. Final report for MMC contract MM6AC018. NTIS PB83-151290. 32 pp. (A03)
- Katona, S.K., and S. Kraus. 1979. Photographic identification of individual humpback whales (*Megaptera novaeangliae*): evaluation and analysis of the technique. Final report for MMC contract MM7AC015. NTIS PB-298 740. 29 pp. (A03)
- Kenney, R.D. 1994. Anomalous 1992 spring and summer distributions of right whales (*Eubalaena glacialis*) and other cetaceans in continental shelf waters off the northeastern United States and adjacent Canada. Final report for MMC contract T94070648. NTIS PB99-102493. 66 pp. (A05)
- Kooyman, G.L. 1982. Development and testing of a time-depth recorder for marine mammals. Final report for MMC contract MM6AC019. NTIS PB82-257932. 10 pp. (A02)
- Kraus, S.D. 1985. A review of the status of right whales (*Eubalaena glacialis*) in the western North Atlantic with a summary of research and management needs. Final report for MMC contract MM2910905-0. NTIS PB86-154143. 61 pp. (A04)
- Kraus, S.D., and R.D. Kenney. 1991. Information on right whales (*Eubalaena glacialis*) in three proposed critical habitats in United States waters off the western North Atlantic Ocean. Final report for MMC contracts T75133740 and 75133753. NTIS PB91-194431. 65 pp. (A04)
- Lefebvre, L.W., and J.A. Powell. 1990. Manatee grazing impacts on seagrasses in Hobe Sound and Jupiter Sound in southeast Florida during the winter of 1988-89. Final report for MMC contracts T62239152, T68108782. NTIS PB90-271883. 36 pp. (A03)
- Lentfer, J.W. (ed). 1988. Selected marine mammals of Alaska: species accounts with research and management recommendations. Final report for MMC contract MM2910798-4. NTIS PB88-178462. 275 pp. (A013)
- Lentfer, J.W. 1990. Workshop on measures to assess and mitigate the adverse effects of arctic oil and gas activities on polar bears. Final report. NTIS PB91-127241. 43 pp. (A03)
- Loughlin, T. 1978. A telemetric and tagging study of sea otter activities near Monterey, California. Final report for MMC contract MM6AC024. NTIS PB-289 682. 64 pp. (A04)
- Marine Mammal Commission. 1974. Annual report of the Marine Mammal Commission, calendar year 1973. Report to Congress. NTIS PB-269 709. 14 pp. (A03)
- Marine Mammal Commission. 1975. Annual report of the Marine Mammal Commission, calendar year 1974. Report to Congress. NTIS PB-269 710. 27 pp. (A04)
- Marine Mammal Commission. 1976. Annual report of the Marine Mammal Commission, calendar year 1975. Report to Congress. NTIS PB 269-711. 50 pp. (A04)
- Marine Mammal Commission. 1977. Annual report of the Marine Mammal Commission, calendar year 1976. Report to Congress. NTIS PB-269 713. 71 pp. (A06)
- Marine Mammal Commission. 1978. Annual report of the Marine Mammal Commission, calendar year 1977. Report to Congress. NTIS PB-281 564. 101 pp. (A06)
- Marine Mammal Commission. 1979. Annual report of the Marine Mammal Commission, calendar year 1978. Report to Congress. NTIS PB80-106784. 108 pp. (A06)
- Marine Mammal Commission. 1980. Humpback whales in Glacier Bay National Monument, Alaska. Final report for an interagency review meeting. NTIS PB80-141 559. 44 pp. (A03)
- Marine Mammal Commission. 1981. Annual report of the Marine Mammal Commission, calendar year 1979. Report to Congress. NTIS PB81-247 892. 100 pp. (A06)
- Marine Mammal Commission. 1981. Annual report of the Marine Mammal Commission, calendar year 1980. Report to Congress. NTIS PB81-247 884. 114 pp. (A06)
- Marine Mammal Commission. 1982. Annual report of the Marine Mammal Commission, calendar year 1981. Report to Congress. NTIS PB82-221 425. 102 pp. (A06)
- Marine Mammal Commission. 1982. Report of a meeting to review on-going and planned research concerning humpback whales in Glacier Bay and surrounding waters in southeast Alaska. Final report of an interagency meeting. NTIS PB82-201039. 20 pp. (A02)
- Marine Mammal Commission. 1983. Annual report of the Marine Mammal Commission, calendar year 1982. Report to Congress. NTIS PB84-132 216. 106 pp. (A06)
- Marine Mammal Commission. 1984. Annual report of the Marine Mammal Commission, calendar year 1983. Report to Congress. NTIS PB84-199 389. 118 pp. (A06)
- Marine Mammal Commission. 1984. Habitat protection needs for the subpopulation of West Indian manatees in the Crystal River area of northwest Florida. NTIS PB84-200 250. 46 pp. (A04)
- Marine Mammal Commission. 1986. Annual report of the Marine Mammal Commission, calendar year 1985. Report to Congress. NTIS PB86-216 249. 180 pp. (A09)
- Marine Mammal Commission. 1987. Annual report of the Marine Mammal Commission, calendar year 1984. Report to Congress. NTIS PB87-209573. 173 pp. (A09)
- Marine Mammal Commission. 1987. Annual report of the Marine Mammal Commission, calendar year 1986. Report to Congress. NTIS PB87-154092. 193 pp. (A09)
- Marine Mammal Commission. 1988. Annual report of the Marine Mammal Commission, calendar year 1987. Report to Congress. NTIS PB88-168984. 209 pp. (A10)
- Marine Mammal Commission. 1989. Preliminary assessment of habitat protection needs for West Indian manatees on the east coast of Florida and Georgia. Final report for MMC contracts T6223950-5, T6223954-7, T6223970-9, and T6224008-6. NTIS PB89-162 002. 120 pp. (A06)

- Marine Mammal Commission. 1989. Annual report of the Marine Mammal Commission, calendar year 1988. Report to Congress. NTIS PB89-166 524. 237 pp. (A11)
- Marine Mammal Commission. 1990. Annual report of the Marine Mammal Commission, calendar year 1989. Report to Congress. NTIS PB90-196361. 239 pp. (A11)
- Marine Mammal Commission. 1991. Annual report of the Marine Mammal Commission, calendar year 1990. Report to Congress. NTIS PB91-164236. 280 pp. (A13)
- Marine Mammal Commission. 1992. Annual report of the Marine Mammal Commission, calendar year 1991. Report to Congress. NTIS PB92-139930. 228 pp. (A11)
- Marine Mammal Commission. 1993. Annual report of the Marine Mammal Commission, calendar year 1992. Report to Congress. NTIS PB93-154995. 241 pp. (A11)
- Marine Mammal Commission. 1995. Annual report of the Marine Mammal Commission, calendar year 1993. Report to Congress. NTIS PB95-154530. 260 pp. (A11)
- Marine Mammal Commission. 1995. Annual report of the Marine Mammal Commission, calendar year 1994. Report to Congress. NTIS PB95-173233. 280 pp. (A13)
- Marine Mammal Commission. 1996. Annual report of the Marine Mammal Commission, calendar year 1995. Report to Congress. NTIS PB96-157482. 235 pp. (A11)
- Marine Mammal Commission. 1997. Annual report of the Marine Mammal Commission, calendar year 1996. Report to Congress. NTIS PB97-142889. 262 pp. (A13)
- Marine Mammal Commission. 1998. Annual report of the Marine Mammal Commission, calendar year 1997. Report to Congress. NTIS PB98-124357. 239 pp. (A13)
- Marmontel, M., T.J. O'Shea, and S.R. Humphrey. 1990. An evaluation of bone growth-layer counts as an age-determination technique in Florida manatees. Final report for MMC contract T6223918-1. NTIS PB91-103564. 94 pp. (A06)
- Mate, B.R. 1977. Aerial censusing of pinnipeds in the eastern Pacific for assessment of population numbers, migratory distributions, rookery stability, breeding effort, and recruitment. Final report for MMC contract MM5AC001. NTIS PB-265 859. 67 pp. (A04)
- Mate, B.R. 1980. Workshop on marine mammal-fisheries interactions in the northeastern Pacific. Final report for MMC contract MM8AC003. NTIS PB80-175144. 48 pp. (A04)
- Mathiesen, O.A. 1980. Methods for the estimation of krill abundance in the Antarctic. Final report for MMC contract MM7AC032. NTIS PB80-175151. 26 pp. (A03)
- Matkin, C.O., and F.H. Fay. 1980. Marine mammal-fishery interactions on the Copper River and in Prince William Sound, Alaska, 1978. Final report for MMC contract MM8AC013. NTIS PB80-159536. 71 pp. (A05)
- Matkin, C.O., and E.L. Saulitis. 1994. Killer whale (*Orcinus orca*) biology and management in Alaska. Final report for MMC contract T75135023. NTIS PB95-166203. 46 pp. (A03)
- Mayo, C.A. 1982. Observations of cetaceans: Cape Cod Bay and southern Stellwagen Bank, Massachusetts 1975-1979. Final report for MMC contract MM1800925-5. NTIS PB82-186263. 68 pp. (A05)
- Medway, W. 1983. Evaluation of the safety and usefulness of techniques and equipment used to obtain biopsies from free-swimming cetaceans. Final report for MMC contract MM2324809-8. NTIS PB83-263269. 14 pp. (A02)
- Miller, L.K. 1978. Energetics of the northern fur seal in relation to climate and food resources of the Bering Sea. Final report for MMC contract MM5AC025. NTIS PB-275 296. 27 pp. (A03)
- Montgomery, S. 1986. Workshop on measures to address marine mammal/fisheries interactions in California. Final report for MMC contract MM3309746-2. NTIS PB86-219 060. 123 pp. (A07)
- Montgomery, S. 1987. Report on the 24-27 February 1987 workshop to assess possible systems for tracking large cetaceans. Final report for MMC contract MM4465764-2. NTIS PB87-182135. 61 pp. (A04)
- Nolan, R.S. 1981. Shark control and the Hawaiian monk seal. Final report for MMC contract MM1801065-5. NTIS PB81-201808. 45 pp. (A03)
- Norris, K.S., and J.D. Hall. 1979. Development of techniques for estimating trophic impact of marine mammals. Final report for MMC contract MM4AC013. NTIS PB-290 399. 16 pp. (A02)
- Norris, K.S., and R.R. Reeves (eds). 1978. Report on a workshop on problems related to humpback whales (*Megaptera novaeangliae*) in Hawaii. Final report for MMC contract MM7AC018. NTIS PB-280 794. 90 pp. (A05)
- Norris, K.S., W.E. Stuntz, and W. Rogers. 1978. The behavior of porpoises and tuna in the eastern tropical Pacific yellowfin tuna fishery: preliminary studies. Final report for MMC contract MM6AC022. NTIS PB-283 970. 86 pp. (A05)
- Northridge, S. 1995. Environmental mismanagement on the high seas: a retrospective analysis of the squid and tuna driftnet fisheries of the North Pacific. Final report for MMC contract T75136200. NTIS PB95-238945. 76 pp. (A05)
- Odell, D.K. 1979. A preliminary study of the ecology and population biology of the bottlenose dolphin in southeast Florida. Final report for MMC contract MM4AC003. NTIS PB-294 336. 26 pp. (A03)
- Odell, D.K., and J.E. Reynolds, III. 1980. Abundance of the bottlenose dolphin, *Tursiops truncatus*, on the west coast of Florida. Final report for MMC contract MM5AC026. NTIS PB80-197650. 47 pp. (A04)
- Odell, D.K., D.B. Siniff, and G.H. Waring. 1979. *Tursiops truncatus* assessment workshop. Final report for MMC contract MM5AC021. NTIS PB-291 161. 141 pp. (A04)
- Packard, J.M. 1982. Potential methods for influencing the movements and distribution of sea otters: assessment of research needs. Final report for MMC contract MM2079342-3. NTIS PB83-109926. 51 pp. (A04)
- Payne, R., O. Brazier, E. Dorsey, J. Perkins, V. Rowntree, and A. Titus. 1981. External features in southern right whales (*Eubalaena australis*) and their use in identifying individuals. Final report for MMC contract MM6AC017. NTIS PB81-161093. 77 pp. (A05)
- Pitcher, K.W. 1977. Population productivity and food habits of harbor seals in the Prince William Sound-Copper River Delta area, Alaska. Final report for MMC contract MM5AC011. NTIS PB-266 935. 36 pp. (A03)
- Pitcher, K.W. 1989. Harbor seal trend count surveys in southern Alaska, 1988. Final report for MMC contract MM4465853-1. NTIS PB90-208828. 17 pp. (A03)
- Prescott, J.H., and P.M. Fiorelli. 1980. Review of the harbor porpoise (*Phocoena phocoena*) in the U.S. northwest Atlantic. Final report for MMC contract MM8AC016. NTIS PB80-176928. 64 pp. (A04)
- Prescott, J.H., P. Fiorelli, G. Early, and P.J. Boyle. 1990. Marine mammal strandings: the New England Aquarium Stranding Network. Final report for MMC contract MM6AC015. NTIS PB90-259177. 119 pp. (A07)
- Prescott, J.H., S.D. Kraus, and J.R. Gilbert. 1980. East Coast/Gulf Coast cetacean and pinniped research workshop. Final report for MMC contract MM1533558-2. NTIS PB80-160 104. 142 pp. (A07)

- Ray, G.C., R.V. Salm, and J.A. Dobbin. 1979. Systems analysis mapping: an approach towards identifying critical habitats of marine mammals. Final report for MMC contract MM6AC011. NTIS PB80-111594. 27 pp. (A03)
- Read, A.J. 1998. Possible applications of new technology to marine mammal research and management. Final report for MMC contract T30919695. NTIS 36 pp.
- Reeves, R.R. 1977. Exploitation of harp and hooded seals in the western North Atlantic. Final report for MMC contract MM6AD055. NTIS PB-270 186. 57 pp. (A04)
- Reeves, R.R. 1977. The problem of gray whale (*Eschrichtius robustus*) harassment: at the breeding lagoons and during migration. Final report for MMC contract MM6AC021. NTIS PB-272 506 (Spanish translation PB-291 763). 60 pp. (A04)
- Reynolds, J.E., III. 1986. Evaluation of the nature and magnitude of interactions between bottlenose dolphins, *Tursiops truncatus*, and fisheries and other human activities in coastal areas of the southeastern United States. Final report for MMC contract MM2910892-5. NTIS PB86-162203. 38 pp. (A03)
- Reynolds, J.E., III, and C.J. Gluckman. 1988. Protection of West Indian manatees (*Trichechus manatus*) in Florida. Final report for MMC contract MM4465868-3 and MM3309741-7. NTIS PB88-222922. 85 pp. (A06)
- Ridgway, S.H., and K. Benirschke (eds). 1977. Breeding dolphins: present status, suggestions for the future. Final report for MMC contract MM6AC009. NTIS PB-273 673. 308 pp. (A14)
- Ridgway, S.H., and W.F. Flanigan, Jr. 1981. An investigation of a potential method for the humane taking of certain whales and seals used for food. Final report for MMC contract MM6AC030. NTIS PB81-161101. 12 pp. (A02)
- Risebrough, R.W. 1978. Pollutants in marine mammals: a literature review and recommendations for research. Final report for MMC contract MM7AD035. NTIS PB-290 728. 64 pp. (A04)
- Risebrough, R.W. 1989. Accumulation patterns of heavy metals and chlorinated hydrocarbons by sea otters, *Enhydra lutris*, in California. Final report for MMC contract MM2910790-0. NTIS PB89-230551. 51 pp. (A04)
- Risebrough, R.W., D. Alcorn, S.G. Allen, V.C. Anderlini, L. Booren, R.L. DeLong, L.E. Fancher, R.E. Jones, S.M. McGinnis, and T.T. Schmidt. 1980. Population biology of harbor seals in San Francisco Bay, California. Final report for MMC contract MM6AC006. NTIS PB81-107963. 67 pp. (A04)
- Rough, V. 1995. Gray seals in Nantucket Sound, Massachusetts, winter and spring, 1994. Final report for MMC contract T10155615. NTIS PB95-191391. 28 pp. (A03)
- Samuels, A., and L. Bejder. 1998. A pilot study of habitual interaction between humans and wild bottlenose dolphins near Panama City Beach, FL. Final report for MMC contract T53700894. 19 pp. Available from the Marine Mammal Commission.
- Sawyer-Steffan, J.E., and V.L. Kirby. 1980. A study of serum steroid hormone levels in captive female bottlenose dolphins, their correlation with reproductive status, and their application to ovulation induction in captivity. Final report for MMC contract MM7AC016. NTIS PB80-177 199. 21 pp. (A03)
- Schmidly, D.J., and S.H. Shane. 1978. A biological assessment of the cetacean fauna of the Texas coast. Final report for MMC contract MM4AC008. NTIS PB-281 763. 38 pp. (A03)
- Scott, G.P., and H.E. Winn. 1980. Comparative evaluation of aerial and shipboard sampling techniques for estimating the abundance of humpback whales (*Megaptera novae-angliae*). Final report for MMC contract MM7AC029. NTIS PB81-109852. 96 pp. (A06)
- Shallenberger, E.W. 1981. The status of Hawaiian cetaceans. Final report for MMC contract MM7AC028. NTIS PB82-109398. 79 pp. (A05)
- Shane, S.H., and D.J. Schmidly. 1978. The population biology of the Atlantic bottlenose dolphin, *Tursiops truncatus*, in the Aransas Pass area of Texas. Final report for MMC contract MM6AC028. NTIS PB-283 393. 130 pp. (A07)
- Silber, G.K., R.S. Wells, and K.S. Norris. 1990. A preliminary assessment of techniques for catching and radio-tagging harbor porpoises. Final report for MMC contract MM33098157. NTIS PB90-239609. 34 pp. (A03)
- Smith, T.D., and T. Polacheck. 1979. Uncertainty in estimating historical abundance of porpoise populations. Final report for MMC contract MM7AC006. NTIS PB-296 476. 59 pp. (A04)
- Smultea, M.A. 1992. Habitat utilization patterns of humpback whales (*Megaptera novaeangliae*) off the island of Hawaii. Final report for MMC contracts T62239259 and T68109257. NTIS PB92-182484. 79 pp. (A05)
- Stoker, S.W. 1977. Report on a subtidal commercial clam fishery proposed for the Bering Sea. Final report for MMC contract MM7AD076. NTIS PB-269 712. 33 pp. (A03)
- Stuntz, W.E. 1980. Preliminary investigations of the possible relationship between passive behavior by spotted dolphins, *Stenella attenuata*, and capture stress. Final report for MMC contract MM7AC027. NTIS PB81-111569. 13 pp. (A02)
- Swartz, S.L. 1986. A review of the status of gray whales (*Eschrichtius robustus*) with a summary of research and management needs. Proceedings of a Marine Mammal Commission sponsored workshop held on 16-18 October 1985 in Monterey, California. Final report for MMC contract MM2911098-4. NTIS PB87-125035. 30 pp. (A03)
- Swartz, S.L., and W.C. Cummings. 1978. Gray whales, *Eschrichtius robustus*, in Laguna San Ignacio, Baja California, Mexico. Final report for MMC contract MM7AC008. NTIS PB-276 319 (Spanish translation PB-288 636). 38 pp. (A03) (A04 Spanish)
- Swartz, S.L., and R.J. Hofman. 1991. Marine mammal and habitat monitoring: requirements; principles; needs; and approaches. NTIS PB91-215046. 18 pp. (A03)
- Swartz, S.L., and M.L. Jones. 1978. The evaluation of human activities on gray whales, *Eschrichtius robustus*, in Laguna San Ignacio, Baja California, Mexico. Final report for MMC contract MM8AC005. NTIS PB-289 737 (Spanish translation PB-299 598). 34 pp. (A03)
- Swartz, S.L., and M.L. Jones. 1980. Gray whales, *Eschrichtius robustus*, during the 1977-1978 and 1978-1979 winter seasons in Laguna San Ignacio, Baja California Sur, Mexico. Final report for MMC contract MM1533497-8. NTIS PB80-202989. 35pp. (A03)
- Swartz, S.L., and M.L. Jones. 1981. Demographic studies and habitat assessment of gray whales, *Eschrichtius robustus*, in Laguna San Ignacio, Baja California Sur, Mexico. Final report for MMC contract MM2079219-4. NTIS PB82-123373. 56 pp. (A04)
- Swartzman, G.L. 1984. Factors bearing on the present status and future of the eastern Bering Sea fur seal population with special emphasis on the effect of terminating the sub-adult male harvest on St. Paul Island. Final report for MMC contract MM2629737-6. NTIS PB84-172329. 77 pp. (A05)
- Swartzman, G., and R. Haar. 1980. Exploring interactions between fur seal populations and fisheries in the Bering

- Sea. Final report for MMC contract MM1800969-5. NTIS PB81-133688. 60 pp. (A04)
- Swartzman, G.L., and R.J. Hofman. 1991. Uncertainties and research needs regarding the Bering Sea and Antarctic marine ecosystems. Final report for MMC contracts T75133669 and T75134820. NTIS PB91-201731. 111 pp. (A06)
- Taylor, L.R. and G. Naftel. 1978. Preliminary investigations of shark predation on the Hawaiian monk seal at Pearl and Hermes Reef and French Frigate Shoals. Final report for MMC contract MM7AC011. NTIS PB-285 626. 34 pp. (A03)
- Testa, J.W. 1997. Importation of polar bear trophies from Canada under the 1994 amendments to the Marine Mammal Protection Act. Final report for MMC contract T53698443. NTIS PB97-167175. 13 pp. (A03)
- Tinney, R.T., Jr. 1983. Assessment of past, present, and future risks of oil spills in and near the present sea otter range in California. Final report for MMC contract MM2324944-0. NTIS PB83-216069. 208 pp. (A10)
- Tinney, R.T., Jr. 1984. Some factors affecting the oil spill risk to sea otters in California. Final report for MMC contract MM2910765-4. NTIS PB85-174035. 68 pp. (A04)
- Tinney, R.T., Jr. 1988. Review of information bearing upon the conservation and protection of humpback whales in Hawaii. Final report for MMC contract MM3309689-0. NTIS PB88-195359. 56 pp. (A04)
- Townsend, R.T. 1991. Conservation and protection of humpback whales in Hawaii -- an update. Final report for MMC contract T75132495. NTIS PB91-215087. 54 pp. (A04)
- Treacy, S.D. 1985. Ingestion of salmonids and gastrointestinal passage in captive harbor seals (*Phoca vitulina*). Final report for MMC contract MM2079357-5. NTIS PB86-200 235. 35 pp. (A03)
- Villa Ramírez, B. 1993. Recovery plan for the vaquita, *Phocoena sinus*. Final report for MMC contract T94070800. NTIS PB93-169415. 40 pp. (A03)
- Waring, G.H. 1981. Survey of federally-funded marine mammal research and studies FY70-FY79. Final report for MMC contract MM1533588-3. NTIS PB81-174336. 265 pp. (A11)
- Waring, G.H. 1981. Survey of federally-funded marine mammal research and studies FY70-FY80. Final report for MMC contract MM1801196-8. NTIS PB81-242059. 50 pp. (A03)
- Waring, G.H. 1982. Survey of federally-funded marine mammal research and studies FY70-FY81. Final report for MMC contract MM2079243-6. NTIS PB82-227570. 74 pp. (A04)
- Waring, G.H. 1983. Survey of federally-funded marine mammal research and studies FY70-FY82. Final report for MMC contract MM2324754-9. NTIS PB83-262998. 90 pp. (A05)
- Waring, G.H. 1984. Survey of federally-funded marine mammal research and studies FY70-FY83. Final report for MMC contract MM2629857-9. NTIS PB84-215086. 92 pp. (A05)
- Waring, G.H. 1985. Survey of federally-funded marine mammal research and studies FY70-FY84. Final report for MMC contract MM2910918-6. NTIS PB85-225613. 106 pp. (A06)
- Waring, G.H. 1986. Survey of federally-funded marine mammal research and studies FY70-FY85. Final report for MMC contract MM3309688-7. NTIS PB86-235637. 117 pp. (A06)
- Waring, G.H. 1987. Survey of federally-funded marine mammal research and studies FY70-FY86. Final report for MMC contract MM4465754-5. NTIS PB87-217386. 127 pp. (A07)
- Waring, G.H. 1988. Survey of federally-funded marine mammal research and studies FY70-FY87. Final report for MMC contract MM4465836-6. NTIS PB88-212782. 140 pp. (A07)
- Waring, G.H. 1989. Survey of federally-funded marine mammal research and studies, FY70-FY88. Final report for MMC contract MM6223905-5. NTIS PB90-104050. 152 pp. (A08)
- Waring, G.H. 1990. Survey of federally-funded marine mammal research and studies FY 70-89. Final report for MMC contract T68108504. NTIS PB90-272097. 163 pp. (A08)
- Waring, G.H. 1991. Survey of federally-funded marine mammal research and studies FY 74-90. Final report for MMC contract T75133766. NTIS PB91-212217. 51 pp. (A04)
- Waring, G.H. 1992. Survey of federally-funded marine mammal research and studies FY74-FY91. Final report for MMC contract T75136103. NITS PB92-190222. 63 pp. (A04)
- Waring, G.H. 1993. Survey of federally-funded marine mammal research and studies FY74-FY92. Final report for MMC contract T94070994. NTIS PB93-227189. 73 pp. (A04)
- Waring, G.H. 1994. Survey of federally-funded marine mammal research and studies FY74-FY93. Final report for MMC contract T10155275. NTIS PB94-195021. 76 pp. (A05)
- Waring, G.H. 1995. Survey of federally-funded marine mammal research and studies, FY74-FY94. Final report for MMC contract T30916452. NTIS PB95-238929. 90 pp. (A05)
- Waring, G.H. 1996. Survey of federally-funded marine mammal research and studies FY74-FY95. Final report for MMC contract T30919035. NTIS PB97-104749. 115 pp. (A02)
- Wartzok, D., and G.C. Ray. 1980. The hauling-out behavior of the Pacific walrus. Final report for MMC contract MM5AC028. NTIS PB80-192578. 46 pp. (A04)
- Weber, M.L., and F. Spivy-Weber. 1995. Proposed elements for international regimes to conserve living marine resources. Final report for MMC contract T30916119. NTIS PB96-119078. 95 pp. (A06)
- Wells, R.S., B.G. Würsig, and K.S. Norris. 1981. A survey of the marine mammals of the upper Gulf of California, Mexico, with an assessment of the status of *Phocoena sinus*. Final report for MMC contract MM1300958-0. NTIS PB81-168791. 51 pp. (A04)
- Whitehead, H., K. Chu, P. Harcourt, and A. Alling. 1982. The humpback whales off west Greenland: summer 1981, with notes on other marine mammals and seabirds sighted. Final report MMC contract MM2079259-2. NTIS PB82-243924. 25 pp. (A03)
- Whitehead, H., and R. Payne. 1981. New techniques for measuring whales from the air. Final report for MMC contract MM6AC017. NTIS PB81-161143. 36 pp. (A03)
- Williams, T.D. 1978. Chemical immobilization, baseline hematological parameters and oil contamination in the sea otter. Final report for MMC contract MM7AD094. NTIS PB-283969. 27 pp. (A03)
- Wilson, S.C. 1978. Social organization and behavior of harbor seals, *Phoca vitulina concolor*, in Maine. Final report for MMC contract MM6AC013. NTIS PB-280 188. 103 pp. (A06)
- Winn, H.E. 1984. Development of a right whale sighting network in the southeastern U.S. Final report for MMC

- contract MM2324805-6. NTIS PB84-240548. 12 pp. (A01)
- Winn, H.E., E.A. Scott, and R.D. Kenney. 1985. Aerial surveys for right whales in the Great South Channel, spring 1984. Final report for MMC contract MM2910792-6. NTIS PB85-207926. 14 pp. (A02)
- Woodhouse, C.D., Jr., R.K. Cowen, and L.R. Wilcoxon. 1977. A summary of knowledge of the sea otter *Enhydra lutris*, L., in California and an appraisal of the completeness of the biological understanding of the species. Final report for MMC contract MM6AC008. NTIS PB-270 374. 71 pp. (A04)
- Woods, C.A. 1987. An investigation of possible sightings of Caribbean monk seals, (*Monachus tropicalis*), along the north coast of Haiti. Final report for MMC contract MM3309519-2. NTIS PB87-164307. 10 pp. (A02)
- Wray, P. 1978. The West Indian manatee (*Trichechus manatus*) in Florida: a summary and analysis of biological, ecological, and administrative problems affecting preservation and restoration of the population. Final report for MMC contract MM8AD054. NTIS PB-285 410. 89 pp. (A05)
- Yellin, M.B., C.R. Agegian, and J.S. Pearse. 1977. Ecological benchmarks in the Santa Cruz County kelp forests before the re-establishment of sea otters. Final report for MMC contract MM6AC029. NTIS PB-272 813. 125 pp. (A07)

NATIONAL TECHNICAL INFORMATION SERVICE  
CURRENT PRICE LIST

Price List	U.S./Canada/Mexico	All Other Countries
A01	\$8.00	\$16.00
A02	12.00	24.00
A03	23.00	46.00
A04	25.50	51.00
A05	27.00	54.00
A06	29.50	59.00
A07	33.00	66.00
A08	36.00	72.00
A09	41.00	82.00
A10	44.00	88.00
A11	47.00	94.00
A12	51.00	102.00
A13	54.00	108.00
A14	56.00	112.00
A15	58.00	116.00
A16	60.00	120.00
A17	62.00	124.00
A18	65.50	131.00
A19	67.50	135.00
A20	69.50	139.00
A21	71.50	143.00
A22	77.00	154.00
A23	79.00	158.00
A24	81.00	162.00
A25	83.00	166.00
A99	Write to NTIS for price quotation.	

Reports are also available on microfiche; call or write NTIS for price quotation. All prices include postage and are given in U.S. currency. Documents announced prior to 1996 (*i.e.*, those with a PB-95 designation or earlier) are subject to an out-of-print surcharge. In addition, there is a \$5.00 handling charge on domestic orders (\$10.00 on foreign orders). When ordering, include the NTIS accession number (*e.g.*, PB98-265-547). Make checks and money orders payable to the National Technical Information Service. Address: 5285 Port Royal Road, Springfield, Virginia 22161, U.S.A. For telephone orders, call 1-800-533-NTIS (6847) or (703) 605-6000 or fax (703) 605-6900. You may also place orders by e-mail ([orders@ntis.fedworld.gov](mailto:orders@ntis.fedworld.gov)) or through the NTIS Web site at <http://www.ntis.gov/ordernow>.

## APPENDIX C

### SELECTED LITERATURE PUBLISHED ELSEWHERE RESULTING FROM COMMISSION-SPONSORED ACTIVITIES

- Abbott, S.B., and W.S. Benninghoff. 1990. Orientation of environmental change studies to the conservation of Antarctic ecosystems. Pp. 394-403. *In* K.R. Kerry and G. Hempel (eds). *Antarctic Ecosystems: Ecological Change and Conservation*. Springer-Verlag, Berlin.
- Ainley, D.G., R.P. Henderson, H.R. Huber, R.J. Boekelheide, S.G. Allen, and T.L. McElroy. 1985. Dynamics of white shark/pinniped interactions in the Gulf of the Farallones. *Memoirs, Southern California Academy of Sciences* 9:109-122. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, and MM1300888-2)
- Ainley, D.G., H.R. Huber, and K.M. Bailey. 1982. Population fluctuations of California sea lions and the Pacific whiting off central California. *Fishery Bulletin (NOAA)* 80(2):253-258. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, and MM1300888-2)
- Ainley, D.G., C.S. Strong, H.R. Huber, T.J. Lewis, and S.H. Morrell. 1981. Predation by sharks on pinnipeds at the Farallon Islands, California. *Fishery Bulletin (NOAA)* 78(4):941-945. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, and MM1300888-2)
- Alexander, L.M., and L.C. Hanson (eds). 1985. Antarctic politics and marine resources: critical choices for the 1980s. *Proceedings from the Eighth Annual Conference, June 17-20, 1984, Center for Ocean Management Studies, University of Rhode Island, Kingston, Rhode Island*. 262 pp. (MMC contract MM2910791-3)
- Allen, S.G., D.G. Ainley, G.W. Page, and C.A. Ribic. 1984. The effect of disturbance on harbor seal haul out behavior patterns at Bolinas Lagoon, California. *Fishery Bulletin (NOAA)* 82(3):493-500. (MMC contract MM8AC012)
- Allen, S.G., H.R. Huber, C.A. Ribic, and D.G. Ainley. 1989. Population dynamics of harbor seals in the Gulf of the Farallones, California. *California Fish and Game* 75(4):224-232. (MMC contracts MM7AD110 and MM8AD059)
- Alverson, D.L., M.H. Freeberg, S.A. Murawski, and J.G. Pope. 1994. A global assessment of fisheries bycatch and discards. *FAO Fisheries Technical Paper 339*. Rome, Italy. 233 pp. (MMC contract T10153921)
- Ashwell-Erickson, S., and R. Elsner. 1981. The energy cost of free existence for Bering Sea harbor and spotted seals. Pp. 869-899. *In* D.W. Hood and J.A. Calder (eds). *The eastern Bering Sea shelf: oceanography and resources*. Vol. II. U.S. Department of Commerce, Office of Marine Pollution Assessment, Washington, D.C. (MMC contracts MM5AC012 and MM7AD011)
- Bailey, K.M., and D.G. Ainley. 1982. The dynamics of California sea lion predation on Pacific hake. *Fisheries Research* 1:163-176. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, and MM1300888-2)
- Baker, C.S., and L.M. Herman. 1981. Migration and local movement of humpback whales (*Megaptera novaeangliae*) through Hawaiian waters. *Canadian Journal of Zoology* 59(3):460-469. (MMC contract MM7AC014)
- Baker, C.S., and L.M. Herman. 1989. Behavioral responses of summering humpback whales to vessel traffic: experimental and opportunistic observations. Technical report NPS-NR-TR8-89-01 to the National Park Service. 50 pp. (MMC contract MM7AC014)
- Baker, C.S., J.M. Straley, and A. Perry. 1992. Population characteristics of individually marked humpback whales in southeastern Alaska: Summer and fall 1986. *Fishery Bulletin (NOAA)* 90:429-437. (MMC contract MM3309822-5)
- Balcomb, K.C., III, and M.A. Bigg. 1986. Population biology of the three resident killer whale pods in Puget Sound and off southern Vancouver Island. Pp. 85-95. *In* B.C. Kirkevold and J.S. Lockard (eds). *Behavioral biology of killer whales*. Zoo Biology Monographs, Vol. 1. Alan R. Liss, Inc, New York. (MMC contract MM1300731-7)
- Balcomb, K.C., III, J.R. Boran, and S.L. Heimlich. 1982. Killer whales in greater Puget Sound. Report of the International Whaling Commission 32:681-685. (MMC contract MM1300731-7)
- Barham, E.G., J.C. Sweeney, S. Leatherwood, R.K. Beggs, and C.L. Barham. 1979. Aerial census of the bottlenose dolphin, *Tursiops truncatus*, in a region of the Texas coast. *Fishery Bulletin (NOAA)* 77(3):585-595. (MMC contract MM8AC011)
- Beach, R.J., A.C. Geiger, S.J. Jeffries, and S.D. Treacy. 1981. Marine mammal-fishery interactions on the Columbia River and adjacent waters, 1981. NOAA, National Marine Fisheries Service, Processed Report 82-04. 186 pp. (MMC contract MM2079357-5)
- Beach, R.J., A.C. Geiger, S.J. Jeffries, S.D. Treacy, and B.L. Troutman. 1985. Marine mammals and their interactions with fisheries of the Columbia River and adjacent waters, 1980-1982. NOAA, NMFS, NWAFSC processed report 85-04, 316 pp. (MMC contracts MM2079221-7 and MM2324788-2)
- Bean, M.J. 1987. Legal strategies for reducing persistent plastics in the marine environment. *Marine Pollution Bulletin* 18:357-360. (MMC contract MM2629994-7)
- Bengtson, J.L. 1985. Review of Antarctic marine fauna. Pp. 1-226. *In* Selected papers presented to the Scientific Committee of CCAMLR 1982-1984 (Part I), Commission for the Conservation of Antarctic Marine Living Resources, Hobart, Australia. (MMC contract MM2629914-1)
- Bengtson, J.L. 1985. Monitoring indicators of possible ecological changes in the Antarctic marine ecosystem. Pp. 43-153. *In* Selected papers presented to the Scientific Committee of CCAMLR 1982-1984 (Part II), Commission for the Conservation of Antarctic Marine Living Resources, Hobart, Australia. (MMC contract MM2629914-1)
- Blix, A.S., L.K. Miller, M.C. Keyes, H.J. Grau, and R. Elsner. 1979. Newborn northern fur seals (*Callorhinus ursinus*) — do they suffer from the cold? *American Journal of Physiology*, 236(5):R322-327. (MMC contract MM5AC025)
- Bockstoce, J.R. 1980. A preliminary estimate of the reduction of the western Arctic bowhead whale population by the pelagic whaling industry: 1848-1915. *Marine Fisheries Review* 42(9-10):20-27. (MMC contract MM7AD111)

- Bockstoce, J.R. 1986. Whales, ice and men. The history of whaling in the western Arctic. University of Washington Press, Seattle. 394 pp. (MMC contract MM7AD111)
- Bräger, S., B. Würsig, A. Acevedo, and T. Henningsen. 1994. Association patterns of bottlenose dolphins (*Tursiops truncatus*) in Galveston Bay, Texas. *Journal of Mammalogy* 75(2):431-437. (MMC contract T75133708)
- Breiwick, J.M. 1978. Reanalysis of Antarctic sei whale stocks. Report of the International Whaling Commission 28:345-368. (MMC contract MM7AC012)
- Breiwick, J.M., E.D. Mitchell, and D.G. Chapman. 1981. Estimated initial population size of the Bering Sea stock of bowhead whale, *Balaena mysticetus*: an iterative method. *Fishery Bulletin* (NOAA) 78(4):843-853. (MMC contract MM8AC007)
- Brown, R.F., and B.R. Mate. 1983. Abundance, movements, and feeding habits of harbor seals, *Phoca vitulina*, at Netarts and Tillamook Bays, Oregon. *Fishery Bulletin* (NOAA) 91(2):291-301. (MMC contract MM8AC003)
- Brownell, R.L., P.B. Best, and J.H. Prescott (eds). 1986. Right whales: past and present status. Proceedings of the workshop on the status of right whales, Boston, Massachusetts, 15-23 June 1983. Report of the International Whaling Commission (Special Issue 10). 289 pp. (MMC contract MM2911051-5)
- Brownell, R.L., Jr., L.T. Findley, O. Vidal, A. Robles, and S. Manzanilla N. 1987. External morphology and pigmentation of the vaquita, *Phocoena sinus* (Cetacea: Mammalia). *Marine Mammal Science* 3(1):22-30. (MMC contract MM3-309558-7)
- Buckland, S.T., T.D. Smith, and K.L. Cattanch. 1992. Status of small cetacean populations in the Black Sea: review of current information and suggestions for future research. Report of the International Whaling Commission 42:513-516. (MMC contract T75133135)
- Burns, J.J., and F.H. Fay. 1974. New data on taxonomic relationships among North Pacific harbor seals, genus *Phoca* (*sensu stricto*). Translation of the 1st International Theriological Congress (Moscow) 1:99. (MMC contract MM4AC005)
- Burns, J.J., F.H. Fay, and G.A. Fedoseev. 1984. Cranio-logical analysis of harbor and spotted seals of the North Pacific region. Pp. 5-16. In F.H. Fay and G.A. Fedoseev (eds). Soviet — American cooperative research on marine mammals. Vol. I-Pinnipeds. NOAA Tech. Report NMFS-12. (MMC contract MM4AC005)
- Cetacean Specialist Group. 1994. The Pilot: newsletter of the Marine Mammal Action Plan. Number 9. 16 pp. (MMC contract T94071605)
- Clapham, P.J., M. Berube, and D.K. Matilla. 1995. Sex ratio of the Gulf of Maine humpback whale population. *Marine Mammal Science* 11(2):227-231. (MMC contracts T10156-643 and T30918256)
- Clapham, P.J., and D.K. Matilla. 1993. Reactions of humpback whales to skin biopsy sampling in the West Indies. *Marine Mammal Science* 9(4):382-391. (MMC contract T75136349)
- Clapham, P.J., and C.A. Mayo. 1987. The attainment of sexual maturity in two female humpback whales. *Marine Mammal Science* 3(3):279-283. (MMC contract MM1800-925 -5)
- Clapham, P.J., and P. J. Palsbøll. 1997. Molecular analysis of paternity shows promiscuous mating in female humpback whales (*Megaptera novaeangliae*, Borowski). Proceedings of the Royal Society of London B246:95-98. (MMC contracts T10156643 and T30918256)
- Clapham, P.J., P.J. Palsbøll, and D.K. Matilla. 1993. High-energy behaviors in humpback whales as a source of sloughed skin for molecular analyses. *Marine Mammal Science* 9(4):213-220. (MMC contract T75136349)
- Clark, W.G. 1981. Restricted least-squares estimates of age composition from length composition. *Canadian Journal of Fisheries and Aquatic Science* 38:297-307. (MMC contracts MM1533439-2 and MM1801114-6)
- Clark, W.G. 1982. Early changes in the recruitment rates of Antarctic minke whales inferred from recent age distributions. Report of the International Whaling Commission 32:889-895. (MMC contracts MM1533439-2 and MM1801114-6)
- Clark, W.G. 1982. Historical rates of recruitment to Southern Hemisphere fin whale stocks. Report of the International Whaling Commission 32:305-324. (MMC contracts MM1533439-2 and MM1801114-6)
- Clark, W.G. 1983. Apparent inconsistencies among countries in measurements of fin whale lengths. Report of the International Whaling Commission 33:431-434. (MMC contracts MM1533439-2 and MM1801114-6)
- Clark, W.G. 1984. Analysis of variance of photographic and visual estimates of dolphin school size. Southwest Fisheries Center Administration Report LJ-84-11C. National Marine Fisheries Service, La Jolla, California. 36 pp. (MMC contract MM2324792-1).
- Clark, W.G. 1984. Recruitment rates of Antarctic fin whales, *Balaenoptera physalus*, inferred from cohort analysis. Report of the International Whaling Commission (Special Issue 6):411-415. (MMC contract MM1533439-2)
- Coe, J.M., and W.E. Stuntz. 1980. Passive behavior by the spotted dolphin, *Stenella attenuata*, in tuna purse seine nets. *Fishery Bulletin* (NOAA) 78(2):535-537. (MMC contract MM6AC022)
- Costa, D.P. 1978. The sea otter: its interaction with man. *Oceanus* 21(2):24-30. (MMC contract MM6AA053)
- Costa, D.P. 1982. Energy, nitrogen, and electrolyte flux and sea water drinking in the sea otter, *Enhydra lutris*. *Physiological Zoology* 55(1):35-44. (MMC contract MM6AA053)
- Cowen, R.K., C.R. Agegian, and M.S. Foster. 1982. The maintenance of community structure in a central California giant kelp forest. *Journal of Experimental Marine Biology and Ecology* 64:189-201. (MMC contract MM7AC023)
- Crone, M.J., and S.D. Kraus (eds). 1990. Right whales (*Eubalaena glacialis*), in the western North Atlantic: a catalog of identified individuals. New England Aquarium, Boston, Massachusetts. 243 pp. (MMC contract T6223913-6)
- Dayton, P.K. 1984. Processes structuring some marine communities: are they general? Pp. 181-197. In D.R. Strong, et al. (eds). Ecological communities: conceptual issues and the evidence. Princeton University Press, Princeton, N.J. (MMC contract MM1300702-9)
- Dayton, P.K., V. Currie, T. Gerrodette, B.D. Keller, R. Rosenthal, and D. Van Tresca. 1984. Patch dynamics and stability of some California kelp communities. *Ecological Monographs* 54(3):253-289. (MMC contract MM1300702-9)
- Dayton, P.K., and M.J. Tegner. 1984. The importance of scale in community ecology: a kelp forest example with terrestrial analogs. Pp. 457-481. In P.W. Price, et al. (eds). A new ecology: novel approaches to interactive systems. John Wiley & Sons, Inc., New York. (MMC contract MM1300702-9)
- Dedina, S., and E. Young. 1995. Conservation as communication: Local people and gray whale tourism in Baja California Sur, Mexico. *Whalewatcher* 29(2):8-13. (MMC contract T10155592)
- Deiter, R.L. 1990. Recovery and necropsy of marine mammal carcasses in and near the Point Reyes National Seashore, May 1982 - March 1987. Pp. 123-141. In J.E.

- Reynolds, III, and D.K. Odell (eds). Marine mammal strandings in the United States. Proceedings of the second marine mammal stranding workshop, 3-5 December 1987, Miami, Florida. National Oceanic and Atmospheric Administration Technical Report No. 98, National Marine Fisheries Service. (MMC contract MM2911030-8)
- Delaney, J., W. Hale, and R. Stone. 1989. Manatees: an educator's guide. Second edition (by M. Lamphear). Save the Manatee Club. 34 pp. (MMC contract T5360304-3)
- DeMaster, D.P., and J.K. Drevenak. 1988. Survivorship patterns in three species of captive cetaceans. *Marine Mammal Science* 4(4):297-311.
- Deutsch, C.J., R.K. Bonde, and J.P. Reid. 1998. Radio-tracking manatees from land and space: Tag design, implementation, and lessons learned from long-term study. *Marine Technology Society Journal* 32(1):18-29. (MMC contract T6810889-2).
- Dizon, A.E., S.J. Chivers, and W.F. Perrin. 1997. Molecular Genetics of Marine Mammals. Society for Marine Mammalogy, Special Publication No. 3. (MMC contract T10155673)
- Domning, D.P. (ed). 1984-Present. *Sirenews*, Newsletter of the IUCN/Species Survival Commission, Sirenian Specialist Group. Howard University, Washington, D.C.
- Domning, D.P. 1996. Bibliography and index of the Sirenia and Desmostylia. Smithsonian Contributions to Paleobiology, Number 80. Smithsonian Institution Press, Washington, D.C. 611 pp. (MMC Contract T10155631)
- Dowling, T.E., and W.M. Brown. 1993. Population structure of the bottlenose dolphin (*Tursiops truncatus*) as determined by restriction endonuclease analysis of mitochondrial DNA. *Marine Mammal Science* 9(2):138-155. (MMC contract MM3309818-6)
- Duignan, P.J., J.R. Geraci, J.A. Raga, and N. Calzada. 1992. Pathology of morbillivirus infection in striped dolphins (*Stenella coeruleoalba*) from Valencia and Murcia, Spain. *Canadian Journal of Veterinary Research* 56:242-248. (MMC contract T75133818)
- Eberhardt, L.L., D.G. Chapman, and J.R. Gilbert. 1979. A review of marine mammal census methods. *Wildlife Monographs*, No. 63. 46 pp. (MMC contract MM4AC014)
- Everitt, R.D., and R.J. Beach. 1982. Marine mammal-fisheries interactions in Oregon and Washington: an overview. Pp. 265-277. In *Transactions of the 47th North American Wildlife and Natural Resources Conference*. Wildlife Management Institute, Washington, D.C. (MMC contracts MM2079345-2 and MM2079357-5)
- Fay, F.H. 1982. Ecology and biology of the Pacific walrus, *Odobenus rosmarus divergens* Illiger. U.S. Fish and Wildlife Service. North American Fauna, No. 74. 279 pp. (MMC contract MM1533576-0)
- Fay, F.H. 1984. Walrus. Pp. 264-269. In D. Macdonald (ed). *Encyclopedia of Mammals*. Equinox Ltd., Oxford, England. (MMC contract MM1533576-0)
- Fay, F.H. 1984. Foods of the Pacific walrus, winter and spring in the Bering Sea. Pp. 81-88. In F.H. Fay and G.A. Fedoseev (eds). *Soviet-American cooperative research on marine mammals*. Vol. I-Pinnipeds. NOAA Technical Report NMFS-12. (MMC contracts MM4AC005, MM4AC006, MM5AC024, MM8AC013, and MM1533576-0)
- Fay, F.H. 1985. *Odobenus rosmarus*. *Mammalian Species* 238:1-7. (MMC contract MM1533576-0)
- Fay, F.H., B.P. Kelly, and J.L. Sease. 1989. Managing the exploitation of Pacific walrus: a tragedy of delayed response and poor communication. *Marine Mammal Science* 5(1):1-16. (MMC contracts MM4AC005, MM4AC006, MM5AC024, MM8AC013, and MM1533576-0)
- Felleman, F.L., J.R. Heimlich-Boran, and R.S. Osborne. 1991. The feeding ecology of killer whales (*Orcinus orca*) in the Pacific Northwest. In K. Pryor and K.S. Norris (eds). *Dolphin societies: discoveries and puzzles*. University of California Press, Berkeley. (MMC contract MM1300731-7).
- Ford, J.K.B., G.M. Ellis, and K.C. Balcomb. 1994. Killer whales. University of British Columbia Press, Vancouver. 102 pp. (MMC contract MM1300731-7)
- Foster, M. 1982. The regulation of macroalgal associations in kelp forests. Pp. 185-205. In L. Srivastava (ed). *Synthetic and degradative processes in marine macrophytes*. W. de Gruyter & Company, Berlin. (MMC contract MM7AC023)
- Fowler, C.W. 1980. A rationale for modifying effort by catch, using the sperm whale of the North Pacific as an example. Report of the International Whaling Commission (Special Issue 2):99-102. (MMC contract MM8AC009)
- Fowler, C.W. 1981. Comparative population dynamics in large mammals. Pp. 437-455. In C.W. Fowler and T.D. Smith (eds). *Dynamics of large mammal populations*. John Wiley & Sons, Inc., New York. (MMC contract MM1300730-4)
- Fowler, C.W. 1981. Density dependence as related to life history strategy. *Ecology* 62(3):602-610. (MMC contract MM7AC013)
- Fowler, C.W. 1987. A review of density dependence in populations of large mammals. Pp. 401-441. In H.H. Genoways (ed). *Current Mammalogy*, Vol. I. Plenum Press, New York. (MMC contract MM7AC013)
- Fox, W.W., Jr. 1990. Statement of concerned scientists on the reauthorization of the Magnuson Fishery Conservation and Management Act. *Natural Resources Modeling* 4(2):133-142.
- Gaines, S.E., and D. Schmidt. 1976. Wildlife management under the Marine Mammal Protection Act of 1972. Pp. 50096-50114. In *Environmental Law Reporter*, Vol. 6. (MMC contract MM5AC029)
- Gentry, R.L., and G.L. Kooyman. 1986. Fur seals: maternal strategies on land and at sea. Princeton University Press, Princeton, New Jersey. 291 pp. (MMC contract MM6AC019)
- Georgia Conservancy, The. 1986. Report of the southeastern U.S. right whale workshop, 18-20 February 1986, Jekyll Island, Georgia. 41 pp. (MMC contract MM3309690-0)
- Geraci, J.R. 1978. The enigma of marine mammal strandings. *Oceanus* 21(2):38-47. (MMC contracts MM5AC008, MM6AD070, MM7AD069, and MM7AC020)
- Geraci, J.R. 1989. Clinical investigations of the 1987-88 mass mortality of bottlenose dolphins along the U.S. central and south Atlantic coast. Final report to the U.S. National Marine Fisheries Service, Office of Naval Research, and the Marine Mammal Commission, Washington, D.C. 63 pp. (MMC contracts MM4465826-9, T5360275-6, T5360277-2, and T5360286-6)
- Geraci, J.R., D.M. Anderson, R.J. Timperi, D.J. St. Aubin, G.A. Early, J.H. Prescott, and C.A. Mayo. 1989. Humpback whales (*Megaptera novaeangliae*) fatally poisoned by dinoflagellate toxin. *Canadian Journal of Fisheries and Aquatic Science* 46(11):1895-1898. (MMC contract T5306271-4)
- Geraci, J.R., M.D. Daily, and D.J. St. Aubin. 1978. Parasitic mastitis in the Atlantic white-sided dolphin, *Lagenorhynchus acutus*, as a probable factor in herd productivity. *Journal of the Fisheries Research Board of Canada* 35(10):1350-1355. (MMC contract MM5AC008)
- Geraci, J.R., and V.J. Lounsbury. 1993. *Marine mammals ashore: a field guide for strandings*. Texas A&M Sea

- Grant Publications, Galveston, Texas. 305 pp. (MMC contract T94071618)
- Geraci, J.R., and D.J. St. Aubin. 1980. Offshore petroleum resource development and marine mammals: a review and research recommendations. *Marine Fisheries Review* 42(11):1-12. (Requested by the Marine Mammal Commission)
- Glockner-Ferrari, D.A., and M.J. Ferrari. 1987. Identification, reproduction, and distribution of humpback whales in Hawaiian waters, 1984 and 1985. Report to National Marine Fisheries Service, National Marine Mammal Laboratory, Seattle. 33 pp. (MMC contract MM2629752-5)
- Goodman, D. 1980. Demographic intervention for closely managed populations. Pp. 171-195. In M.E. Soule and B.A. Wilcox (eds). *Conservation biology: an evolutionary-ecological perspective*. Sinaur Associates, Inc., Sunderland, Massachusetts. (MMC contract MM8AD-008)
- Goodman, D. 1981. Life history analysis of large mammals. Pp. 415-436. In C.W. Fowler and T.D. Smith (eds). *Dynamics of large mammal populations*. John Wiley & Sons, Inc., New York. (MMC contract MM8AD-008)
- Haenel, N.J. 1986. General notes on the behavioral ontogeny of Puget Sound killer whales and the occurrence of allomateral behavior. Pp. 285-300. In B.C. KirkevoId and J.S. Lockard (eds). *Behavioral biology of killer whales*. Zoo Biology Monographs, Vol. 1. Alan R. Liss, Inc., New York. (MMC contract MM1300731-7)
- Hain, J.H.W., G.R. Carter, S.D. Kraus, C.A. Mayo, and H.E. Winn. 1982. Feeding behavior of the humpback whale, *Megaptera novaeangliae*, in the western North Atlantic. *Fishery Bulletin* (NOAA) 80(2):259-268. (MMC contract MM1800925-5)
- Hall, J.D. 1977. A non-lethal lavage device for sampling stomach contents of small marine mammals. *Fishery Bulletin* (NOAA) 75(3):653-656. (MMC contract MM4AC013)
- Harvey, J.T., R.F. Brown, and B.R. Mate. 1990. Abundance and distribution of harbor seals (*Phoca vitulina*) in Oregon, 1975-1983. *Northwestern Naturalist* 71(3):65-71. (MMC contract MM5AC001)
- Harvey, J.T., and B.R. Mate. 1984. Dive characteristics and movements of radio-tagged gray whales in San Ignacio Lagoon, Baja California Sur, Mexico. Pp. 561-575. In M.L. Jones, S.L. Swartz, and S. Leatherwood (eds). *The gray whale *Eschrichtius robustus**. Academic Press, Inc., Orlando, Florida. (MMC contract MM1533416-9)
- Heimlich-Boran, J.R. 1986. Photogrammetric analysis of growth in Puget Sound *Orcinus orca*. Pp. 97-111. In B.C. KirkevoId and J.S. Lockard (eds). *Behavioral biology of killer whales*. Zoo Biology Monographs. Alan R. Liss, Inc., New York. Vol. 1. (MMC contract MM1300731-7)
- Heimlich-Boran, J.R. 1986. Fishery correlations with the occurrence of killer whales in greater Puget Sound. Pp. 113-131. In B.C. KirkevoId and J.S. Lockard (eds). *Behavioral biology of killer whales*. Zoo Biology Monographs. Alan R. Liss, Inc., New York. Vol. 1. (MMC contract MM1300731-7)
- Heimlich-Boran, S.L. 1986. Cohesive relationships among Puget Sound killer whales. Pp. 251-284. In B.C. KirkevoId and J.S. Lockard (eds). *Behavioral biology of killer whales*. Zoo Biology Monographs. Alan R. Liss, Inc., New York. Vol. 1. (MMC contract MM1300731-7)
- Herman, L.M. 1979. Humpback whales in Hawaiian waters: a study in historical ecology. *Pacific Science* 33(1):1-16. (MMC contract MM7AC014)
- Herman, L.M., and R.C. Antinaja. 1977. Humpback whales in the Hawaiian breeding waters: population and pod characteristics. Scientific Report of the Whales Research Institute, No. 29:59-85. (MMC contract MM7AC014)
- Heyning, J.E., and T.D. Lewis. 1990. Entanglements of baleen whales in the fishing gear off southern California. Report of the International Whaling Commission 40:427-431. (MMC contract T6223923-3)
- Heyning, J.E., and W.F. Perrin. 1991. Re-examination of two forms of common dolphins (genus *Delphinus*) from the eastern north Pacific; evidence for two species. National Marine Fisheries Service Administrative Report LJ-91-28. 37 pp. (MMC contract T6223923-3)
- Heyning, J.E., and W.F. Perrin. 1994. Evidence for two species of common dolphins (Genus *Delphinus*) from the eastern north Pacific. *Contributions in Science, Natural History Museum of Los Angeles County* 442:1-35. (MMC contract T6223923-3)
- Hoelzel, A.R., and R.W. Osborne. 1986. Killer whale call characteristics: implications for cooperative foraging strategies. Pp. 373-403. In B.C. KirkevoId and J.S. Lockard (eds). *Behavioral biology of killer whales*. Zoo Biology Monographs. Alan R. Liss, Inc., New York. Vol. 1. (MMC contract MM1300731-7)
- Hofman, R.J. 1985. The Convention on the Conservation of Antarctic Marine Living Resources. Pp. 113-122. In L.M. Alexander and L.C. Hanson (eds). *Antarctic politics and marine resources: critical choices for the 1980s*. Center for Ocean Management Studies, University of Rhode Island, Kingston, Rhode Island.
- Hofman, R.J., and W.N. Bonner. 1985. Conservation and protection of marine mammals: past, present and future. *Marine Mammal Science* 1(2):109-127.
- Huber, H.R. 1987. Nataly and weaning success in relation to age of first reproduction in northern elephant seals. *Canadian Journal of Zoology* 65(6):1311-1316. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, MM1300888-2, MM1533599-3)
- Huber, H.R. 1991. Changes in distribution of California sea lions north of the breeding rookeries during the 1982-83 El Niño. Pp. 129-137. In F. Trillmich and K.A. Ono (eds). *Pinnipeds and El Niño: responses to environmental stress*. Ecological Studies, Vol. 88. Springer-Verlag, Berlin. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, MM1300888-2, MM1533599-3)
- Huber, H.R., C. Beckham, and J. Nisbet. 1991. Effects of the 1982-83 El Niño on northern elephant seals on the South Farallon Islands, California. Pp. 219-233. In F. Trillmich and K.A. Ono (eds). *Pinnipeds and El Niño: responses to environmental stress*. Ecological Studies, Vol. 88. Springer-Verlag, Berlin. (MMC contracts MM4AC002, MM5AC020, MM6AC027, MM7AC025, MM1300888-2, MM1533599-3)
- Huber, H.R., D.G. Ainley, and S.H. Morrell. 1982. Sightings of cetaceans in the Gulf of the Farallones, California, 1971-1979. *California Fish and Game* 68(3):183-189. (MMC contract MM1300888-2)
- Huber, H.R., A.C. Rovetta, L.A. Fry, and S. Johnston. 1991. Age-specific nataly of northern elephant seals at the South Farallon Islands, California. *Journal of Mammalogy* 72(3):525-534.
- Hui, C.A. 1980. Variability of dentin deposits in *Tursiops truncatus*. *Canadian Journal of Fisheries and Aquatic Science* 37(4):712-716. (MMC contract MM7AC021)
- Irvine, A.B., M.D. Scott, R.S. Wells, and J.H. Kaufman. 1981. Movements and activities of the Atlantic bottlenose dolphin, *Tursiops truncatus*, near Sarasota, Florida. *Fishery Bulletin* (NOAA) 79(4):671-688. (MMC contracts MM4AC004 and MM5AC018)
- Irvine, A.B., R.S. Wells, and M.D. Scott. 1982. An evaluation of techniques for tagging small odontocete cetaceans.

- Fishery Bulletin (NOAA) 80(1):135-143. (MMC contracts MM4AC004 and MM5AC018)
- Johnson, P.A., B.W. Johnson, and L.R. Taylor. 1981. Inter-island movement of a young Hawaiian monk seal between Laysan Island and Maro Reef. *'Elepaio*, 41(11):113-114. (MMC contracts MM7AC009 and MM8AC008)
- Jones, M.L. 1985. Evaluation of the potential impact of whale-watching activities on gray whales in Laguna San Ignacio, Baja California Sur, Mexico, 1978 to 1982. Master's thesis, Moss Landing Marine Laboratory, San Jose State University, San Jose, California. 73 pp. (MMC contracts MM7AC008, MM8AC005, MM1533497-8, MM2079219-4, MM2324713-8, and MM2911098-4)
- Jones, M.L. 1990. The reproductive cycle in gray whales based on photographic resightings of females on the breeding grounds from 1977-82. Report of the International Whaling Commission (Special Issue 12):177-182. (MMC contracts MM7AC008, MM8AC005, MM1533497-8, MM2079219-4, MM2324713-8, and MM2911098-4)
- Jones, M.L., and S.L. Swartz. 1984. Demography and phenology of breeding gray whales in Laguna San Ignacio, Baja California Sur, Mexico: 1978-1982. Pp. 309-374. *In* M.L. Jones, S.L. Swartz, and S. Leatherwood (eds). The gray whale *Eschrichtius robustus*. Academic Press, Inc., Orlando, Florida. 602 pp. (MMC contracts MM7AC008, MM8AC005, MM1533497-8, MM2079219-4, MM2324713-8, and MM2911098-4)
- Jones, M.L., S.L. Swartz, and S. Leatherwood (eds). 1984. The gray whale *Eschrichtius robustus*. Academic Press, Inc., Orlando, Florida. 602 pp. (MMC contracts MM7AC008, MM8AC005, MM1533497-8, MM2079219-4, MM2324713-8, MM2911098-4)
- Kennedy, R.D., H.E. Winn, and M.C. Macaulay. 1995. Cetaceans in the Great South Channel, 1979-1989: right whale (*Eubalaena glacialis*). *Continental Shelf Research* 15:385-414. (MMC contract T94070648)
- Kirby, V. 1983. Progesterone and estrogens in pregnant and nonpregnant dolphins (*Tursiops truncatus*) and the effects of induced ovulation. *Biology of Reproduction* 28:897-901. (MMC contract MM7AC016)
- Kirk, A.G., and K.G. Vanderhye. 1996. Marine Mammal Commission working bibliography on physical and chemical constituents in the marine environment and effects on marine mammals. Available from the Marine Mammal Commission, Bethesda, Maryland. 100 pp.
- Klimley, A.P., and D.G. Ainley (eds). 1996. Great white sharks: The biology of *Carcharodon carcharias*. Academic Press, San Diego. 517 pp. (MMC contract T94070415)
- Knowlton, A.R., S.D. Kraus, D.F. Meck, and M.L. Mooney-Seus. 1997. Shipping/Right Whale Workshop. Report 97-3. New England Aquarium, Boston, Massachusetts. (MMC contract T53696940)
- Kooyman, G.L., J.O. Billups, and W.D. Farwell. 1983. Two recently developed recorders for monitoring diving activity of marine birds and mammals. Pp. 197-214. *In* A.G. MacDonald and I.G. Priede (eds). *Experimental biology at sea*. Academic Press, New York. (MMC contract MM6AC019)
- Kooyman, G.L., and L.H. Cornell. 1981. Flow properties of expiration and inspiration in a trained bottle-nosed porpoise. *Physiological Zoology* 54(1):55-61. (MMC contract MM4AC012)
- Kooyman, G.L., R.L. Gentry, and D.L. Urquhart. 1976. Northern fur seal diving behavior: A new approach to its study. *Science* 193:411-412. (MMC contract MM6AC019)
- Kooyman, G.L., K.S. Norris, and R.L. Gentry. 1975. Spout of the gray whale: its physical characteristics. *Science* 190:908-910. (MMC contract MM4AC012)
- Kooyman, G.L., and E.E. Sinnett. 1979. Mechanical properties of the harbor porpoise lung, *Phocoena phocoena*. *Respiratory Physiology*, 36:287-300. (MMC contract MM4AC012)
- Kraus, S.D. 1990. Rates and potential causes of mortality in North Atlantic right whales (*Eubalaena glacialis*). *Marine Mammal Science*, 6(4):278-291. (MMC contract MM3309800-5)
- Kraus, S.D., J.R. Gilbert, and J.H. Prescott. 1983. A comparison of aerial, shipboard and land-based survey methodology for the harbor porpoise, *Phocoena phocoena*. *Fishery Bulletin (NOAA)* 81:910-913. (MMC contract MM1801023-1)
- Kraus, S.D., K.E. Moore, C.A. Price, M.J. Crone, W.A. Watkins, H.E. Winn, and J.H. Prescott. 1986. The use of photographs to identify individual North Atlantic right whales (*Eubalaena glacialis*). Report of the International Whaling Commission (Special Issue 10):145-151. (MMC contracts MM2079355-9 and MM3309800-5)
- Kraus, S.D., J.H. Prescott, and A.R. Knowlton. 1988. Wintering right whales along the Southeastern United States: a primary calving ground. Pp. 148-157. *In* Proceedings of the third southeastern non-game and endangered wildlife symposium. Georgia Department of Natural Resources, pp. 148-157. (MMC contract MM3309800-5)
- Kraus, S.D., J.H. Prescott, A.R. Knowlton, and G.S. Stone. 1986. Migration and calving of right whales (*Eubalaena glacialis*) in the western North Atlantic. Report of the International Whaling Commission (Special Issue 10):139-144. (MMC contracts MM2079355-9 and MM3309800-5)
- Laist, D.W. 1987. An overview of the biological effects of lost and discarded plastic debris in the marine environment. *Marine Pollution Bulletin* 18(6B):319-326.
- Laist, D.W. 1996. Entanglement of marine life in marine debris including a comprehensive list of species with entanglement and ingestion records. Pages 99-139 *in* J.M. Coe and D.R. Rogers (eds). *Marine Debris: Sources, Impacts, and Solutions*. Springer-Verlag, New York NY.
- Laist, D.W. 1996. Marine debris entanglement and ghost fishing: A cryptic and significant type of bycatch? Pages 33-39 *in* Proceedings of the Solving Bycatch Workshop: Considerations for Today and Tomorrow, 25-27 September 1995, Seattle WA. Report No. 96-03. Alaska Sea Grant College Program, Fairbanks AK.
- Laws, R.M. (ed.) 1994. *Antarctic Seals: Research Methods and Techniques*. Cambridge University Press. Cambridge, United Kingdom. 390 pp. (MMC contract T75133672)
- Leatherwood, S. 1975. Some observations of feeding behavior of bottlenosed dolphins (*Tursiops truncatus*) in the northern Gulf of Mexico and (*Tursiops cf. T. gilli*) off Southern California, Baja California, and Nayarit, Mexico. *Marine Fisheries Review* 37(9):10-16. (MMC contract MM6AC001)
- Leatherwood, S., J.R. Gilbert, and D.G. Chapman. 1978. An evaluation of some techniques for aerial censuses of bottlenosed dolphins. *Journal of Wildlife Management* 42(2):239-250. (MMC contract MM6AC001)
- Leatherwood, J.S., R.A. Johnson, D.K. Ljungblad, and W.E. Evans. 1977. Broadband measurements of underwater acoustic target strengths of panels of tuna nets. Technical Report 126. Naval Ocean Systems Center, San Diego, California. 19 pp. (MMC contract MM6AC020)
- LeBoeuf, B.J., and R.M. Laws (eds). 1994. *Elephant seals: population ecology, behavior and physiology*. University of California Press, Berkeley. 414 pp. (MMC contract T7-5133724)
- Loughlin, T.R. 1979. Radio telemetric determination of the 24-hour feeding activities of sea otters, *Enhydra lutris*. Pp.

- 717-724. In C.J. Amlaner, Jr., and D.W. McDonald (eds). A handbook on biotelemetry and radio-tracking. Pergamon Press, Oxford and New York. (MMC contracts MM6AC004 and MM6AC024)
- Loughlin, T.R. 1980. Home range and territoriality of sea otters near Monterey, California. *Journal of Wildlife Management* 44(3):576-582. (MMC contracts MM6AC004 and MM6AC024)
- Lowry, L.F., and F.H. Fay. 1984. Seal eating by walrus in the Bering and Chukchi Seas. *Polar Biology* 3:11-18. (MMC contracts MM5AC006 and MMC5AC024)
- Lowry, L.F., K.J. Frost, D.G. Calkins, G.L. Swartzman, and S. Hills. 1982. Feeding habits, food requirements, and status of Bering Sea marine mammals. North Pacific Fishery Management Council, Anchorage, AK. Doc. Nos. 19 and 19a. 574 pp. (MMC contract MM1533596-4)
- Lowry, L.F., and K.J. Frost. 1985. Biological interactions between marine mammals and commercial fisheries in the Bering Sea. Pp. 41-61. In J.R. Beddington, R.J.L. Beverton, and D.M. Lavigne (eds). *Marine Mammals and Fisheries*. George Allen and Unwin, London. (MMC contract MM1533596-4)
- Lowry, L.F., K.J. Frost, R. Davis, D.P. DeMaster, and R.S. Suydam. 1998. Movements and behavior of satellite-tagged spotted seals (*Phoca largha*) in the Bering and Chukchi Seas. *Polar Biology* 19:221-230. (MMC contract MM1533596-4)
- Mangel, M., L.M. Talbot, G.K. Meffe, M.T. Agardy, D.L. Alverson, J. Barlow, D.B. Botkin, G. Budowski, T. Clark, J. Cooke, R.H. Crozier, P.K. Dayton, D.L. Elder, C.W. Fowler, S. Funtowicz, J. Giske, R.J. Hofman, S.J. Holt, S.R. Kellert, L.A. Kimball, D. Ludwig, K. Magnusson, B.S. Malayang, III, C. Mann, E.A. Norse, S.P. Northridge, W.F. Perrin, C. Perrings, R.M. Peterman, G.B. Rabb, H.A. Regier, J.E. Reynolds, III, K. Sherman, M.P. Sissenwine, T.D. Smith, A. Starfield, R.J. Taylor, M.F. Tillman, C. Toft, J.R. Twiss, Jr., J. Wilen, and T.P. Young. 1996. Principles for the conservation of wild living resources. *Ecological Applications* 6(2):338-362. (MMC contract T94071553)
- Marine Mammal Commission. 1994. The Marine Mammal Commission compendium of selected treaties, international agreements, and other relevant documents on marine resources, wildlife, and the environment. Volumes 1-3. Government Printing Office, Washington, D.C. 3,547 pp. (MMC contracts T75135573, T94069358, T94069772, T94070240, T94070978, T94070981, T94071113, T94071511, T94071647, T10154111, T10154124, T10154234, T10157257, and T10157639)
- Marmontel, M. 1993. Age determination and population biology of the Florida manatee, *Trichechus manatus latirostris*. Ph.D. Dissertation. University of Florida. 408 pp. (MMC contract T6223918-1)
- Marmontel, M., T.J. O'Shea, H.I. Kochman, and S.R. Humphrey. 1996. Age determination in manatees using growth-layer-group counts in bone. *Marine Mammal Science* 12(1):54-88. (MMC contract T6223918-1)
- Mate, B.R., and J.T. Harvey. 1984. Ocean movements of radio-tagged gray whales. Pp. 577-589. In M.L. Jones, S.L. Swartz, and S. Leatherwood (eds). *The gray whale *Eschrichtius robustus**. Academic Press, Inc., Orlando, Florida. (MMC contract MM1533416-9)
- Mate, B.R., J.T. Harvey, L. Hobbs, and R. Maiefski. 1983. A new attachment device for radio-tagging large whales. *Journal of Wildlife Management* 47(3):868-872. (MMC contract MM1533416-9)
- Mayo, C.A., C.A. Carlson, P.J. Clapham, and D.K. Mattila. 1985. Humpback whales of the southern Gulf of Maine. Shankpainter Press, Provincetown, Massachusetts. (MMC contract MM1800925-5)
- Mead, J.G. 1977. Records of sei and Bryde's whales from the Atlantic Coast of the United States, the Gulf of Mexico and the Caribbean. Report of the International Whaling Commission (Special Issue 1):113-116. (MMC contract MM6AD054)
- Melteff, B.R., and D.H. Rosenberg (eds). 1984. Proceedings of the workshop on biological interactions among marine mammals and commercial fisheries in the southeastern Bering Sea, October 18-21, 1983, Anchorage, Alaska. Alaska Sea Grant College Program, University of Alaska, Fairbanks, Alaska. 300 pp. (MMC contract 7MM232480-2-7)
- Merrell, T.R. 1985. Fish nets and other plastic litter on Alaska beaches. Pp. 160-182. In R.S. Shomura and H.O. Yoshida (eds). Proceedings of the workshop on the fate and impact of marine debris, 27-29 November 1984, Honolulu, Hawaii. U.S. Dept. Commerce, NOAA Technical Memorandum NMFS. (MMC contract MM2910786-1)
- Mizroch, S.A., D.W. Rice, J.L. Bengtson, and S.W. Larson. 1985. Preliminary atlas of *Balaenopterid* whale distribution in the southern ocean based on pelagic catch data. Pp. 113-193. In Selected papers presented to the Scientific Committee of CCAMLR, 1985, Commission for the Conservation of Antarctic Marine Living Resources, Hobart, Australia. (MMC contract MM3309521-5)
- Morales, V.B., D. Olivera G., and P. Ramirez G. 1996. Conservación de los manatíes en la región del Caribe de México y Belice. Informe Técnico prepared for El Colegio de la Frontera Sur, Number MM01, Consejo Nacional de Ciencia y Tecnología, N9301-2017. 131 pp. (MMC contract T10155657)
- Nafziger, J.A.R. 1978. The management of marine mammals after the fishery conservation and management act. *Willa-mette Law Journal* 14:153-215. (MMC contract MM7AC001)
- National Research Council. 1981. An evaluation of Antarctic marine ecosystem research. Polar Research Board. National Academy Press, Washington, D.C. 99 pp. (MMC contract MM1800913-2)
- National Research Council. 1988. Priorities in arctic marine science. Polar Research Board. National Academy Press, Washington, D.C. 73 pp. (MMC contracts MM2911056-0 and MM3309821-2)
- Naveen, R. 1996. Human activity and disturbance: building on Antarctic site inventory. Pages 389-400 in Foundations for Ecological Research West of the Antarctic Peninsula. American Geophysical Union, Washington, D.C. (MMC contract T10155660)
- Naveen, R. 1997. Compendium of Antarctic Peninsula visitor sites: a report to the Governments of the United States and the United Kingdom. U.S. Department of State (Washington) and U.K. Foreign and Commonwealth Office (London). 243 pp. (MMC contract T10155660)
- Naveen, R. 1997. The Oceanites site guide to the Antarctic Peninsula. Oceanites, Inc., Chevy Chase, MD. 128 pp. (MMC contract T10155660)
- Norris, K.S., R. Goodman, B. Villa-Ramirez, and L. Hobbs. 1977. The behavior of California gray whales (*Eschrichtius robustus*) in Southern Baja California, Mexico. *Fishery Bulletin* (NOAA) 75(1):159-172. (MMC contract MM5AC007)
- Odell, D.K. 1975. Status and aspects of the life history of the bottlenose dolphin, *Tursiops truncatus*, in Florida. *Journal of the Fisheries Research Board of Canada* 32(7):1055-1058. (MMC contract MM4AC003)

- Odell, D.K. 1976. Distribution and abundance of marine mammals in south Florida: Preliminary Results. Pp. 203-212. In A. Thorhaug (ed). Biscayne Bay: Past/Present/Future. Biscayne Bay symposium I, 2-3 April 1976. University of Miami Sea Grant Special Report No. 5. (MMC contract MM4AC003)
- Odell, D.K. 1979. Distribution and abundance of marine mammals in the waters of the Everglades National Park. Proceedings of the first conference on research in national parks. USDI, NPS, Transactions Proceedings Series No. 5:673-678. (MMC contract MM4AC003)
- Packard, J.M. 1981. Abundance, distribution, and feeding habits of manatees (*Trichechus manatus*) wintering between St. Lucie and Palm Beach Inlets, Florida. U.S. Fish and Wildlife Contract Report No. 14-16-004-80-105. 139 pp. (MMC contract MM1801025-7).
- Packard, J.M. 1984. Impact of manatees, *Trichechus manatus*, on seagrass communities in eastern Florida. Acta Zoologica Fennica 172:21-22. (MMC contract MM1801025-7)
- Packard, J.M. 1984. Proposed research/management plan for Crystal River manatees. Vols. 1-3. Technical Report No. 7. Florida Cooperative Fish and Wildlife Research Unit, University of Florida, Gainesville, Florida. Prepared for Fish and Wildlife Service, U.S. Department of the Interior, Washington, D.C. 31 pp. 235 pp. 346 pp. (MMC contract MM1801024-4)
- Packard, J.M., R.K. Frohlich, J.E. Reynolds, III, and J.R. Wilcox. 1985. Manatee response to interrupted operation of the Fort Myers power plant, winter 1984/85. Manatee population research report No. 8. Technical Report No. 8-8. Florida Cooperative Fish and Wildlife Research Unit, University of Florida, Gainesville, Florida. 20 pp. (MMC contract MM3309522-8)
- Packard, J.M., R.K. Frohlich, J.E. Reynolds, III, and J.R. Wilcox. 1989. Manatee response to interruption of a thermal effluent. Journal of Wildlife Management 53(3):692-700. (MMC contract MM2324650-8)
- Packard, J.M., D.B. Siniff, and J.A. Cornell. 1986. Use of replicate counts to improve indices of trends in manatee abundance. Wildlife Society Bulletin 14:265-275. (MMC contract MM2324650-8)
- Packard, J.M., and O.F. Wetterquist. 1986. Evaluation of manatee habitat on the northwestern Florida coast. Coastal Zone Management Journal 14(4):279-310. (MMC contract MM1801025-7)
- Palsbøll, P., J. Allen, M. Berube, P. Clapham, T. Feddersen, P. Hammond, R. Hudson, H. Jorgensen, S. Katona, A. Larsen, F. Larsen, J. Lien, D. Matilla, J. Sigurjónsson, R. Sears, T. Smith, R. Spomer, P. Stevick, and N. Øien. 1997. Genetic tagging of humpback whales. Nature 388:767-769. (MMC contracts T10156643 and T30919556)
- Payne, R., O. Brazier, E.M. Dorsey, J.S. Perkins, V.J. Rowntree, and A. Titus. 1983. External features in southern right whales (*Eubalaena australis*) and their use in identifying individuals. Pp. 371-445. In R. Payne (ed). Communication and behavior of whales. AAAS Selected Symposium 76. Westview Press, Inc. Boulder, Colorado. (MMC contract MM6AC017)
- Pearse, J.S., D.P. Costa, M.B. Yellin, and C.R. Agegian. 1977. Localized mass mortality of red sea urchin, *Strongylocentrotus franciscanus*, near Santa Cruz, California. Fishery Bulletin (NOAA) 75(3):645-648. (MMC contract MM6AC029)
- Perrin, W.F., R.L. Brownell, Jr., and D.P. DeMaster (eds). 1984. Reproduction in whales, dolphins, and porpoises. Report of the International Whaling Commission (Special Issue 6). 495 pp. (MMC contract MM2079356-2)
- Perrin, W.F., R.L. Brownell, Jr., Z. Kaiya, and L. Jiankang (eds). 1989. Biology and conservation of the river dolphins. IUCN Species Survival Commission Occasional Paper No. 3. (MMC contract MM3309828-3)
- Perrin, W.F., G.P. Donovan, and J. Barlow (eds). 1994. Gillnets and Cetaceans. Report of the International Whaling Commission (Special Issue 15). 629 pp. (MMC contract T6810860-1)
- Perrin, W.F., and A.C. Myrick, Jr. (eds). 1980. Age determination of toothed whales and sireniens. Report of the International Whaling Commission (Special Issue 3). 229 pp. (MMC contract MM8AC004)
- Perry, A., C.S. Baker, and L.M. Herman. 1990. Population characteristics of individually identified humpback whales in the central and eastern North Pacific: A summary and critique. Report of the International Whaling Commission (Special Issue 12):307-317. (MMC contract MM7AC014)
- Pierotti, R.J., D.G. Ainley, T.S. Lewis, and M.C. Coulter. 1977. Birth of a California sea lion on Southeast Farallon Island. California Fish and Game 63(1):64-65. (MMC contract MM4AC002)
- Pitcher, K.W. 1980. Food of the harbor seal, *Phoca vitulina*, in the Gulf of Alaska. Fishery Bulletin (NOAA) 78(2):544-549. (MMC contract MM5AC011)
- Pitcher, K.W. 1980. Stomach contents and feces as indicators of harbor seal, *Phoca vitulina*, foods in the Gulf of Alaska. Fishery Bulletin (NOAA) 78(3):797-798. (MMC contract MM5AC011)
- Pitcher, K.W. 1986. Variation in blubber thickness of harbor seals in Southern Alaska. Journal of Wildlife Management 50(3):463-466. (MMC contract MM5AC011)
- Pitcher, K.W. 1990. Major decline in the number of harbor seals, *Phoca vitulina*, on Tugidak Island, Gulf of Alaska. Marine Mammal Science 6(2):121-134. (MMC contract T75133261)
- Ralls, K. 1989. A semi-captive breeding program for the Baiji, *Lipotes vexillifer*: genetic and demographic considerations. Pp. 150-156. In W.F. Perrin, R.L. Brownell, Jr., Z. Kaiya, and L. Jiankang (eds). Biology and conservation of the river dolphins. IUCN Species Survival Commission Occasional Paper No. 3. (MMC contract MM3309828-3)
- Ralls, K., and J.D. Ballou (eds). 1986. Proceedings of the workshop on the genetic management of captive populations. Zoo Biology 5(2):81-239. (MMC contract MM2910864-0)
- Ralls, K., and J.D. Ballou. 1986. Captive breeding programs for populations with a small number of founders. Trends Ecology and Evolution 1:19-22. (MMC contract MM2910864-0)
- Ralston, F. (ed). 1977. A workshop to assess research related to the porpoise/tuna problem, February 28, March 1-2. Southwest Fisheries Center Admin. Report LJ-77-15. Southwest Fisheries Service, National Marine Fisheries Service, La Jolla, California. 119 pp. 6 appendices. (MMC contract MM7AC022).
- Ray, G.C., J.A. Dobbin, and R.V. Salm. 1978. Strategies for protecting marine mammal habitats. Oceanus 21(2):55-67. (MMC contract MM6AC011)
- Reeves, R.R., D. Tuboku-Metzger, and R.A. Kapindi. 1988. Distribution and exploitation of manatees in Sierra Leone. Oryx 22(2):75-84. (MMC contract MM2911037-9)
- Reeves, R.R., R.J. Hofman, G.K. Silber, and D. Wilkinson. 1996. Acoustic deterrence of harmful marine mammal-fishery interactions: proceedings of a workshop held in Seattle, Washington, 20-22 March 1996. U.S. Department of Commerce, NOAA Technical Memorandum, NMFS-OPR-10. 68 pp. (MMC contract T30919705)

- Reijnders, P., S. Brasseur, J. van der Toorn, P. van der Wolf, I. Boyd, J. Harwood, D. Lavigne, and L. Lowry. 1993. Seals, fur seals, sea lions, and walrus. Status survey and conservation action plan. IUCN—The World Conservation Union, Species Survival Commission, Seal Specialist Group. Gland, Switzerland. 88 pp. (MMC contract T94070651)
- Reynolds, III, J.E., and K.D. Haddad (eds). 1990. Report of the workshop on geographic information system as an aid to managing habitat for West Indian manatees in Florida and Georgia. Rep. No. 49. Florida Marine Research, Florida Department of Natural Resources, St. Petersburg, Florida. 57 pp. (MMC contract T6223916-5)
- Roffe, T.J., and B.R. Mate. 1984. Abundances and feeding habits of pinnipeds in the Rogue River, Oregon. *Journal of Wildlife Management* 48(4):1262-1274. (MMC contract MM8AC003)
- Scott, G.P., and H.E. Winn. 1978. Assessment of humpback whale (*Megaptera novaeangliae*) stocks using vertical photographs. Proceedings PECORA IV symposium, national wildlife science and technology series 3:235-243. (MMC contract MM7AC029)
- Scott, M.D., R.S. Wells, and A.B. Irvine. 1990. A long-term study of bottlenose dolphins on the west coast of Florida. Pp. 235-244. In S. Leatherwood and R.R. Reeves (eds). *The bottlenose dolphin*. Academic Press, Inc., San Diego, California. (MMC contract MM4465739-6)
- Sergeant, D.E., D.J. St. Aubin, and J.R. Geraci. 1980. Life history and northwest Atlantic status of the Atlantic white-sided dolphin, *Lagenorhynchus acutus*. *Cetology* 37:1-12. (MMC contract MM5AC008)
- Shallenberger, E.W. 1977. Humpback whales in Hawaii: population and distribution. *Oceans '77*, marine technology society, institute of electrical and electronics engineers, p. Hawaii C-1-7. (MMC contract MM7AC014)
- Shane, S.H. 1978. Suckerfish attached to a bottlenose dolphin. *Journal of Mammalogy* 59(2):4399-440. (MMC contract MM6AC028)
- Shane, S.H. 1980. Occurrence, movements, and distribution of bottlenose dolphin, *Tursiops truncatus*, in southern Texas. *Fishery Bulletin* (NOAA) 78(3):593-601. (MMC contract MM6AC028)
- Shane, S.H. 1990. Comparison of bottlenose dolphin behavior in Texas and Florida, with a critique of methods for studying dolphin behavior. Pp. 541-558. In J.S. Leatherwood and R.R. Reeves (eds). *The bottlenose dolphin*. Academic Press, Inc., San Diego, California. (MMC contract MM6AC028)
- Shane, S.H., and D. McSweeney. 1990. Using photo-identification to study pilot whale social organization. Report of the International Whaling Commission (Special Issue 12):259-263. (MMC contracts MM2629899-3 and MM2910859-8)
- Shane, S.H., and D.J. Schmidly. 1976. Bryde's whale (*Balaenoptera edeni*) from the Louisiana coast. *Southwest Naturalist* 21(3):409-410. (MMC contract MM4AC008).
- Shaughnessy, P.D., and F.H. Fay. 1977. A review of the taxonomy and nomenclature of North Pacific harbour seals. *Journal of Zoology*, London 182:385-419. (MMC contract MM4AC005)
- Sherman, K., and L.M. Alexander (eds). 1986. Variability and management of large marine ecosystems. AAAS Selected Symposium 99. Westview Press, Inc., Boulder, Colorado. 319 pp. (MM1300736-2)
- Sherman, K., and L.M. Alexander (eds). 1989. Biomass yields and geography of large marine ecosystems. AAAS Selected Symposium 111. Westview Press, Inc., Boulder, Colorado. 493 pp. (MMC contracts MM4465739-6 and T6810861-4)
- Sherman, K., L.M. Alexander, and B.D. Gold (eds). 1990. Large marine ecosystem: patterns, processes, and yields. American Association for the Advancement of Science, Washington, D.C. 242 pp. (MMC contract MM465739-6)
- Sherman, K., L.M. Alexander, and B.D. Gold (eds). 1991. Food chains, yields, models and management of large marine ecosystems. Westview Press, Inc., Boulder, Colorado. 320 pp. (MMC contract MM4465739-6).
- Sherman, K., L.M. Alexander, and B.D. Gold (eds). 1992. Stress, migration, and sustainability of large marine ecosystems. American Association for the Advancement of Science, Washington, D.C. (MMC contract MM4465739-6)
- Shomura, R.S., and H.O. Yoshida (eds). 1985. Proceedings of the workshop on the fate and impact of marine debris, 27-29 November 1984, Honolulu, Hawaii. NOAA-TM-NMFS-SWFC-54. 580 pp. (MMC contract MM2629949-7)
- Shomura, R.S., and M.L. Godfrey (eds). 1990. Proceedings of the second international conference on marine debris, 2-7 April 1989, Honolulu, Hawaii. NOAA-TM-NMFS-SWFC-154. 1,274 pp. (MMC contract T6224086-6)
- Silber, G.K., K.A. Waples, and P.A. Nelson. 1994. Response of free-ranging harbor porpoises to potential gillnet modifications. Pages 579-584. In W.F. Perrin, G.P. Donovan, and J. Barlow (eds). *Gillnets and Cetaceans*. Report of the International Whaling Commission (Special Issue 15). (MMC contracts MM4465854-4 and MM3309815-7)
- Sirenia Project. 1993. Atlantic coast manatee telemetry 1986-1993 progress report. Volumes I and II. National Biological Survey, Gainesville, Florida. (MMC contract T6810889-2)
- Siniff, D.B., T.D. Williams, A.M. Johnson, and D.L. Garshelis. 1982. Experiments on the response of sea otters (*Enhydra lutris*) to oil contamination. *Biological Conservation* 23(4):261-272. (MMC contract MM7AD-094)
- Smith, T.D. 1981. The adequacy of the scientific basis for the management of sperm whales. Pp. 333-343. In *Mammals in the Seas*. FAO Fisheries Series No. 5, Vol. III. Food and Agriculture Organization of the United Nations. (MMC contract MM6AD047)
- Smith, T.D., and T. Polacheck. 1979. Analysis of a simple model for estimating historical population sizes. *Fishery Bulletin* (NOAA) 76(4):771-779. (MMC contract MM7AC006)
- Smultea, M.A. 1989. Humpback whales off west Hawaii. *Whalewatcher* 23(1):11-14. (MMC contract T6810925-7)
- Smultea, M.A. 1994. Segregation by humpback whale (*Megaptera novaeangliae*) cows with a calf in coastal habitat near the island of Hawaii. *Canadian Journal of Zoology* 72:805-811. (MMC contract T6223925-9)
- Society for Marine Mammalogy. 1994. Strategies for pursuing a career in marine mammal science. Supplement to *Marine Mammal Science* 10(2). 14 pp. (MMC contract T10157419)
- Southern, S.O., P.J. Southern, and A.E. Dizon. 1988. Molecular characterization of a cloned dolphin mitochondrial genome. *Journal of Molecular Evolution* 28:32-42. (MMC contract MM2910998-2)
- Species Survival Commission. 1994. Whales, dolphins, and porpoises, 1994-1998. (MMC contract T30916627)
- St. Aubin, D.J., J.R. Geraci, and V.J. Lounsbury. 1996. Rescue, rehabilitation, and release of marine mammals: an analysis of current views and practices. Proceedings of a workshop held in Des Plaines, Illinois, 3-5 December 1991. NOAA Technical Memorandum, NMFS-OPR-8. 65 pp. (MMC contract T75136433)
- Stone, G.S., S.D. Kraus, J.H. Prescott, and K.W. Hazard. 1988. Significant aggregations of the endangered right

- whale, *Eubalaena glacialis*, on the continental shelf of Nova Scotia. *The Canadian Field-Naturalist* 102(3):471-474. (MMC contract T6223913-6)
- Straley, J.M. 1994. Seasonal characteristics of humpback whales (*Megaptera novaeangliae*) in southeastern Alaska. Master of Science thesis, University of Alaska, Fairbanks. 121 pp. (MMC contract MM3309822-5)
- Straley, J.M., C.M. Gabriele, and C.S. Baker. 1994. Annual reproduction by individually identified humpback whales (*Megaptera novaeangliae*) in Alaskan waters. *Marine Mammal Science* 10(1):87-92. (MMC contract MM3309822-5)
- Stevick, P., N. Øien, and D. Matilla. 1998. Migrations of a humpback whale between Norway and the West Indies. *Marine Mammal Science* 14(1):162-166. (MMC contract T30919556)
- Swartz, S.L. 1981. Cleaning symbiosis between topsmelt, *Atherinops affinis*, and gray whales, *Eschrichtius robustus*, in Laguna San Ignacio, Baja California Sur, Mexico. *Fishery Bulletin* (NOAA) 79(2):360. (MMC contracts MM8AC005 and MM1533497-8)
- Swartz, S.L. 1986. Gray whale migratory, social and breeding behavior. Report of the International Whaling Commission (Special Issue 8):207-229. (MMC contracts MM7AC008, MM8AC005, MM1533497-8, MM2079219-4 and MM2324713-8).
- Swartz, S.L. 1986. Demography, migration, and behavior of gray whales *Eschrichtius robustus* (Lilljeborg, 1861) in San Ignacio Lagoon, Baja California Sur, Mexico and in their winter range. Ph.D. Dissertation. University of California, Santa Cruz, California. 95 pp. (MMC contracts MM7AC008, MM8AC005, MM1533497-8, MM2079219-4, MM2324713-8, MM2911098-4)
- Swartz, S.L., and M.K. Bursk. 1979. The gray whales of Laguna San Ignacio after two years. *Whalewatcher* 13(1):709. (MMC contracts MM7AC008 and MM8AC005)
- Swartz, S.L., and M.L. Jones. 1983. Gray whale (*Eschrichtius robustus*) calf production and mortality in the winter range. Report of the International Whaling Commission 33:503-507. (MMC contracts MM7AC008, MM1533497-8 and MM2079219-4)
- Swartz, S.L., and M.L. Jones. 1984. Gray whale mothers and their calves. *Oceans* 17(2):47-55. (MMC contracts MM7AC008, MM1533497-8 and MM2079219-4)
- Swartz, S.L., and M.L. Jones. 1987. Gray whales at play in San Ignacio Lagoon. *National Geographic* 171(6):755-771. (MMC contract MM7AC008, MM8AC005, MM1533497-8, MM2079219-4 and MM2324713-8)
- Swartzman, G.L. 1984. Present and future potential models for examining the effect of fisheries on marine mammal populations in the Eastern Bering Sea. Pp. 157-181. In B. Melteff (ed). *Proceedings of the workshop on biological interactions among marine mammals and commercial fisheries in the Southeastern Bering Sea*. Alaska Sea Grant Report 84-1. (MMC contract MM1800969-5).
- Swartzman, G.L., and R.T. Haar. 1983. Interactions between fur seal populations and fisheries in the Bering Sea. *Fishery Bulletin* (NOAA) 81(1):121-132. (MMC contracts MM1800969-5 and MM2629737-6)
- Swartzman, G.L., and R.T. Haar. 1985. Interactions between fur seal populations and fisheries in the Bering Sea. Pp. 62-93. In J.R. Beddington, R.J.H. Beverton, and D.M. Lavigne (eds). *Marine mammals and fisheries*. George Allen and Unwin, London. 354 pp. (MMC contracts MM1800969-5 and MM2629737-6)
- Sydeman, W.J., H.R. Huber, S.D. Emslie, C.A. Ribic, and N. Nur. 1991. Age-specific weaning success of northern elephant seals in relation to previous breeding experience. *Ecology* 72(6):2204-2217. (MMC contract MM3309858-4)
- Talbot, L.M. 1996. Living resource conservation: an international overview. Available from the Marine Mammal Commission, Bethesda, Maryland. 56 pp. (MMC contract T94071553)
- Tillman, M.F., and G.P. Donovan (eds). 1983. Special issue on historical whaling records. Report of the International Whaling Commission (Special Issue 5). 269 pp. (MMC contract MM7AC017)
- Tolley, K.A., A.J. Read, R.S. Wells, K.W. Urian, M.D. Scott, A.B. Irvine, and A.A. Hohn. 1995. Sexual dimorphism in wild bottlenose dolphins (*Tursiops truncatus*) from Sarasota, Florida. *Journal of Mammalogy* 76(4):1190-1198. (MMC contract T75132864)
- Tricas, T.C., L.R. Taylor, and G. Naftel. 1981. Diel behavior of the tiger shark, *Galeocerdo cuvier*, at French Frigate Shoals, Hawaiian Islands. *Copeia* 1981. pp. 904-908. (MMC contract MM7AC011)
- Van Wagenen, R.F., M.S. Foster, and F. Burns. 1981. Sea otter predation on birds near Monterey, California. *Journal of Mammalogy* 62(2):433-434. (MMC contract MM7AC023)
- Villa-R., B. 1976. Report on the status of *Phocoena sinus*, Norris and McFarland 1958, in the Gulf of California. *Anales de la Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología* 47(2):203-207. (MMC contract MM6AD052)
- Weller, D.W., V.G. Cockcroft, B. Würsig, S.K. Lynn, and D. Ferti. 1997. Behavioral responses of bottlenose dolphins to remote biopsy sampling and observations of surgical biopsy wound healing. *Aquatic Mammals* 23(1):49-58. (MMC contract T75133708)
- Wells, R.S. 1991. The role of long-term study in understanding the social structure of a bottlenose dolphin community. Pp. 199-225. In K. Pryor and K.S. Norris (eds). *Dolphin societies: discoveries and puzzles*. University of California Press, Berkeley. (MMC contract MM4465739-6)
- Wells, R.S., A.B. Irvine, and M.D. Scott. 1980. The social ecology of inshore odontocetes. Pp. 263-317. In L.M. Herman (ed). *Cetacean behavior: mechanisms and processes*. John Wiley & Sons, Inc., New York. (MMC contracts MM4AC004 and MM5AC0018)
- Whitehead, H., K. Chu, J. Perkins, P. Bryant, and G. Nichols. 1983. Population size, stock identity, and distribution of the humpback whales off West Greenland — summer 1981. Report of the International Whaling Commission 33:497-501. (MMC contract MM2079259-2).
- Williams, T.D., and F.H. Kocher. 1978. Comparison of anaesthetic agents in the sea otter. *Journal of American Veterinary Medical Association* 173(9):1127-1130. (MMC contract MM7AD-094)
- Williams, T.D., and L.T. Pulley. 1983. Hematology and blood chemistry in the sea otter (*Enhydra lutris*). *Journal of Wildlife Diseases* 19(1):44-47. (MMC contract MM7AD-094)
- Williams, T.D., and D.B. Siniff. 1983. Surgical implantation of radiotelemetry devices in the sea otter. *Journal of the American Veterinary Medical Association* 183(11):1290-1291. (MMC contract MM7AD-094)
- Williams, T.D., A.L. Williams, and D.B. Siniff. 1981. Fentanyl and azaperone produced neuroleptanalgesia in the sea otter. *Journal of Wildlife Diseases* 17(3):337-342. (MMC contract MM7AD-094)
- Würsig, B., and B. Ter shy. 1989. The baiji: perhaps the most endangered of them all. *Whalewatcher* 23:3-5. (MMC contract T6223922-0)
- Wynne, K. 1992. Guide to marine mammals in Alaska. Alaska Sea Grant College Program, Fairbanks. 75 pp. (MMC contract T75136394)

- Young, N. (ed). 1993. Examining components of a revised management scheme. Center for Marine Conservation, Washington, D.C. 84 pp. (MMC contract T10154344)
- Zemsky, V.A., A.A. Berzin, Y.A. Mikhalyev, and D.D. Tormosov. 1995. Materials on whaling by Soviet Antarctic whaling fleets (1947-1972). Center for Russian Environmental Policy, Moscow. 320 pp. (In Russian) (MMC contract T10157150)