THE MARINE MAMMAL COMMISSION

Annual Report to Congress 2008

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Marine Mammal Commission
4340 East-West Highway, Room 700
Bethesda, Maryland, 20814

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Marine Mammal Commission

Committee of Scientific Advisors on Marine Mammals

Special Advisor on Native Affairs

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John Russell Twiss, Jr.
1938 – 2009

John Russell Twiss, Jr., was the first Executive Director of the U.S. Marine Mammal Commission. He died on 23 July 2009 after a long battle with Parkinson's disease. He is survived by his wife, Mary, and three children, John, Alison, and Emily.

John graduated from Yale University and was a Charter Member of the Society for Marine Mammalogy. Before accepting the job as the Commission's Executive Director, he held several high-level positions at the National Science Foundation, including the U.S. Antarctic Research Program's representative in Antarctica, and the Acting Head of the International Decade of Ocean Exploration.

During the course of his remarkable career, John served on numerous boards and committees to promote conservation ideals. He also received numerous awards for his many contributions to conservation and science, both in the United States and abroad. These are described in an "In Memoriam" article in the fall edition of the Journal of the Society for Marine Mammalogy. Indeed, John is the only non-scientist to have been elected as an Honorary Member of the Society, a reflection of his quiet but invaluable contributions to marine mammal science.

But such facts fall short of capturing the essence of John Twiss. For 26 years, from 1974 to 2000, John was the heart of the Marine Mammal Commission. In many respects he built the Commission, blending the statutory framework set forth in the Marine Mammal Protection Act with impeccable professional integrity to create a model of excellence that still sets the standard for the Commission today. During that long period, he was a role model for a generation of young scientists and conservationists, many of whom credit John for giving direction to, and having a profound effect on, their own careers. His rare talent was an uncanny ability to integrate the world around him, to anticipate conservation problems, and to bring people together to address them before they became crises. He was a visionary of deep passion, committed to conservation in both the marine and terrestrial realms. He was confident enough to operate behind the scenes, where he catalyzed crucial conservation actions with anonymity and little recognition or credit. He was a leader who did not seek to rise above his peers, but rather to raise them with him as he sought a higher ground. Even in retirement, as he fought the crippling effects of Parkinson's Disease, he brought dignity and inspiration to all those who had the good fortune to meet with him. Not simply a man for all seasons, John Twiss was, and remains, a man for all times.

Chapter I

INTRODUCTION

Passage of the Marine Mammal Protection Act of 1972 was a remarkable achievement. The Act provides a cornerstone for U.S. policy regarding the protection of marine ecosystems, and it reflected the value that the U.S. public assigns to the conservation of marine mammals specifically and our natural world generally. Title II of the Act created the Marine Mammal Commission as an independent federal agency with oversight and advisory responsibilities to promote the implementation of the Act's provisions and the achievement of its over-arching goal—to maintain the health and stability of marine ecosystems.

The Marine Mammal Commission is privileged to work for the U.S. public to achieve that difficult but vital goal. The Commission consists of three members, one of whom serves as Chairman. All are nominated by the President and confirmed by the U.S. Senate. The Act requires that Commissioners be knowledgeable in marine ecology and resource management. The Commissioners are supported by a nine-member Committee of Scientific Advisors on Marine Mammals. Committee members are appointed by the Chairman with the concurrence of the other Commissioners and after consultation with the Chairman of the Council on Environmental Quality, the Secretary of the Smithsonian Institution, the Director of the National Science Foundation, and the Chairman of the National Academy of Sciences. The Marine Mammal Protection Act requires that committee members be knowledgeable in marine ecology and marine mammal affairs. The work of the Commission is carried out primarily by its staff, located in Bethesda, Maryland.

The Marine Mammal Protection Act sets forth the Commission's duties as follows:

(1) undertake a review and study of the activities of the United States pursuant to existing laws and international conventions relating to marine mammals, including, but not limited to, the International Convention for the Regulation of Whaling, the Whaling Convention Act of 1949, the Interim Convention on the Conservation of North Pacific Fur Seals, and the Fur Seal Act of 1966

(2) conduct a continuing review of the condition of the stocks of marine mammals, of methods for their protection and conservation, of humane means of taking marine mammals, of research programs conducted or proposed to be conducted under the authority of this Act, and of all applications for permits for scientific research, public display, or enhancing the survival or recovery of a species or stock

(3) undertake or cause to be undertaken such other studies as it deems necessary or desirable in connection with its assigned duties as to the protection and conservation of marine mammals

(4) recommend to the Secretary and to other federal officials such steps as it deems necessary or desirable for the protection and conservation of marine mammals

(5) recommend to the Secretary of State appropriate policies regarding existing international arrangements for the protection and conservation of marine mammals and suggest appropriate international arrangements for the protection and conservation of marine mammals

(6) recommend to the Secretary such revisions of the endangered species list and threatened species list published pursuant to section 4(c)(1) of the Endangered Species Act of 1973 as may be appropriate with regard to marine mammals

(7) recommend to the Secretary, other appropriate federal officials, and Congress such additional measures as it deems necessary or desirable to further the policies of this Act, including provisions for the protection of the Indians, Eskimos, and Aleuts whose livelihood may be adversely affected by actions taken pursuant to this Act

These duties are aimed at maintaining marine mammal populations as functioning elements of healthy marine ecosystems. The status and trends of a population are determined by survival and reproductive rates that, in turn, are determined by such things as individual health and condition; exposure and resilience to disease, contaminants, noise, and harmful algal blooms; the quantity and quality of habitat for foraging, reproduction, and rest; natural ecological processes, including predation; threats to the population and its habitat; and the manner in which those threats are managed, minimized, or mitigated. The Commission's task is to promote the objectives of the Marine Mammal Protection Act by overseeing and advising other federal agencies regarding the effects of their activities on marine mammals and marine ecosystems.

Chapters in this Report

No single marine mammal species occurs entirely within the waters of the United States. Even the Hawaiian monk seal (*Monachus schauinslandi*), which is endemic to the Hawaiian Archipelago, occasionally ventures into the international waters of the deep central Pacific. Thus, we begin this report by emphasizing the importance of an international perspective and international cooperation to achieve the goals of the Marine Mammal Protection Act.

Chapter II describes marine mammal research and conservation issues in the Wider Caribbean region, a term used to refer to the Caribbean region proper and the Gulf of Mexico. The Wider Caribbean is composed of 38 different political entities (island nations, continental nations, territories) speaking four languages and distributed over 2.7 million km^2. Both the Gulf and Caribbean regions are complex oceanographically, ecologically, and politically. In 2008 the Commission held its annual meeting in San Juan, Puerto Rico, and focused most of the meeting on marine mammal research and conservation in the Caribbean region and the U.S. waters of the Gulf of Mexico.

The Caribbean region provides habitat for a number of large baleen and toothed whales, medium-sized toothed whales, small cetaceans, and the West Indian manatee (*Trichechus manatus*). With rare exceptions, only one pinniped species, the Caribbean monk seal (*Monachus tropicalis*), has occurred naturally in the region in historical times, but the last confirmed sighting of a Caribbean monk seal was in 1952 and the species is now considered extinct, a victim of unmanaged hunting and disturbance. Human activities in the region continue to subject manatees and cetaceans to a variety of threats. In many instances, countries have been slow to investigate and address the threats, often due to a lack of resources and direction for research and assessment. However, a small group of dedicated researchers, managers, and conservationists have recently prepared a Caribbean Marine Mammal Action Plan under the auspices of the United Nations Environment Programme. The plan and related activities are evidence of a growing awareness of and commitment to marine mammal conservation in the region. Still, most countries in the region do not have the resources to mount robust research and management efforts.

The Caribbean region exemplifies the challenges faced elsewhere in the world where human activities fuel threats to marine mammal conservation, where marine conservaton has been largely neglected except by small cadres of concerned scientists and conservationists, and where financial resources are insufficient to investigate and address the underlying problems. The status of many of the world's marine mammals remains poorly described. In recent years the Marine Mammal Commission has supported the work of sirenian, cetacean, and pinniped specialist groups convened by the International Union for Conservation of Nature (IUCN) to carry out global assessments of the status of species in these taxonomic groups. Much of that work has now been completed and will serve as a basis for a synoptic report on the status of marine mammals worldwide, which the Commission anticipates submitting to Congress in 2011.

Conservation of marine mammals also needs more attention in U.S. waters of the Gulf of Mexico.

There, conservation is confounded by activities such as oil and gas development, commercial fishing, coastal development, and training exercises carried out by the U.S. military. The area is further degraded by contaminated runoff and nutrient enrichment from the Mississippi and other rivers that drain into the Gulf. Selective and relatively intense research has been conducted on certain marine mammal species (e.g., sperm whales (*Physeter macrocephalus*), manatees, bottlenose dolphins (*Tursiops truncatus*)), but much remains to be learned about the distribution and biodiversity of inshore, coastal, and offshore cetacean species in the area.

Chapter III highlights some of the more critical foreign and international conservation issues involving marine mammals. The 2006 survey indicated that the Yangtze River dolphin (or baiji, *Lipotes vexillifer*) is probably extinct and provided a sharp reminder of the urgent nature of some of these conservation challenges. The escalating demands of an ever-growing human population have created a host of human-related risk factors. Climate change is such a factor, but it is not the only one. The market for high-value, wild-caught shrimp in the United States drives the Gulf of California fisheries that have decimated the vaquita (*Phocoena sinus*) population through entanglement in gillnets. The demand for oil and gas and bycatch in fishing gear pose known threats to the western population of North Pacific gray whales (*Eschrichtius robustus*), although it may face various other threats during its poorly described migration and in its unknown reproductive habitat. Pollution, entanglement in fishing gear, and habitat loss are among the major threats to several species of river dolphins, particularly in southern Asia. Furthermore, information on many marine mammal species is not sufficient to describe their stock structure, the status of the stocks, or the factors that threaten their persistence.

Chapter IV describes species of concern found in U.S. waters. Those species generally include taxa that are listed as endangered or threatened under the Endangered Species Act or designated as depleted under the Marine Mammal Protection Act. They are at high risk of extinction for any number of reasons, and efforts to conserve them often are controversial. Their fate likely will be determined by our willingness and ability to manage human activities that affect them directly or indirectly through changes to their habitat. In 2008 the Commission submitted its report to Congress on the viability of the most endangered marine mammals and the cost-effectiveness of recovery programs.

Chapter V discusses progress on some special projects being undertaken independently by the Commission or under congressional direction. In 2008 the Commission also completed reports on the potential effects of climate change on Arctic marine mammals; monitoring strategies for Arctic marine mammals; the biological viability of the most endangered marine mammals and the cost-effectiveness of protection programs; co-management of the marine mammal subsistence harvests by Alaska Native organizations, the Fish and Wildlife Service, and the National Marine Fisheries Service; the fundamental principles of sound in the marine environment; and the potential effects of tagging large whales.

Chapter VI describes the Commission's research and studies program. Annual funding for the Commission includes a small amount for research, which the Commission uses to promote marine mammal conservation. The Commission attempts to use this funding to support studies that are likely to have a large impact on future research and management. In many cases, the Commission's support serves as seed funding to encourage other agencies and organizations with greater resources to contribute to and pursue important research. The Commission also uses this funding to convene meetings and workshops to examine significant conservation matters. The Commission encourages publication and wide dissemination of the results of its research program to maximize the conservation value of new knowledge and understanding.

Chapter VII reviews matters pertaining to marine mammal health and strandings. Animals stranded on beaches or found dead or distressed in nearshore waters are often the focus of considerable public attention. Such events generate concern about the well-being of individual animals, and they provide opportunities for responders and scientists to learn about the animals, the factors that caused them to come ashore, and the implications for their populations. Stranded animals also generate considerable debate about their handling and future disposition (i.e., questions such as can and should

they be rehabilitated, will they be fit for release or require permanent holding in captivity, should they be on display or maintained with minimal human contact). Addressing these issues is difficult. A variety of values and incentives need to be considered by multiple interested parties. During 2008 a total of 11 unusual mortality events were ongoing from 2006 or 2007, and three others began. Taken together, these events raise serious questions about the influence of a range of factors—such as harmful algal blooms, disease, chemical contamination, and tanthropogenic noise—on the health of the nation's coastal ecosystems and species dependent on those ecosystems, including the human species.

Chapter VIII describes efforts to address interactions between marine mammals and fisheries. It provides a general overview of the framework established by the Marine Mammal Protection Act to prevent unacceptably high levels of direct interaction (i.e., where marine mammals are killed or seriously injured). Much of the discussion focuses on take reduction teams convened to address specific interactions and on the extent to which those teams have achieved their purpose. This chapter also provides a brief summary of the tuna/dolphin issue, which was one of the three major concerns that led to the passage of the Marine Mammal Protection Act and which remains a concern today because of the failure of affected populations to recover once reported mortality was reduced. Finally, this chapter discusses indirect fishery interactions (e.g., competition for prey, secondary ecological changes), which has been at the center of several controversies regarding the effects of fishing on marine ecosystems. The Act provides a well-structured framework for addressing direct fishery interactions, but it does not provide a sufficient basis for addressing indirect effects of fishing, such as competition between marine mammals and fisheries for prey. The most important question yet to be addressed is how much fish biomass can be removed without significantly altering the ecological characteristics of fished ecosystems and the biological communities they support.

Chapter IX reviews research and regulatory activities pertaining to human-generated sound in the marine environment. In 2008 the potential effects of sound provoked great interest, in part because of increased naval training activities in various existing or planned training ranges throughout U.S. waters and in part because of a marked increase in seismic exploration for energy resources following the rapid rise in oil and gas prices in the United States. In addition, the Supreme Court entered the fray in 2008, ruling on a case regarding the requirement for mitigation measures during naval exercises off southern California.

Chapter X describes matters pertaining to reauthorization of the Marine Mammal Protection Act. Congress did not reauthorize the Act in 2008, but a number of related bills were developed or introduced in Congress. Congressman Abercrombie (Hawaii) introduced one of those bills, which was based in part on the Marine Mammal Commission's recommendations in its 2007 report entitled "Marine Mammals and Noise: A Sound Approach to Research and Management."

Chapter XI lists and briefly describes permits and authorizations issued for the take of marine mammals, either for research purposes or incidental to other activities. Appendix A lists recommendations made by the Marine Mammal Commission in 2008 and responses by the corresponding agencies. Appendix B lists reports emanating from the Commission or studies conducted with Commission funding.

The Commission submits its reports to Congress pursuant to section 204 of the Marine Mammal Protection Act of 1972. To ensure accuracy, federal and state agencies and knowledgeable individuals review report drafts, and the Commission gratefully acknowledges their efforts. The Commission also provides its reports to federal and state agencies, public interest groups, the academic community, private citizens, and the international community. Interested readers may download the Commission's reports dating back to 2000 at www.mmc.gov/reports/annual.

Chapter II

MARINE MAMMAL CONSERVATION IN THE WIDER CARIBBEAN REGION

No single marine mammal species lives entirely in U.S. waters and, therefore, conservation must entail both national and international protection and management. Congress recognized as much when it passed the Marine Mammal Protection Act of 1972, finding that marine mammals are of "great international significance" and calling for international arrangements for research on and conservation of all marine mammals. In fact, the three major issues leading to the passage of the Act were international in scope: the killing of harp seal pups in the North Atlantic, inadequate management of commercial whaling worldwide, and the killing of dolphins in tuna fisheries of the eastern tropical Pacific.

Within the Act, section 108 sets forth the provisions for an international program for marine mammal conservation. Title II of the Act establishes the duties of the Marine Mammal Commission, requiring it first to review U.S. activities "pursuant to existing laws and international conventions relating to marine mammals" and then to "recommend to the Secretary of State appropriate policies regarding existing international arrangements for the protection and conservation of marine mammals, and suggest appropriate international arrangements for the protection and conservation of marine mammals." Titles III and V pertain to specific international issues: dolphin conservation in the eastern tropical Pacific and joint United States–Russia conservation of polar bears in the Chukchi Sea, respectively.

Over the past three decades, the Marine Mammal Commission has engaged in many international activities pertaining to risk factors for marine mammals and marine ecosystems, including fishery interactions (both direct and indirect), noise, contaminants, disease, harmful algal blooms, habitat loss, coastal development, ship strikes, trade in small cetaceans, tourism, and—most recently—climate change (Reynolds et al. 2005). The Commission also has been directly involved in research and conservation of specific species that occur, at least in part, in foreign or international waters, including the western population of North Pacific gray whales, bowhead whales, sperm whales, beluga whales, vaquitas, Indo-Pacific bottlenose dolphins in the Solomon Islands, Hector's dolphins, Irrawaddy dolphins, franciscana dolphins, North Atlantic right whales, West Indian manatees, polar bears, Mediterranean monk seals, sea otters, ringed seals, northern fur seals, Steller sea lions, striped and common dolphins in the Gulf of Oman, and river dolphins in the Ganges, Indus, and Yangtze Rivers. In those endeavors, the Commission has worked with a number of foreign and international organizations, such as the International Union for Conservation of Nature (IUCN), International Whaling Commission (IWC), United Nations Environment Programme (UNEP), Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), and the Inter-American Tropical Tuna Commission (IATTC). For example, the Commission has helped support the Cetacean, Pinniped, and Sirenian Specialist Groups of IUCN's Species Survival Commission in the assessment of species' status and development of corresponding action plans.

Despite efforts by many local, regional, national, and international agencies and organizations, conservation of marine mammals remains a great challenge throughout the world's oceans, as well as in a number of lakes and river systems that certain

marine mammals inhabit. The task is compounded by inadequate resources to develop and sustain scientific capacity (i.e., staff, infrastructure, and support for their research) and gather the information required to make informed decisions.

At its roots, however, conservation is not simply a matter of adequate scientific capacity but also a matter of values and priorities (Reynolds et al. 2009). All too often, conservation does not fare well in the company of competing priorities, such as economic crises, social unrest, and growing demand for diminishing resources. The reasons for the frequent failure of conservation efforts are described in a paper (to be published in 2009) by the Commission's Chairman and Executive Director and a leading Australian scientist. The recent loss of the baiji, or Yangtze River dolphin *(Lipotes vexillifer)*, was not simply a function of inadequate science but rather a lack of adequate priority in the face of competing concerns. To reduce the chance of further losses of marine mammal taxa, the Commission is initiating a global assessment of marine mammal stocks, their status and trends, the factors that threaten them, and the most critical management actions needed to ensure their conservation.

In 2008 the Commission held its annual meeting in San Juan, Puerto Rico, to consider issues related to marine mammal conservation in the Wider Caribbean Region, as defined by the United Nations Environment Programme. The region consists primarily (but not exclusively) of the Caribbean Sea, the Gulf of Mexico, and associated countries and territories. This chapter provides an overview of issues related to marine mammal and ecosystem conservation in the wider Caribbean. The overview illustrates some of the circumstances under which well-intentioned but inadequately supported researchers, managers, and conservationists attempt to protect and conserve marine ecosystems in many parts of the world. The overview also highlights information and programmatic needs that must be addressed to conserve the region's marine mammals and ecosystems.

Wider Caribbean Region

The Wider Caribbean Region is politically complex, consisting of 13 island nations, 12 continental nations, and 13 territories under the jurisdictions of the United Kingdom, France, the Netherlands, or the United States (Table 1, Figure 1). The combined population of these 38 political entities is presently about 570 million, more than half of which is in the United States, and is projected to reach about 670 million by 2025 (U.S. Census Bureau, http://www.census.gov/ipc/www/idb/summaries.html). At present, the island nations and territories collectively support about 40 million people, a number projected to grow to 46 million by 2025 (U.S. Census Bureau, http://www.census.gov/ipc/www/idb/summaries.html). Only six nations (Cuba, Jamaica,

Table 1. Political entities of the Wider Caribbean Region

Island Nations	Continental Nations	Territories
Antigua and Barbuda	Belize	Aruba (Netherlands)
Bahamas	Colombia	Netherlands Antilles (Netherlands)
Barbados	Costa Rica	Anguilla (U.K.)
Cuba	Guatemala	Cayman Islands (U.K.)
Dominica	Guyana	Montserrat (U.K.)
Dominican Republic	Honduras	Turks and Caicos Islands (U.K.)
Grenada	Mexico	British Virgin Islands (U.K.)
Haiti	Nicaragua	French Guyana (France)
Jamaica	Panama	Guadeloupe (France)
St. Kitts and Nevis	Surinam	St. Martin – St. Barthelemy (France)
St. Lucia	United States	Martinique (France)
St. Vincent and the Grenadines	Venezuela	Puerto Rico (U.S.)
Trinidad and Tobago		U.S. Virgin Islands (U.S.)

Haiti, Dominican Republic, Puerto Rico, and Trinidad and Tobago) have populations exceeding a million people. Conservation efforts in this region are complicated by physical and ecological variability; political and cultural diversity, including four languages (Spanish, French, Dutch, and English) and two legal systems (common and civil law); a range of economic activities that depend on or pose risks to the marine environment; and standards of living ranging widely between extremes of severe poverty and great wealth.

The Marine Mammal Commission's meeting in San Juan emphasized that the optimal strategies for science and management in the wider Caribbean must be inclusive, despite the diversity of cultures, economies, and ecosystems of that region. The Commission used that theme to determine the scope, agenda, and speakers for the meeting. To that end, it also sought and welcomed participation by colleagues from the U.S. Department of State, National Marine Fisheries Service, National Ocean Service, Fish and Wildlife Service, and Navy to highlight the need for coordinated research and management efforts throughout the region.

As a result of the meeting, the Commission committed itself to help raise funding and support for marine mammal conservation and research throughout the Wider Caribbean Region. The Commission focused on those activities listed as high priority in the Caribbean-wide Marine Mammal Action Plan (described in the following sections) to maintain the momentum that the approval of that plan created in September 2008. The Commission anticipated preparing a 2009 request for proposals to emphasize the need to build research and management capacity in the region.

Despite the merits of integrating conservation efforts throughout the Wider Caribbean Region, research and management needs differ somewhat between the Caribbean Sea and the Gulf of Mexico. The following sections deal separately with those two water bodies to allow a more tailored discussion.

Caribbean Sea

The Caribbean Sea itself is the dominant aquatic system in the region (Figure 1). It encompasses an area of about 2.754 million km^2, about one-third the size of the continental United States. Its eastern boundary is marked by a chain of small islands extending northward from Trinidad and Tobago at the northeastern edge of South America to the Virgin Islands. The chain includes the Lesser Antilles, which are often subdivided into the Windward Islands (from Martinique to Grenada) and the Leeward Islands (from Dominica to the Virgin Islands). To the north, the Caribbean is bounded by the larger islands of Puerto Rico, Hispaniola (Dominican Republic and Haiti), Jamaica, and Cuba (i.e., the Greater Antilles). The Turks and Caicos and the Bahamas extend northward into the Atlantic Ocean from the Greater Antilles to a latitude due east of southern Florida. To the west and south, the Caribbean Sea is bounded by Central America and northern South America, respectively.

The physical characteristics of the Caribbean Sea vary considerably. The primary oceanic current flows in a northwesterly direction from the equatorial Atlantic (via the North Equatorial, North Brazil, and Guiana Currents) leaving the Caribbean through the Yucatan Channel and entering the Gulf of Mexico or turning to join the Gulf Stream moving northeastward along the U.S. Atlantic coast (Figure 2). The Caribbean current also drives the counterclockwise Colombia-Panama Gyre, evident offshore of southern Central America (Nicaragua, Costa Rica, and Panama) and northern Colombia. Water depths in the Caribbean vary markedly from the shallow reef areas for which the region is famous to depths of more than 7.6 km (25,000 ft) in the Cayman Trench between Cuba and the Cayman Islands. The physical and biological diversity of the Caribbean Sea creates a variety of marine mammal habitats ranging from shallow-water coral reefs supporting bottlenose dolphins, for example, to deep pelagic habitat supporting deep divers such as sperm whales and beaked whales.

Marine Mammals

The marine mammal fauna of the Caribbean Sea is composed almost entirely of large, medium, or small cetaceans (Table 2). The two exceptions are the West Indian manatee (*Trichechus manatus*), the only sirenian species in this region, and the Caribbean monk seal (*Monachus tropicalis*), the only native pinniped.

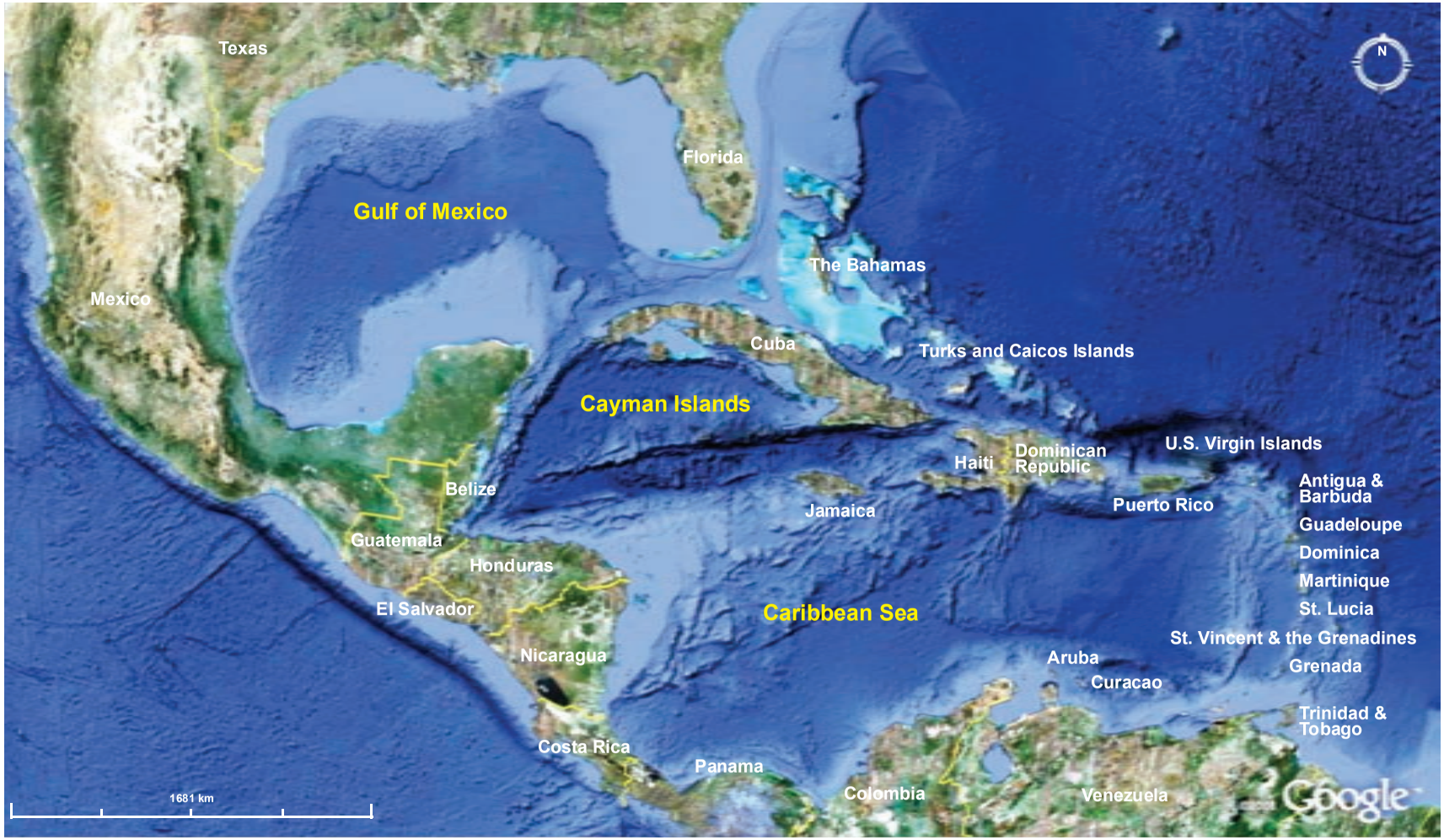

Figure 1. The Wider Caribbean Region
(Data: SIO, NOAA, U.S. Navy, NGA, GE8CO. © 2009 Europa Technologies © 2009 Google © Image 2009 TerraMetrics)

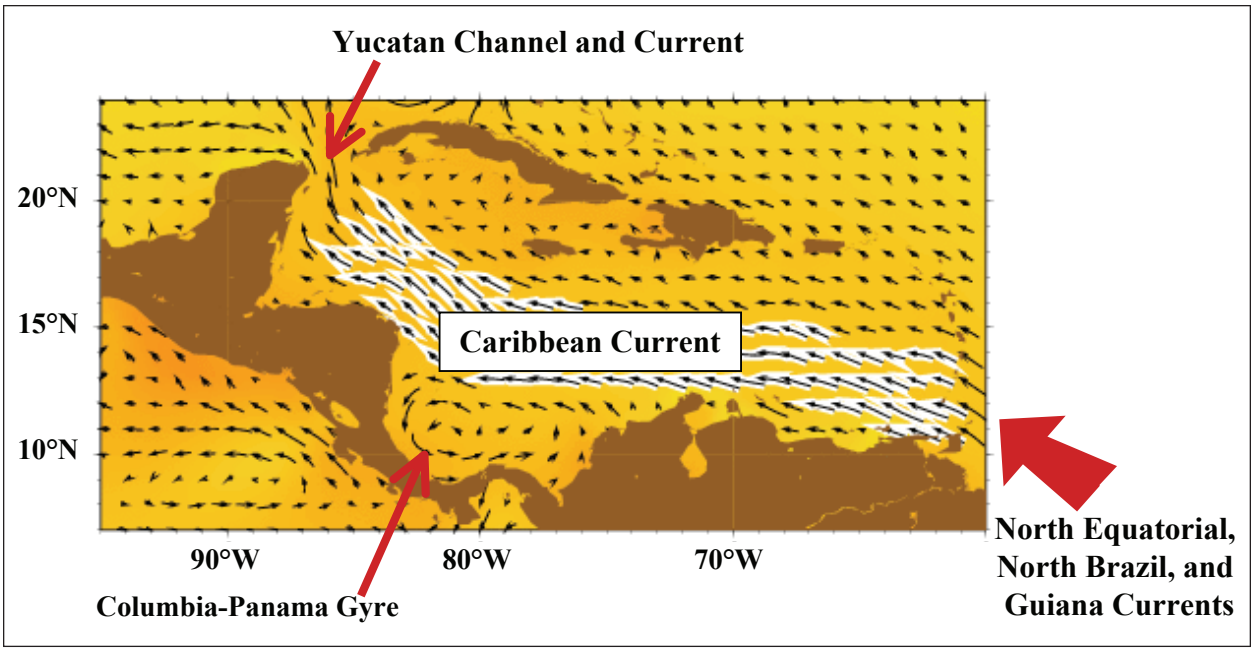

Figure 2. Oceanographic currents in the Caribbean Sea region
(From http://oceancurrents.rsmas.miami.edu/caribbean/caribbean.html)

Estimated abundance for the West Indian manatee is about 9,000 individuals, distributed unevenly in coastal waters around 21 nations or territories. Fifteen of those island populations are composed of fewer than 300 individuals, indicating that the overall population is fragmented and that many of the island populations are at high risk of extirpation because of their exceedingly low abundance and directed or accidental takes. The United Nations Environment Programme funded an effort to update the Regional Management Plan for the West Indian Manatee (Quintana-Rizzo and Reynolds in press). In 2009 the Commission will publish the document in both Spanish and English to make it broadly available to scientists, managers, and decision-makers in the Caribbean region.

At one time, the Caribbean monk seal may have exhibited the same pattern of small, isolated populations. According to Rice (1973), "up until 1952 there was a small colony of seals on Serranilla Bank," but no reliable sightings have occurred since that time, and the National Marine Fisheries Service has declared the species extinct and removed it from the List of Endangered and Threatened Species (73 Fed. Reg. 63901). Although the Caribbean monk seal no longer exists, pinniped sightings still occur in the Caribbean. These include occasional extra-limital sightings of young hooded seals (*Cystophora cristata*) as far south as Puerto Rico and feral (escaped or released from captivity) otariids, including southern sea lions (*Otaria byronia*) and California sea lions (*Zalophus californianus*).

Cetaceans in the Caribbean Sea do not form a clearly defined or distinct fauna but rather are a subset of the North Atlantic cetacean fauna with occasional incursions from the South Atlantic. Thus, management responsibilities for some species and stocks are shared by a number of different countries, including ones bordered by the North and South Atlantic Oceans.

Major Risk Factors

As is the case throughout much of the world's oceans, lakes, and rivers where marine mammals occur, potential human-related risk factors have been identified but poorly characterized. In the Caribbean Sea region, they are as follows.

Operational (direct) interactions with fisheries: On a global basis, bycatch appears to be the single greatest direct cause of marine mammal mortality (Read 2005), but in the Caribbean Sea region (and many other regions) existing information

Table 2. Cetaceans of the Wider Caribbean Region

Size	Common name	Scientific name
Large whales	Humpback whale	*Megaptera novaeangliae*
	Bryde's whale	*Balaenoptera edeni*
	Common minke whale	*Balaenoptera acutorostrata*
	Sperm whale	*Physeter macrocephalus*
	Blue whale	*Balaenoptera musculus*
	Fin whale	*Balaenoptera physalus*
	Sei whale	*Balaenoptera borealis*
	North Atlantic right whale	*Eubalena glacialis*
Medium whales	Long-finned pilot whale	*Globicephala melas*
	Short-finned pilot whale	*Globicephala macrorhynchus*
	Killer whale	*Orcinus orca*
	False killer whale	*Pseudorca crassidens*
	Pygmy sperm whale	*Kogia breviceps*
	Dwarf sperm whale	*Kogia sima*
	Beaked whales	*Ziphius cavirostris, Mesoplodon densirostris, M. europaeus*, others
Small cetaceans	Common dolphins	*Delphinus delphis*
	Common bottlenose dolphin	*Tursiops truncatus*
	Atlantic spotted dolphin	*Stenella frontalis*
	Pantropical spotted dolphin	*Stenella attenuata*
	Risso's dolphin	*Grampus griseus*
	Guiana dolphin	*Sotalia guianensis*
	Fraser's dolphin	*Lagenodelphis hosei*
	Clymene dolphin	*Stenella clymene*
	Pygmy killer whale	*Feresa attentuata*
	Melon-headed whale	*Peponocephala electra*
	Rough-toothed dolphin	*Steno bredanensis*
	Striped dolphin	*Stenella coeruleoalba*
	Spinner dolphin	*Stenella longirostris*

is not sufficient to characterize the biological significance of this problem. The fisheries involved, the number of animals taken, when and where they are being taken, the status of their populations, and the conservation significance of take levels are all undescribed or poorly described. In at least some parts of the Caribbean (e.g., Curaçao), fishing methods and intensity are likely to result in minimal marine mammal bycatch, but focused, well-designed studies are necessary to confirm that this is the case and, if not, to ascertain the extent of bycatch-related injuries and mortality and determine where and in what fisheries they occur. Doing so is one priority of the International Division of the National Marine Fisheries Service, and the director of that program attended the Commission's annual meeting to participate in discussions on the need for such research. In addition, planned stranding workshops (as recommended in the Marine Mammal Action Plan) provide a mechanism by which local and regional participants can begin to characterize the extent of fishery-related entanglement of marine mammals.

Industrial, recreational, and artisanal fisheries all interact with marine mammals. Marine mammals that are caught incidentally may be discarded, used for bait, or consumed (i.e., they may not be considered "bycatch" at all). The Marine Mammal

Action Plan draws attention to these issues and the need for moving beyond anecdotal data to systematic assessment of fishery interactions.

Despite the fact that manatees are legally protected throughout their range, they also interact with the fishing activities of a number of countries in the region, including the United States. The numbers taken and the effects on local populations are not known but, given the extremely small size of the manatee populations in many Caribbean countries, such taking could lead to local extirpation.

Ecological interactions with fisheries: Fisheries also affect conservation of marine mammals by competing with them for prey and by altering food webs. This issue, long a source of frustration for fishermen and concern for conservationists, is poorly understood in virtually all parts of the world, including the Caribbean. The Marine Mammal Commission has identified assessment of "indirect effects of fisheries" as high priority for research (see Plagányi and Butterworth 2005).

Commercial shipping and recreational boating: The Caribbean Sea, with all its islands, is an area of concentrated commercial shipping (Figure 3). The ships move oil and gas (crude and refined), tourists (e.g., cruise lines), and general cargo. Some of the species of whales known to be killed by large vessels (Laist et al. 2001) are present in the Caribbean. Fishing also adds to the traffic, although fishing vessels are generally smaller, slower, and limited in range. Vessels of all kinds pose three main threats to marine mammals: spills of oil, fuels, or other potentially toxic compounds; noise; and vessel strikes. In addition, some of the individuals involved in the development and approval of the Caribbean Marine Mammal Action Plan expressed concern about the effects of the rapidly expanding cruise ship industry on marine mammals, other wildlife, and coastal ecosystems. Here, too, scientific efforts have not determined the incidence and significance of such effects, either in the Caribbean or other parts of the world.

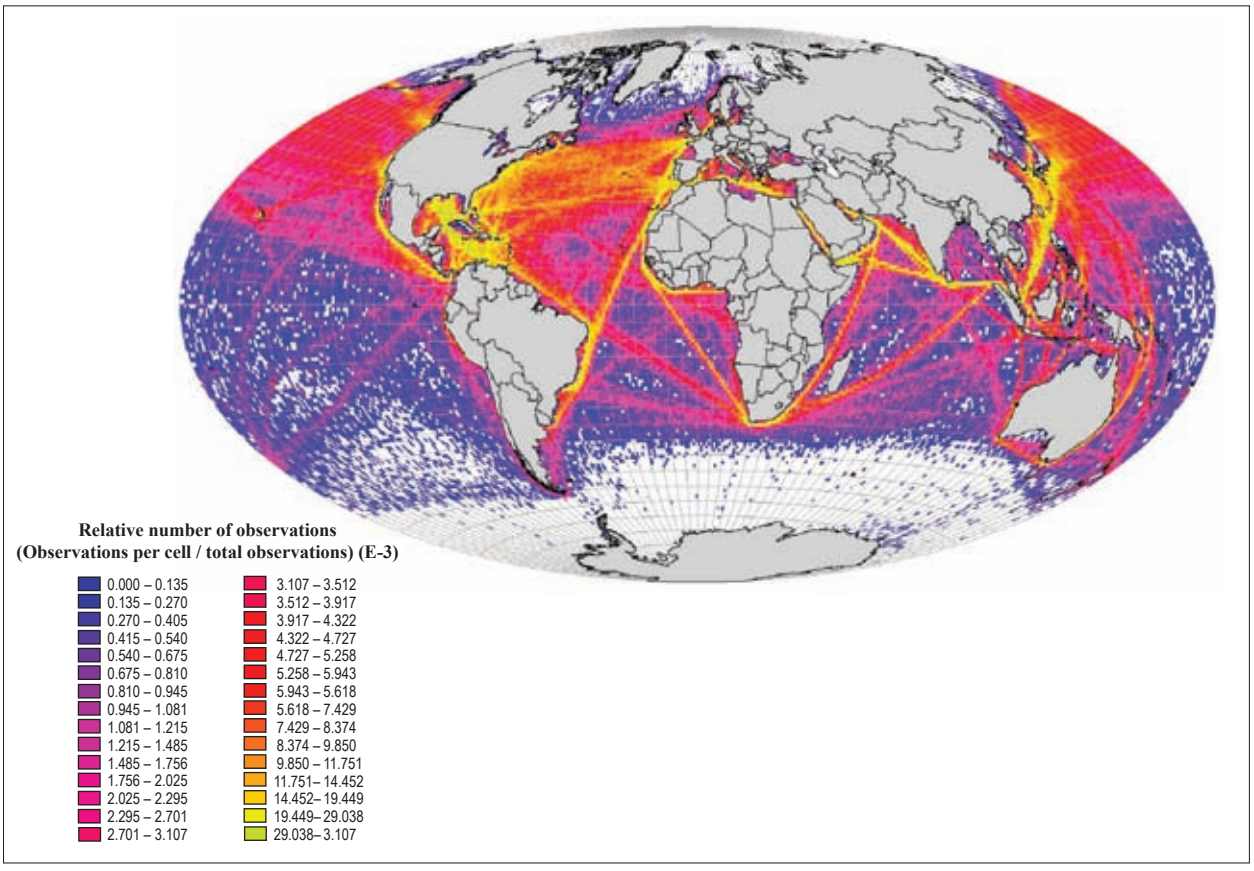

Figure 3. World shipping lanes illustrating the extensive shipping traffic in the Caribbean Sea region (Source: http://www.amver.com, 29 October 2009)

In Florida, collisions with watercraft result in the death and serious injury of many manatees every year (see Chapter IV). This problem has been and continues to be particularly important (and well documented) for the Florida subpopulation of manatees. However, this threat also appears to be increasing for Antillean manatees in some Central and South American countries (e.g., Belize, Brazil). As noted above, the small size of these manatee populations and their relatively high risk of extirpation make them particularly vulnerable to watercraft interactions.

Contaminants: Concerns about contaminant levels and effects in the coastal waters of the Caribbean are widespread and legitimate. Fifty percent of the Caribbean shoreline has been contaminated to at least a moderate degree, primarily by fuel spills from vessels, pesticides used for agriculture, and run-off from developed areas (United Nations Environment Programme 1999). Scientists are capable of measuring contaminant levels in marine mammals but have been largely unable to describe the biological significance of those contaminants. In addition, a comprehensive global overview by O'Shea et al. (1999) of studies of contaminant levels in marine mammals produced just a handful of citations from the Caribbean, despite the concern for contaminant levels and effects in this region.

Documented contaminant levels in marine mammals do not promote informed decision-making unless the effects of those contaminants also are determined. Except in extreme cases, contaminants are not thought to cause immediate mortality. Rather, they are thought to exert long-term effects, primarily by affecting the functioning of reproductive and immune systems. Marine mammals are generally long-lived and store extensive fat and blubber where fat-soluble contaminants are stored. Most are top-level predators that are exposed to contaminants that have accumulated in the food web. Others, such as manatees, may be at risk when they feed on seagrasses and other vegetation and coincidentally ingest contaminated sediments.

The contaminants of primary concern include organochlorine pesticides (OCPs), polyaromatic hydrocarbons (PAHs), polybrominated diphenyl ethers (PBDEs), polychlorinated byphenyls (PCBs), and a small number of heavy metals or elements (e.g., mercury, cadmium, lead, selenium, copper). These and other contaminants may originate from a number of sources, oil and gas being one of the more obvious. Other sources include coastal development, urban run-off, and agricultural development leading to run-off of fertilizers and pesticides. Contaminants and various types of debris may affect marine mammals directly or may degrade the habitat upon which they depend.

Fifteen percent of the oil that the United States imports each year comes from the Caribbean Sea region (Energy Information Administration, http://www.eia.doe.gov/emeu/cabs/ Caribbean/OilRefining.html). Offshore and coastal production is greatest in the waters around Venezuela and Mexico and around Trinidad and Tobago, just offshore of northeastern Venezuela. However, crude oil and gas are shipped from those sites to refineries, and the shipping and refinement processes also are sources of contaminants. Major refineries are located in Cuba, Netherlands Antilles (both Aruba and Curaçao), Dominican Republic, Trinidad and Tobago, U.S. Virgin Islands, and Jamaica. Oil and gas enter marine and coastal environments at or near refineries, but transportation of oil also is a major source of oil entering the marine environment (National Research Council 2003). In some locations, people living downwind of refineries have been reported to suffer significant health risks and high mortality. PAHs have been found at very high levels in coastal environments of Trinidad and Tobago (Siung-Chang 1997).

Contaminants may become more available to marine ecosystems because of climate change. If climate change causes a general increase in strength and frequency of hurricanes, those hurricanes will perturb nearshore sediments and resuspend contaminants. The contaminants may then enter the food chain with effects on both wildlife and people.

The United Nations Environment Programme developed a major report on land-based sources of contaminants in the Caribbean (for this and other useful publications, see www.cep.unep.org). The effects of some contaminants may be felt locally, but other contaminants disperse and travel long distances in the atmosphere and in ocean currents. In addition to their effects on marine mammals, contaminants pose risks to marine ecosystems generally, potentially affecting their health and stabil-

ity, and to human health. However, until scientists have better information on contaminant effects, governments are not likely to invest in expensive mitigation measures. Thus, studies of such potential effects are necessary to either (a) allay unnecessary fears where levels and effects are low or (b) promote focused and aggressive mitigation where health, reproduction, and survival are at risk.

Noise: Oil and gas operations also are a source of noise from seismic testing, construction, general operations, and vessel and other (e.g., helicopter) support. Seismic surveys focus high levels of low-frequency sound energy downward through the water column and into the seabed to investigate the subsea geology, locate potentially exploitable deposits of oil and gas, and monitor changes in those deposits as exploitation proceeds. Although intermittent, the loud, low-frequency sound from these surveys may affect marine mammals at close and far distances. Scientists have incomplete knowledge of the effects of different underwater sounds on marine mammal health and survival; however, those effects likely range from changes in behavior that alter habitat-use patterns to those that, under more extreme conditions, cause changes in behavior or serious injuries that lead to stranding and subsequent death.

Commercial vessels also produce large amounts of low-frequency noise, and a general increase in the background din in the marine environment (McDonald et al. 2006) has often been attributed largely to the increase in commercial shipping. That increase is projected to continue as human numbers and international trade increase, with an expected doubling of ship traffic in the first three decades of the 21st century (U.S. Department of Transportation 1999).

Although perhaps less obvious, any sort of vessel traffic (or even low-flying air traffic) adds to noise levels in the water. Although the incremental increase in sound due to a single large tanker is substantial, so too is the cumulative noise from a large number of recreational boats, fishing vessels, personal watercraft, Coast Guard ships, tourism vessels, etc. Attention to date has focused on loud, acute sounds rather than on the chronic noise from a multitude of everyday activities. Both sorts of noise need to be documented and monitored and their effects on marine mammals and other acoustically sensitive species mitigated whenever they may have significant effects.

Military activities also contribute to noise in the marine environment, and the use of naval sonar, in particular, has become highly controversial because of the potential effects on marine mammals. Naval operations employ a variety of sonars, but low- and mid-frequency types have garnered most attention. Both of these types are used to detect quiet submarines, low-frequency sonar being used over greater distances while mid-frequency sonar is used in close quarters. Mid-frequency sonar has been linked to a number of stranding or mortality events in U.S. and other waters. Perhaps the most noteworthy incident occurred in the Bahamas in 2000 (Anonymous 2001) when naval exercises using mid-frequency sonar led to the deaths of at least 17 marine mammals, mostly beaked whales. The effects of mid-frequency sonar require further investigation, and the U.S. Navy has taken important steps in that direction by using a testing range in the Bahamas where it can monitor marine mammal behavioral responses to various sounds. Such studies are in the early stages of development but offer great potential for reducing uncertainty regarding the potential effects of noise on marine mammals.

Whale-watching: Tourism is an economic pillar of the Wider Caribbean Region, and whale-watching is a rapidly growing tourist activity. Hoyt and Iñíguez (2008) reviewed whale-watching activities in Latin America and estimated an increase in associated income of about 11 percent annually over the past decade. Their data indicated that whale-watching contributed as much as $278 million into the Caribbean economy in a single year.

In addition to its ability to generate income, properly conducted whale-watching and manatee-watching provide potentially valuable sources of information on the marine mammals in the Caribbean region, including their habitat use, movements, distribution, behavior, and relative abundance. That being said, whale-watching has itself been a controversial activity in some regions as it can disturb the animals, and vessels can strike or collide with the whales or manatees being observed. Here, too, management efforts are needed to investigate and balance the costs and benefits of this kind of tour-

ism to ensure that it helps conserve cetacean and manatee populations.

The desire to observe marine mammals in the wild often leads to or is associated with a desire to interact with, follow, feed, or swim with the animals. Although such activities are illegal in many areas, they are increasing dramatically throughout the world's tropical and subtropical regions. Delphinids (e.g., bottlenose dolphins *[Tursiops truncatus]*, spinner dolphins *[Stenella longirostris]*) and manatees are most often involved, as many populations of these species use coastal waters for feeding, resting, and nursing their young and therefore are accessible to shore-based tourism.

The Caribbean-wide Marine Mammal Action Plan placed high priority on development of best practices for marine mammal-watching in the region. Such practices would be useful for guiding an increasingly important economic activity while helping to ensure that its effects are tolerable for the populations involved.

Bringing dolphins into captivity: Just as tourism ventures offer opportunities to observe marine mammals in the wild, various oceanaria and aquaria are developing opportunities to interact with dolphins in captive settings. Bringing dolphins into captivity has generated considerable controversy, pitting economic opportunity, education, and recreation against concerns about animal welfare and the conservation of wild populations, particularly when the animals are being removed from the wild solely for display and recreational purposes. The controversy is exacerbated by the growing, lucrative international trade in dolphins, with individual animals sometimes being sold for tens of thousands of dollars. The effects of removals on source populations are often poorly studied, and some populations may not be able to sustain the levels of removals. A number of countries in the Caribbean region are taking steps to provide the necessary monitoring and regulation although the force and success of such efforts remain to be seen. The Specially Protected Areas and Wildlife (SPAW) Protocol of the Cartagena Convention (considered later in this chapter) contains specific language designed to protect species of wildlife from undue human impacts, including removal for captivity. Certain conservation groups at the Commission's annual meeting expressed concern about the capture of wild dolphins for public display.

Marine mammal harvests: Cetaceans are hunted regularly around St. Lucia and St. Vincent and the Grenadines and opportunistically elsewhere in the Caribbean (e.g., dolphin meat has been sold in markets in Trinidad and Tobago, and Price [1985] refers to occasional catches around Dominica and Martinique). Humpback whales *(Megaptera novaeangliae)* are hunted regularly at Bequia (St. Vincent and the Grenadines), but otherwise the cetacean fisheries target mainly dolphins and "blackfish," a generic term that can include pilot whales (Globicephala spp.), false killer whales *(Pseudorca crassidens)*, and other small or medium-sized, black-skinned cetaceans (e.g., see Reeves 1988, 2002). Although humpback whale hunting in Bequia is closely monitored and subject to management by the International Whaling Commission, the taking of other cetaceans, which may total several hundred animals per year, is largely unmonitored and unregulated. Thus, hunting could be having significant effects on local stocks of harvested species (see Reeves et al. 1987, Reeves 2002) if the animals are being taken from small, local, or island-associated populations.

As noted previously, manatees are hunted for food in many countries across their range. Manatee meat can be found in markets at prices that are reported to reach as high as $100 (U.S.) per pound. Thus, the monetary value of a dead manatee can be substantial and, to a coastal villager, perhaps much higher than the perceived value of the same animal while alive. Situations such as this pose a great challenge to conservation.

Coastal development and habitat degradation: The islands of the Caribbean provide a variety of coastal habitats (e.g., coral, mangrove, seagrass) that are vulnerable to the effects of coastal development and associated human activities. Marine mammals that depend on nearshore habitat often are at increased risk because of their proximity to human activities. The effects may be direct (e.g., construction-related disturbance, contaminants, debris, vessel strikes and noise, harmful algal blooms) or indirect (i.e., altering the physical or chemical features of the habitat or the biological communities that they support). Assessing such effects, individually or cumu-

latively, requires baseline information that is generally not available in the Caribbean or, for that matter, in many other coastal regions of the world.

Nonetheless, as a possible index of "environmental health," it may be useful to consider what has happened in recent decades to coral reefs in the region. Caribbean coral reefs are vulnerable to a range of threats including sedimentation, eutrophication, contaminants, overfishing, algal growth, bleaching, rising temperatures, invasive species, diseases, physical damage, and acidification from climate change. On a regionwide basis, hard corals have declined about 80 percent (Gardner et al. 2003). Such changes have implications not only for the reefs per se but also for the many ecological services that they would otherwise provide, such as habitat for fish species ranging from gobies to large sharks and destinations for tourism. What changes would be necessary to support coral reef recovery and whether, in fact, they can recover at all are now subjects of active research and debate. Nonetheless, as an indicator of marine ecosystem health, Caribbean corals are now sounding a very disturbing alarm.

Climate change: Under normal climatic conditions, atmospheric and oceanic currents transfer heat energy from tropical and subtropical regions toward the poles. Climate change is increasing the amount of heat energy so transferred, and much of the attention given to climate change has focused on the profound changes underway in Arctic and Antarctic ecosystems. Tropical and subtropical marine ecosystems also are being affected and are highly vulnerable to the effects of climate change. Sea level rise from melting snow and ice on land (i.e., glaciers) poses significant risks to many island-based marine ecosystems, particularly those that are low-lying and protrude only a few meters above sea level (Baker et al. 2006). These islands (including some located in the Caribbean) may be inundated by rising sea levels, accompanying changes in nearshore currents, or both.

Ocean acidification is less obvious to our senses but highly disruptive to tropical and subtropical marine ecosystems. As noted, increasing acidification is killing corals and destroying coral reefs in the Caribbean and worldwide (Hoegh-Guldberg et al. 2007). It is also disrupting ocean production by pteropods, small planktonic organisms that may lose their ability to form their calcareous shells as the oceans become more acidic (Pacific Marine Environmental Laboratory, http://www.pmel.noaa.gov/co2/OA/). Thus, ocean acidification threatens entire ecosystems and food webs. On a global scale, such acidification may result from increased carbon dioxide in the atmosphere and entering the oceans. On a regional basis, Caribbean oil refineries may add to that problem because the oil in that region is high in sulfur. Under current practices, refineries create large piles of sulfur that is exposed to the atmosphere and oxidized to form highly acidic sulfur dioxide.

The relationship between climate change and hurricanes is not completely clear, but the Caribbean region is clearly vulnerable to such storms. Any increase in the frequency or strength of hurricanes could have severe effects on coastal ecosystems in particular. In addition to their more visible impacts from the shoreline landward, they also affect shallow-water ecosystems, disturbing and destroying habitat important for marine life, ranging from coral reefs to certain marine mammals. Manatees may be the most vulnerable, and observations in the coastal regions of Florida have revealed the disappearance (and presumed death) of manatees following intense storms. Changes in weather patterns (e.g., temperature, precipitation) also may affect coastal ecosystems by changing run-off patterns from land, altering salinity where freshwater and saltwater systems mix, and resuspending sediments and causing increased bioavailability of certain contaminants.

Finally, climate change alone or in combination with various human activities may contribute to harmful algal blooms and dead zones, both indicative of disturbed or altered ecosystem states. These phenomena have been better studied off the southeastern United States but also may occur in the Caribbean region with changes in water temperature and nutrient input. Harmful algal blooms and dead zones are similar phenomena in some respects, and both can be detrimental to populations of invertebrates, fish, seabirds, and marine mammals.

Cumulative effects: To persist, populations of marine mammals and other marine organisms must be able to tolerate not only the effects of any single risk factor but also the combined effects of multiple factors. Effects may be additive if they operate in-

dependently or either synergistic or countervailing if they interact. For example, as reef ecosystems deteriorate from climate change, coastal bottlenose dolphins could be required to extend their feeding range, thereby increasing their risk of interactions with fisheries—a negative synergistic effect.

Scientific Capacity

Many recent publications have discussed the role of science in the conservation of marine mammals and marine ecosystems. High-quality scientific research can provide information that, if properly communicated, informs decision-makers and influences mitigation and conservation efforts. However, the availability of good scientific information does not necessarily lead to conservation action. In addition, scientific information is not always communicated in a way that convinces or compels decision-makers to respond in ways that lead to improved conservation. Furthermore, and most important, many conservation issues are so urgent that solutions need to be implemented immediately based on what is known, rather than waiting for prolonged monitoring or more scientific studies. At its annual meeting the Marine Mammal Commission applauded the various Caribbean nations and territories for their evident interest in and willingness to learn from experience elsewhere and to develop their own capacity to conduct scientific studies. At the same time, the Commission urged them to take a precautionary approach and to implement actions immediately to address those issues judged to be most urgent.

Purposes: In the Wider Caribbean Region, scientific research is needed to (1) determine species composition and population structure, (2) assess the status of each population, (3) characterize important natural history traits including habitat use, (4) determine vulnerability to various threats in the region, and (5) identify and develop appropriate monitoring, prevention, and mitigation measures.

An understanding of population structure is necessary to identify appropriate conservation units, but such structure is poorly understood for the majority of marine mammals in the region. Structure is generally defined on the basis of reproductive mixing, which is most reliably determined using genetic information. Absent such information, population structure often is described on the basis of demography (status, trends, age/sex composition), morphology (change in shape or form that are expressions of genetic variation), and geography (indicative of differences in ecological niche or demographic isolation). For example, Bryde's whales *(Balaenoptera brydei)* in the Caribbean and in the Gulf of Mexico may constitute multiple distinct populations, depending on their degree of reproductive isolation. If applicable to the Caribbean, recent research findings in Hawaii (Baird et al. 2009) suggest that a number of species of beaked whales and small delphinids may form separate local or island-associated populations that must be considered in the development of management and conservation strategies.

In general, investigation of population structure is a necessary precursor for determining population status. That is, the concept of status is most useful and reliable when the unit to which it applies is clearly described. Status usually has been defined in terms of abundance, trends, and mortality levels, but the concept is being expanded to include other indicators such as the health, reproductive potential, and condition of individuals.

Understanding status and the factors that affect it generally requires insight into natural history, including such things as distribution, movement patterns, diet, foraging patterns, and behavior. These traits help determine whether marine mammals are at risk from, for example, bycatch in fishing gear, entanglement in debris, hunting, exposure to contaminants, or vessel strikes.

The likelihood of maintaining marine mammal populations in a healthy status is enhanced by careful assessment and mitigation of threats. In the Caribbean Sea and elsewhere, threats are relatively easy to identify but difficult to characterize and quantify in a meaningful way. For example, in the Caribbean region, the number and species of marine mammals taken for food are unknown, as are the levels of bycatch in fisheries, the number of animals struck by vessels, and the influences of climate change, contaminants, and noise. The lack of such information complicates the setting of priorities and undermines or precludes a proactive, cost-effective management strategy.

A number of research tools are being used in the Caribbean to build a working knowledge of species, populations, and pertinent risk factors. Many

of these tools are used opportunistically because resources are not sufficient to support systematic research programs. Biopsy sampling is being used with some species (e.g., humpback whales) to understand population structure and, in some cases, to investigate contaminant levels. Photographs are being used to identify individuals, estimate abundance, and investigate individual animal behavior and habitat use. Manatee-watching and whale-watching provide platforms to collect photographs and study the distribution, movements, habitats, and behavior of some populations. In exceptional cases, satellite-linked tags are being attached to certain species to study distribution, movements, and behavior. Scientists are gathering what information they can from stranded animals, and such opportunistic data collection provides information on the species present, their natural history (e.g., diet based on stomach contents), and threats (e.g., entanglement in fishing gear). Ongoing work on beaked whales in the Bahamas may be especially useful to clarify certain effects of underwater noise on especially vulnerable species. Support for these studies comes primarily from the U.S. Navy, prompted by the strandings of whales during a Navy mid-frequency sonar exercise in 2000. The studies have several components, including beaked whale natural history, population ecology, and behavioral responses to human-generated sound. Although expensive, such studies provide an excellent opportunity to understand cetacean responses to noise and resolve at least some of the associated controversy. They also provide a basis for more effective management of this risk factor. Finally, in 2007 the Puerto Rico Department of Natural and Environmental Resources created a Marine Mammal Rescue Program with the intent of enhancing research opportunities.

Despite such efforts, the shortage of scientific information on marine mammals and risk factors in the Caribbean region greatly diminishes the possibility that those factors will be managed in a well-directed, cost-effective manner. To focus research efforts in the near future, the Caribbean Marine Mammal Action Plan prioritized three efforts to develop capacity to study and better understand selected threats to marine mammals. Those included (a) a series of workshops to establish stranding networks that use similar methods and collect comparable data, (b) a workshop to create a code of conduct for marine mammal watching enterprises and to promote the use of such enterprises to enhance data collection (e.g., via photo-identification), and (c) a workshop to promote sampling and analyses to determine the extent to which contaminants constitute a significant risk for marine mammals in parts of the Caribbean. At its annual meeting in Puerto Rico, the Marine Mammal Commission expressed interest in these activities and indicated a willingness to try to help find support for them.

Solutions to the various risk factors for marine mammals and marine ecosystems of the Caribbean cannot await the development of region-wide, multi-year studies. The critical threats must be identified and mitigated to the extent possible based on what is known today. However, under the auspices of the Marine Mammal Action Plan and the United Nations Environment Programme (see later discussion), the Commission endorsed the idea of maintaining an expert working group to guide selected studies that will clarify the nature and intensity of threats and, in turn, inform and focus management and conservation efforts.

Management

The Convention for the Protection and Development of the Marine Environment of the Wider Caribbean Region (the Cartagena Convention): The Cartagena Convention (described at http://www.cep.unep.org/cartagena-convention/cartagena-convention.pdf) provides the primary international legal framework for the protection and development of the marine environment in the Wider Caribbean Region. As such, it represents a vital tool for conservation of habitat and wildlife, including marine mammals. The Convention entered into force in 1986, and 23 of 28 possible countries and territories (including the United States) have signed as contracting parties. The purpose of the Convention is to protect the Caribbean marine environment by promoting regional cooperation, and it is the only regional agreement that facilitates intergovernmental efforts to ensure economic and ecological sustainability.

The Cartagena Convention is built around three protocols. They are the Protocol Concerning Co-op-

eration in Combating Oil Spills in the Wider Caribbean Region (which entered into force in 1986), the Protocol Concerning Pollution from Land-Based Sources and Activities (which has not yet been ratified by enough countries to allow it to enter into force), and the Protocol Concerning Specially Protected Areas and Wildlife (which entered into force in 2000). The latter is often referred to as the SPAW Protocol and is intended to protect and preserve sensitive areas, threatened and endangered species, and species of regional concern. The SPAW Protocol has been widely recognized for its intent to use an ecosystem approach to conservation, and it represents an important vehicle to assist with implementation of the Convention on Biological Diversity, as well as other initiatives. To date, 13 countries (including the United States) have ratified the SPAW Protocol. As noted below, the Caribbean-wide Marine Mammal Action Plan was developed under the auspices of SPAW, and the plan was approved at the Conference of Parties to SPAW in September 2008.

The Caribbean Environment Programme is headquartered in Kingston, Jamaica, and represents one of the Regional Seas Programmes of the United Nations Environment Programme. The Caribbean Environment Programme is responsible for providing a framework to implement the Cartagena Convention, generally, and SPAW, specifically. The three primary sub-programmatic foci for the Programme are (a) Assessment and Management of Environmental Pollution, (b) Communication, Education, Training, and Awareness and (c) SPAW. The Programme's work is facilitated by the Caribbean Regional Coordinating Unit, also located in Kingston. The Coordinating Unit serves as Secretariat to the Caribbean Environment Programme and seeks to (a) provide assistance to all countries of the region, (b) strengthen national and subregional institutions, (c) coordinate international assistance, and (d) stimulate technical cooperation among countries. Some of the work of the Programme and Coordinating Unit is conducted through a Regional Activity Centre located on Guadeloupe.

The Marine Mammal Action Plan: Several years ago, the Caribbean Environment Program started working with representatives of Caribbean countries that had ratified the SPAW Protocol to develop a Caribbean-wide marine mammal action plan. The goal was to create a network similar to the acclaimed WIDECAST (Wider Caribbean Sea Turtle Network) program for sea turtle conservation and research in the Caribbean. The development of the marine mammal action plan involved a number of meetings with country representatives and an expert working group that was coordinated by the Regional Activity Center. The Chairman of the Marine Mammal Commission and a member of the Commission's Committee of Scientific Advisors on Marine Mammals participated in this effort.

In 2008 the parties completed the Action Plan for the Conservation of Marine Mammals (MMAP) in the Wider Caribbean Region (available at http://www.cep.unep.org/publications-and-resources/promotional-material/publications/spaw/mmap). The plan was formally approved at the September 2008 Conference of Parties in Antigua.

The plan is intended to address the issues described previously: the general inadequacy of scientific information, protection measures, national capacity, conservation policy, enforcement, and public understanding and involvement. To address those matters, it establishes a framework to—

- improve knowledge and build alliances to assess and manage fisheries interactions, habitat degradation, pollution, vessel strikes, and climate change;
- improve local, national, and regional capacity to address and/or manage strandings, whale-watching, marine mammals in captivity, marine protected areas, and sources of human-generated noise; and
- improve research capacity to, among other things, fill existing data gaps, provide a stronger basis for management, and ensure adequate monitoring of marine mammal status.

Its more specific and immediate priorities include—

- developing and adopting standardized reporting forms for fisheries-related takes;
- creating a group of marine mammal experts to guide research efforts;
- conducting stranding workshops to train personnel in the skills and activities required to respond to the stranded animals and collect pertinent data;
- developing best practices for marine mammal-watching; and

- convening a workshop to organize research on sources and effects of contaminants.

The plan provides important structure and momentum, and the Marine Mammal Commission has made a commitment to provide expertise and funding, as possible, to help parties make progress toward the plan's goals.

The Manatee Action Plan: The United Nations Environment Programme also is preparing a separate regional management plan for the West Indian manatee. The plan describes the status of the West Indian manatee, its fragmented distribution, the primary threats to the species, and impediments to its conservation. It also describes a variety of recommended conservation actions, including protection of key habitat areas, enforcement, and outreach and education. With regard to research, the plan emphasizes general stock assessment including consistent surveys to investigate abundance and habitat-use patterns, screening for information on health and contaminants, evaluation of human-related risk factors, and collection of information from stranding networks. As noted earlier, in 2009 the Marine Mammal Commission will print this document in English and Spanish to make it available to managers, decision-makers, and interested individuals or groups.

Marine Protected Areas: Marine protected areas have become a topic of great interest throughout many of the world's oceans, particularly in coastal regions. Their usefulness depends on the extent to which they actually provide protection, as opposed to being protected areas in name only. In that regard, they vary widely, some offering little or no protection while others provide strong limits on potentially harmful human activities. Given the mandate and scope of the Cartagena Convention, protecting habitat is an obvious focus of the ratifying countries, and in 2008 the Caribbean Environment Program developed a regional approach to creating and managing protected areas (www.cep.unep.org).

A so-called "sister sanctuary" relationship has been established between the Silver Bank Sanctuary in the Dominican Republic and the Stellwagen Bank National Marine Sanctuary off the U.S. East Coast (managed by the National Ocean Service). These sanctuaries share a common population of humpback whales at the reproductive and feeding ends of the species' range, and the relationship between the two sanctuaries facilitates the sharing of information and expertise to enhance understanding of that population and its conservation needs. The information gathered to date has contributed significantly to two large ocean-basin projects—the Year of the North Atlantic Humpback (YONAH) and More Years of the North Atlantic Humpback (MONAH). Data collected in these and related studies indicate that the waters off the Dominican Republic constitute a substantial portion of the winter reproductive habitat for the humpback whales that feed in summer months in various parts of the western and northern North Atlantic.

The role of non-governmental organizations: In the absence of adequate governmental support, non-governmental organizations have assumed both leadership and supportive roles in promoting marine mammal research and conservation in the Caribbean region. To date, much of the marine mammal research and conservation work in the Caribbean has been initiated and carried out by various individuals and non-governmental organizations, and they deserve great credit for their work.

Gulf of Mexico

The Gulf of Mexico is bordered by the United States, Mexico, and Cuba and is considered part of the Wider Caribbean Region. It covers 1.6 million km^2, about one-fifth of the area of the continental United States. It has an average depth of about 1,615 m and consists of a deep central basin surrounded by a broad continental shelf with the shelf break varying from gradual in the west to relatively steep in the east (Figure 4; http://www.gulfbase.org/facts.php). The major source of sea water is from the Caribbean Current entering the Gulf through the Yucatan Channel. There, the water is entrained into a clockwise Gulf current, eventually exiting the Gulf between Florida and Cuba and joining the North Atlantic Gulf Stream flowing northeastward along the North American coast. Within the Gulf, the current occasionally forms counterclockwise eddies and oceanic fronts that provide important habitat for the Gulf's biota. The Gulf also receives extensive fresh water from several rivers, the Mississippi and Atchafalaya Rivers being the most prominent. The Mississippi River drains 41

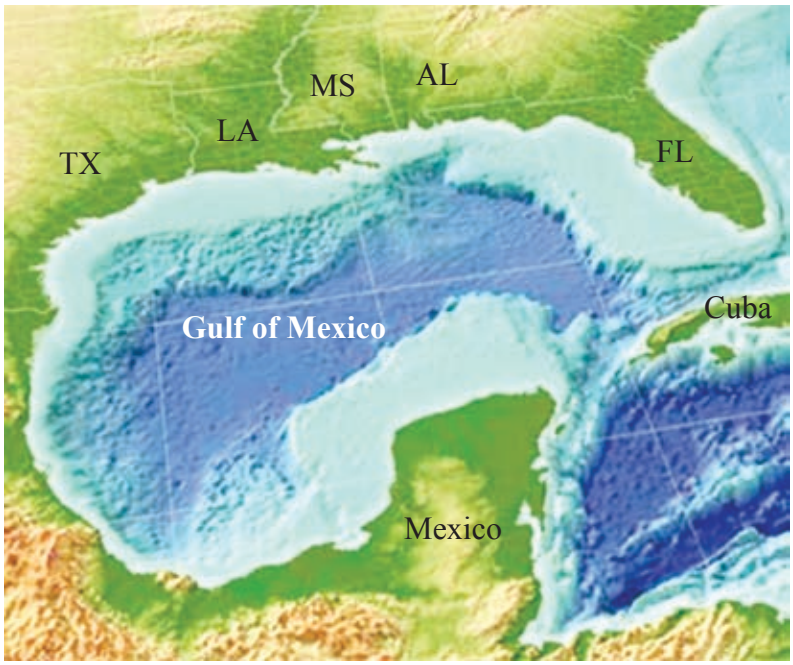

Figure 4. Gulf of Mexico showing continental shelf and shelf break

(Source: U.S. Army Corps of Engineers. Available at http://www.ndc.iwr.usace.army.mil/factcard/fc08/factcard.htm)

percent of the continental United States, carrying water, sediments, nutrients, and contaminants to the Gulf (http://www.mvn.usace.army.mil/pao/bro/misstrib.htm). Finally, the Gulf is well known for its weather patterns, particularly its hurricanes. In 2005 alone, 27 named storms and 13 hurricanes pounded the U.S. Gulf coasts of Florida, Alabama, Mississippi, Louisiana, and Texas (http://gulfofmexicoalliance.org/actionplan/actionplan1.html). Such events are capable of major physical, biological, and ecological effects, particularly in shallow water and nearshore areas (e.g., bays, estuaries, coastal wetlands).

Marine Mammals

The National Marine Fisheries Service lists 21 marine mammal species as occurring in the Gulf of Mexico, all cetaceans (Table 3, http://www.nefsc.noaa.gov/publications/tm/tm210/). The Fish and Wildlife Service manages one additional species, the Florida manatee (*Trichechus manatus latirostris*), a sirenian. Historically, Caribbean monk seals (*Monachus tropicalis*) likely ventured into the Gulf, but because that species is now extinct, the only pinnipeds seen in this body of water are, with rare exceptions, ones (mostly California sea lions, *Zalophus californianus*) that have escaped from captivity. In general, the stock structure of marine mammals that occur in the Gulf, or that occur in both in the Gulf and the Atlantic, is not well understood. The stock structure of bottlenose dolphins (*Tursiops truncatus*) appears to be the most complex, based in large part on the fidelity of inshore dolphins to particular bays, inlets, sounds, and estuaries. The National Marine Fisheries Service presently recognizes 33 inshore stocks, 3 coastal stocks, 1 continental shelf stock, and 1 oceanic stock of bottlenose dolphins. The relationships among these stocks are still being investigated using genetic techniques and other research tools. Management of such a large number of stocks clearly presents a challenge, even for the most basic processes such as stock assessment. However, to the extent that the identified stocks reflect actual social and reproductive units, recognizing and accounting for the differences among them appear to be necessary if management efforts are to succeed in protecting and conserving the ecological functions of bottlenose dolphins within the Gulf's inshore and coastal ecosystems.

Risk Factors

The Gulf of Mexico is highly industrialized and heavily used for a variety of human activities, including coastal development, commercial and recreational fishing, oil and gas extraction, commercial shipping, military exercises, and tourism. These activities pose risks to marine mammal populations through loss of habitat; operational (e.g., bycatch) and ecological (e.g., competition) fishery interactions; ship strikes; and exposure to noise, other forms of disturbance, contaminants, disease, harmful algal blooms, and dead zones. The following discussion provides an overview of these risk factors and their potential effects on marine mammal populations.

Table 3. Cetacean species in the Gulf of Mexico

Common name	Scientific name
Sperm whale	*Physeter macrocephalus*
Bryde's whale	*Balaenoptera edeni*
Cuvier's beaked whale	*Ziphius cavirostris*
Blainville's beaked whale	*Mesoplodon densirostris*
Gervais' beaked whale	*Mesoplodon europaeus*
Common bottlenose dolphin	*Tursiops truncatus*
Atlantic spotted dolphin	*Stenella frontalis*
Pantropical spotted dolphin	*Stenella attenuata*
Striped dolphin	*Stenella coeruleoalba*
Spinner dolphin	*Stenella longirostris*
Rough-toothed dolphin	*Steno bredanensis*
Clymene dolphin	*Stenella clymene*
Fraser's dolphin	*Lagenodelphis hosei*
Killer whale	*Orcinus orca*
False killer whale	*Pseudorca crassidens*
Pygmy killer whale	*Feresa attenuata*
Dwarf sperm whale	*Kogia sima*
Pygmy sperm whale	*Kogia breviceps*
Melon-headed whale	*Peponocephala electra*
Risso's dolphin	*Grampus griseus*
Short-finned pilot whale	*Globicephala macrorhynchus*

Source: http://www.nefsc.noaa.gov/publications/tm/tm210/

Coastal Development: In 2008 Florida, Alabama, Mississippi, Louisiana, and Texas had a combined population of about 54.7 million people (http://quickfacts.census.gov/qfd/states/48000.html), and demographers project that by 2030 the total population of these states will be about 74.8 million (http://www.census.gov/population/www/projections/projectionsagesex.html). This is an increase of 20 million people, half of which is expected to reside in coastal regions. The Gulf's coastal regions are composed entirely of lowland areas, including wetlands, marshes, barrier islands, coral reefs, beaches, and mangrove forests. These areas have been and continue to be altered markedly to accommodate human population growth and the industry associated with it. For example, about 40 percent of the country's wetlands are in Louisiana, and those are being lost at the rate of about 90 km^2 per year (National Ocean Service 2008).

Sediment input from the Mississippi, Atchafalaya, and other rivers is a significant element of the Gulf's coastal ecosystems but is being changed markedly. Over the past century, the sediment load from the Mississippi River has declined from about 396 mt per year in 1851–1853 to 82 mt per year in 1963–1982 (Kesel 1988). The decline reflects upriver activities (building of dams and levees, straightening of river banks, changes in land-use patterns). It also fundamentally alters the natural processes that created a sizable portion of the Gulf's coastal ecosystems. In addition, vessels require certain water depths, and many of the Gulf's ports are dredged on a continuous basis. In 2006 dredging removed about 100 million m^3 of sediment from major ports in the Gulf (http://www.ndc.iwr.usace.army.mil/dredge/drgcorps.htm). Beaches also are an important economic asset for the Gulf states, particularly Florida. Each year, hundreds of miles of beach are maintained by adding sand either transported from inland areas or dredged from the marine environment.

Population growth and economic expansion in the foreseeable future will undoubtedly lead to further alteration and destruction of coastal ecosystems within the Gulf. Following the destruction caused by hurricanes Katrina and Rita in 2005, restoration of natural coastal ecosystems has become a common topic because such systems provide a degree of protection from storms. Whether and to what extent restoration is undertaken and, in the end, whether it will be successful remains to be seen. Although activities associated with coastal development may take marine mammals directly, their more significant effect likely comes through alteration of the ecology of coastal regions and a diminished ability to support healthy marine mammal populations and marine ecosystems.

Commercial and recreational fishing: Commercial fishing in the Gulf of Mexico accounts for about 25 percent of the total annual fishing revenue in the United States. Three of the top six U.S. commercial fishing ports by weight landed are in the

Gulf, and Louisiana ports account for about 70 percent of the Gulf landings. The largest catches are of menhaden, brown shrimp, white shrimp, blue crab, and eastern oyster. Recreational fishing in the Gulf accounts for 40 percent of the overall U.S. total by weight landed, the majority of which is taken in the waters off Florida (http://www.st.nmfs.noaa.gov/st1/fus/fus08/index.html).

The National Marine Fisheries Service publishes an annual List of Fisheries that categorizes commercial Gulf fisheries based on the frequency with which they take marine mammals. Fourteen of those fisheries are listed in category III (remote or no likelihood of taking marine mammals), two (menhaden and gillnet) in category II (occasionally takes marine mammals), and one (pelagic longline) in category I (frequently takes marine mammals). The placement of the pelagic longline fishery in category I is based primarily on injury and mortality of short- and long-finned pilot whales in the Mid-Atlantic Bight rather than the Gulf of Mexico. In general, however, the effects of fisheries on marine mammal populations are uncertain because most are poorly monitored or observed. For example, data on the menhaden fishery collected from 1992 to 1995 suggested that 172 dolphins were taken, of which 57 died. Despite evidence of continuing takes, the National Marine Fisheries Service has failed to implement and maintain an observer program for this fishery. Similarly, the Service does not place observers on gillnet fisheries in the state waters of Louisiana, Mississippi, and Alabama. Furthermore, many of the nearshore marine mammal stocks that might be taken in these fisheries occur locally and are inherently small in number and vulnerable to human-related sources of mortality. Thus, managers have good reason to be concerned about the incidental taking of marine mammals in Gulf of Mexico fisheries but have little information to ensure that the impact from fisheries is not detrimental.

Oil and gas development: Twenty-one percent of the U.S. production of natural gas and 30 percent of oil come from the federal waters in the Gulf of Mexico. There some 4,000 platforms of varying sizes pump oil and gas through 40,000 km of pipeline—enough to encircle the globe at the equator (Figure 5). The principal threats from these operations are oil spills and leaks; noise and disturbance associated with seismic studies, construction, maintenance, and support activities; ship strikes from support vessels; habitat degradation from contaminants (e.g., crude oil, production wastes); and noise or blasting impacts from removal of platforms. The industry must remove at least 100 platforms annually, which is generally done using explosives. Despite modest research efforts, the potential effects

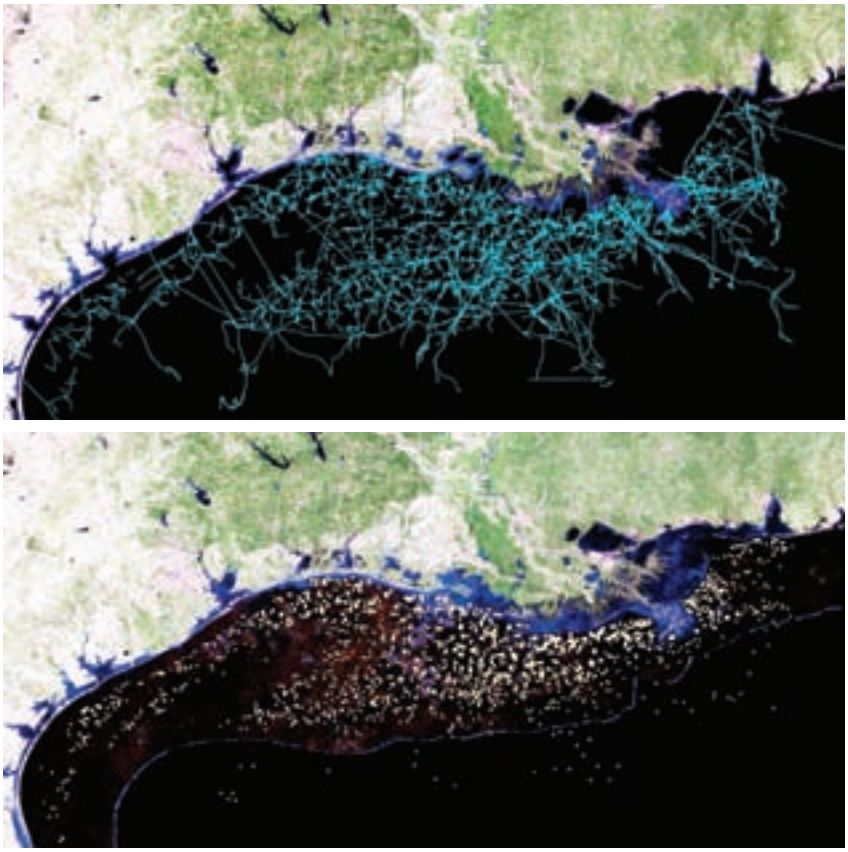

Figure 5. U.S. Geological Survey maps of offshore oil and gas pipelines (above) and platforms (below) in the Gulf of Mexico

of these sources of risk are, at best, only partially understood.

From 2000 to 2008 the Minerals Management Service documented 134 spills (of 50 barrels or more) of crude oil, refined oil products, synthetic fluids, or chemicals (http://www.mms.gov/incidents/spills1996-2008.htm). The largest number of spills occurred in 2005 when hurricanes Katrina and Rita together destroyed 115 platforms, damaged another 52 platforms, and damaged 535 pipeline segments (http://www.mms.gov/tarprojectcategories/hurricaneKatrinaRita.htm). Although these events are not known to have affected wildlife, such effects—if they occurred—are not likely to have been detected under hurricane or storm conditions. Spill statistics indicate that transport of oil through pipelines is safer than transport by tankers. However, the extent of spillage or leakage from pipelines is difficult to determine. Under normal operating conditions, the best available leak detection systems for pipelines are capable of detecting leaks of a few tenths of 1 percent of throughput. Leakage of, say, 0.4 percent of a throughput of 30,000 barrels per day could introduce up to 120 barrels of crude oil per day into the marine environment without detection by leak detection systems. For that reason, those systems must be complemented with aerial and shipboard surveys whenever possible to pick up oil at the surface. Aircraft and vessels that are used for supporting platform operations also are used to survey for oil. In addition, the Coast Guard surveys for oil in the Gulf.

Oil and gas operations rely on initial seismic studies to search for and characterize potential oil and gas reservoirs and guide the placement of platforms and drilling operations. Oil and gas companies then use additional studies to monitor changes to the reservoirs as extraction proceeds. In any given month, between 5 and 20 seismic studies are conducted in the Gulf (Figure 6). As a result, large amounts of sound energy are released annually into the Gulf environment. This introduction of noise has been a matter of some controversy because of concern that it may injure or potentially kill marine mammals or disrupt biologically important behaviors or habitat-use patterns. The extent of such effects remains largely unknown, but the Minerals Management Service and collaborating agencies

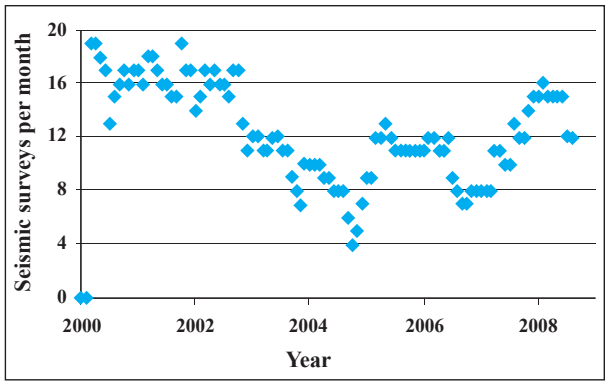

Figure 6. Number of seismic surveys per month in the Gulf of Mexico

(Source: Energy Information Administration, http://tonto.eia.doe.gov/dnav/pet/hist/e_ertces_xs0_r48f_cm.htm)

and organizations have supported considerable efforts to investigate the potential effects of seismic surveys, primarily on sperm whales (*Physeter macrocephalus*) (Jochens et al. 2008), as described later in this chapter. As required by the Marine Mammal Protection Act, the Service also has applied to the National Marine Fisheries Service for authorization to take marine mammals incidentally during the course of seismic studies.

Commercial shipping: Commercial shipping is a major activity within the Gulf. Six of the ten largest ports (by tonnage shipped) in the United States are in the Gulf of Mexico (U.S. Army Corps of Engineers 2007). The ships that use these ports pose a number of risks to marine mammals and other elements of the Gulf ecosystem, including ship strikes and the introduction of noise, contaminants, and alien species. As noted under coastal development, shipping requires constant dredging in some areas to maintain sufficient water depth. Ships may introduce contaminants by using various solvents for deck washing and other maintenance duties. They may introduce alien species if those species attach to their hulls or are transported outside their range in bilge or ballast water, the latter used for maintaining ship stability. Commercial vessels also carry large amounts of fuel oil, which is highly toxic and may have significant ecological effects if spilled.

Military activities: Branches of the U.S. military use the Gulf of Mexico for vessel and aircraft

training and testing activities involving various weapons (missiles, bombs, etc.) and technologies. The largest training/testing area is the U.S. Air Force Eglin Range, which covers most of the eastern third of the Gulf (Figure 7). Military exercises and oil and gas activities are largely separated, a form of ocean zoning. The principal threats to marine mammals from military activities are disturbance; potential injury or death from noise, explosive impact, or marine mammal/vessel collisions; and loss of important habitat as a result of long-term disturbance. Monitoring of military activities by the Navy suggests that injurious and lethal effects are rare. The Navy does not use the Gulf for extensive low-frequency or mid-frequency sonar training, and training exercises in this region generally have been much less controversial than those in other U.S. coastal waters. The Navy's spending on environmental analysis nearly doubled between fiscal years 2004 and 2008, with approximately $30 million being spent in fiscal year 2008 (Figure 8). The majority of that funding was aimed at surveys of marine mammal abundance and distribution and technologies for detecting marine mammals. Further increases are expected in planning and carrying out training and testing exercises in the Gulf and in the environmental analyses that must accompany such exercises.

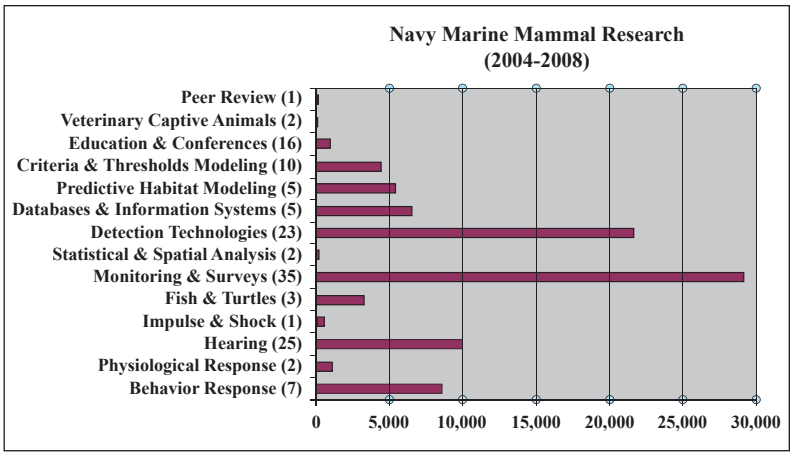

Figure 8. Total funding by the U.S. Navy (in thousands of dollars) by research topic from 2004 to 2008 (numbers in parentheses indicate the number of studies during the 2004 to 2008 period)

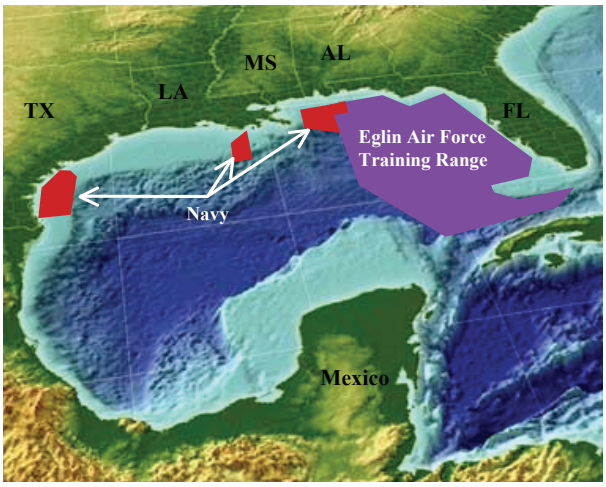

Figure 7. Approximate locations of the Eglin Air Force Training Range and three Navy training ranges in the Gulf of Mexico

Pollution, dead zones, and harmful algal blooms: Exposed as it is to extensive river input, coastal development, various types of industry (e.g., oil and gas), and military exercises, the ecology of the Gulf of Mexico has been and is being altered significantly by various human-generated contaminants. These result in at least four effects, including the introduction of toxic chemicals and compounds, the introduction and growth of harmful bacteria, the creation of dead zones, and the creation of harmful algal blooms (Figure 9). In its founding document, the Gulf of Mexico Alliance (described later) noted that 57 percent of the Gulf's estuaries have been degraded by excess nutrients. These nutrients can lead to blooms of various plankton that either (1) die and decay, thereby depleting the oxygen in the water (i.e., an anoxic dead zone) or (2) produce toxic chemicals that pose risks to other forms of marine life (i.e., a harmful algal bloom). The Gulf of Mexico dead zone is among the world's largest, sometimes extending from the mouth of the Mississippi River to waters off eastern Texas. Harmful algal blooms (e.g., red tides) have occurred for hundreds of years in the Gulf but are now increasing in frequency and occur annually or nearly constantly in some areas, such as off western Florida. Red tides are caused by the algae *Karenia*

Figure 9. Aerial view of a red tide event (Photograph courtesy of Peter Franks, University of California at San Diego)

brevis, which produces various brevetoxins that can be harmful to fish, seabirds, marine mammals, and humans. *Karenia brevis* normally occurs in low densities in offshore waters and then moves inshore in the winter. There, in the presence of nutrients (i.e., fertilizers) from rivers emptying into the Gulf, the algae may bloom. Over time the blooms appear to have become larger and more persistent, perhaps because of increased water temperature in the Gulf. Currents then carry the algae from the northern Gulf to waters off western Florida, where red tides have killed a variety of marine life including fish, seabirds, and marine mammals. The marine mammals most frequently affected are bottlenose dolphins (mortality events occurred in 1947, 1987, 1994, 1996, 1999/2000, 2004, 2005, 2006, 2007, and 2008) and manatees (mortality events occurred in 1963, 1982, 1996, 2002, 2003, 2005, 2006, 2007, and 2008). Unusual mortality events in recent years are described in greater detail in Chapter VII. All of the previously mentioned factors—contaminants, bacteria, dead zones, and harmful algal blooms—are strong indicators of degraded marine ecosystems.

Climate change: Climate change appears to be having, and almost surely will continue to have, profound effects on the Gulf of Mexico marine ecosystem, primarily through four mechanisms. The first is the increased heating of tropical and subtropical waters in the Caribbean and Atlantic, increasing the propensity for more frequent and/or stronger hurricanes and storms, with associated implications for marine mammals and ecosystems such as resuspension of contaminated sediments (see previous section of this chapter on Caribbean Sea). The second involves a reconfiguration of the Gulf's coastal regions from increases in sea level, both diminishing and creating new wetlands, reshaping estuaries and bays, and altering coastlines. More than half of the coast is vulnerable to sea level rise associated with climate change (Theiler and Hammar-Klose 2000), and therefore the coastal regions of the Gulf can be expected to undergo considerable change in coming decades. The third involves the biological effects of increasing water temperatures, which likely will favor continued growth of harmful algal blooms and may fundamentally shift the Gulf's trophic web. The fourth involves changes in the composition, cycles, and flows of freshwater into the Gulf because of changing continental weather patterns. For a more complete discussion, see the Caribbean section earlier in this chapter.

Tourism and recreation: Tourism is a mainstay of the Gulf of Mexico economy, as is true of the Caribbean. Tourism also provides an important mechanism for promoting conservation of marine mammals by educating the public on the values and benefits of healthy marine ecosystems. At the same time, tourism and recreational activities can pose significant threats to marine mammals, including (1) boat strikes of manatees, (2) disturbance caused by whale-watching, (3) harassment of marine mammals as humans attempt to interact with them (e.g., swimming with dolphins), and (4) acclimation of marine mammals to humans through interactions such as feeding of wild dolphins. The last of these factors also may increase the probability of depredation by dolphins on the bait used in commercial and recreational fisheries or their catch. Such interactions increase the probability that fishermen will take measures that injure or kill the dolphins. Interactions of dolphins with fisheries have increased markedly in the past few decades, as have tourism ventures that offer the public a chance to interact with wild dolphins. With some success, the National Marine Fisheries Service has been carrying out a campaign to reduce such interactions in the Gulf and other regions, such as Hawaii. Nonetheless, more needs to be done to prevent these interactions.

Research

Research on marine mammals in the Gulf of Mexico has generally fallen far short of that envisioned in the Marine Mammal Protection Act. Despite considerable efforts by individual scientists and a few laudable projects carried out jointly by several research and management agencies (e.g., the sperm whale seismic study described in the following paragraph), the existing scientific information on marine mammals in the Gulf generally does not provide a sound foundation for conservation efforts. The types of research needed fall into at least five main categories: (1) stock structure, (2) natural history, (3) status, (4) risk factors, and (5) efficacy of management efforts. The kinds of questions needed to shed light on these topics are illustrated in Table 4. Most of those questions remain unanswered for virtually all marine mammal species and stocks in the Gulf. Answering all of these questions for each population stock would be a daunting task, and research strategies using limited resources must evaluate the pertinence and priority of any particular question. Nonetheless, the existing information, or lack thereof, clearly signals the need for greater support of marine mammal research in the Gulf of Mexico.

Two exceptions to generalizations about the lack of adequate research efforts warrant description: the sperm whale and manatee. The sperm whale illustrates an exceptional case where a coordinated, reasonably well-funded research program has generated valuable insight into the ecology of sperm whales in the Gulf and their tolerance to noise introduced by seismic studies. From 2002 to 2005 the Minerals Management Service coordinated a $9.2 million sperm whale seismic study (referred to as SWSS). The objectives were to (1) establish baseline information on the biology and behavior of sperm whales in the northern Gulf, (2) characterize the species' habitat use in that area, and (3) determine possible behavioral responses of sperm whales to human-generated noise, particularly from seismic studies. The study was conducted by researchers from Texas A&M University, Woods Hole Oceanographic Institution, Oregon State University, Scripps Institution of Oceanography, University of Colorado, University of South Florida, University of St. Andrews (United Kingdom), and University of Durham (United Kingdom). The Minerals Management Service, Fish and Wildlife Service, Industry Research Funders Coalition, National Science Foundation, and Office of Naval Research all contributed support. The key findings describe sperm whales in the Gulf, elements of their population structure and important natural history traits and behaviors. The results also suggest that sperm whales farther than 1 km from vessels conducting seismic studies do not respond by moving away from them but may alter their behavior by decreasing their foraging rates.

The other exception involves the Florida manatee. The principal risks to this population are boat strikes, red tides, loss of habitat from coastal development, and, in the coming decades, loss of warm-water refuges because of shutdowns or conversions of power plants. Research to assess the manatee population and its vulnerability to these risks is conducted principally by the U.S. Geological Survey at the federal level and the Florida Fish and Wildlife Conservation Commission at the state level. The state of Florida has contributed substantially to manatee research and management, and a review of funding for endangered marine mammal species indicated that no other state provides comparable, high-level support for the conservation of an endangered marine mammal (Marine Mammal Commission 2008). Much of the state's research effort is focused on determining causes of death, and each year state biologists collect and conduct necropsies on several hundred dead manatees. The results have been vital in understanding the risks to manatees and guiding management actions aimed at recovery.

A third case, the bottlenose dolphin, warrants mention because it highlights intense study of some populations (e.g., Wells et al. 2004) and neglect of others (Waring et al. 2007). As indicated previously, the stock structure of this species is highly complex due to partitioning of Gulf habitat into inshore, coastal, continental shelf, and oceanic realms and the fidelity of inshore and coastal bottlenose dolphins to particular geographic areas. The Southeast Fisheries Science Center of the National Marine Fisheries Service has the expertise to evaluate this structure but progress has lagged for years due to the lack of resources for sampling and

analysis. Understanding this structure and assessing the status of the stocks is imperative because these dolphins live near the very interface of land and sea and, therefore, are exposed to sometimes intense interactions with human activities. Like the Florida manatee, this species also appears to be significantly affected by harmful algal blooms along the Gulf's northern coast.

Other data gaps in the stock assessment reports for Gulf marine mammals provide evidence that the scientific effort and support in this region are inadequate. Abundance estimates may be the single most important indicators of status, and such estimates are available with sufficient precision to meet the National Marine Fisheries Service's own standards (coefficient of variation ≤ 0.3) only for the sperm whale, the Atlantic spotted dolphin (*Stenella frontalis*), the pantropical spotted dolphin (*Stenella attenuata*), and Risso's dolphin (*Grampus griseus)*—that is, 4 of the 21 cetacean species in the Gulf. As a group, these species are difficult to study. Nonetheless, the problem to date has had more to do with the lack of effort than the difficulty of the task.

Management

Management challenges in the Gulf of Mexico pertain to sustainable use the Gulf's services and products without significant degradation of its natural ecological character. The principal agencies responsible for managing either marine mammals or the activities that pose risks to them are the National Marine Fisheries Service, Fish and Wildlife Service, Minerals Management Service, Navy, Air Force, Army Corps of Engineers, and various state agencies of Florida, Alabama, Mississippi, Louisiana, and Texas. With regard to the protection of marine mammals, the major challenges for each agency are as follows.

National Marine Fisheries Service: The National Marine Fisheries Service must balance potentially conflicting mandates—that is, managing fisheries that are important to the nation's food production and economy but that pose risks to the marine mammals that also are under the Service's protection. Fishing likely poses the single largest direct and immediate threat to marine mammals worldwide, including the Gulf of Mexico. In the United States, the three major tools for protecting marine mammal stocks from adverse, incidental fishery interactions are (1) the stock assessment framework set forth in section 117 of the Marine Mammal Protection Act, (2) the implementation of observer programs to determine the number of marine mammals taken incidental to commercial fishing operations, and (3) the implementation of take reduction efforts under section 118 of the Act if the level of taking may be impeding the maintenance of marine mammal stocks at—or their recovery to—optimum sustainable population levels. Such efforts may include convening take reduction teams, developing take reduction plans, and implementing and enforcing take reduction measures.

The Service's implementation of these tools in the Gulf of Mexico has fallen well short of that envisioned in the Act. As noted earlier, the Service can provide abundance estimates that meet its own precision standards for only 4 of the Gulf's 21 marine mammal species and only 4 of the 24 stocks identified in stock assessment reports for the Gulf (which group 33 inshore bottlenose dolphin populations into one stock and 3 coastal populations into one stock). Many of the existing abundance estimates now are or soon will be outdated (more than eight years old). Abundance estimates for estuarine stocks are based on surveys conducted nearly two decades ago (from 1992 to 1994). The last complete aerial surveys for continental shelf stocks were flown from 1992 to 1996, and the last complete vessel surveys were conducted in 1998 to 2001. The Navy funded vessel surveys for oceanic stocks in 2003 and 2004. The Service planned to survey oceanic stocks in 2008, but the survey was cancelled because of inadequate funding. Although smaller surveys have been conducted more recently in portions of the Gulf, the majority of stocks in this region are poorly studied, undermining the Service's ability to conserve them.

With regard to assessing interactions between marine mammals and commercial fisheries, managers have long recognized that self-reporting by fishery participants is not reliable; they often operate in isolated areas and are subject to conflicts of interest that weigh against their reporting interactions. The most reliable monitoring method to date has been the placement of independent observers on fishing vessels. Here again, the Service has either lacked

Table 4. Pertinent research topics and questions regarding marine mammal species in the Gulf of Mexico

I. Stock structure
- *How many population stocks exist within each species?*
- *To what extent are they reproductively isolated?*
- *What is the rate of movement among stocks?*

II. Natural history
- A. Distribution and movement patterns
  - *What is the range of each stock?*
  - *How is it distributed within that range?*
  - *Does it undertake seasonal migrations?*
- B. Habitat types and uses
  - *What types of habitat are essential for the stock and how does it use them?*
- C. Foraging patterns
  - *What are the stocks' primary prey?*
  - *Where and when do members of the stock forage?*
- D. Reproductive patterns
  - *What is the stock's reproductive habitat?*
  - *How long does a calf remain with its mother (i.e., when does weaning occur)?*
- E. Social structure
  - *What are the stock's social association patterns?*
  - *How do they change over time (e.g., during the reproductive season)?*

III. Status
- A. Abundance
  - *How many individuals exist in the stock?*
- B. Trend and growth rate
  - *How is the stock's abundance changing over time?*
  - *What is the stock's potential growth rate given its life history?*
- C. Age/sex distribution
  - *How is the existing stock distributed among different age and sex classes?*
- D. Health and condition
  - *What diseases, parasites occur in the stock?*
  - *What is their prevalence and conservation significance?*
  - *What is the general condition of animals within the stock and, if it is less than healthy, what factors are responsible?*
- E. Vital rates (reproduction, survival)
  - *What is the age of maturity or first reproduction?*
  - *What is the reproductive rate for mature females?*
  - *What is the survival rate by age classes (e.g., young-of- the-year, juveniles, adults)?*

IV. Risk factors
- A. Coastal development
  - *Is the stock's habitat being lost or degraded by development; if so, how?*
  - *Is the habitat of ecologically related species being lost or degraded; if so, how?*
- B. Commercial and recreational fisheries
  - *How many individuals of the stock are seriously injured or killed in fisheries?*
  - *Which fisheries/gear types cause the most serious injury and deaths?*
  - *What is the tolerance of each stock for such losses?*
  - *What mitigation measures are available and what measures are being used?*

Pertinent research topics and questions regarding marine mammal species in the Gulf of Mexico
(continued)

C. Oil and gas development
- *How much oil is lost to the environment and how is it lost (e.g., leaks, spills)?*
- *How does it affect marine mammals directly or indirectly through contamination of their habitat (e.g., prey resources)?*
- *How do disturbance and noise associated with construction, operations, and de commissioning of platforms and pipelines affect marine mammals?*

D. Military activities
- *How many individuals of the species are seriously injured or killed during the course of these activities?*
- *Do these activities affect marine mammal habitat- use patterns or behavior; if so, how and how significant are the effects?*

E. Pollution, dead zones, and harmful algal blooms
- *What contaminants are being absorbed and stored in marine mammals?*
- *What are their biological effects (e.g., reproduction, immunology)?*
- *What are their sources?*
- *Can they be removed from the environment?*
- *How can they be addressed at their source?*
- *What are the biological and ecological effects of dead zones on marine mammals?*
- *How can scientists predict harmful algal blooms?*
- *How can the factors that contribute to these blooms and dead zones be controlled?*

F. Climate change
- *How will increasing water temperatures affect the ecology (composition, diversity, trophic structure) of Gulf of Mexico ecosystems?*
- *How will sea level rise affect coastal and inshore marine ecosystems and how will those effects alter the quantity and quality of coastal marine mammal habitat?*
- *How will an increase in the frequency and/or strength of storms in the Gulf of Mexico affect marine mammal injury or mortality and gulf ecology?*
- *How will changes in freshwater input into the gulf affect marine mammal habitat?*

G. Tourism and recreation
- *What are the conservation benefits of whale-watching and other tourism activities?*
- *How might whale-watching be used to collect information on marine mammals?*
- *What are the adverse effects of whale-watching?*
- *How much illegal taking occurs (e.g., feeding or harassing wild marine mammals)?*
- *What are the trends in marine mammal harassment from tourism?*

H. Cumulative effects
- *What is the combined effect of multiple risk factors on any given stock?*
- *Do the risk factors exert independent effects or do their effects interact with each other to create countervailing or synergistic effects?*

V. Management strategies

A. Mitigation
- *What mitigation measures are available?*
- *What measures have been validated and how well do they work?*
- *What uncertainties and gaps remain in mitigation strategies?*
- *What development activities are needed to address those uncertainties and gaps?*

B. Monitoring
- *How might monitoring data be better collected, stored, and analyzed to provide insights into new mitigation approaches?*
- *How might monitoring data be used to assess mitigation efficacy over large temporal and spatial scales?*

sufficient resources to provide—or when funding has been available has opted not to provide—adequate observer coverage, or any coverage at all, for most Gulf fisheries using longlines, gillnets, trawls, purse seines, and pots and traps. All these types of fishing gear are known to injure and kill marine mammals. Only the pelagic longline fishery is classified as a category I fishery, and observer coverage for that fishery varies from 5 to 8 percent (or occasionally higher). Observer coverage for the shrimp fishery in federal waters is now mandatory rather than voluntary, but covers 1 percent of the fishery. The menhaden purse seine (category II), gillnet (category II), and crab and lobster pot (category III) fisheries are not observed at all, despite extensive evidence of take from past years in the menhaden purse seine fishery and of interactions with research fishing using gillnets and fisheries using the same gillnet and pot/trap gear in other U.S. waters. Indeed, the failure of the Service to provide adequate or, in some cases, any observer coverage raises serious questions as to how these fisheries can be accurately categorized. In essence, the Service can provide neither precise estimates of marine mammal stock abundance nor reliable estimates of the number of marine mammals taken in fisheries, thereby undercutting the primary means of collecting the information essential for managing marine mammal-fishery conflicts. Although the Service has convened a total of eight take reduction teams (which have had varying degrees of success), it has not convened a single team for any fishery in the Gulf of Mexico.

The northern Gulf of Mexico, particularly the waters off Louisiana and Florida, also supports extensive recreational fishing that interacts with marine mammals, especially small cetaceans and particularly bottlenose dolphins. As noted previously, dolphins may be more inclined to approach boats if they have been fed by humans hoping to interact with them. In particular, ventures offering tourists an opportunity to swim with dolphins, some of whom have been known to attract the animals by feeding them, have diminished the dolphins' natural fear of such situations. As a result, the dolphins may be conditioned to approach commercial and recreational fishing boats where they can be caught on hooks or entangled in lines as they attempt to eat bait or catch. In the worst cases, such interactions frustrate fishermen or tourism guides to the point where they resort to measures that injure or kill the dolphins, including shooting and use of explosives. If not properly managed, interactions between fishermen and marine mammals are bound to increase as fishing effort increases. The Marine Mammal Commission has brought this issue to the Service's attention in numerous letters. The Service is attempting to address this problem through outreach and education measures to inform people of the applicable laws and the risks and consequences associated with violating those laws. However, absent adequate and sustained support for monitoring and enforcement, managers are hard pressed to determine the frequency of such events and therefore whether those measures are working. The available evidence suggests that managers have been reasonably effective at reducing but not eliminating one form of illegal interaction—tours that advertise opportunities to swim with dolphins. Nonetheless, more needs to be done or the circumstances will almost certainly worsen as a result of human population growth in the Gulf region and increased fishing effort.

The Service also uses stranding networks to collect information on marine mammals that become sick or that are injured or killed and to increase its management capacity throughout the northern Gulf of Mexico. These networks consist largely of volunteers who have had varying amounts of training in dealing with stranded marine mammals. When the stranded animals are still alive, these volunteers provide humane care, such as keeping live stranded animals damp and covered to minimize sunburn. They also collect basic information that can be analyzed to learn more about the species that strand, the causes of strandings, and the stranding patterns over time and space. The Service has been attempting to expand and develop such networks in all regions of the country, including the Gulf. They provide a valuable complement to the Service's efforts, although they are not a substitute for fulfilling important Service responsibilities, such as implementation of observer programs.

Managing interactions between marine mammals and fisheries, both commercial and recreational, in an area as large as the Gulf of Mexico is a considerable undertaking, To date, the evidence

indicates that the Service's management efforts in the Gulf lag well behind those in other parts of the country and are falling far short of the standards established by the Marine Mammal Protection Act. Because the major problems are lack of assessment and observer data, the cause appears to be failure on the Service's part to obtain and direct the resources necessary to fully implement its research and management responsibilities under the Act.

Fish and Wildlife Service: The Fish and Wildlife Service faces very different challenges in the Gulf of Mexico. It is responsible for conserving the West Indian manatee in the waters off both Florida and Puerto Rico. The major threats to the Florida manatee are boat strikes, harmful algal blooms, and loss of habitat. The last of these factors is expected to become an especially serious threat to manatees as aging power plants are closed or replaced and no longer produce thermal effluents that create artificial warm-water refuges for manatees during the winter. Sea level rise from climate change also may have significant effects on manatee habitat, although the change is expected to be gradual and the net effect may be to increase or decrease the amount and quality of habitat available for manatees.

The Fish and Wildlife Service's efforts to conserve the Florida manatee are strongly bolstered by those of the state of Florida, a situation unmatched elsewhere in the United States. To date, the combined management efforts have achieved notable success: counts of various sorts over the past four decades provide compelling evidence that the manatee population has increased during that period. At the same time, however, the state's human population also has increased considerably—by about three million over the past 15 years —and is expected to increase another 10 million in the next 20 years (http://www.census.gov/population/www/projections/projectionsagesex.html). Growth of both the manatee population and Florida's human population likely will exacerbate the conflict between the use of coastal habitats by humans and manatees. Overall, the continuing high level of boat-related mortality, the now-common deaths from red tides, the impending loss of warm-water refuges, the ever-increasing human demand for coastal and inland waterway habitat, and the unpredictable effects of climate change mean that the long-term future of the Florida manatee remains uncertain.

Minerals Management Service: The Minerals Management Service does not have lead responsibility for marine mammal conservation but undertakes or regulates a number of activities that pose threats to marine mammals. That being the case, the Service is responsible for ensuring that the actions it takes or regulates under the Outer Continental Shelf Lands Act are consistent with the Marine Mammal Protection Act, Endangered Species Act, National Environmental Policy Act, Coastal Zone Management Act, and other pertinent legislation. With regard to marine mammals, the major questions for the Minerals Management Service are (1) whether the activities it regulates pose excessive risks to the species or its habitat and (2) how it should monitor and mitigate those activities to ensure that their effects do not exceed acceptable levels. As noted previously, the principal threats associated with oil and gas development in the Gulf are disturbance (and possible injury or death) from seismic studies; disturbance from construction, support, and decommissioning of platforms and pipelines; and exposure to contaminants as a result of spills or leaks of crude oil or other potentially toxic materials such as drilling wastes. The Service-sponsored study to assess the effects of seismic noise on sperm whales was a model of interagency, multidisciplinary research. Nonetheless, the study focused on a single species that, although perhaps the most vulnerable, cannot be assumed to be representative of the other marine mammals present in the Gulf's industrialized central and western regions. In that regard, the Service's responsibilities extend beyond this single species, and further research is needed to assess the vulnerability of other potentially affected species. The Service has contracted for a study to assess data collected to date from marine mammal observers stationed on seismic vessels to better assess any impact to marine mammals detected during these surveys.

The Service also has a responsibility to ensure that its activities are not introducing into the Gulf environment contaminants that will enter the food chain, accumulate through ecological processes (e.g., predation), and cause significant effects on the ecosystem's top-level predators, including marine mammals. The amount of infrastructure used to support

oil and gas extraction and transportation in the Gulf is remarkable, but the safety record is generally considered to be good (http://www.mms.gov/incidents/spills1996-2008.htm). However, monitoring the integrity of pipelines, in particular, is not an easy task. The two principal means of detecting pipeline malfunction are (1) vessel cruises and aerial overflights to look for oil slicks at the surface and (2) leak detection systems that monitor pressure and flow within a pipeline to determine if oil is being lost between the source and destination. The Service maintains a control center on the mainland to monitor the flow of oil through the pipelines, enabling it to shut down the pipelines rapidly when problems are detected. The industry, the Minerals Management Service, and the Coast Guard use overflights to search for leaks. The flights are relatively frequent because they also are used for support activities, such as crew changes. All that being said, the amount and environmental effects of oil entering the marine environment from drilling and transport are not clear. If the underlying concern is that leaked oil is entering the food web to a degree that poses conservation risks, then one additional means for assessing the impacts of leaks would be to test tissues from animals that may have been exposed to oil for elevated levels of polycyclic aromatic hydrocarbons or other contaminants. The Commission knows of no systematic testing of marine mammals in the western and central regions of the Gulf where oil and gas operations are concentrated. However, such testing would provide a direct and useful measure of whether oil in the marine environment is being kept to an acceptable level.

Navy and Air Force: Like the Minerals Management Service, the primary missions of the Navy and Air Force are not focused on the protection of marine mammals and their habitat. However, like the Service, contributing to conservation efforts is required by a suite of legislation, including the Marine Mammal Protection Act. The Navy and Air Force have attempted to act as good stewards of the marine environment, as is evident from the resources that the Navy, in particular, has directed toward research on the effects of sound on marine mammals (see Chapter IX). Nonetheless, much more research is needed to understand fully the impacts of Navy and Air Force operations on marine mammals in the Gulf of Mexico.

The three principal concerns with regard to Navy and Air Force activities pertain to (1) the risk of injury or death of marine mammals from high-intensity noise (e.g., sonar) or pressure waves (e.g., explosives) introduced by testing and training activities; (2) the risk of disturbance that may affect behavior, reproduction, or survival; and (3) the risks stemming from Navy vessel traffic that add to the probability of ship strikes or other encounters that may injure or kill marine mammals. As noted throughout this report and in multiple other publications, the risks from high-intensity sound and explosives have been highly controversial, leading to debate and litigation. However, the Navy does not use the Gulf as an important testing and training ground for sonar, and this controversy has focused on other U.S. waters where such testing and training do occur. The Navy and Air Force do use the Gulf to test and train with various weapons, and this can pose risks to marine mammals in the area. A suite of measures are used to avoid injuring or killing marine mammals, principally surveys prior to and after testing and training activities to ensure the area involved is clear (to the extent it can be determined by surveys) and that any injured or killed marine mammals are discovered and reported. The results to date indicate that adverse effects occur only rarely. The interpretation of those results, however, hinges on whether one considers the monitoring and mitigation measures to be effective. The uncertainty is generally cast as two questions: (1) if marine mammals were in a target area prior to or during testing or training, what is the likelihood that they would be detected, and (2) if marine mammals were in the area and were injured or killed, what is the likelihood that they would be discovered and reported during post-activity surveys. Answering these types of questions requires a harder look at monitoring and mitigation measures to determine their efficacy or performance, which is central to the question of whether marine mammals are adequately protected during military training and testing activities in the Gulf and elsewhere.

In addition, pre- and post-monitoring and mitigation measures do not address potential long-term impacts, which can be more subtle but also can pose serious ecosystem and conservation risks. Certain marine mammals, for example, may be more sensitive to repeated disturbance in what oth-

erwise might be their prime habitat. If disturbance causes those marine mammals to abandon such areas for habitat of lesser quality, their ability to reproduce and survive may be compromised. These kinds of shifts are difficult to detect and require long-term datasets that characterize habitat-use patterns under undisturbed conditions for comparison with patterns when prime habitat is disturbed. The existing lack of essential data on marine mammal abundance and distribution in the Gulf precludes such analysis but does not diminish the legitimacy of the question as to whether areas of focused human activities are slowly degrading the quality of marine mammal habitat in large parts of the Gulf of Mexico. Such effects might be particularly likely in nearshore areas where a variety of human activities (e.g., shipping, military training, fishing, oil and gas development) overlap. Despite their difficulty, such analyses are necessary for managers to maintain the health and stability of marine ecosystems as called for under the Marine Mammal Protection Act.

The third concern with regard to Navy impacts on marine mammals pertains to the general level of activity in an area, which may lead to the injury or death of whales as a result of collisions with ships. Vessel commanders are required to report such incidents, but vessel strikes may not be noticed by the crew and may go unreported. Reports to date indicate vessel strikes are infrequent, but they may be significant nonetheless if they involve endangered species or stocks of low abundance. The evidence collected to date is not sufficient to characterize this risk to marine mammals.

Finally, despite the fact that the Navy's primary mission is not marine mammal conservation, its research efforts have contributed significantly to the general understanding of some marine mammals. Because of its extensive infrastructure and stewardship goals, the Navy represents an underutilized partner for marine mammal science. Collaboration between the Navy and the National Marine Fisheries Service has been increasing in recent years, and continued collaboration offers an opportunity to increase our understanding of marine mammals and avoid unnecessary constraints on naval testing and training activities. Furthermore, the Marine Mammal Commission and the Navy have held regular meetings to identify areas of collaboration, among other things.

Army Corps of Engineers: Perhaps more than any other federal agency, the Army Corps of Engineers resides at the sometimes ragged edge between coastal development and conservation. The Corps' mission is to "provide vital public engineering services in peace and war to strengthen our Nation's security, energize the economy, and reduce risks from disasters." Its environmental section is based on environmental operating principles that "foster unity of purpose on environmental issues, reflect a new tone and direction for dialogue on environmental matters, and ensure that employees consider conservation, environmental preservation and restoration in all Corps activities" (http://www.usace.army.mil/Environment/Pages/eop.aspx). Those principles are to—

- Strive to achieve environmental sustainability. An environment maintained in a healthy, diverse, and sustainable condition is necessary to support life;
- Recognize the interdependence of life and the physical environment and proactively consider environmental consequences of Corps' programs and act accordingly in all appropriate circumstances;
- Seek balance and synergy among human development activities and natural systems by designing economic and environmental solutions that support and reinforce one another;
- Continue to accept corporate responsibility and accountability under the law for activities and decisions under the Corps' control that impact human health and welfare and the continued viability of natural systems;
- Seek ways and means to assess and mitigate cumulative impacts to the environment; bring systems approaches to the full life cycle of the Corps' processes and work;
- Build and share an integrated scientific, economic, and social knowledge base that supports a greater understanding of the environment and impacts of the Corps' work; and
- Respect the views of individuals and groups interested in Corps activities, listen to them actively, and learn from their perspective in the search to find innovative win-win solutions to the nation's problems that also protect and enhance the environment.

The Corps' vision, mission, and guiding principles are laudable and emphasize sustainability, restoration, and assessment and mitigation of cumulative impacts, concepts that the Marine Mammal Commission has long championed. Perhaps nowhere in the country have coastal ecosystems been as extensively modified as those in the Gulf of Mexico. Such coastal development rarely injures or kills marine mammals outright, but it does affect the nature of the ecosystems upon which they and other marine life depend. As noted previously, development in Louisiana alone is destroying wetlands at the rate of 90 km^2 per year. Wetlands provide vital services for inland, coastal, and even pelagic habitat. They filter water, provide protection from storm surges, and serve as nursery grounds for myriad invertebrates and fishes. On that basis, they contribute to or help structure marine trophic webs that extend from primary producers to top-level predators, including marine mammals. Oceanographic science is teaching us that ocean discontinuities or interfaces provide essential habitat for many of the ecological processes that occur in the ocean. In that regard, no interface or discontinuity is more ecologically significant than the coastline where land, sea, and air meet.

The States of Florida, Alabama, Mississippi, Louisiana, and Texas: In 2004 the governors of the states of Florida, Alabama, Mississippi, Louisiana, and Texas entered a partnership with 13 federal agencies to form the Gulf of Mexico Alliance. The intent of the alliance is to promote healthy and resilient coasts through regional collaboration. On 28 March 2006 the governors signed a joint Governors' Action Plan focusing on efforts to improve water quality, promote wetland and coastal conservation, enhance environmental education, characterize Gulf habitats, and reduce nutrient inputs.

Indeed, the states have a vital role to play in promoting the health of the Gulf ecosystem in at least three important respects. The first is that the states regulate activities that occur within state waters (generally within 3 nmi of shore). In the Gulf, that means that they regulate significant portions of the Gulf's nearshore fisheries (commercial and recreational) and oil and gas development. The second is that they also regulate coastal development and have the authority to conserve ecologically important coastal habitat. In essence, they determine—or exert strong influence on—the balance between development and conservation. And third, they regulate and manage many inland activities that lead to the transport of debris and contaminants into the Gulf. How well the states perform their role will strongly influence the ability of the Gulf ecosystem to support healthy food webs and, in turn, the marine mammal populations that are part of those webs. The existence of the dead zone off the Mississippi River delta, increasing frequency of harmful algal blooms and marine mammal mortality events, persistent loss and decline of coastal wetlands, inadequate management of fisheries interactions, and contamination of the nearshore environment via river and atmospheric input all suggest that the states must exert a stronger influence on those human activities that are degrading the Gulf ecosystem. It remains to be seen whether they will do so through the Gulf of Mexico Alliance or through other arrangements such as state and agency partnerships. It also remains to be seen how they will do so when, in the next two decades, they are faced with many competing concerns, such as the need to create nine to ten million new jobs just to keep pace with regional population growth.

Summary

The Caribbean Sea region and the Gulf of Mexico support diverse assemblages of marine mammals that, with some notable exceptions, are poorly studied and poorly understood. In both regions, human activities may pose significant risks to marine mammals and their habitats. Although the magnitude and effects of those risk factors are poorly documented to date, undoubtedly they will increase in the foreseeable future with human population growth and increasing competition for diminishing resources.

In both the Caribbean Sea and the Gulf of Mexico, management of human-related risk factors and their effects on marine mammals falls well short of that envisioned in international agreements or national laws that call for sustaining healthy, stable marine ecosystems. Important research and management activities are being considered—and in certain instances undertaken—but, on the whole,

they are not sufficient to assess the status of marine mammal species. In many areas, research and management efforts are still at a nascent stage. Holding workshops and developing stranding networks, for example, are useful for piecing together a more complete picture of human-marine mammal interactions, but efforts must move beyond this stage if we are to ensure a healthy and sustainable relationship with the marine environment.

Developing the necessary scientific and management capacity in both regions will require a substantial increase in support, continued over years or, more likely, decades. In both regions, one can find individuals and organizations determined to improve the state of science and management related to marine mammals. However, their concerns generally garner little support when forced to compete with social or economic demands. Developing the necessary capacity will require efforts to train scientists and managers and inform the public, build infrastructure to support research, provide fiscal resources for carrying out research and management activities, and coordinate national and regional (i.e., international) science and management to ensure that both are state-of –the-art in quality and focused on conservation solutions, rather than just monitoring.

More important, developing the necessary scientific and management capacity will require the leadership and vision from all stations in society that, in the midst of many social and economic challenges, remain cognizant of, and determined to sustain, the marine ecosystems upon which marine mammals—and people—depend.

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Chapter III

INTERNATIONAL ASPECTS OF MARINE MAMMAL CONSERVATION AND MANAGEMENT

The Departments of Commerce, the Interior, and State, in consultation with the Marine Mammal Commission, are instructed by section 108 of the Marine Mammal Protection Act to protect and conserve marine mammals under existing international agreements and to negotiate additional agreements as needed to achieve the purposes of the Act. Furthermore, section 202 of the Act requires 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 2008 the Commission was involved in a number of international efforts to protect and conserve marine mammals, both through participation in international organizations and working multilaterally with scientists, managers, agencies, and organizations of other nations to address specific issues involving marine mammals. These activities are discussed in the following sections.

International Agreements and Organizations

International Whaling Commission

The International Whaling Commission (IWC) was established under the International Convention for the Regulation of Whaling of 1946. Its purpose is to oversee the conservation of the world's whale stocks by conducting a continuing review of the status of those stocks and modifying conservation measures as appropriate. The Republic of the Congo, Lithuania, Romania, and Tanzania joined the IWC in 2008, bringing the total number of member nations to 83 at the end of 2008. The 2008 meeting of the IWC was held in Santiago, Chile, from 23 to 27 June. The central issue considered at that meeting was the future of the IWC. This and other matters considered at the 2008 IWC are summarized in this section.

Future of the IWC: Over the past several years, the ability of the IWC to function efficiently has been undermined by a rift between two factions. On one side are those countries that favor a return to commercial whaling and the member countries that are sympathetic to their concerns. On the other side are countries that favor a more protectionist approach that emphasizes non-lethal uses of whales. These factions are fairly evenly split and, on many critical issues, neither side is able to garner the three-quarters majority needed to pass amendments to the IWC schedule.

In 1982 the IWC established a moratorium on commercial whaling that entered into effect during the 1985–1986 whaling season. The purpose of the moratorium was to promote the recovery of a number of whale stocks that had been depleted by whaling. The schedule amendment that established the moratorium indicated that the provision would be kept under review and specified that, by 1990 at the latest, the IWC would undertake a comprehensive assessment of the effects of the moratorium on whale stocks and consider the establishment of new catch limits. In the early 1990s the IWC adopted a Revised Management Procedure (RMP), which establishes the methodological framework for establishing catch limits, should the moratorium on commercial whaling be lifted. The RMP is one element of a Revised Management Scheme (RMS) that, if adopted, would guide the overall conservation of whales and the management of commercial whale harvests. The RMS would establish not only the mechanisms for setting harvest limits but identify other measures and practices needed to ensure

that those limits are not exceeded. Although the IWC has been working on the RMS since the early 1990s, its Working Group on the Revised Management Scheme concluded at its 2006 meeting that discussions were at an impasse and recommended that further work on the RMS be suspended.

Despite the moratorium, commercial whaling has continued. Norway filed a timely objection to the moratorium, thus exempting its whaling operations. In addition, Iceland, which withdrew from the IWC in 1992, was allowed to rejoin in 2002 subject to a reservation allowing it to resume commercial whaling beginning in 2006. Iceland agreed, however, not to engage in commercial whaling if it determined that sufficient progress was being made to negotiate the RMS.

Japan withdrew an initial objection to the commercial whaling moratorium effective in 1988 but that same year began a scientific whaling program targeting hundreds of minke whales (*Balaenoptera bonaerensis*) in waters surrounding Antarctica. Article VIII of the whaling convention allows member countries to issue special permits authorizing its nationals to take whales for purposes of scientific research and to process and sell the whale meat if it decides to do so. Scientific whaling under this provision is outside the control of the IWC. Since it ceased commercial whaling, Japan has gradually increased the number of whales killed under its scientific whaling program, has expanded the number of species being taken, and has established a separate program targeting whales in the North Pacific. In addition, Japan has been advocating for several years for the recognition of a new category of whaling—small-type coastal whaling—to authorize whaling by four of its coastal communities with a history of whaling. Japan contends that such whaling is akin to aboriginal subsistence whaling, which is sanctioned by the IWC. Several other countries, including the United States, believe that Japan's small-type coastal whaling is just a limited form of commercial whaling and oppose authorizing such whaling while the commercial whaling moratorium remains in place. Despite repeated consideration by the IWC, proposals to authorize small-type coastal whaling have never come close to achieving the three-quarters majority necessary for adoption.

Another area of contention within the IWC is the establishment and recognition of whale sanctuaries. The IWC established the Indian Ocean Sanctuary in 1979 and the Southern Ocean Sanctuary in 1994. These sanctuaries are areas in which commercial whaling is prohibited. Nevertheless, Japan filed an objection to the amendment that created the Southern Ocean Sanctuary and thus is exempted from it as it pertains to minke whales. In addition, Japan continues to conduct research whaling in the Southern Ocean Sanctuary despite opposition from many IWC members. At the same time, some member countries are pressing to establish additional whale sanctuaries in the South Atlantic and the South Pacific but have been unable to garner the votes needed for adoption.

The United States is particularly concerned about the potential for some pro-whaling countries to block the adoption of aboriginal subsistence harvest limits, including those authorizing the taking of bowhead whales (*Balaena mysticetus*) that are hunted primarily by Alaska Native hunters. These countries successfully blocked adoption of a bowhead quota in 2002, although a five-year harvest limit was ultimately approved at a special IWC meeting later that year. When the five-year authorization next came up for review in 2007, countries in favor of commercial whaling again threatened to block the adoption of a harvest limit for aboriginal subsistence whaling of bowhead whales. In light of then-emerging efforts to improve the operation of the IWC and seek ways to resolve the significant issues it faces, the nations favoring commercial whaling acquiesced in approving new bowhead whale harvest limits, which were adopted by consensus. Nevertheless, if these countries are not satisfied with the progress made within the IWC to address other issues of concern, they almost certainly will have the votes necessary to block the adoption of new harvest limits when they come up for renewal in 2012.

At its 2007 meeting, the IWC began to address the problem of a polarized and ineffective commission. Among other things, the IWC reviewed the results of three international meetings that had recently been convened on the topic.

In December 2006 representatives of nine Latin American countries met in Buenos Aires to con-

sider alternative approaches that could be pursued to "modernize" the IWC. Participants at that meeting identified several key elements for any future debate, including the promotion of non-lethal use of whale resources, the establishment of new whale sanctuaries, and the suspension of scientific whaling pending a negotiated solution as to whether, and under what conditions, whales should be hunted. In February 2007 Japan hosted a conference in Tokyo for the "normalization" of the IWC. The aim of that conference was to identify actions needed to restore the IWC as an "effective resource management organization" overseeing the sustainable use of whales. In April 2007 the Pew Foundation sponsored a meeting in New York City to review the status of whale stocks, developments in ocean law since 1946 when the whaling convention was concluded, the history of whaling diplomacy, and possible ways forward.

After considerable discussion at the 2007 IWC annual meeting, members agreed in general that the IWC needed to resolve the impasse and that, in doing so, the parties should take into account the results of the three international meetings. The parties agreed to hold an additional meeting, open to all parties and observers, prior to the 2008 IWC meeting to pursue this matter. That meeting was convened in London on 6–8 March 2008 and focused largely on the process that would be established to resolve the differences within the IWC, rather than being a substantive discussion of the underlying issues. Participants at that meeting recommended several ways in which the IWC could improve the way it functions, including (1) striving to reach consensus whenever possible, (2) ensuring that adequate notice is given of issues to be considered by the Commission, (3) recognizing the diversity of views and interests within the Commission and the need for parties to respect the views of others, (4) improving the negotiation process within the Commission, including the use of both open and closed sessions and cooling-off periods, and (5) reviewing the composition and function of the Commission's Scientific Committee.

The results of the London meeting formed the basis for discussions at the IWC's 2008 annual meeting in Chile. Members agreed that they would make every effort to resolve issues by consensus and put issues to a vote only as a last resort. To maximize the prospects for reaching consensus, it was agreed that the full text of all proposals for action by the IWC should be circulated at least 60 days before annual meetings. To reduce the uncertainty surrounding voting, the parties agreed that new members be required to wait 30 days after adherence to the whaling convention before being allowed to vote. The parties also agreed to continue to attempt to resolve the substantive differences among its members and established a Small Working Group on the Future of the IWC. The working group was tasked with reporting the initial results of its deliberations to an intersessional meeting of the IWC on the Commission's future planned for 2009 and with submitting a final report on possible compromises at least five weeks before the IWC's 2009 annual meeting.

The working group met twice in 2008, on 15–18 September in St. Petersburg, Florida, and on 8–10 December in Cambridge, England. The United States participated in both meetings and is expected to be a key participant in the future efforts of the small working group. The working group identified 33 issues that require resolution within the IWC, although relatively few of these were identified as requiring immediate attention. The most pressing issues for which an interim compromise solution is being pursued include research whaling, the creation of and compliance with sanctuaries, and Japan's proposal for small-type coastal whaling. At the end of 2008 the small working group was planning a third meeting in March 2009. Documents and other information related to discussions concerning the future of the IWC can be found on the IWC's Web site at http://www.iwcoffice.org/commission/future.htm.

Aboriginal Subsistence Whaling: The moratorium on commercial whaling does not apply to aboriginal subsistence whaling, which is managed under separate provisions of the whaling convention. The IWC authorized subsistence whaling from the following stocks at its 2007 meeting: (1) the Bering–Chukchi–Beaufort Seas stock of bowhead whales, (2) the eastern North Pacific stock of gray whales (*Eschrichtius robustus*) (3) minke, fin (*Balaenoptera physalus*), and bowhead whale stocks off Greenland, and (4) North Atlantic humpback

whales (*Megaptera novaeangliae*) off St. Vincent and the Grenadines.

The first two stocks are hunted by Natives in the United States. Members of the Alaska Eskimo Whaling Commission are the primary hunters of bowhead whales, with a limited number of the available strikes reserved for Native hunters in Russia. Bowhead whales are an important food source for inhabitants of remote areas of Alaska, and hunting whales is central to the cultural traditions of some Native villages. For the period from 2008 to 2012, subsistence hunters may land up to a total of 280 bowhead whales, with no more than 67 whales to be struck in any year, except that up to 15 unused strikes from a previous year may be carried over into the subsequent year.

The IWC adopted a catch limit of 620 gray whales for the same five-year period, with a maximum of 140 to be taken in any one year. Natives in Russia are the primary subsistence hunters of gray whales, but a small number of the allowable strikes is allocated to hunters from the Makah Tribe, which resides on the Olympic Peninsula in Washington. However, under a 2004 ruling by the Ninth Circuit Court of Appeals, the Makah Tribe is precluded from whaling unless and until it obtains authorization to hunt whales through a waiver of the taking moratorium under the Marine Mammal Protection Act.

At the 2007 IWC meeting, Denmark requested authorization for an aboriginal subsistence take on behalf of Greenland. The request proved to be controversial because it sought to increase the number of West Greenland minke whales (*Balaenoptera acutorostrata*) that could be taken from 175 to 200 a year and to expand the species covered by the authorization to include 10 humpback whales and 2 bowhead whales per year. Denmark also requested the renewal of previous authorizations for the annual take of 19 fin whales and 12 minke whales off East Greenland. Several countries, including the United States, thought that the science underlying the proposal, particularly with respect to the requests concerning humpback and bowhead whales, needed to be strengthened before they could support its adoption. The United States initially recommended that consideration of the requested takes of these two species be deferred until the IWC Scientific Committee could provide further advice. Based on the initial reaction from several nations, Greenland revised its proposal, dropping the request for a humpback whale quota, adding a requirement that the catch limit for minke whales off West Greenland be subject to annual review by the Scientific Committee, and conditioning the taking of bowhead whales in a given year on a determination by the Scientific Committee that the take would be unlikely to endanger the stock. This revised proposal ultimately was adopted.

At its 2008 meeting, the IWC Scientific Committee provided interim advice that the taking of minke, fin, and bowhead whales under the catch limits adopted the previous year would not harm the affected stocks. Denmark also indicated that it would again seek authorization of an aboriginal subsistence quota of 10 humpback whales from the West Greenland stock and sought the advice of the Scientific Committee before presenting the proposal to the IWC. The Scientific Committee's interim management advice indicated that striking up to 10 humpback whales per year would not harm the stock. When the proposal was presented to the IWC for its consideration, Denmark indicated its willingness to reduce its take of fin whales voluntarily from 19 to 8 per year if the humpback proposal were adopted. Despite this advice, and the proposed reduction in the number of fin whales that would be taken, the proposal again met with opposition. Several countries expressed the view that, although the science indicated the proposed humpback quota would not be detrimental, Denmark had not made a convincing case that taking the additional whales was necessary to meet the subsistence needs of Greenlanders. Ultimately the proposal was put to a vote and failed to pass, with 29 votes in favor, 36 opposed, and 2 abstentions. Denmark indicated that it intended to pursue the issue at the 2009 IWC meeting.

The number of whales taken during 2008 for subsistence purposes is shown in Table 5.

Continuing Commercial Whaling: Despite the moratorium on commercial whaling, two countries still engage in the practice: Norway, which lodged an objection to the moratorium when it was adopted, and Iceland, which left the IWC in 1992 but was allowed to rejoin in 2002 with a reservation

to the moratorium. Under its reservation, Norway authorized the take of up to 1,052 minke whales in 2008. Iceland established a whaling quota of 40 minke whales for 2008. The numbers of whales taken by Norway and Iceland during 2008 are provided in Table 5.

Scientific Whaling: The International Convention for the Regulation of Whaling allows scientific whaling (whaling undertaken for the purpose of collecting scientific information) to be conducted outside the management sphere of the IWC. Japan is the only country currently engaged in such whaling, with ongoing research programs in Antarctic waters and in the North Pacific. Iceland began a scientific whaling program in 2003, but that program ended in 2007.

Japan issued a special permit for scientific whaling in Antarctic waters during the 2007–2008 season that authorized the lethal take of 935 Antarctic minke whales, 50 fin whales, and 50 humpback whales. For the 2008–2009 season, Japan has reduced the take of common minke whales to 750, although the allowable take of fin whales and humpback whales remains unchanged. Japan's scientific whaling catches for the 2008–2009 are shown in Table 5.

Table 5. Whales taken during 2008 by country and by purpose (subsistence, scientific research, commercial)

	Aboriginal Subsistence Whaling	Scientific Research Whaling	Commercial Whaling
North Atlantic			
Denmark for West Greenland East Greenland	14 fin, 153 minke 1 minke	—	—
Iceland	—	—	38 minke
Norway	—	—	536 minke
St. Vincent & the Grenadines	2 humpback	—	—
North Pacific			
Japan	—	100 sei 50 Bryde's 171 minke 2 sperm	—
Korea	—	—	6 minke[1]
Russian Federation	2 sperm 130 gray	—	—
United States	50 bowhead	—	—
Antarctic			
Japan	—	1 fin 680 minke[2]	—

[1] Unlike other whaling, this hunt is not conducted under a reservation or objection to the commercial whaling moratorium and is illegal under Korean law.

[2]The total includes takes from the 2008–2009 whaling season.

Japan's decision to expand its scientific whaling to include humpback whales, some of which may belong to depleted breeding populations, was particularly troubling to the United States and certain other countries. Following the 2007 IWC meeting, the chairman of the IWC pursued negotiations with Japan, asking it to reconsider this aspect of its scientific whaling program. In response, Japan announced in December 2007 that it would postpone the hunting of humpback whales, at least until after the 2008 meeting of the IWC. Japan continued to refrain from taking humpback whales throughout the remainder of 2008. It remains unclear whether Japan will begin hunting humpback whales in 2009.

Japan's special permit for scientific whaling in the North Pacific during 2008 authorized the lethal take of 100 sei whales (*Balaenoptera borealis*), 100 common minke whales, 50 Bryde's whales (*Balaenoptera edeni*), and 5 sperm whales. The taking of minke whales has prompted conservation concerns because some of the whales being taken are from a stock (the J stock) that has been reduced in numbers by whaling and bycatch in Japanese and Korean fisheries. The catch of minke whales from the J stock also is a concern for Japan's proposed coastal whaling discussed in the following section. The number of whales caught in the North Pacific by Japan under its special permit during 2008 is provided in Table 5.

The issue of scientific whaling remains controversial within the IWC. Several nations, including the United States, believe that much of the research now being done could be accomplished using nonlethal alternatives. Over the years this has prompted the IWC to adopt several resolutions calling on members to refrain from scientific whaling in the Southern Ocean Sanctuary and to permit scientific research involving the killing of whales only when it involves critically important research needs that cannot be addressed using other means. Noting that Japan had more than doubled its authorized take of minke whales and added fin whales and humpback whales to its list of targeted species, the IWC, at its 2007 meeting, passed a resolution calling on Japan to suspend indefinitely the lethal aspects of its research program in the Southern Ocean Sanctuary. At the 2008 meeting, several countries on both sides of the issue reiterated their positions with respect to the need for and value of lethal scientific whaling. However, no new resolution was put forward.

Although scientific whaling can be authorized by countries unilterally, the IWC Scientific Committee routinely a reviews the research proposals and results. At its 2008 meeting, the Scientific Committee agreed by consensus to new procedures for conducting such reviews. These reviews will now be conducted by independent experts at intersessional workshops. A limited number of scientists associated with the research being reviewed will be permitted to attend but only in an advisory capacity that allows them to make presentations and answer questions from the reviewers.

Coastal Whaling: Japan considers small-type coastal whaling to be similar to aboriginal subsistence whaling and, for the past two decades, has sought IWC approval of such whaling. Several other countries, including the United States, consider small-type whaling in Japan to be essentially commercial whaling.

At the 2007 IWC meeting, Japan proposed a schedule amendment that sought authorization for a catch of common minke whales from the Okhotsk Sea–West Pacific stock. Japan did not specify a number in its proposal because it was willing to negotiate a number that would be acceptable to the IWC. Further, Japan indicated that it was willing to reduce its scientific whaling program quota by the number of minke whales being taken from this stock, such that the total take would remain unchanged. Subsequent discussion indicated a lack of support for the proposal and no vote was taken.

Japan once again raised the issue of small-type coastal whaling at the 2008 IWC meeting. Although Japan had prepared a new proposal for consideration by the Commission, it decided not to pursue the issue, citing the improved atmosphere of cooperation fostered by the discussions of the IWC's future.

Whale Sanctuaries: The IWC currently has in place two whale sanctuaries, areas in which commercial whaling is prohibited. The Indian Ocean Sanctuary, established in 1979, covers the entirety of the Indian Ocean, extending southward to 55°S latitude. The Southern Ocean Sanctuary, established in 1994, covers waters surrounding Antarctica north to 40°S latitude, except where it abuts the Indian

Ocean Sanctuary, and in the area around and west of the tip of South America, where it extends only to 60°S latitude. In 1998 Brazil and Argentina began to push for the creation of a South Atlantic Sanctuary, a matter that has been considered at the past seven IWC meetings. In 2007 Brazil and Argentina, joined by South Africa, proposed a schedule amendment to create a sanctuary in the South Atlantic. The sanctuary would include the portion of the Atlantic Ocean stretching from the equator to the boundary of the Southern Ocean Sanctuary. Although favored by a majority of parties, the proposal failed to garner the required three-quarters majority vote.

These countries again proposed creation of a South Atlantic Sanctuary at the 2008 meeting. They noted their commitment to promoting the establishment of this sanctuary as part of the path forward on the IWC's future. However, in keeping with the discussions on the future of the organization, Brazil and its co-sponsors decided not to put the measure to a vote.

Status of Whale Stocks: The IWC and its Scientific Committee routinely review the status of whale stocks. At the 2008 meeting, members received new information on Antarctic minke whales, North Pacific common minke whales, Southern Hemisphere humpback whales, Southern Hemisphere blue whales (*Balaenoptera musculus*), and a number of small stocks of bowhead, right (*Eubalaena* spp.), and gray whales. The Scientific Committee concluded that, although some evidence indicates increased abundance of several stocks of humpback, blue, and right whales (*Eubalaena australis*) in the Southern Hemisphere, these stocks remain at reduced numbers compared to their pre-whaling status. Special attention was paid to the status of the western North Pacific stock of gray whales, which numbers about 130 animals. The Scientific Committee noted that the survival of this population remains in doubt due to threats from oil and gas development off Sakhalin Island in Russia and entrapment in fishing gear in Japanese waters. (See additional discussion of this stock elsewhere in this chapter.) The IWC also noted that the North Atlantic stock of right whales (*Eubalaena glacialis*), which numbers between 350 and 400 animals, continues to face threats from ship strikes and entanglement in fishing gear. It reiterated an urgent need to reduce anthropogenic mortality from this stock to zero as soon as possible. (See Chapter IV for further discussion of issues concerning this stock.)

Small Cetaceans: Although parties to the IWC have differing views as to the organization's legal authority to manage small cetaceans, many countries continue to cooperate to address issues involving these species, particularly within the IWC Scientific Committee. The committee undertook a regional review of conservation issues involving the 39 species of small cetaceans that inhabit the southeast Pacific along the coasts of Colombia, Ecuador, Peru, and Chile. The committee noted that the distribution and abundance of many of these species are poorly known and expressed concern about possible anthropogenic impacts. Some species, such as common bottlenose dolphins (*Tursiops truncatu*s), Peale's dolphins (*Lagenorhynchus australis*), and pantropic spotted dolphins (*Stenella attenuata*), may be threatened because they are caught, killed, and used as bait for other fisheries. The Scientific Committee made several recommendations concerning research on these species and the threats they face.

The Scientific Committee also reviewed progress to implement previous recommendations concerning other small cetaceans, including (1) the vaquita (*Phocoena sinus*) (discussed elsewhere in this chapter), (2) the harbor porpoise (*Phocoena phocoena*), which experiences high bycatch rates in fisheries, (3) the franciscana dolphin (*Pontoporia blainvillei*), at risk from fisheries bycatch and harbor construction, (4) the boto (*Inia geoffrensis*), which is subject to bycatch and illegal direct take, (5) Dall's porpoise (*Phocoenoides dalli*), which is subject to bycatch and taken in directed hunts, and (6) Hector's dolphin (*Cephalorhynchus hectori*), which is bycaught in gillnets. The vaquita is of paramount concern. The Scientific Committee noted that the species may number no more than 150 individuals and has experienced an exceptionally rapid decline–perhaps by about 75 percent in the past decade. The committee estimated that, if current bycatch rates persist, the species is likely to go extinct within only a few years.

Venue for 2009 Meeting: The parties agreed to hold the 61st meeting of the IWC and its committees in Madeira, Portugal. The Commission will meet from 22–26 June 2009.

The Convention on Migratory Species

The Convention on the Conservation of Migratory Species of Wild Animals (commonly known as the Bonn Convention) entered into force on 1 November 1983. Its purpose is to conserve migratory avian, terrestrial, and marine species worldwide. As of 2008, 110 nations were party to the Convention.

Under the Convention, species in need of protection are placed on either one or both of two appendices. Appendix I includes "endangered migratory species," including those in danger of extinction throughout all or a significant portion of their range. Appendix II lists species of questionable conservation status that "require international agreements for their conservation and management" or that "would significantly benefit from the international cooperation that could be achieved by an international agreement." Parties to the Convention agree to adopt strict protection measures for listed species that pass through their national jurisdictions and to establish international agreements for their conservation when such cooperation is required. The United States is not a party to the Convention because of concern that it could alter federal/state relationships. However, the United States is a party to one of its agreements, the Memorandum of Understanding on the Conservation and Management of Marine Turtles and their Habitats of the Indian Ocean and South-East Asia. The U.S. Senate is considering ratification of the Agreement on the Conservation of Albatrosses and Petrels, and the United States also is participating in development of a new Memorandum of Understanding for Migratory Sharks.

Of the more than 100 species or populations listed on Appendix I, 18 are marine mammals, including large and small cetaceans, pinnipeds, and sirenians. Thirty-two marine mammal species or populations are listed on Appendix II. Some species or populations are included on both appendices, indicating that they require protective measures at both national and international levels.

Before 2008 Parties to the Convention had completed seven binding regional agreements for Appendix II species, three of which pertain to marine mammals. Those are the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea, and Contiguous Atlantic Area (ACCOBAMS); the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS); and the Agreement on the Conservation of Seals in the Wadden Sea, concluded between the Netherlands, Germany, and Denmark. In addition, certain parties have signed memoranda of understanding to conserve cetaceans of the Pacific Islands region, dugongs throughout their range, and the Mediterranean monk seal. In October 2008 Parties also completed a memorandum of understanding to conserve manatees and small cetaceans in Western Africa and Macaronesia.

The Ninth Conference of the Parties to the Convention was held from 27 November to 5 December 2008 in Rome, Italy. At that meeting, Parties passed resolutions supporting development of a regional agreement on cetaceans in Southeast Asia, proposing measures to reduce fisheries bycatch of non-target migratory species, and proposing measures

Figure 10. The Irrawaddy dolphin is one of several species of small cetaceans added to Appendix I under the Convention on Migratory Species. (Photograph courtesy of Nachiket Kelkar)

to reduce noise pollution from vessels and other sources, especially in the habitat of whales, dolphins, and other marine species that may be particularly vulnerable to noise-related disturbance. The Parties also agreed to give greater consideration to climate change and the use of migratory species as indicators of detrimental ecosystem effects.

At the 2008 meeting the Parties added several marine mammal species to the appendices. They added the Irrawaddy dolphin (*Orcaella brevirostris*), Black Sea bottlenose dolphin, Atlantic humpback dolphin (*Sousa teuszii*), and West African manatee (*Trichechus senegalensis*) to Appendix I, giving them full protection (Figure 10). They added the West African population of the Clymene dolphin (*Stenella clymene*), Mediterranean population of the Risso's dolphin (*Grampus griseus*), Mediterranean population of the common bottlenose dolphin, and northwest African population of the harbor porpoise to Appendix II.

The Convention on Migratory Species has been successful in raising awareness of the plight of threatened migratory species, especially in developing countries. In addition to creating regional agreements and memoranda of understanding, the Convention uses small seed grants and workshops to build research capacity and promote conservation objectives at local and national levels. For example, in Southeast Asia, the Convention has sponsored capacity-building workshops in the Philippines, Malaysia, Vietnam, Myanmar, Bangladesh, and Indonesia, all promoting efforts by governmental and non-governmental organizations to further marine mammal conservation. The Parties have organized similar events in Africa and Oceania. The number of parties to the Convention and its geographic coverage are steadily increasing, and the Parties seek to expand membership, agreements, and memoranda of understanding until all important issues involving migratory species are being addressed.

A number of countries in the Western Hemisphere, including the United States and Canada, have not joined the Convention on Migratory Species. In 2003 a group of governments, international organizations, and non-governmental organizations formed the Western Hemisphere Migratory Species Initiative to promote collaboration on issues involving conservation of migratory and other species in Western Hemisphere countries. The initiative covers migratory birds, marine turtles, marine and terrestrial mammals, fishes, and invertebrates. It seeks to compile pertinent conservation resources; promote adoption of best management practices; mitigate primary threats; restore populations of threatened species; facilitate the generation of key information; produce a catalogue of areas of importance for migratory species; articulate ongoing and planned conservation efforts; communicate and raise awareness of the ecological, economic, and cultural importance of migratory species; and increase the constituency that supports the conservation of migratory species through, for example, the promotion of local initiatives.

A memorandum of understanding between the Convention on the Conservation of Migratory Species of Wild Animals and the Western Hemisphere Migratory Species Initiative was signed at the Third Conference of the latter body in Asunción, Paraguay, 22–25 July 2008. The memorandum promotes conservation of sites of international importance to both partners. The two organizations plan to work together to mobilize the human and financial resources needed to develop and strengthen programs for species and habitat conservation.

International Union for Conservation of Nature

The International Union for Conservation of Nature (IUCN) maintains a Red List of Threatened Species on which it lists plants and animals in certain categories reflecting knowledge of them and their risk of extinction. The categories are "not evaluated," "data deficient," "least concern," "near threatened," "vulnerable," "endangered," "critically endangered," "extinct in the wild," and "extinct." The IUCN uses specialist groups to assess individual species, including specialist groups for sirenians, cetaceans, pinnipeds, otters, and the polar bear. The criteria used for categorizing species are not the same as those used for the listing designations under the U.S. Endangered Species Act, and they are not legally binding in the United States. The Marine Mammal Commission provided support for updating data and assessing or reassessing marine mammals and a Commissioner and members of the Committee of Scientific Advisors on Marine Mam-

mals participated in the cetacean, pinniped, polar bear, and sirenian assessments.

The 2008 Red List update was officially launched at the IUCN World Conservation Congress in Barcelona in October 2008. The update included a number of changes in the global status of cetacean species, most of which were last assessed in 1996. Cetaceans are threatened in many areas by entanglement in fishing gear, habitat deterioration, ship strikes, declining prey, and noise-related disturbance. Of the 85 species evaluated, 14 were designated as either vulnerable, endangered, or critically endangered, 5 were near threatened, and 44 were data deficient. Two large whale species, the humpback and the southern right whale, were reclassified as being of least concern, reflecting an improvement in status (but see later discussion). Data deficient species, subspecies, or populations include baleen whales such as the Antarctic minke whale, the Bryde's whale complex, and the pygmy blue whale, most of the beaked whales, and various dolphins or medium-sized whales. The relatively high number of species in this category points to a major data gap, signaling a need for more and better research. The river dolphins are one of the few groups in which all species could be assessed, and all of them were designated as vulnerable, endangered, or critically endangered.

In many cases, species designated as having relatively lower risk of extinction (e.g., of least concern) include subspecies and populations that are considered to be at relatively higher risk of extinction. The bowhead whale, for example, is listed as a species of least concern but contains two subpopulations—Okhotsk Sea and Svalbard–Barents Sea—that are designated as endangered and critically endangered, respectively. Similar differences between species listings and subspecies or population listings are found for humpback whales, gray whales, blue whales, southern right whales, and North Pacific right whales. Among toothed cetaceans, Hector's dolphin, beluga whale (*Delphinapterus leucas)*, killer whale (*Orcinus orca*), short-beaked common dolphin (*Delphinus delphis*), Irrawaddy dolphin, harbor porpoise, Indo-Pacific humpback dolphin (*Sousa chinensis*), spinner dolphin (*Stenella longirostris*), and common bottlenose dolphin all have endangered or critically endangered subspecies or populations at a higher level of risk than the species as a whole.

In 2007 the Pinniped Special Group updated status reports for all 35 pinniped species for the Global Mammal Assessment. The results were sobering. Sixteen of the 35 recognized species are on the Red List. As with cetaceans, many of the species considered to be of least concern in the global assessment contain subspecies or subpopulations that are serious conservation concerns. For example, the ringed seal (*Pusa hispida)* is comprised of five subspecies. Only the Arctic subspecies is of least concern. The other four subspecies are vulnerable, endangered, critically endangered, and data deficient. In 2008 the group met again, with support from the National Marine Fisheries Service's Office of International Affairs and the Marine Mammal Commission, to develop action plans for addressing the threats identified in the assessments.

Finally, in 2008 IUCN concluded a five-year comprehensive assessment of the conservation status and distribution of the world's mammals (Schipper et al. 2008). This Global Mammal Assessment involved more than 1,700 experts and covered all 5,487 wild mammal species recognized as extant since 1500. The results suggest that threat levels are generally higher for marine mammals than for terrestrial species, and that incidental mortality in fisheries has been the dominant threat to marine mammals in the recent past, followed by pollution and deliberate exploitation. The most pervasive threat to terrestrial mammals is loss of habitat. Threats to terrestrial mammals are most immediate and severe in Southeast Asia, whereas threats to marine mammals are greatest in the northern oceans. The assessment highlighted the North Atlantic as an area where past human exploitation has depleted natural marine mammal species richness, which generally was found to be highest in belts of high productivity around 40°N and 40°S latitudes.

Species and Events of Special Concern in Foreign and International Waters

The Marine Mammal Protection Act directs the Commission to "recommend to the Secretary of State appropriate policies regarding existing in-

ternational arrangements for the protection and conservation of marine mammals." Many marine mammal species and populations elsewhere in the world face major conservation challenges. Some species are in danger of extinction in the immediate future and others are being extirpated in parts of their range. This report highlights some of the non-U.S. species and populations at greatest risk and identifies issues that must be addressed to conserve them. No attempt has been made to treat the subject comprehensively. The species and populations described here are only a sample of those for which significant new information became available to the Commission in 2008. More detail is provided on species and issues in which the Commission was actively engaged (e.g., funding or development of research or conservation measures) in 2008, particularly the vaquita and western population of North Pacific gray whales.

Vaquita

The vaquita (*Phocoena sinus*) is the world's smallest porpoise. Following the presumed extinction of the Yangtze River dolphin or baiji, (*Lipotes vexillifer*), the conservation and scientific community has increased its attention on this critically endangered species with the hope that its extinction can be avoided. In 2007 Jaramillo et al. concluded that vaquita abundance may have declined to only about 150 animals, with ongoing incidental capture in fishing nets the primary continuing cause of mortality. The Marine Mammal Commission's 2007 annual report summarized conservation efforts over the 50 years since the vaquita was first described (Norris and McFarland 1958). Here, the focus is primarily on more recent developments.

In February 2007 Mexico President Calderón announced that the vaquita would be included among five Mexican species of highest priority under the Conservation Program for Species at Risk (Programa de Conservación de Especies en Riesgo, PROCER). The Mexican government initiated development of a formal recovery plan for the vaquita in September 2007 and published the final plan in 2008. The plan describes the Mexican government's commitment to recovery of this species. On 7 March 2008 Mexico's Ministry of the Environment and Natural Resources and Ministry of Fisheries jointly announced they would be working together to conserve the vaquita.

On 25 March 2008 the Marine Mammal Commission wrote to the U.S. Department of Commerce's Undersecretary for Oceans and Atmosphere to encourage support of the Southwest Fisheries Science Center's vaquita survey cruise in the Gulf of California, planned for fall 2008. The Commission stressed that the recovery of the vaquita depends on the will of Mexican officials and that the scientific information from the cruise would inform those officials, strengthen the basis for their decisions, and provide valuable insights into thoughtful and creative recovery measures.

The Action Plan for the Conservation of the Species Vaquita establishes specific goals, actions, target dates, and funding requirements to facilitate recovery while also promoting the sustainable use of marine and coastal resources in the upper Gulf of California, including the economic and social well-being of local communities. The six goals require (1) managing fisheries to eliminate vaquita bycatch and adapting fishing practices to be consistent with the Northern Gulf of California Biosphere Reserve; (2) recovering and protecting the vaquita and its natural habitat; (3) developing an inspection and monitoring program to ensure compliance with regulations; (4) conducting necessary research to guide recovery efforts; (5) educating and involving stakeholders to support vaquita conservation efforts; and (6) administering the recovery plan through collaboration and communication with fishing communities, the responsible federal, state, and local governments, non-governmental organizations, academic organizations, and other concerned entities and experts.

In 2007 and 2008 the Mexican government directed a total of about $16 million in U.S. dollars toward vaquita recovery. Fishermen operating about 850 pangas (small watercraft used by artisanal fishermen) have stopped setting their nets in the vaquita refuge established in September 2005 (Figure 11) and either fished elsewhere or taken up other livelihoods. About 1,440 fishing permits have been retired and 1,200 km^2 closed to fishing. The Mexican government directed the majority of the funds (about $11 million in U.S. dollars) to 72 projects in Golfo de Santa Clara, Sonora, 31 proj-

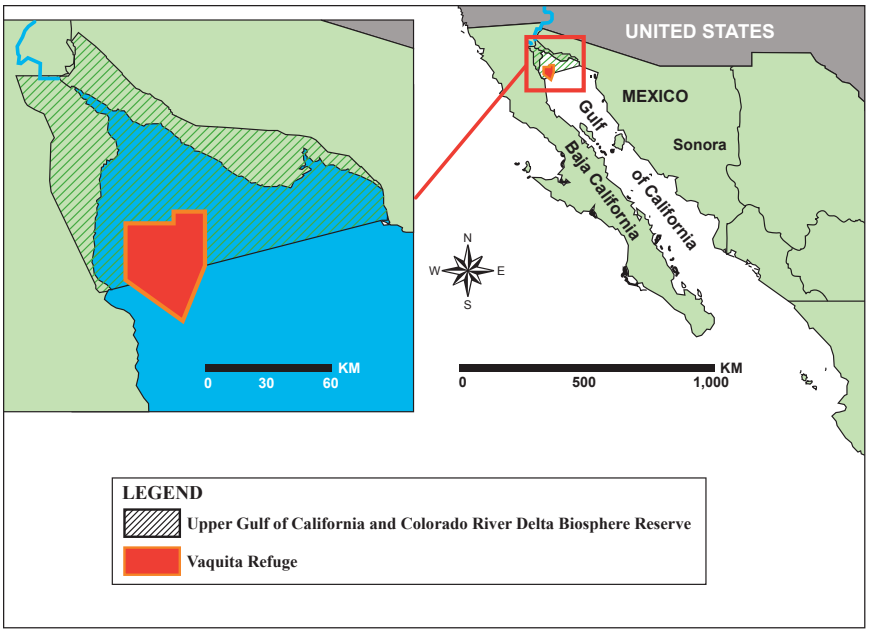

Figure 11. The vaquita occupies a limited range in the upper part of the Gulf of California, 80 percent of which has been set aside by the Mexican government as a refuge.

ects in Puerto Peñasco, Sonora, and 46 projects in San Felipe, Baja California. In 2008 these funds emphasized the promotion of alternative economic activities other than fishing with gillnets, including fishing with alternative gear, tourism, commerce, and aquaculture. Of about 880 artisanal fishing boats originally fishing in the Reserve, approximately 247 were removed from the upper Gulf and are no longer in the fishery. Currently 543 pangas (small watercraft used by artisanal fishermen) with permits continue to fish with gillnets in the upper Gulf, but they are prohibited from fishing in the vaquita refuge and receive compensation for staying out of the area. About 100 pangas have converted from gillnets to new fishing gear. Of these, 77 are from San Felipe, 9 are from Santa Clara, and 14 are from Puerto Peñasco. The Mexican government spent about $5 million in U.S. dollars on enforcement and other activities to ensure pangas were not fishing with gillnets in the vaquita reserve.

On 19 May 2008 the Mexican Society for Marine Mammalogy held a special session on conservation of the vaquita at its 31st International Meeting on the Study of Marine Mammals in Ensenada, Mexico. The Chairman of the Marine Mammal Commission, who is also Chairman of the Society for Marine Mammalogy, participated in the meeting together with scientists from the United States and Mexico. Potential funders (non-governmental organizations) interested in supporting vaquita conservation action attended the meeting. A report of the meeting was sent to the National Commission of Natural Protected Areas calling on the Mexican Government to take immediate conservation actions to implement the Action Plan for the Conservation of the Species – Vaquita.

A number of events and symposia in 2008 considered the plight of the vaquita and sought to generate support for and reinforce Mexico's efforts. At its 1–13 June 2008 meeting in Santiago, Chile, the Scientific Committee of the International Whaling Commission expressed great concern that the proposed three-year phase-out for the gillnet fishery may be too slow to save the vaquita. The Committee "reiterated its extreme concern about the conservation status of the vaquita, which is the most endangered cetacean species in the world." The Committee strongly recommended that "if extinction is to be avoided all gillnets should be removed immediately from the upper Gulf of California." Failing that, it indicated that removal must certainly occur within the three-year time period starting in 2008. The Committee called on the international community, including International Whaling Commission member countries and non-governmental organizations, to assist the government of Mexico in this task.

On 8 September 2008 in Washington, D.C., the Smithsonian Institution, National Oceanic and Atmospheric Administration, and the Marine Mammal Commission hosted the Vaquita Symposium: Status, Conservation and Future of the World's Most Critically Endangered Cetacean. The symposium featured presentations from Mexican and U.S. scientists on the oceanography of the Gulf of California,

the past and present status of the vaquita, and the economics of the fisheries that have an impact on vaquitas. Mexican officials described vaquita recovery efforts and implementation of the buy-out plan and a U.S. scientist described plans for the October-November 2008 acoustic and visual survey effort.

On 28 October 2008 the trilateral Commission for Environmental Cooperation formally unveiled the North American Conservation Action Plan for the Vaquita. The Commission for Environmental Cooperation consists of representatives from Canada, Mexico, and the United States and was established under the North American Free Trade Agreement. The action plan emphasizes that measures to eliminate mortality of vaquita must be implemented immediately. It also emphasized a recovery program including socioeconomic alternatives for fishermen in the upper Gulf of California, the availability and use of alternative vaquita-safe fishing gear, and continued enforcement. The launch event featured senior officials from Mexico's federal and state governments, including the governor of the state of Sonora, the Executive Director of the Commission for Environmental Cooperation, the National Commissioner of Natural Protected Areas, the Secretary of Agriculture, Livestock, Rural Development, Fishing, and Food, and the Secretary of Environment and Natural Resources. A fisherman representative of the Alto Golfo Sustentable program discussed how the plan promotes sustainable livelihoods while supporting the recovery of the vaquita, and representatives of the U.S. National Oceanic and Atmospheric Administration and Mexico's Instituto Nacional de Ecología described the vaquita monitoring cruise underway at that time.

The formal unveiling of the action plan was followed by a one-day technical workshop to review the elements of the plan; identify urgent, high-priority actions; identify parties responsible for those actions; and set a schedule for their completion.

At IUCN's World Conservation Conference in Barcelona, Spain, 5–14 October 2008, IUCN members passed a resolution entitled "Avoiding extinction of the Vaquita porpoise (*Phocoena sinus*)." The resolution called on the Mexican National Commission for Natural Protected Areas of the Ministry of Environment and Natural Resources and the National Commission of Aquaculture and Fisheries of the Ministry of Agriculture, Livestock, Rural Development, Fishing, and Food to establish a zone covering the entire vaquita refuge established in 2005 and prohibiting gillnet fishing therein; continue withdrawing fishing and gillnet permits in the upper Gulf of California; promote alternative livelihoods and vaquita-safe fishing methods; and implement the Mexican recovery plan. The resolution also called for public registration of all legal fishermen, enforcement to ensure adherence to all fishing and environmental regulations in the vaquita refuge, and economic compensation for withdrawn fishing permits. The resolution called on the shrimp industry to support the Mexican government in its efforts to eliminate gillnets and promote economic alternatives and vaquita-safe fishing methods. Finally the resolution called on the governments of the United States and Canada to support Mexico's strategy through the North American Conservation Action Plan for the Vaquita.

From 6 October to 25 November the United States and Mexico conducted a joint vaquita survey to provide baseline information on population abundance and distribution to guide recovery efforts. The survey used three vessels that deployed stationary acoustic gear, an acoustic array, and research buoys supporting autonomous acoustic recorders. All acoustic surveys were used to estimate vaquita abundance. The survey also included visual line-transects to estimate abundance and oceanographic studies to better describe vaquita habitat. Scientists from Mexico, the United States, Canada, United Kingdom, Japan, Germany, Australia, and South Africa contributed to the expedition. In addition to support from Instituto Nacional de Ecología and the National Marine Fisheries Service, funds were provided by the Marine Mammal Commission for expenses on the research vessel *Koipai Xu-Ya* and for innovative acoustic equipment used in the survey and by the Pacific Life Foundation for chartering the sailing vessel *Vaquita Express* and participation of associated acousticians.

The scientists were not able to analyze their data by the end of 2008. Preliminary observations indicated that the upper Gulf of California is noisy in the same high frequencies used by the vaquita. Nonetheless, they were able to detect vaquitas, particularly from one of their vessels (a sailboat) that

was able to survey in shallow, nearshore waters. Survey observations suggest that the vaquita's distribution is patchy and similar to that described after a previous survey in the 1990s. The survey also detected vaquita through acoustic and visual means outside the refuge on all sides. In addition, the survey effort revealed intense and concentrated gillnet fishing along the current borders of the refuge. Responding to these results, the Mexican Government is reportedly working to extend the gillnet-free zone in the upper Gulf of California.

A photographic team worked in concert with the visual and acoustic survey efforts to obtain high-quality still and video footage of vaquitas. This effort, supported in part by the Marine Mammal Commission, was successful in obtaining some of the first high-quality images of live vaquitas. These compelling images (see cover of this report) will be useful for generating recovery support at local, national, and international levels.

Western Population of North Pacific Gray Whales

The two extant populations of gray whales (*Eschrichtius robustus*) occur in the North Pacific Ocean. The western population is genetically distinct from the eastern population and is listed as critically endangered by IUCN. Scientists do not know the historical abundance of the western population, but commercial whaling nearly led to its demise. By the mid-1970s many thought the population was extinct. In the 1980s, however, gray whales were sighted off the northeastern coast of Sakhalin Island, Russia, and the number of sightings increased over the next decade. In the mid-1990s scientists, managers, conservation organizations, and several oil and gas companies initiated research and monitoring efforts to assess the population and address threats from ongoing and planned oil and gas activities off Sakhalin Island.

Population Status in 2008: The western population now consists of 130 to 150 animals, undoubtedly only a small fraction of its historical size. Of these, fewer than 30 are mature females. For unknown reasons, the sex ratio of calves is biased with about two males for each female. Nonetheless, the population appears to have increased, at least through 2004–2005. The 2008 assessment (Western Gray Whale Advisory Panel 2008) projects that the population will continue to increase if current environmental conditions persist and the number of human-related deaths is kept low. However, during the three-year period from 2005 to 2007, five females were known to have died in Japanese waters, most and possibly all from entrapment in set nets. If gray whales continue to become entrapped in nets at the rate observed between 2005 and 2007, the probability of a population decline between 2008 and 2050 is about 25 percent and of extirpation about 10 percent (Western Gray Whale Advisory Panel 2008).

Recovery Efforts Sponsored by IUCN: International efforts to manage or mitigate the impact of industrial projects in or near the whales' seasonal (June to November) feeding areas have been coordinated by IUCN, first through a panel of experts convened in 2004 and later through the Western Gray Whale Advisory Panel, convened in 2006. The advisory panel is chaired by a member of the Commission's Committee of Scientific Advisors on Marine Mammals. The panels have worked primarily with Sakhalin Energy (otherwise known as SEIC), which manages Sakhalin II, the most advanced oil and gas project on the Sakhalin shelf. Reports of meetings held to date and related documents can be found at IUCN's Western Gray Whale Conservation Initiative Web site (http://www.iucn.org/wgwap/).

2008 Observations and Activities: The Western Gray Whale Advisory Panel met twice in 2008 to consider new data from the 2007 field season, review progress on implementation of its previous recommendations, and develop further advice on the company's monitoring and mitigation programs. During 2008 Sakhalin Energy's activities were in transition. The company has completed most construction and has limited its offshore activities. It also has decommissioned the old system of transporting oil to shore (a system consisting of a short pipeline, a floating storage facility, and tankers), and all oil being extracted is now being transported only through pipelines. As a result, the company has limited vessel traffic in the area to three small vessels used to transport crews to and from the three platforms. In 2008 those vessels made about 500 trips through the coastal waters of northeastern Sakhalin Island.

Preliminary results from shore-based and vessel-based surveys indicated fewer whales and fewer sightings than expected based on data from previous years. The number of individual whales identified using photographs in 2008 also was lower than expected based on the numbers identified in previous years.

Threats Related to Oil and Gas Operations: The Marine Mammal Commission's annual report for 2007 reviewed in detail the four main threats to the population from oil and gas operations off Sakhalin Island. The following discussion presents new information regarding those threats in 2008.

Noise: The primary hypothesis to explain the decrease in both sightings and whales in 2008 is that animals abandoned primary feeding areas because of noise produced by other oil and gas companies involved in pile-driving and seismic surveys near the feeding areas. The Western Gray Whale Advisory Panel is investigating whether acoustic data collected in 2008 by Sakhalin Energy contractors can be used to assess (1) the nature and amount of underwater noise in the primary feeding area (known as the Piltun feeding area) and (2) possible causal relationships between the noise and whale numbers and distribution (Western Gray Whale Advisory Panel 2008).

The advisory panel also has continued to work with Sakhalin Energy to develop a rigorous gray whale monitoring and mitigation plan for a seismic survey scheduled for 2009. The panel and company have formed a Seismic Survey Task Force that met in April 2008 and emphasized the value of conducting the survey early in the open-water season before large numbers of whales arrive at the feeding area. The task force also emphasized the need to optimize the seismic survey design and equipment to collect the required geophysical data while reducing the risk of disturbance or injury to gray whales. The task force recommended requirements for monitoring during the 2009 seismic survey and emphasized that monitoring is an essential part of mitigation. In addition, the advisory panel and task force developed terms of reference for a three-day workshop to be held 31 January to 2 February 2009 to complete the monitoring and mitigation plan before the panel's sixth meeting in April 2009.

At its June 2008 meeting in Santiago, Chile, the International Whaling Commission's Scientific Committee commended Sakhalin Energy's willingness to work with IUCN's advisory panel to monitor and mitigate its planned seismic survey but noted with concern that other operators in the region (e.g., Exxon Neftegas) do not engage in such joint planning. The committee called on such operators to provide information on their activities to the Scientific Committee and to IUCN's advisory panel in a more open and timely manner and well in advance of any planned seismic surveys (International Whaling Commission 2008).

Oil spills: In 2008 IUCN's advisory panel also planned to complete a thorough review of Sakhalin Energy's oil spill prevention and response plans. However, Sakhalin Energy failed to provide much of the requested documentation on schedule, and the panel now plans to conduct the review in the second half of 2009.

Ship strikes: In 2008 Sakhalin Energy continued to place marine mammal observers on vessels used to transport crews to and from platforms and for other offshore activities. To date, these vessels are not known to have struck any gray whales. However, Sakhalin Energy apparently increased the speed limit for crew transport vessels from 17 to 21 knots in traffic corridors and good weather conditions. This change is inconsistent with the advisory panel's recommendation that large vessels not exceed 10 knots in areas where there is a substantial probability of encountering whales.

Habitat degradation: The advisory panel and company also have formed a joint long-term environmental monitoring task force, which was scheduled to visit the Sakhalin II project area in September 2008 to observe the foraging habitat of western gray whales and adjacent areas (e.g., Piltun and Chayvo Lagoons) and to discuss environmental monitoring with Sakhalin Energy personnel. The trip was subsequently postponed until 2009.

Research: The identification of individual whales by use of photographs is central to gray whale population assessment. Two research teams collect photographs to characterize the population. In 2008 the Russia-U.S. research team identified individual whales during boat surveys and counted

whales from the Piltun lighthouse. The number of whales identified was smaller than expected. The other photo-identification team is based at the Institute of Marine Biology in Vladivostok and is funded jointly by Sakhalin Energy and Exxon Neftegas (sponsor of the nearby Sakhalin I project). This team logged an effort similar to those of previous years and also documented gray whales off the southern Kamchatka Peninsula. A photo-ID task force of the IUCN panel was established to facilitate comparisons of photo catalogues of the two teams, but as of the end of 2008, the group had not made significant progress.. Both the advisory panel and the International Whaling Commission's Scientific Committee have called for greater cooperation and collaboration, in part to maximize the information that could be gained by combining the catalogues and in part to minimize the disturbance caused when scientists approach the whales in small boats to take photographs. To date, the Institute of Marine Biology and Sakhalin Energy have stymied the task force's efforts, and little progress has been made on nine specific tasks set out by the task force in 2007 (e.g., to cross-match the two data sets, strengthen population assessment, and provide insights into the effects of human disturbance). In December 2008 the advisory panel reemphasized the importance of this work and set a new timetable for completion of tasks.

The condition of the whales on the feeding grounds also is a critical research topic. The joint Russia-U.S. research team presented an analysis of the body condition of gray whales to the International Whaling Commission's Scientific Committee in June 2008 and to the advisory panel at its December 2008 meeting. The study, based on data from 1994 to 2005, concluded that lactating females were in significantly poorer body condition than all other age and sex classes. Such results are not unexpected as lactating females must meet their own energetic needs and those of their calves. On average, body condition was significantly lower in 1999 than in other years. Still, the number of whales in poor condition in all years has been surprising because this population is small and should not be experiencing density-related competition for resources. Thus, scientists have not yet been able to explain the poor condition of these whales, particularly in 1999. The team plans to revise its analysis by incorporating data from 2006 and 2007 and publish the revised results in 2009.

Western Gray Whale Range-wide Workshop: IUCN also convened the Western Gray Whale Range-wide Workshop on 21–24 September 2008 in Tokyo (IUCN 2008b). The workshop included scientists from Japan, the Republic of Korea, China, and Russia, invited experts from Canada and the United States, and members of current and past IUCN gray whale panels, including a scientific advisor and a staff member of the Marine Mammal Commission. The workshop focused on developing a comprehensive strategy to save western gray whales and their habitat. Research efforts over the past decade have investigated the whales on their summer feeding grounds. Their winter breeding grounds and migratory paths remain unknown. To address this shortcoming, IUCN, its panel, and conservation organizations have called for more research in other parts of Russia (e.g., coastal waters of the southern Kamchatka Peninsula and the northern Sea of Okhotsk) and in other range states.

To that end, the workshop focused on parts of the population's range beyond Sakhalin Island and on issues beyond the potential impact of oil and gas development. The workshop conclusions and recommendations addressed, among other things, the need for improved information on whale movements and distribution outside the summer feeding season, threats to the whales in these other areas, potential mitigation strategies, and the specific problem of gray whale mortality in Japanese set nets.

Workshop participants reiterated the need to reduce human-caused mortality to zero and recommended this as a core goal of conservation planning for western gray whales. They noted that population monitoring is needed to determine whether mitigation measures are effective and recommended that monitoring of the population off Sakhalin Island continue as the highest research priority. They encouraged an expansion of photo-identification efforts in other areas and comparison of photographs across regions, most notably between Kamchatka and Sakhalin. They also reinforced the recommendations of the Western Gray Whale Advisory Panel and International Whaling Commission's Scientific Committee that the complementary information in

the two Sakhalin photo-identification catalogues be used to the fullest possible effect to understand the biology and status of western gray whales.

Workshop participants also concluded that characterizing the movements of the whales, their migratory routes, and their breeding areas is essential for developing and implementing conservation measures. They noted the paucity of data and sightings of western gray whales outside the Sakhalin region and recommended increased efforts to detect, report, and investigate occurrences of gray whales in all range states, including China. As part of this push, researchers in range states must be equipped with the appropriate knowledge and tools, particularly with regard to photography and tissue sampling. Broader public awareness campaigns are needed to support these efforts.

That being said, participants recommended a carefully planned satellite tagging program on western gray whales. They based the recommendation on a discussion of whale tagging, various recommendations by the International Whaling Commission's Scientific Committee and the IUCN advisory panel, and the conclusions in the report of the Large Whale Tagging Workshop convened by the Marine Mammal Commission and the National Marine Fisheries Service in 2005 (Weller 2008). Participants agreed that tagging is the most efficient, and perhaps the only way to obtain the spatial and temporal data needed to identify and mitigate potential threats. They acknowledged the need to safeguard the health of individual whales and the population but recommended that every effort be made to attempt tagging late in the 2009 open-water field season. At its December 2008 meeting, the IUCN advisory panel reaffirmed its support for initiation of a satellite tagging program and urged the coordination group already established at the 2007 International Whaling Commission's Scientific Committee meeting to begin working toward that objective.

Finally, workshop participants considered the problem of gray whale entrapment in fishing gear. As mentioned above, several gray whales died in recent years after becoming entrapped in set nets off Japan. The participants recommended that entrapped animals be released as quickly as possible and that rewards be used to encourage fishermen to release the animals. Japan has already implemented measures to raise awareness of the gray whale entrapment issue, but workshop participants encouraged Japanese authorities to go farther and to pursue a campaign to educate all set-net fishing cooperatives on gray whales and gray whale bycatch issues. They also recommended that similar training efforts and campaigns be implemented in the Republic of Korea and China. Participants recommended the establishment and training of rapid-response teams to assist fishermen in disentanglements. Participants from the Republic of Korea reported that stranding and entanglement response teams had already been established in their country to deal with live-stranded or accidentally caught marine mammals, including gray whales.

Yangtze River Dolphin (Baiji)

In 2006 a comprehensive survey failed to find a single Yangtze River dolphin (or baiji; *Lipotes vexillifer*). The species represents the last member of an entire family of mammals (Lipotidae). In August 2007 scientists were unable to confirm a reported sighting, and many consider the species to be extinct. In 2008 the Marine Mammal Commission funded an international review to clarify the causes of the baiji's presumed extinction and explain the failure of conservation efforts. The review should inform future conservation programs, such as those for the Yangtze finless porpoise (see following discussion). From February to November 2008 investigators interviewed 601 fishermen along 1,700 km of the Yangtze River. They also conducted opportunistic vessel surveys for baiji and finless porpoises in former baiji habitat but found no baiji. At the end of 2008 the investigators were analyzing their data.

Yangtze Finless Porpoise

The Yangtze finless porpoise is one of three subspecies of the finless porpoise (*Neophocaena phocaenoides*), which occur in warm coastal Indo-Pacific waters, both fresh and marine, from the Persian Gulf eastward to China, Korea, and Kyushu in Japan. The Yangtze subspecies is confined to the Yangtze River where it ranges up to 2,575 km (1,600 mi) upstream as far as the gorges above Yichang (200 m above sea level) (Culik 2004). The

Yangtze subspecies is in decline and faces the same threats that caused the demise of the baiji.

Scientists surveying the Yangtze for baiji in 2006 also searched for the Yangtze finless porpoise (Akamatsu et al. 2008, Zhao et al. 2008). They estimated a population of about 1,800 porpoises, approximately half the number estimated from surveys between 1984 and 1991 (Zhao et al. 2008). In addition to the apparent decline, the population is becoming more fragmented, with most porpoises found in the middle to lower reaches of the river. The lowest densities (about 130 porpoises in 716 km) and the greatest risk of local extirpation are in the river's upper reaches between Yichang to Ezhou. There the scientists observed significant gaps in the distribution of the finless porpoise.

One of the concerns regarding finless porpoises is that they do not move long distances in the river. If true, this may lead to genetic isolation and reduced likelihood that abandoned portions of the species' range will be recolonized. Taken together, the evidence suggests that finless porpoises will soon disappear from the upper reaches of the Yangtze River. Observations in the middle and lower parts of the river indicate a more continuous distribution but reduced abundance (about 800 porpoises compared to just under 1,500 from 1989–1992 surveys and 1,652 from 1984–1991 surveys; Zhao et al. 2008).

Many of the same factors known or suspected to have caused the extinction of the baiji also are responsible for the decline of Yangtze finless porpoises. Entanglement in gear used in unregulated and unselective fishing (e.g., rolling hooks, electrofishing gear, gillnets) is the major threat, increasing boat traffic is a likely source of propeller strikes, and boat noise may mask porpoise communication and disrupt their ability to forage efficiently. Important prey habitat is being destroyed and primary production disrupted by widespread mining of the river bed, lake beds, and banks. Severe pollution from the activities of the 400 million people in the Yangtze River basin is a serious threat, albeit difficult to quantify (Zhao et al. 2008).

Recovery prospects for the Yangtze finless porpoise are bleak. Nonetheless, most of the porpoises observed in the 2006 survey were in or near nominally designated reserves, a fact that offers some hope for future conservation. Measures to protect and restore natural habitat and to eliminate fisheries bycatch of wild Yangtze finless porpoises must remain the highest conservation priorities (Zhao et al. 2008).

Other River Dolphins

River dolphins comprise four families distributed in the Amazon and Orinoco Rivers of South America (Iniidae), in the coastal waters of northern Argentina and southern Brazil (Pontoporiidae), in the Indus, Ganges, Brahmaputra, Meghna, Karnaphuli, and Sangu River systems (Platanistidae) and, until recently, in China's Yangtze River (Lipotidae). The Amazon River dolphin (*Inia geoffrensis*) is thought to number in the tens of thousands. A recent survey of the franciscana (*Pontoporia blainvillei)* suggested about 40,000 individuals in the upper two-thirds of its distribution. The Indus River dolphin (*Plantanista gangetica minor*) is thought to number at least 1,000, whereas the Ganges River dolphin (*P. g. gangetica*) is considered to be more abundant than its Indus relative, although no reliable abundance estimates are available. As already described, a 2006 survey for the Yangtze River dolphin, or baiji, indicates that the species may be extinct.

Although it is often not grouped with other "river dolphins," a member of the family Delphinidae occurs in two forms, one of which is distributed throughout much of the Amazon River basin. That form is referred to as the "tucuxi," whereas its coastal counterpart is referred to as the "costero" or the Guyana river dolphin. Based on papers by Perrin and Brownell (2007) and Caballero et al. (2007) the International Whaling Commission now recognizes the two forms as separate species: *Sotalia fluviatilis* and *S. guianensis*, respectively.

Much remains to be learned about the various river dolphins, but scientists and conservationists generally agree that they are among the most threatened cetaceans because they compete with humans for water, food, and habitat. In April 2008, 40 scientists from eight countries attended an International Workshop on the Conservation of River Dolphins in Santa Cruz de La Sierra, Bolivia, to discuss the major threats to the survival of river dolphins and their habitat in South America. The most serious concern is the deliberate killing of river dolphins

for use as bait in fisheries. To address this problem and a number of other threats, the workshop participants initiated work on a plan for research and management, institutional enforcement, education and community participation, legislation and policy, and communication. They anticipated completing the plan by the end of March 2009.

Also in 2008 the Marine Mammal Commission allocated funding for an Asian Freshwater Cetacean Workshop to be held in October 2009. The workshop will provide a forum to (1) exchange ideas and experience among international experts and policymakers in Asia on conservation and management of freshwater dolphins and their habitat, (2) evaluate the effectiveness of current conservation measures, (3) discuss the interaction between protection of freshwater dolphins and ecosystem health and the welfare of human communities, and (4) develop recommendations for strengthening management of existing protected areas and establishing new areas. Participants will be invited from Indonesia, India, Bangladesh, Nepal, Pakistan, Cambodia, and China and will include members of the IUCN Cetacean Specialist Group and other interested experts.

Indo-Pacific Bottlenose Dolphins

The live capture of large numbers of Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) in the Solomon Islands and their export to other countries for live exhibition, usually in private, hotel-based swim-with-dolphin programs, has been a concern since it first came to global attention in 2003. In 2007 the Marine Mammal Commission concluded that the information needed to assess the impact of capture and export operations on the Solomon Islands dolphin population was not available.

To address this deficiency the Secretariat of the Pacific Regional Environment Programme, part of the United Nations Environment Programme, hosted a workshop on 21–23 August 2008 in Apia, Samoa. The World Wildlife Fund International, Ocean Conservancy, Animal Welfare Institute, Humane Society of the United States, Whale and Dolphin Conservation Society, National Oceanic and Atmospheric Administration, and Marine Mammal Commission provided funding for the workshop and the IUCN Cetacean Specialist Group developed the agenda. Nineteen invited experts from eight countries participated, and a member of the Marine Mammal Commission's Committee of Scientific Advisors on Marine Mammals served as the meeting chair. The meeting focused on (1) scientific and technical issues relating to the conservation of small cetaceans, especially Indo-Pacific bottlenose dolphins, and (2) the development of a framework to assess bottlenose dolphins in the Solomon Islands and other populations of small cetaceans elsewhere. Participants first reviewed background information on the biology and life history of bottlenose dolphins, on direct take and other threats, and on population assessment. They then outlined an assessment framework, made suggestions for genetic sampling and analysis, and summarized local conditions of importance to researchers working in the Pacific Islands region.

The workshop results reinforce the need to examine the conservation status of the nearshore bottlenose dolphin populations targeted in live capture and other fisheries. Where they have been studied, nearshore, island-associated populations of Indo-Pacific bottlenose dolphins in areas of limited continental shelf have been small (usually in the hundreds). In contrast, offshore populations of common bottlenose dolphins (*T. truncatus)* may be much larger. To sustain the annual removal of 80 to 100 animals (export levels currently permitted by the Solomon Islands government), the local population would have to number at least 5,000 individuals. Based on their review, workshop participants concluded that the population size of Indo-Pacific bottlenose dolphins in the capture areas of the Solomon Islands is probably well below 5,000. Therefore, the participants stressed the need for further population assessment with emphasis on photographic mark-recapture studies and genetic analyses. Based on the discussions and finding of the workshop, the Marine Mammal Commission expects that the workshop report will focus on a principle embodied in the IUCN Global Plan of Action for the Conservation of Cetaceans (Reeves et al. 2003): that small cetaceans should not be captured or removed from a wild population unless that specific population has been assessed and shown capable of sustaining removals. At the end of 2008 a drafting team was finalizing the report for publication by IUCN.

International trade in endangered species is regulated under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). For trade involving countries that have signed the convention, CITES requires the exporting country's Scientific Authority to provide a "non-detriment finding" indicating that the export will not be detrimental to the survival of that species. This approach places the burden of proof on the exporter to establish, with appropriate data, that a given level of removal is biologically sustainable. Furthermore, CITES treats populations within a country in the same manner as species. Therefore, the island-associated population of Indo-Pacific bottlenose dolphins in the Solomon Islands must be treated as a species for assessment and management purposes.

On 17–22 November 2008 CITES held a Non-detriment Finding Workshop in Cancun, Mexico. The workshop conveners requested that a case study on Indo-Pacific bottlenose dolphins from the Solomon Islands be presented. The case study by Reeves and Horokou (2008), prepared and presented with support from the Marine Mammal Commission, concluded that data currently available on population structure, abundance, population growth rate, and recent human-caused removals were not sufficient to support a credible finding that exports of Indo-Pacific bottlenose dolphins from the Solomon Islands at recent levels would not be detrimental to the species. The case study stressed that at least two years of field study would be required to generate sufficient mark-recapture data to allow robust abundance estimation. A proper estimate of current abundance could then be considered alongside environmental, trade, and other data to assess the sustainability of any further exports based on live capture of Indo-Pacific bottlenose dolphins from the Solomon Islands. The conclusions of the CITES Non-detriment Finding Workshop and of the IUCN workshop report on Indo-Pacific bottlenose dolphins were scheduled to be reviewed at a meeting of the CITES Animals Committee in April 2009.

Iran Dolphin Strandings

In 2007 the Regional Organization for Protection of the Marine Environment (ROPME), in cooperation with the Iran Department of Environment, requested assistance to investigate the causes of two mass marine mammal mortality events involving spinner (*Stenella longirostris*) and striped dolphins (*Stenella coeruleoalba*). The events occurred in autumn 2007 and involved more than 150 dolphins along the Gulf of Oman coast of Iran (Figure 12). The request was directed at the IUCN Cetacean Specialist Group, which sought support from the Marine Mammal Commission to send two outside experts to Iran. Their findings were summarized in the Commission's 2007 annual report.

On 16–19 November 2008 ROPME and the government of Iran held an Expert Meeting on Mass Mortality of Marine Mammals to follow up on the stranding investigation and begin to develop a stranding network. The meeting was held in Tehran and attended by senior scientists and managers from ROPME member states (Bahrain, Iran, Iraq,

Figure 12. Two mass stranding incidents, involving striped and spinner dolphins, occurred in the autumn of 2007 on beaches of Iran. (Photograph courtesy of Department of Environment, Tehran)

Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates). The Marine Mammal Commission provided travel support for the two cetacean specialists who had conducted the on-site evaluation of the 2007 mortality events. They provided background information and instruction on such topics as marine mammal species identification and ecology, species identification, field survey methods, causes of mortality and strandings, pathology, epidemiology, and necropsy and sampling methods. The meeting resulted in commitments by the various representatives of member governments to establish regional and national stranding networks. A regional plan of action on mass mortality of marine mammals was drafted and circulated.

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Chapter IV

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 Departments of Commerce and the Interior and other federal agencies regarding research and management actions needed to conserve species and stocks of marine mammals.

To meet this charge, the Commission devotes special attention to particular species and populations that are vulnerable to the effects of human-related activities. Chapter III presented information pertaining to species occurring primarily in foreign and international waters. This chapter focuses on species occurring in U.S. waters. Such species may include marine mammals listed as endangered or threatened under the Endangered Species Act or as depleted under the Marine Mammal Protection Act (Table 6). In addition, the Commission often directs attention to other species or populations of marine mammals not so listed whenever special conservation challenges arise that may affect them.

During 2008 special attention was directed to a number of species or populations including polar bears, walruses, Arctic ice seals, Cook Inlet beluga whales, southern resident killer whales, North Pacific and North Atlantic right whales, Hawaiian monk seals, sea otters in Alaska, Washington, and California, and Florida manatees.

Polar Bear
(Ursus maritimus)

The polar bear, perhaps the quintessential symbol of the Arctic, is the largest member of the genus *Ursus*. The species is distributed throughout the circumpolar Arctic in 19 populations totaling 20,000 to 25,000 bears (Aars et al. 2006). Polar bears evolved to exploit the Arctic sea ice niche and, in recent years, global warming has led to a rapid decrease in the sea ice habitat. This phenomenon, coupled with other threats, has raised serious concerns about the fate of polar bears, dependent as they are on sea ice habitat and healthy populations of ice seals for prey. The risk to polar bears has been recognized for more than a decade and prompted the Polar Bear Specialist Group of the International Union for Conservation of Nature (IUCN) to adopt a resolution in 2001 calling for increased research into the effects of global warming (Lunn et al. 2002). In 2005 the Polar Bear Specialist Group recommended that the species' status be changed from "low risk" to "vulnerable" based on the likelihood of an overall decline of more than 30 percent in the size of the total population within the next 35 to 50 years (Aars et al. 2006). This threat also prompted the Fish and Wildlife Service in 2008 to list the polar bear as a threatened species throughout its range.

Two populations of polar bears are found within the jurisdiction of the United States. The Beaufort Sea stock numbers about 1,500 animals and is shared with Canada (Regehr et al. 2006). Although this population appears to have remained relatively stable over the past two decades, recent evidence—such as reduced cub survival, smaller body size, earlier emergence from dens, and episodes of cannibalism—suggests that the population is under stress due to the earlier and more extensive retreat of ice in summer and later formation of the ice in fall and winter (Regehr et al. 2006, Amstrup et al. 2006). The Chukchi/Bering Seas stock is shared with Russia (Lunn et al. 2002). The best estimate of

Table 6. Marine mammals listed as endangered (E) or threatened (T) under the Endangered Species Act or depleted (D) under the Marine Mammal Protection Act, as of 31 December 2008

Common Name	Scientific Name	Status	Range
Manatees and Dugongs			
West Indian manatee	*Trichechus manatus*	E/D	Caribbean Sea and North Atlantic from southeastern United States to Brazil; Greater Antilles; Bahamas
Amazonian manatee	*Trichechus inunguis*	E/D	Amazon River basin of South America
West African manatee	*Trichechus senegalensis*	T/D	West African coast and rivers; Senegal to Angola
Dugong	*Dugong dugon*	E/D	East Africa to Japan; Philippines; Australia; Palau
Polar Bear			
Polar Bear	*Ursus maritimus*	T/D	Throughout its range in the circumpolar Arctic
Otters			
Marine otter	*Lontra felina*	E/D	Western South America; Peru to southern Chile
Southern sea otter	*Enhydra lutris nereis*	T/D	Central California coast
Northern sea otter, Southwest Alaska population	*Enhydra lutris kenyoni*	T/D	Aleutian Islands to Cook Inlet, Alaska
Seals and Sea Lions			
Hawaiian monk seal	*Monachus schauinslandi*	E/D	Hawaiian Archipelago
Mediterranean monk seal	*Monachus monachus*	E/D	Mediterranean and Black Seas; northwestern African coast; Madeira
Guadalupe fur seal	*Arctocephalus townsendi*	T/D	Baja California, Mexico, to Southern California
Northern fur seal	*Callorhinus ursinus*	D	North Pacific from California to Japan; Bering Sea
Steller sea lion, western population	*Eumetopias jubatus*	E/D	North Pacific from Japan to Prince William Sound, Alaska (west of 144° W longitude)
Steller sea lion, eastern population	*Eumetopias jubatus*	T/D	North Pacific from Prince William Sound, Alaska, (east of 144° W longitude) to central California
Saimaa ringed seal	*Phoca hispida saimensis*	E/D	Lake Saimaa, Finland
Whales, Porpoises, and Dolphins			
Chinese river dolphin (baiji)	*Lipotes vexillifer*	E/D	Yangtze River, China
Indus river dolphin	*Platanista minor*	E/D	Indus River, Pakistan
Vaquita	*Phocoena sinus*	E/D	Northern Gulf of California
NE offshore spotted dolphin	*Stenella attenuata attenuata*	D	Eastern tropical Pacific Ocean
Coastal spotted dolphin	*Stenella attenuata graffmani*	D	Eastern tropical Pacific Ocean
Eastern spinner dolphin	*Stenella longirostris orientalis*	D	Eastern tropical Pacific Ocean
Common bottlenose dolphin, U.S. mid-Atlantic coastal population	*Tursiops truncatus*	D	Atlantic coastal waters from New York to Florida
Beluga, Cook Inlet population	*Delphinapterus leucas*	D	Cook Inlet, Alaska
North Atlantic right whale	*Eubalaena glacialis*	E/D	North Atlantic Ocean
North Pacific right whale	*Eubalaena japonicus*	E/D	North Pacific Ocean/Bering Sea
Southern right whale	*Eubalaena australis*	E/D	South Atlantic, South Pacific, Indian, Southern Oceans
Killer whale, AT1 population	*Orcinus orca*	D	Prince William Sound; Kenai Fjords, Alaska
Killer whale, southern resident population	*Orcinus orca*	E/D	Coastal waters from central California to Vancouver Island and the Queen Charlotte Islands
Bowhead whale	*Balaena mysticetus*	E/D	Arctic Ocean and adjacent seas
Humpback whale	*Megaptera novaeangliae*	E/D	Oceanic; all oceans
Blue whale	*Balaenoptera musculus*	E/D	Oceanic; all oceans
Finback or fin whale	*Balaenoptera physalus*	E/D	Oceanic; all oceans
Sei whale	*Balaenoptera borealis*	E/D	Oceanic; all oceans
Gray whale, western North Pacific population	*Eschrichtius robustus*	E/D	Western North Pacific Ocean and adjacent seas
Sperm whale	*Physeter macrocephalus*	E/D	Oceanic; all oceans

Source: U.S. 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

abundance is about 2,000 bears, but this is a crude approximation only. Otherwise, little information is available on the status of the Chukchi/Bering Seas stock, but anecdotal evidence suggests that illegal subsistence hunting by Russian Natives on the Chukotka peninsula, coupled with legal hunting in Alaska, may have reached an unsustainable level. As with the Beaufort Sea stock, climate change is likely diminishing the habitat of this stock, with secondary effects on bear condition, reproduction, and survival.

Listing Polar Bears under the Endangered Species Act

On 16 February 2005 the Center for Biological Diversity petitioned the Secretary of the Interior to list the polar bear as a threatened species under the Endangered Species Act. The petition contended that the polar bear "faces likely global extinction in the wild by the end of this century as a result of global warming." Citing a recent report by the Arctic Climate Impact Assessment, the petition predicted that summer sea ice coverage will decline by more than 50 percent and possibly disappear completely. The petition contended that even partial loss of sea ice has the potential to drive the polar bear to extinction within the foreseeable future. In addition to the effects of global warming, the petition noted that polar bears face threats from increasing oil and gas exploration and development in the Arctic and the associated risk of oil spills, high levels of contaminants such as PCBs (polychlorinated biphenyls) and heavy metals, unsustainable levels of hunting in some areas, and a general increase in human activities in the Arctic.

The petition also noted that some adverse effects are already manifesting themselves in at least one polar bear population, that in Canada's western Hudson Bay. The break-up of ice in western Hudson Bay is occurring about two and a half weeks earlier than it did 30 years ago. This means that bears have less time to hunt seals, and the bears in that area are noticeably thinner and are experiencing lower reproductive rates and higher juvenile and subadult mortality (Stirling et al. 1999).

Initial Finding: Under the provisions of the Endangered Species Act, the Fish and Wildlife Service is required to make a determination within 90 days of receiving a listing petition as to whether the petition presents substantial information that the listing may be warranted. If an affirmative finding is made, the Service must promptly initiate a review of the species' status and, within 12 months of receipt of the petition, publish either (1) a finding that listing is not warranted, (2) a proposed rule to list the species, or (3) a finding that listing is warranted but precluded by other pending listing proposals. The Fish and Wildlife Service published a finding on 9 February 2006 that the petition presented sufficient information to initiate a more thorough status assessment of polar bears worldwide. The Endangered Species Act defines an "endangered species" as any species in danger of extinction throughout all or a significant portion of its range. A "threatened species" is defined as any species that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range. The Act specifies that a status assessment and subsequent listing determination be based on the following five factors: (1) present or threatened destruction, modification, or curtailment of habitat or range; (2) overutilization for commercial, recreational, scientific, or educational purposes; (3) disease or predation; (4) inadequacy of existing regulatory mechanisms; and (5) other natural or manmade factors affecting the species' continued existence.

Foreseeable Future: The Endangered Species Act does not specify what constitutes the "foreseeable future" for purposes of listing actions, so one of the key determinations that the Service needed to make was the time frame to use in its assessment. IUCN's Polar Bear Specialist Group had examined the status of polar bears in 2005 and used three generations as the appropriate time span for its projections. Generations, as defined by IUCN, are calculated as the age of sexual maturity (five years for polar bears) plus 50 percent of the length of the lifetime reproductive period (20 years for polar bears). Based on these determinations, the Polar Bear Specialist Group calculated the period of one generation as 15 years and three generations as 45 years. Given the IUCN criteria, the life history and population dynamics of polar bears, documented recent changes in both multi-year and annual sea ice, and the direction of projected rates of change of

sea ice in future decades, the Fish and Wildlife Service considered the three-generation, 45-year time span to be a reasonable projection of the foreseeable future in analyzing whether the species merited listing under the Endangered Species Act.

Proposed Listing Rule: On 9 January 2007 the Fish and Wildlife Service published a proposed rule to list all populations of polar bears as threatened under the Endangered Species Act. The Service believed that the species as a whole met the definition of a threatened species and the various populations need not be listed separately. The proposed rule analyzed each of the five factors that are to be considered in making listing determinations and found that the first factor—present or threatened destruction, modification, or curtailment of the species' habitat or range—was sufficient basis for listing. The Service reviewed various climate models that indicate a likelihood that sea ice, on which polar bears are dependent for hunting, seasonal movements, resting, and mating, will continue to decrease in extent and thickness. The Service noted that some models predict that, during summer months, sea ice will disappear almost completely by the end of this century. Researchers have already detected a link in certain areas (e.g., southern and western Hudson Bay) between a warming climate and declines in polar bear condition, distribution, and numbers (Stirling et al. 1999). The Service found that other potential listing factors could take on added importance as polar bears are further stressed by habitat change, but that none of these other factors, by themselves, currently threatens the species throughout all or a significant portion of its range.

The Service is required to designate critical habitat concurrent with the listing of a species under the Endangered Species Act unless it determines that such a designation is not prudent or not determinable. If critical habitat is not determinable at the time of listing, the Service has up to an additional year in which to make such a determination. The proposed listing of polar bears discussed critical habitat in general terms—for example, areas with annual and perennial sea ice used by polar bears for hunting, traveling, denning, etc., and terrestrial areas used for denning—but did not include a proposed critical habitat designation. Rather, the Service indicated that such a designation would require additional time and evaluation, and it specifically solicited related information from the public.

Commission Comments on the Proposed Rule: The Marine Mammal Commission provided comments by letter of 9 April 2007. The letter supported the proposed listing of the polar bear as a threatened species. Because polar bears currently have a relatively large total population size and a broad distribution, the Commission did not believe that the species currently is in danger of extinction. However, the Commission agreed with the Service that the loss of sea ice habitat as a consequence of continued climate change and the lack of adequate management mechanisms to address sea ice recession are likely to place the species in danger of extinction throughout all or a significant portion of its range within the foreseeable future (i.e., within the 45-year time frame considered by the Service).

The Commission noted that, because of the species' wide distribution and far-ranging movements, efforts to prevent further population decline of polar bears would require coordinated efforts among all of the range states with management responsibility for the species. The Commission therefore recommended that the Service collaborate with management authorities in other range states to develop and enhance conservation programs for polar bears, including protection of their habitat.

The Endangered Species Act requires that a recovery plan be developed and implemented for each listed species unless the Service determines that such a plan will not promote the conservation of the species. The Commission noted that, in general, recovery plans promote the conservation of species. Although it recognized that it may be premature to constitute a recovery team immediately, the Commission recommended that the Service make a concerted effort to identify and begin addressing management and research needs so that efforts to conserve polar bears are as timely and well informed as possible. The Commission advised the Service to consider not only the direct effects of climate change but to anticipate secondary effects, such as increased shipping in the Arctic and expanded opportunities for commercial fishing, oil and gas production, tourism, and coastal development. The Commission stressed the importance of

identifying essential polar bear habitats and collecting baseline information on use of those habitats before secondary threats associated with climate change occur and become irreversible.

The Commission recognized the complexity involved in identifying critical habitat but disagreed with the Service's proposal to defer designation until after a listing decision is made. For example, polar bear denning areas along the North Slope of Alaska have been recognized for several decades, and biologists with the U.S. Geological Survey have mapped terrestrial areas used for denning and resting. The Commission recommended that these areas be designated as critical habitat. Sea ice habitat is dynamic, variable, and constantly changing, so identification of such areas that may require special management or protection is more difficult. Nevertheless, the Commission believed that the Service needed to consider designating as critical habitat those areas of multiyear or annual pack ice north of Alaska that may provide suitable denning sites for polar bears. The Commission suggested that the Service work closely with sea ice scientists to predict areas where ice may persist in future decades for designation as critical habitat. In addition, the Commission observed that it might be necessary to develop a management system with dynamic boundaries that can be adjusted to reflect variations in the locations and extent of sea ice. The Commission also noted the importance of areas used by polar bears for feeding and movements between feeding and denning areas and recommended that the Service implement a study to identify such areas for inclusion in the critical habitat designation.

The Commission's letter also discussed the implications of listing the polar bear under the Endangered Species Act for the importation of trophies from sport hunts conducted in Canada, as authorized under section 104(c)(5) of the Marine Mammal Protection Act. If the species is listed, it will be considered depleted under the Marine Mammal Protection Act, and imports will be allowed only under permits issued for purposes of scientific research or species enhancement. The Commission noted that the requirements for trophy imports established under the Marine Mammal Protection Act had prompted improvements in Canada's polar bear management programs and provided an incentive within remote villages in Canada to support science-based management of polar bears. The Commission cautioned that the benefits of continued hunting needed to be weighed carefully against the costs to the bear population as those populations decline due to changing environmental conditions. The Commission acknowledged that, at present, the conservation benefits outweigh the costs. It therefore recommended that the Service consider ways in which the conservation benefits of allowing polar bear trophies to be imported from approved hunts in Canada could be retained and how those programs could be strengthened to enhance the long-term viability of polar bear populations. The Commission further suggested that the Service explore the establishment of criteria that could be used to determine when the costs of allowing closely regulated hunting of polar bears would outweigh the benefits. Whatever criteria are used to make that determination, they will have to pertain to the present and future growth rates of the bear populations and their ability to withstand the effects of climate change.

Additional Information: Shortly after publication of the proposed listing rule, the Secretary of the Interior asked the U.S. Geological Survey to develop new information, models, and interpretations on polar bears and their sea ice habitats that would be made available within the one-year decision-making time frame. Specifically, the agency was asked to (1) develop population projections for the southern Beaufort Sea population and analyze existing data on two polar bear populations in Canada, (2) evaluate Northern Hemisphere sea ice projections as they relate to polar bear habitat and the species' future distribution, and (3) model future range-wide polar bear populations by developing a synthesis of the range of likely spatial and numerical responses to sea ice projections. In response to this directive, the U.S. Geological Survey prepared nine new reports on polar bear status and demography, uncertainty concerning climate models, and the relationships between sea ice projections and polar bear distribution. These were made available for comment by the Fish and Wildlife Service on 20 September 2007.

The reports divided the range of polar bears into four ecoregions based on significant differences in current and projected sea ice conditions.

These ecoregions are (1) the seasonal ice ecoregion, which occurs mainly at the southern extreme of the polar bear range and includes Hudson Bay, (2) the archipelagic ecoregion consisting of the Canadian Arctic, (3) the polar basin divergent ice ecoregion, where ice is formed and then drawn away from nearshore areas, especially during the summer minimum ice season, and (4) the polar basin convergent ice ecoregion, where sea ice formed elsewhere collects against the shore. The reports also presented new information on the status of 3 of the 19 populations of polar bears, each from a different ecoregion. Based on current conditions, projected sea ice trends, and the associated effects on polar bears, the U.S. Geological Survey predicted population declines in western Hudson Bay (in the seasonal ice ecoregion) and southern Beaufort Sea (in the divergent ice ecoregion) due to reduced availability of sea ice. Furthermore, agency scientists predicted that polar bears could be extirpated from the polar basin divergent ice ecoregion and the seasonal ice ecoregion within the next 45 years. Extirpation of polar bears in the polar basin convergent ice ecoregion was likely to occur within the next 75 years. The models predicted that polar bears in the archipelagic ecoregion were likely to persist through the end of this century but in reduced numbers.

Commission Comments on the Additional Information: On 22 October 2007 the Marine Mammal Commission transmitted comments on the new reports and their implications for the listing of polar bears to the Fish and Wildlife Service. The Commission believed that the papers made available by the Service made a compelling case that the polar bear as a circumpolar species faces threats that are likely to reduce its numbers in the foreseeable future to the point where the risk of extinction is significant. The Commission noted further that some populations already are in danger of extinction unless the declining trends in sea ice coverage are somehow reversed. Based on the new information indicating that polar bears inhabiting the divergent ice ecoregion and the seasonal ice ecoregion could be extirpated by the middle of the 21st century, the Commission recommended that populations in those regions (the southern Beaufort Sea, Chukchi Sea, Laptev Sea, Kara Sea, Barents Sea, western Hudson Bay, and southern Hudson Bay) be listed as endangered. The Commission also recommended that polar bear populations in the other two ecoregions be listed as threatened.

The Commission noted that the Endangered Species Act requires that listing decisions be based on the best available scientific and commercial information and indicated that the papers and analyses circulated by the Service for review constituted the best scientific information currently available on the likely changes to polar bear habitat and the implications of those changes for the species. The Commission observed that, in some areas, populations already are showing signs of stress (i.e., shifting toward land-based denning, abandonment of areas with high rates of ice degradation, the presence of starving and underweight bears, and cannibalism).

The critical factor for polar bear persistence is the extent and characteristics of sea ice. As such, the case for listing bears made by the new reports hinges largely on whether the reductions in sea ice predicted by the U.S. Geological Survey are reasonably likely to occur. The Commission thought that the models used had been selected with objectivity and rigor and that the agency had appropriately relied on the models that were most consistent with observed ice trends. One possible shortcoming identified by the Commission was that the models used to predict future ice patterns failed to take into account observations from 2007. In 2007 minimum sea ice coverage declined to a historic low of just over 4 million km^2, which is about 1 million km^2 less than the previously observed minimum (in 2005) and reflects a nearly 40 percent reduction compared with the average from 1979 through 2000. Had data from 2007 been used, the projected sea ice coverage in future years would likely have been lower and the impact on polar bears greater than those reflected in the agency's analyses. In addition, those analyses failed to account for some factors that might exacerbate the problem, including projected increases in the release of greenhouse gases from the thawing of permafrost and the albedo effect that is expected to increase thermal absorption in the oceans and on land as ice coverage diminishes. Noting that recent trends in sea ice coverage suggest an accelerating loss of ice, the Commission observed that the projections from the models used by the U.S. Geological Survey in its assessment might prove to be optimistic.

Final Listing Rule: The Fish and Wildlife Service published a final rule on 15 May 2008 listing the polar bear throughout its range as a threatened species. This was the deadline established by the U.S. District Court for the Northern District of California in *Center for Biological Diversity* v. *Kempthorne* by which a final action on the proposed listing was to be taken. Because of this court-imposed deadline, the listing became effective immediately, rather than being subject to the otherwise applicable 30-day notice requirement of the Administrative Procedure Act.

The listing rule presented detailed information on the population trends and demographics of polar bears worldwide and addressed the five listing factors to be considered under section 4(a)(1) of the Endangered Species Act. The Service's analyses focused on the factor pertaining to the present or threatened destruction, modification, or curtailment of the species habitat or range, concluding that listing was warranted based on the ongoing and projected decline of sea ice habitat and the effect that this will have on polar bear populations worldwide.

The Service invoked an exception in the Endangered Species Act to extend the deadline for designating critical habitat, or determining that such a designation is not prudent, to 15 May 2009. However, as discussed in the litigation section below, the Service later entered into a settlement agreement with environmental groups extending this deadline until 30 June 2010.

Special Rule for Polar Bears: If a species is listed as endangered under the Endangered Species Act, all of the prohibitions set forth in section 9 of the Act automatically apply. For species listed as threatened, however, this is not the case. Rather, section 4(d) of the Act directs the Fish and Wildlife Service to adopt such regulations as are "necessary and advisable" for the conservation of the species. The Service has the option of adopting the full suite of prohibitions applicable to endangered species or choosing a different combination tailored to the threats faced by the particular species. In the case of polar bears, the Service published an interim final rule under section 4(d) concurrent with its listing decision. Both were published in the *Federal Register* on 15 May 2008 (73 Fed. Reg. 28212).

For the most part, the Service relied on the provisions applicable under the Marine Mammal Protection Act and the Convention on International Trade in Wild Species of Fauna and Flora (CITES). If an activity is authorized under a permit or authorization issued under the Marine Mammal Protection Act, or is subject to one of the Act's exceptions or exemptions, no additional authorization under the Endangered Species Act would be needed. This would include, for example, subsistence hunting and trade in handicrafts, cultural exchanges among circumpolar Natives, taking in defense of life or property or for the welfare of the animal, scientific research and enhancement permits, and incidental take authorizations. Similarly, no additional Endangered Species Act authorization would be needed for the import or export of a polar bear or its parts if it is authorized under a CITES permit or is allowed under one of the Convention's exceptions (e.g., for personal or household effects). If, however, one of the Marine Mammal Protection Act or CITES exceptions is not applicable, an authorization under the Endangered Species Act provisions will be required. The interim final rule also clarified that, as a consequence of the listing, certain activities that previously were permissible could no longer be authorized, such as the taking or importation of polar bears for purposes of public display or the importation of polar bear trophies from Canada (see following discussion).

Another provision of the interim final rule specified that none of the prohibitions that otherwise would be applicable under its regulations implementing the Endangered Species Act will apply to the taking of a polar bear "that is incidental to, but not the purpose of, carrying out an otherwise lawful activity within any area subject to the jurisdiction of the United States, except Alaska."

Federal actions, including those carried out, funded, or authorized by federal agencies, that may affect a listed species or its critical habitat are subject to consultation under section 7 of the Endangered Species Act to insure that they are not likely to jeopardize the continued existence of the species or destroy or adversely modify critical habitat. Although an action may affect species or habitat that occur outside of the area where the action will take place (e.g., through indirect effects), the Service

stated that, to meet the applicable regulatory standards, such effects must (1) be caused by the action subject to consultation and (2) be reasonably certain to occur. The Service explained that "effects are only appropriately considered in a section 7 analysis if there is a causal connection between the proposed action and a discernable effect to the species or critical habitat that is reasonably certain to occur." The Service recognized that every agency action that contributes greenhouse gases to the atmosphere arguably could trigger a consultation for polar bears or other species that are affected by climate change. Nevertheless, the Service thought that there was an insufficient basis for drawing a causal connection between emissions from a specific federal action and impacts to the species or its critical habitat. As such, the Service indicated that it does not intend to consult on federal actions that occur outside of the polar bear's range but that could affect the species or its habitat through the release of greenhouse gases.

The Marine Mammal Commission submitted comments on the interim final rule on 14 July 2008. The Commission noted that the regulations relied almost exclusively on the provisions of the Marine Mammal Protection Act and CITES to provide for the conservation of polar bears. However, these same provisions have not been sufficient to keep the species from reaching the point where it warrants listing as a threatened species. This being the case, the Commission did not see how relying on these same provisions without any supplementation would satisfy the mandate of section 4(d) to conserve the polar bear, which, in the context of the Endangered Species Act, means to bring the species to the point where the protective measures of the Act are no longer needed. In fact, the interim final rule included no provisions specifically designed to address the primary threat faced by polar bears– the ongoing and projected loss of sea ice habitat. The Commission therefore recommended that the Service develop a new proposed rule tailored to address the conservation needs of and the specific threats faced by polar bears.

The Commission also identified certain differences between the provisions of the Endangered Species Act and the Marine Mammal Protection Act that did not seem to have been accounted for in the rule. For example, the definition of the term "take" differs between the two statutes, with the Endangered Species Act having a somewhat broader reach. The Commission thought that it would be useful for the Service to review the differences in what it considered to constitute a taking under the two Acts and recommended that the Service account for any such differences by adding as prohibitions in the final rule any elements included under the Endangered Species Act definition that are not also covered under the Marine Mammal Protection Act. Similarly, the Commission identified differences between the subsistence taking provisions under the two statutes. Under the Marine Mammal Protection Act, Alaska Natives are authorized to take marine mammals either for subsistence purposes or for purposes of creating and selling authentic Native articles of handicrafts and clothing. In contrast, under the Endangered Species Act, the initial taking must be for a subsistence purpose and only then may the non-edible by-products be used for creating and selling handicrafts and clothing. Even though most polar bears used to create handicrafts were taken for a subsistence purpose, the Commission thought that the more restrictive provisions of the Endangered Species Act were more appropriate and should be reflected in the final rule.

The Commission also said it did not see why it would be administratively burdensome to comply with overlapping provisions of the two statutes in certain contexts. For example, because the consultation requirements of section 7 likely would be triggered any time an incidental take authorization is being considered under the Marine Mammal Protection Act, the Commission believed that it would be relatively simple to comply with the incidental take provision of both statutes. Similarly, the Service's permit office has a long history of processing research or enhancement permits authorizations for listed species under both Acts simultaneously. The Commission believed that concurrent review under the similar but not identical standards applicable under the two statutes should be required. The Commission recommended that, in such situations, the Service not rely entirely on the Marine Mammal Protection Act provisions, which would be the case under the interim final rule.

In addition, the Commission identified problems with the provision of the interim regulations

that provided a general exemption under the Endangered Species Act for the taking of polar bears incidental to activities conducted in areas subject to the jurisdiction of the United States other than Alaska. First, the Service provided no analysis of what activities, if any, would be subject to authorization under the Endangered Species Act but not the Marine Mammal Protection Act. If there are none, the Commission noted that they would be covered under the more general regulatory provision that defers to the authorization issued under the Marine Mammal Protection Act authorization. As such, there would be no need for this seemingly redundant provision. If the Service thought some activities would be subject to the Endangered Species Act but not the Marine Mammal Protection Act, the Commission believed that the Service should not provide a blanket authorization. The Commission also noted that the term "Alaska" has a precise legal meaning that did not include the areas outside state waters (i.e., waters beyond three nautical miles from shore) inhabited by polar bears. The Commission assumed that the Service had not intended to exempt all activities within the U.S. Exclusive Economic Zone or in international waters but within the area occupied by polar bears from the incidental taking requirements of the Endangered Species Act. The Commission recommended that the Service review this aspect of the regulations and adopt a single set of provisions applicable to the incidental taking of polar bears throughout their range.

The Commission's comments also flagged the discussion in the preamble to the interim final rule that set forth the Service's interpretation of the section 7 consultation requirements as they pertain to federal actions that emit greenhouse gases. The Commission indicated that it did not necessarily agree with the Service's analysis, but, because this issue was tangential to the need for or content of the regulations under section 4(d), it saw no need to comment on the issue in the context of the interim rule. Rather, the Commission indicated that it would address this issue in a separate letter. The opportunity to comment further on this issue arose when the Fish and Wildlife Service and the National Marine Fisheries Service proposed changes to their regulations implementing section 7. That proposed rule, published in the *Federal Register* on 15 August 2008 (73 Fed. Reg. 47868), proposed a generally applicable approach to evaluating the impacts of greenhouse gas emissions on listed species and critical habitat similar to that set forth in the special rule for polar bears.

The Commission commented on the proposed section 7 regulations on 14 October 2008. Although the Commission agreed with the Services that consulting on every federal action that could contribute incrementally to greenhouse gas emissions would be impractical, discounting the effects of such emissions entirely, as the Services seemed to be proposing, would be inconsistent with the statutory mandates of the Endangered Species Act. The effect of a particular release may be difficult to link to a specific impact on polar bears or their habitat. Nevertheless, as indicated in the polar bear listing regulation, the release of these gases at anticipated levels, including releases from actions authorized, funded, or carried out by federal agencies, and the predicted impact of these releases on sea ice habitat are likely to jeopardize the continued existence of polar bears and to adversely modify essential polar bear habitat. Thus, the Services cannot discount the effects of greenhouse gas emissions entirely just because they are produced by multiple sources. The Commission recommended that the Services consider alternative approaches for conducting consultations involving the release of greenhouse gases. For example, the Services might establish a threshold that exempts relatively minor emissions but that requires consultation for more significant sources.

The Fish and Wildlife Service published its final special rule for polar bears under section 4(d) of the Endangered Species Act on 16 December 2008. In most respects, the final rule tracked the provisions of the interim final rule. Minor clarifying changes were made to the provision concerning deference to authorizations under the Marine Mammal Protection Act and CITES. The one substantive change concerned the provision applicable to incidental takes. The Service adopted the Commission's recommendation that the exemption for such takings be scaled back such that it is now applicable in all areas within the current range of the polar bear and subject to U.S. jurisdiction and not just in Alaska. Also on 16 December 2008 the Fish and Wildlife Service and the National Marine Fisheries Service

published a final rule making changes to the section 7 regulations. Those regulations adopted the proposed changes for how greenhouse gas emissions would (or would not be) addressed during Endangered Species Act consultations.

Litigation: The Service's listing of polar bears and issuance of the special rule almost immediately spawned a variety of legal challenges. Environmental groups contended that the species should have been listed as endangered rather than threatened. The State of Alaska and others claimed that listing polar bears as threatened was unwarranted. Hunters who had applied for or had been issued trophy import permits challenged the Service's interpretation that such imports could no longer be authorized. Litigants also challenged the special rule, some contending that it should have incorporated all of the protections afforded species listed as endangered and others that it had been too inclusive of those prohibitions.

The lawsuit filed by environmental organizations also challenged the Service's decision to defer designation of critical habitat and sought to compel the Service to issue guidance under the Marine Mammal Protection Act on non-lethal means of deterring polar bears that present threats to public safety. The parties reached a partial settlement on these two issues on 6 October 2008. The Service committed to publishing a final critical habitat designation by 30 June 2010. Final deterrence guidelines must be published by 31 March 2010.

As of the end of 2008 action on the various lawsuits was pending, although a motion had been filed to consolidate the multiple cases into a single proceeding in the U.S. District Court for the District of Columbia.

Trophy Imports

The 1994 amendments to the Marine Mammal Protection Act allow the Secretary of the Interior to issue permits authorizing the importation of polar bear trophies from sport hunts conducted in Canada, provided that certain findings are made. Among other things, the applicable provision (section 104(c)(5)) requires the Secretary to find that Canada has a monitored and enforced sport hunting program that is (1) consistent with the purposes of the Agreement on the Conservation of Polar Bears and the Marine Mammal Protection Act and (2) based on scientifically sound quotas that will ensure the maintenance of the affected population stock at a sustainable level. Imports of trophies had been approved from 6 of 13 management units identified by Canada. Imports from a seventh management unit (M'Clintock Channel) also had been approved but only for bears that were legally harvested prior to 1 April 2000 when the sustainability finding was revoked. Imports from the other management units were never authorized except under a grandfather provision that allowed the importation of any polar bear trophy legally taken in Canada before 18 February 1997, the date on which the Fish and Wildlife Service published regulations implementing the polar bear import provision.

All of this changed, however, when the Fish and Wildlife Service listed the polar bear as a threatened species. Under the statutory definition of "depletion," any species or population of marine mammal listed as endangered or threatened under the Endangered Species Act is automatically considered a depleted species or stock under the Marine Mammal Protection Act. In accordance with section 102(b)(3), depleted marine mammals may be imported into the United States only for purposes of scientific research or for enhancing the survival or recovery of the species or stock. In an opinion issued by the Department of the Interior's Solicitor on 23 May 2008 (available at http://www.doi.gov/solicitor/opinions.html), the agency determined that this general import prohibition took priority over the specific permit provision applicable to polar bear trophies. The opinion concluded that "Congress did not intend to allow the importation of sport-hunted polar bear trophies from Canada under section 104(c)(5) of the MMPA if polar bears were listed as a threatened species or endangered species under the ESA." The Solicitor noted, however, that the Service can still authorize the importation of polar bear parts under scientific research or enhancement permits, provided that all of the applicable statutory and regulatory requirements have been satisfied. Consistent with the Solicitor's determination, the Service suspended its review of pending applications for trophy import permits and informed those who had been issued import permits but had yet to import their trophies that those permits were

no longer valid. Some of the hunters whose import permit applications were pending at the time of the listing, as well as hunting organizations, filed lawsuits challenging the Service's determination. As of the end of 2008 these lawsuits had been consolidated with several other cases stemming from the listing of polar bears under the Endangered Species Act, but no further action had been taken.

The listing of polar bears and its implications for the importation of trophies from Canada also attracted the attention of Congress. Shortly after the close of the initial comment period on the proposed listing rule, members of Congress introduced two bills (H.R. 2327 and S. 1406) designed to "ensure that citizens of the United States do not contribute to polar bear mortalities in Canada" by eliminating the trophy import permit provision and adding a new provision specifying that no permit may be issued to authorize the importation of polar bear parts taken in a sport hunt. Following publication of the listing rule and the Service's determination that it could no longer authorize the importation of polar bear trophies, the congressman from Alaska introduced two bills that would reinstate the permitting authority. The first bill, H.R. 6936, would have allowed polar bears legally taken in Canada before 14 May 2008 to be imported into the United States, notwithstanding the listing. The second bill, H.R. 7171, took a broader approach and would have reinstated the permitting authority of section 104(c)(5) in its entirety. That is, not only would hunters have been able to import polar bear trophies taken prior to the publication of the listing rule, but they would have been able to import trophies taken in Canada in the future from approved management units.

Following the listing of the polar bear as a threatened species, Conservation Force submitted applications on behalf of several hunters seeking enhancement permits to authorize the importation of polar bear trophies from Canada. All of the bears had been taken in sport hunts from the Gulf of Boothia population, which was not one of the populations that had been approved by the Fish and Wildlife Service under the trophy import provision. The applicants contended, among other things, that allowing U.S. hunters to import trophies taken in Canada's sport hunting program enhanced the survival and recovery of polar bears by providing (1) socioeconomic benefits to Native communities, thereby providing an incentive for Inuit hunters to support effective management programs, (2) additional funding to support population monitoring and other research and management measures, and (3) an incentive for Canada to adopt and enforce harvest limits that further the goals of the Marine Mammal Protection Act.

The Marine Mammal Commission provided comments on these applications to the Fish and Wildlife Service on 16 December 2008. In its comments, the Commission reviewed the history behind enactment of the Marine Mammal Protection Act's enhancement permit authority. The Commission had participated in drafting those provisions and explained that Congress had crafted a rather narrow exception and, notwithstanding the potential for some general conservation benefit, never intended for sport hunting to be considered an enhancement activity. The Commission also provided an analysis of whether the proposed imports and underlying hunting activities satisfied the applicable statutory criteria for obtaining an enhancement permit. The Commission indicated that the applicants had not demonstrated that the proposed taking and importation is likely to contribute significantly to maintaining or increasing the distribution or numbers of polar bears necessary to ensure their survival or recovery. The applicants seemed to be suggesting that Canada would not be managing polar bears responsibly were it not for the incentives provided by sport hunting, something that would be contrary to its obligations as a party to the Agreement on the Conservation of Polar Bears. The Commission further noted that, for an activity to qualify for an enhancement permit, it should address the factors that are causing a decline in the population or otherwise compromising its persistence. In this case, the hunting and importation of polar bear trophies would do nothing to address the primary threat faced by the species, the loss of sea ice habitat.

The Commission also noted that all of the bears for which permits were being sought had been taken from a population for which imports had not been approved under the trophy import provisions. That is, the Service has yet to determine that the management program for that population is based on scientifically sound quotas that ensure the maintenance

of the population at a sustainable level. For that reason, the Service would have even less basis for concluding that imports would meet the enhancement permit requirements. Action by the Service on the enhancement permit applications was pending at the end of 2008.

Native Subsistence Hunting

The Marine Mammal Protection Act authorizes Alaska Natives to take marine mammals for subsistence uses and for purposes of making and selling authentic Native articles of handicraft and clothing. Subsistence hunters take polar bears from both stocks that occur in Alaska (see Table 7). The Fish and Wildlife Service's marking and tagging program has provided data on the numbers of polar bears taken since 1988, the year that program was instituted. Under the program, Alaska Native hunters are required to report, within 30 days, on each polar bear taken and to present the animal's skin and skull for tagging. The Service has established a network of "taggers" located in each of the hunting villages who tag the bear parts and collect information on the size, sex, and approximate ages of the bears and the locations where they were taken.

The number of bears taken from the Chukchi/Bering Seas stock has declined since the 1980s. The average annual take in the 1980s was 92. This fell to about 50 per year during the 1990s and has dropped to about 45 per year since 2000. The causes for this reduction are not well understood but may be related to (1) changing climate conditions and the altered duration, extent, movement, and thickness of the sea ice in the area, (2) a population decline, (3) the suspected but not quantified increase in the number of bears taken from this population in Russia, and (4) a decline in the number of active Native hunters. In contrast to the Chukchi/Bering Seas population, the average number of polar bears taken from the Beaufort Sea stock has remained relatively constant since 1980 at about 36 bears per year.

In the 2007–2008 hunting season, the number of bears taken for subsistence by Alaska Natives dropped to the lowest level on record. Although all bears taken may not yet have been reported to the Service, the available data indicate that only 34 bears were taken, 22 from the Chukchi/Bering Seas stock and 12 from the Beaufort Sea stock. Some

Table 7. Numbers of polar bears reported taken by Alaska Natives, 1980–2008

Harvest Year	Total Take	Chukchi/ Bering Seas Stock	Beaufort Sea Stock
1980–1981	109	71	38
1981–1982	92	69	23
1982–1983	88	56	32
1983–1984	297	235	62
1984–1985	120	67	53
1985–1986	133	103	30
1986–1987	104	68	36
1987–1988	128	91	37
1988–1989	142	83	59
1989–1990	103	78	25
1990–1991	82	60	22
1991–1992	62	34	28
1992–1993	81	43	38
1993–1994	128	78	50
1994–1995	96	73	23
1995–1996	46	12	34
1996–1997	92	38	54
1997–1998	61	33	28
1998–1999	108	85	23
1999–2000	66	36	30
2000–2001	96	53	43
2001–2002	109	76	33
2002–2003	66	27	39
2003–2004	65	21	44
2004–2005	65	34	31
2005–2006	89	57	32
2006–2007	71	50	21
2007–2008	34	22	12

Harvest year is 1 July to 30 June.

Data courtesy of the Fish and Wildlife Service

of the factors noted above may have contributed to this decline. During this season, nearshore ice initially was heavy, which may have prevented Natives from accessing hunting grounds. Later, the ice became thin and unstable and perhaps too dangerous for hunters to access safely. Other possible contributing factors could have been the high cost of fuel, which may have limited access to remote hunting areas, or concern about the conservation status of polar bears.

Since 1994 the marking and tagging program has collected information on whether polar bears reported by Alaska Natives were taken as part of traditional subsistence hunts or in defense of life or property. Although the number of polar bears taken in defense of life or property varies considerably among years, the trend generally has increased in recent years from about three per year in the mid-1990s to about 12 per year since 1998. This trend appears to be related to changing sea ice conditions: polar bears must spend more time on shore and their increasing presence results in more human/bear interactions. During the 2007–2008 season, four polar bears were reported to have been taken in defense of life or property. This decline may be related to the overall decline in the number of bears being taken or may reflect increasing efforts to use non-lethal deterrence measures to respond to bears that come near villages.

Take information from Alaska does not indicate the total removal of bears from these stocks because they are shared with either Canada (Beaufort Sea stock) or Russia (Chukchi/Bering Seas stock) and are subject to hunting in those countries as well. To address the potential for overharvesting of the shared Beaufort Sea population, the North Slope Borough, representing polar bear hunters in Barrow, Nuiqsut, Wainwright, Atqasuk, and Kaktovik, entered into a management agreement with the Inuvialuit Game Council, representing hunters in Canada. The agreement was signed in 1988 and remains in effect. Although outside the scope of the Marine Mammal Protection Act, the agreement is more restrictive than the provisions of the Act in some respects. For example, it prohibits the taking of bears in dens or bears constructing dens and protects family groups made up of females and cubs, as well as any cubs less than 1.5 m (5 ft) in length. In addition, the parties to the agreement jointly establish annual hunting limits, which are divided between the parties before the hunting season. In part because of that agreement, the Beaufort Sea stock has been fairly well studied and maintained in good health. However, recent observations have detected a reduction in cub survival and decreased skull measurements in adult males, presumably related to stress in the population due to the retreat of sea ice and associated reduction in availability of prey.

The situation is markedly different for the Chukchi/Bering Seas stock. The most recent abundance estimate (about 2,000 animals) is more than 10 years old and is not considered reliable. Up-to-date and reliable data also are needed on bear recruitment, survival, and movement patterns. As noted earlier, questions remain about the number of polar bears being removed by hunters in Russia where hunting is currently prohibited but illegal harvest levels may be substantial. To address these concerns, the United States and Russia have concluded a bilateral agreement to conserve this stock, set hunting limits, and provide a vehicle for cooperative research. Efforts to implement that agreement are described in the following section.

International Polar Bear Agreements

Polar bears can traverse great distances, often crossing national boundaries and moving into international waters. Hence, efforts to conserve them often require international cooperation. As discussed here, the United States participates in both multilateral and bilateral agreements to protect polar bears.

Agreement on the Conservation of Polar Bears: In addition to the two polar bear stocks that occur in the Alaskan Arctic (Figure 13), several other stocks occur throughout the Arctic in Canada, Greenland, Norway, and Russia. In the 1950s and 1960s an increasing number of polar bears were being taken by hunters. For that reason, the United States and other countries where polar bears occur negotiated 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 and entered into force in 1976. Among other things, the agreement limits the purposes for which polar bears may be taken,

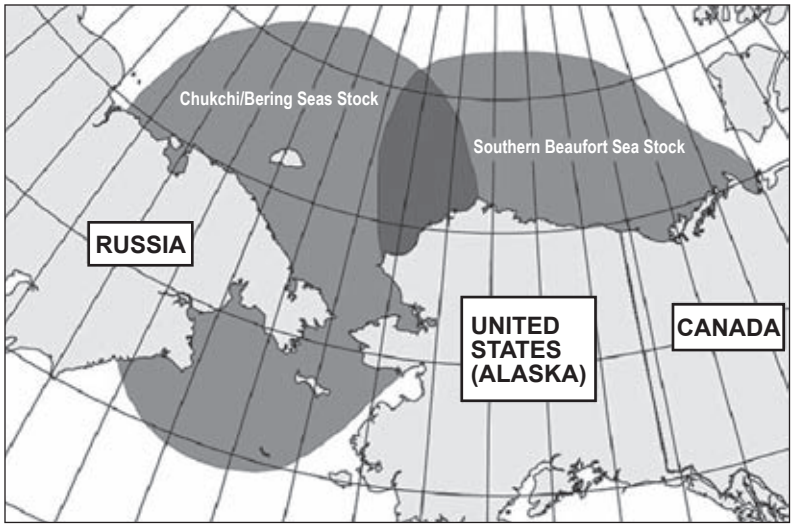

Figure 13. The United States shares two distinct polar bear populations, one with Canada and the other with Russia.

prohibits certain methods of taking, and requires the parties to protect important bear habitats, such as denning and feeding areas and migratory corridors. It also requires signatory countries to maintain national research programs. Implementation of the agreement by the United States relies on domestic legislation, primarily the Marine Mammal Protection Act.

The Agreement on the Conservation of Polar Bears also calls on the party nations to consult with one another to further the conservation of polar bears and to exchange information concerning their research and management programs, particularly with respect to shared populations. However, until recently, the party nations had never established a formal mechanism for consulting and meetings rarely occurred. Rather, they relied largely on the Polar Bear Specialist Group, which was established under the auspices of the IUCN and is composed of polar bear experts from the five polar bear range states, as the primary conduit for the exchange of information. The Specialist Group meets periodically, usually every three or four years, to review matters pertaining to research and management of polar bears and to provide scientific advice and technical support that can be used by the contracting governments to implement the agreement.

In 2007 the United States called for a meeting of the parties to the agreement to provide an international forum in which to exchange information on polar bear research and management programs, review the status of polar bear populations, and consider additional measures that the parties could take to strengthen polar bear conservation programs. On 26–28 June 2007 the United States hosted a meeting of the polar bear range states in Shepherdstown, West Virginia. This was the first time that the parties to the 1973 polar bear agreement had met since 1981. A summary of the 2007 meeting was included in the Commission's 2007 annual report.

The participants in the Shepherdstown meeting considered the exchange of information and discussion of polar bear conservation needs to be valuable and agreed that more frequent meetings were needed to assess and oversee implementation of the polar bear agreement. They resolved to do so, and Norway offered to host the next meeting of the range states during the first quarter of 2009.

United States–Russia Polar Bear Agreement: In the early 1990s the Fish and Wildlife Service began discussions with its Russian counterparts to develop a unified management approach for the Chukchi/Bering Seas polar bear stock shared by the two countries. These discussions culminated in the two countries signing a protocol in 1992 expressing their intent to pursue a joint management agreement. The 1994 amendments to the Marine Mammal Protection Act provided further impetus for a bilateral polar bear treaty. Section 113(d) of the Act called on the Secretary of the Interior, acting through the Secretary of State and in consultation with the Marine Mammal Commission and the State of Alaska, to consult with Russian officials on the development and implementation of enhanced cooperative research and management programs for the shared stock.

In October 2000 efforts to pursue greater cooperation between the United States and Russia with respect to the Chukchi/Bering Seas polar bear stock culminated with the signing of the Agreement between the Government of the United States of America and the Government of the Russian Fed-

eration on the Conservation and Management of the Alaska–Chukotka Polar Bear Population. The agreement specifies that subsistence taking by Native residents of Alaska and Chukotka is to be the only allowable consumptive use of the affected stock of polar bears. The agreement establishes a joint commission composed of a governmental official and a representative of the Native people from Russia and the same from the United States. The commission is to establish annual taking limits that may not exceed the sustainable harvest level determined for the stock. The allowable take will be divided equally between the two parties, but, subject to approval by the commission, either party may transfer a portion of its allowable take to the other party. Once in place, the commission will establish a scientific working group to assist in setting annual sustainable harvest levels and identifying scientific research to be carried out by the parties.

Other provisions of the agreement prohibit the taking of denning bears, females with cubs, or cubs less than one year old and the use of aircraft and large motorized vessels for hunting polar bears. Also, the agreement directs the parties to undertake all efforts necessary to conserve polar bear habitats, particularly denning areas and those areas where polar bears concentrate to feed or migrate. Implementation of these provisions is expected to help ensure that the United States is in full compliance with the provisions of the multilateral 1973 polar bear treaty. Additional information concerning the Chukchi/Bering Seas polar bear stock and the treaty can be found at the Web site maintained by the Fish and Wildlife Service's Alaska Region (http://alaska.fws.gov/fisheries/mmm/polarbear/pbmain.htm).

Both parties must ratify the agreement before it takes effect. Russia did so in a decree issued on 10 March 2005. In the United States, ratification requires, among other things, that the Senate provide its advice and consent. On 31 July 2003 the Senate unanimously passed a resolution providing its advice and consent, subject to one condition. That condition requires the Secretary of State to provide prompt notification to the Senate Committee on Environment and Public Works and the Committee on Foreign Relations if, pursuant to Article 3 of the agreement, the parties modify the boundaries of the area covered by the agreement.

In addition, the United States recognized the need for legislation to implement certain provisions of the agreement domestically. That was provided by Public Law 109-479 enacted on 12 January 2007. Section 902 of that law added a new Title V to the Marine Mammal Protection Act to implement the provisions of the bilateral agreement and to authorize appropriations to carry out functions related to the agreement through fiscal year 2010. Among other things, the new title—

- sets forth the procedures by which U.S. commissioners are selected
- establishes prohibitions on taking polar bears in violation of the U.S.–Russia agreement or any annual limit or other restriction on the taking of polar bears adopted by the parties to that agreement
- relies on the existing authorities under Title I of the Act for enforcement
- directs the Secretary of the Interior to promulgate regulations to implement the provisions of the Act and the agreement
- authorizes the Secretary to share authority for managing the taking of polar bears with the Alaska Nanuuq Commission, and
- allows the United States to vote on issues before the United States–Russia Polar Bear Commission (to be established under the agreement) only if the two U.S. Commissioners agree on the vote.

Appointment of the U.S. Commissioners was pending at the end of 2008. The Commission expects them to be appointed early in 2009 and the first meeting of the bilateral commission to be held before the end of the year.

Interior Department–Environment Canada Memorandum: Recognizing that Canada is home to about two-thirds of the world's polar bears, and thus a key partner in conserving the species, the Secretary of the Interior met with Canada's Minister of the Environment on 8 May 2008 to discuss the Endangered Species Act listing decision to be made by the Secretary the following week. That meeting resulted in a memorandum of understanding between the Department of the Interior

and Environment Canada for the conservation and management of shared polar bear populations. The memorandum calls for the development of a cooperative polar bear conservation action plan and the creation of a bilateral oversight group to meet at least annually to develop, implement, review, and coordinate cooperative conservation projects and programs. The bilateral oversight group likely will meet in 2009. Among other things, the group will develop a cooperative polar bear action plan.

Ice-Associated Pinnipeds

Scientists, managers, and Alaska Natives often refer to the bearded (*Erignathus barbatus*), ribbon (*Phoca fasciata*), ringed (*Phoca hispida*), and spotted (*Phoca largha*) seals as "ice seals" because they, like the walrus (*Odobenus rosmarus*), associate with sea ice. Although these seals are all closely affiliated with sea ice, they exhibit notable differences in their life history traits and ecology. Despite the lack of systematic assessment for some of these species, scientists generally have surmised that ice seal and walrus populations in U.S. waters were relatively abundant and largely unaffected by human activities other than in localized areas (e.g., subsistence harvests by Alaska Natives). As is now evident, climate change, the associated rapid changes in sea ice habitat and other environmental and ecological conditions, and the current and anticipated increases in human activities in the Arctic (e.g., oil and gas exploration and development, commercial shipping, commercial fishing, coastal development) all pose serious risks to these species and to Arctic marine ecosystems.

The National Marine Fisheries Service is the lead federal agency responsible for conservation of seals, and on matters pertaining to ice seals it cooperates with the Ice Seal Committee, which is composed of Alaska Natives who harvest seals for subsistence purposes. The Fish and Wildlife Service is the lead federal agency responsible for conservation of walruses, and it cooperates with another Alaska Native organization, the Alaska Eskimo Walrus Commission. The Services and these organizations work with Alaska Native communities, the Alaska Department of Fish and Game, the U.S. Geological Survey, university researchers, and environmental groups to conduct or support research and management activities related to the walrus or ice seal species.

The lack of research and assessment has been and continues to be an impediment to management and conservation of ice seals. These species live in remote and inhospitable environments, and research on them is logistically difficult and expensive. Faced with competing concerns, the National Marine Fisheries Service has given lesser priority to its research and management responsibilities related to ice seals. Despite the growing awareness of climate change and the severe threats posed to Arctic marine ecosystems, including these species, the Service still has not initiated efforts needed to assess changes in status or guide conservation actions in the foreseeable future. As a result, the status and trends of these species are poorly known, as is readily apparent in their stock assessment reports (http://www.nmfs.noaa.gov/pr/sars/region.htm). Despite uncertainty regarding their current status, few doubt that the direct and indirect effects of climate change pose potentially significant threats to ice seals and walruses. On 20 December 2007, 7 February 2008, and 28 May 2008, the Center for Biological Diversity submitted three petitions to list the ribbon seal, the walrus, and bearded, ringed, and spotted seals under the Endangered Species Act. The petitions were based on threats from (1) loss of Arctic sea ice, (2) suspected high harvest levels in Russia, (3) oil and gas exploration and development, (4) rising contaminant levels in the Arctic, and (5) bycatch and competition for prey resources from commercial fisheries. On 28 March 2008 the National Marine Fisheries Service released its 90-day finding on the petition to list the ribbon seal. The Service found that the petition contained substantial scientific and commercial information and that the status of this species warranted full review. On 4 September 2008 the National Marine Fisheries Service released its 90-day finding regarding the petition to list the bearded, ringed, and spotted seals. The Service found that this petition also contained substantial scientific and commercial information and that the status of these species warranted full review.

On 7 November 2008 the Marine Mammal Commission wrote to the National Marine Fisheries Service, reiterating its longstanding concern

about inadequate research and management of ice seals. The Commission focused its recommendations to the Service on the five listing factors identified in the Endangered Species Act. Specifically, the Commission recommended that, in its review of the status of the bearded, ringed, and spotted seals, the Service—

- analyze habitat changes relative to the unique life history characteristics and seasonal habitat requirements of each of the species, evaluate the ability of each ice seal species to adapt in the face of changing conditions, and identify limits to behavioral adaptation to determine whether the present or threatened destruction, modification, or curtailment of its range places at risk the continued existence of any of the species, now or in the foreseeable future;
- analyze in detail the potential for overutilization—primarily for subsistence purposes—and how it will ensure that such harvests do not become a factor that increases the risk of extinction of any of the three species;
- consider how the three species might be affected by increasing exposure and susceptibility to disease, changing trophic food-web relationships, and changing ecological interactions as the Arctic climate warms;
- conduct a thorough review of regulatory mechanisms to address the effects of climate change, setting the stage for proposing concerted action in this area, should any or all of these species be listed as threatened or endangered; and
- characterize and evaluate the predicted increase in human activities in the ranges of the three ice seal species that may threaten them, now or in the foreseeable future.

On 3 December 2008 the Center for Biological Diversity filed suit against the Fish and Wildlife Service and the Secretary of the Interior for failing to respond to the petition to list the walrus.

The following sections summarize existing information on walruses and ice seals and related research and management activities in 2008. The ice seals are ordered by their apparent dependence on ice: ringed seal (most dependent), bearded seal, ribbon seal, and spotted seal (least dependent). Note, however, that climate change will have ramifications throughout Arctic ecosystems, not just to the physical structure provided by sea ice, and assessment of relative vulnerabilities does not necessarily follow this order.

Pacific Walrus
(Odobenus rosmarus divergens)

Walruses (*Odobenus rosmarus*) are subdivided into two subspecies: Atlantic walruses (*O. r. rosmarus*) and Pacific walruses (*O. r. divergens*) (Figure 14). Pacific walruses occur along the continental shelf of the Bering, East Siberian, Chukchi, and Beaufort Seas and are easily recognized by their prominent tusks and large size (an average male weighs about 1,200 kg [2,645 lb]). In winter, most Pacific walruses concentrate in polynyas and open leads southwest of St. Lawrence Island and in Bristol Bay. In

Figure 14. Pacific walruses hauled out on ice (Photograph courtesy of Joel Garlich-Miller, U.S. Fish and Wildlife Service)

summer, most females, juveniles, and calves follow the retreating pack ice into the Chukchi Sea, staying with the ice edge throughout the summer as it recedes and passes over the continental shelf. Other females and calves remain on land, particularly in the Gulf of Anadyr. Most adult males remain year-round in the Bering Sea, Gulf of Anadyr, and Karaginski Bay. In summer, they rest on and feed from terrestrial haul-out sites. The four most common haul-out sites in Alaska are Round Island, Cape Peirce, Cape Newenham, and Cape Seniavin, all in Bristol Bay. Other walruses remain at terrestrial haul-out sites along the north coast of the Chukotka Peninsula and on Wrangel Island in the Chukchi Sea. During fall, walruses move south with the advancing ice, sometimes aggregating in herds of thousands as they pass back through the northern Bering Sea.

Walruses can live for up to 40 years. Mature females produce a calf every two or three years. They breed in late winter and usually give birth in May. They feed in shallow waters, usually less than 80 m, and consume mostly clams and other benthic invertebrates such as snails and marine worms. They use their flippers and snouts to root in soft sediments, feeling for prey with their sensitive vibrissae. They use their tongues to create suction and remove animals from their shells. They also eat seals, although the frequency with which they do so is not clear, and seals are not considered common prey. Walruses collectively consume an estimated 3 million metric tons of prey per year, making them an important ecological component of Bering and Chukchi Seas ecosystems (Ray et al. 2006). The only nonhuman predators on walruses are polar bears and killer whales, although adult walruses are formidable prey.

Status, Trends, and Commercial Harvests

The pristine abundance of the Pacific walrus population is not known but may have been on the order of 200,000. Commercial hunting began in earnest in the mid-1800s and caused wide fluctuations in walrus abundance over the next century (Fay 1982). By the late 1800s declines in walrus abundance were so severe that they contributed to widespread famine and starvation among Native populations (Allen 1895). Commercial hunting intensified again in the 1930s, peaking in 1937–1938 when more than 8,000 Pacific walruses were taken in Russia alone (Krylov 1968). By the 1950s the Pacific walrus population had been reduced to 50,000 to 100,000 animals (Fay 1982). In the 1960s the Soviet Union and the state of Alaska independently established conservation measures to protect the Pacific walrus and the population rebounded. From 1975 to 1990 U.S. and Russian scientists conducted joint range-wide aerial surveys every five years to estimate abundance of the Pacific walrus population. The last such survey in 1990 resulted in an estimate of 201,039 animals (Gilbert et al. 1992). Scientists did not survey the population between 1990 and 2006, partly because surveys are expensive and difficult to coordinate. In addition, the prior surveys produced population estimates with such wide confidence intervals that they were considered of little value for describing population trends. In 2006 the Fish and Wildlife Service, working with the U.S. Geological Survey and the Russian institutes Giprorybflot and Chukotka TINRO, surveyed the population again using newly developed aerial census techniques. The results are not yet available.

Atlantic walruses are distributed among several small discrete populations scattered between eastern Canada and the Laptev Sea off the Siberian coast of north-central Russia. They are less numerous than the Pacific walrus, with a total population of perhaps 18,000 to 20,000 (Table 8). As is the case for a number of Arctic marine mammal species and stocks, Atlantic walruses are poorly studied and their status is not clear.

Table 8. Current estimates of abundance and trends of walruses

Region	Abundance	Year	Trend
Bering-Chukchi Seas[1]	~201,000	1990	unknown
Atlantic[2]	18,000–20,000	2005–2008	mixed
Laptev Sea[3]	4,000–5,000	1982	unknown

[1] Gilbert et al. 1992, [2] COSEWIC 2006, Lydersen et al. 2008, Witting and Born 2005
[3] Fay 1982

Effects of Climate Change

Climate change and the associated reduction in sea-ice habitat pose a serious threat to walruses. These animals are able to swim and feed for only a few days at a time and must find suitably thick sea ice or land on which to rest between feeding bouts. The availability of resting habitat near feeding areas determines whether walruses are able to maintain a positive energy balance (i.e., consume enough prey to provide for their energetic needs).

In 2007 the summer sea ice declined by 40 percent compared to previous years. Large numbers of walruses came ashore in Alaska and northern Chukotka after the sea ice had retreated northward beyond the shallow continental shelf where walruses feed. Under such circumstances, they are more likely to deplete their local food supply because they are limited to feeding around the haul-out area. In addition, when hauled out on land they are more vulnerable to disturbance and, if disturbed, more prone to injury from trampling. Calves and yearlings are particularly vulnerable to injury by large adults moving to and from the water. The risk of injury can be greatly exacerbated if the animals are startled and stampede toward the water. In 2007 Chukotka Natives and biologists observing these haul-out areas reported high levels of mortality, particularly among calves, and suspected trampling to have been the cause.

Anticipating similar conditions in 2008, Fish and Wildlife Service staff toured North Slope villages, communicating with staff of the Federal Aviation Administration and mariners in an effort to reduce disturbances of walruses. Similarly, the Eskimo Walrus Commission passed a resolution urging communities to avoid hunting and disturbing large aggregations of hauled-out walruses. However, conditions in 2008 were less severe, and relatively few walruses hauled out on land in northern Alaska.

Subsistence Harvests

For several thousand years Native communities in Alaska and Russia have relied on the Pacific walrus as a vital economic and cultural resource. Natives have depended, and continue to depend, on meat, ivory, and other walrus parts for food and other subsistence needs, including the production of handicrafts. In modern times, ivory carvings have become a particularly important source of income in some villages.

In the 1960s and 1970s the Alaska Department of Fish and Game monitored the harvest. The Marine Mammal Protection Act of 1972 included exemptions to its moratorium on taking to allow Alaska Natives to continue harvesting marine mammals for subsistence purposes or for making authentic handicrafts and clothing, provided that the take is not wasteful. The Fish and Wildlife Service assumed responsibility for harvest management in 1980. Currently, the Service and the Eskimo Walrus Commission work together with Native communities to manage the subsistence harvest, collect biological samples from harvested animals, and conduct a statutorily required ivory tagging program. In the 1960s and 1970s authorities monitored the harvest in seven villages. Currently, they monitor only the spring hunt in the two villages where most of the hunting occurs—Gambell and Savoonga on St. Lawrence Island. A Fish and Wildlife Service employee and local residents hired for this purpose record the number of walruses taken and collect biological samples.

In 2002 the Marine Mammal Commission recommended initiation of long-term tissue sampling to provide information on age-specific reproduction, prey selection, contaminant levels, and other important parameters to facilitate evaluation of the population's status and trends. The Service and the Eskimo Walrus Commission have been developing guidelines for collection of biological samples, but those efforts have been limited by lack of funds. In 2008 monitoring and sample collection occurred only during a few weeks of the spring hunt. As a result, the total harvest is not known, sampling objectives have not been met, and the benefits of such information have not been realized.

The marking, tagging, and reporting program for walrus suffers from similar shortcomings. The Fish and Wildlife Service initiated the program in 1988 to help monitor the harvest and prevent illegal trade in ivory. The program requires that all walrus tusks be tagged within 30 days after an animal is harvested. Although the Service intends the program to be comprehensive, compliance with tagging requirements is incomplete in some villages. The program does not provide the expected biological infor-

mation (e.g., reproductive parameters), and it underestimates the total number of animals harvested (including adults and calves, the latter often taken but not reported). To adjust for poor compliance, the Service must use correction factors of unknown reliability to produce uncertain estimates of the total number of animals removed from the population.

An additional and potentially significant number of walruses are shot but sink before they can be recovered. Fay et al. (1994) used data collected between 1952 and 1972 to estimate that 42 percent of walruses shot were not recovered. The Fish and Wildlife Service still uses this correction factor for struck-and-lost animals, although its accuracy and reliability are uncertain. The total estimated harvest by Russians and Americans in 2007 (the latest year for which complete data are available) was between 5,834 and 6,593 walruses (Table 9). The numbers taken in recent years are about half those taken in the mid-1980s. The change could reflect a purposeful reduction in harvests, a decline in the walrus population, or both.

The Fishery Department in Russia's Agricultural Ministry is responsible for managing walrus harvests in Russian territory. Since 1992 Russian managers have allowed only Native people to harvest walruses, and the current limit is 3,000 annually. In 1998 Russia suspended its walrus harvest monitoring and research programs because of economic constraints. In 1999 the Alaska Eskimo Walrus Commission and the Fish and Wildlife Service secured funding from various sources, including the North Slope Borough and the National Park Service, to train and support Native villagers from Russia's Chukotka region in the collection of walrus harvest data. That support continued through 2005. In 2008 the National Park Service's Beringia Program provided further funding under a cooperative agreement with the Eskimo Walrus Commission, and that funding will be used to resume the collection of Russian harvest data in 2009.

Other Management Issues

Increasing human activities in Arctic regions also pose a threat to walruses. Such activities include commercial shipping, oil and gas development, commercial fishing, military exercises, tourism, and coastal development. Collectively, these activities may affect walruses by disturbing them on land and at sea, contaminating their feeding and resting areas, and injuring or killing them in fishing gear. Commercial shipping through the Arctic will undoubtedly increase as sea ice recedes. Shipping likely will not pose a significant risk of collisions with walruses, but it may increase disturbance from noise or the simple presence of vessels. Shipping also may contribute to contamination of walrus habitat, particularly from accidents that spill oil, fuels, or other toxic chemicals.

Oil and gas development may disturb walruses by generating noise, moving vessels and barges to support construction and drilling operations, constructing various types of infrastructure (e.g., platforms, pipelines), and developing coastal areas needed to support oil and gas operations. Oil and gas development also poses a risk of habitat contamination through discharge of drilling wastes and leaks or spills of oil, fuel, and other toxic chemicals. A large spill could have significant consequences for the walrus population if it occurred or spread at a time and in an area occupied by a large number of

Table 9. Estimated harvest of Pacific walrus, 2003–2007

	Reported Harvest			
Year	**Russia**	**United States**	**Total**	**Total Corrected**
2003	1,425	2,002 – 2,375	3,427 – 3,800	5,909 – 6,551
2004	1,118	1,451 – 1,700	2,569 – 2,818	4,429 – 4,858
2005	1,470	1,287 – 1,448	2,757 – 2,918	4,754 – 5,032
2006	1,047	1,241 – 1,455	2,288 – 2,502	3,945 – 4,314
2007	1,173	2,211 – 2,651	3,384 – 3,824	5,834 – 6,593
Mean	1,247	1,638 – 1,926	2,885 – 3,173	4,974 – 5,470

Source: The Russian harvest information provided by Chukotka TINRO and the Russian Agricultural Department. U.S. harvest information collected by the Fish and Wildlife Service and adjusted for harvested but unreported walruses using a mark-recapture method that yields upper and lower harvest estimates. The total estimates also incorporate a 42 percent struck-and lost rate based on the data and analyses of Fay et al. (1994).

walruses, such as could occur seasonally near the Bering Strait. Contaminants may affect walruses if they consume contaminated prey or if contaminants affect the amount or type of prey available to them. In 2008 the Fish and Wildlife Service provided letters of authorization to Shell, ConocoPhillips, and Petroleum Geo-Services Onshore, Inc., for incidental take of walruses during oil and gas development activities in the Chukchi Sea region. The authorizations require monitoring and mitigation activities as well as new research in the Chukchi Sea region, including surveys of walrus distribution during summer and fall months. Trained marine mammal observers on the seismic vessels will monitor for marine mammals before and during operations, ensure that no marine mammals enter designated safety zones, and report on observations and incidents. Mitigation efforts will include avoidance of groups of marine mammals on ice or land and efforts to minimize harassment and avoid restricting movements of marine mammals in the water. During operations, airguns will be ramped up to full power to allow animals in the area to move away and shut down if marine mammals are encountered in or expected to move into safety zones. Although measures such as ramp-up seem logical, their efficacy has not been evaluated and, conceivably, they could be harmful under certain scenarios.

Commercial fishing could affect walruses if it involves the use of gear that might catch or entangle them or disturb or destroy their feeding habitat. At the end of 2008 the North Pacific Fishery Management Council was considering the development of a fishery management plan for U.S. Arctic regions that would place a moratorium on commercial fishing until the effects of climate change on the region could be assessed. If recommended by the Council and accepted by the Secretary of Commerce, this measure would contribute significantly to efforts to protect and conserve marine mammals and marine ecosystems in this region.

The effects of military activities cannot be predicted without better information on the nature and extent of those activities. Presumably they will pose a risk of disturbance through the generation of noise from vessels and carrying out training exercises. Military accidents also may contaminate walrus habitat if they involve oil or fuel spills. Tourism and coastal development may disturb walruses both on land and at sea. Development may increase human access to coastal areas that otherwise would provide undisturbed haul-out refuges for walruses.

Stock Assessment Report

The Fish and Wildlife Service's management responsibilities include preparation and updating of a stock assessment report for the Pacific walrus. The Service completed its most recent report in 2002 (http://alaska.fws.gov/fisheries/mmm/walrus/pdf/Final_%20Pacific_Walrus_SAR.pdf). The report lacks essential management information, including a reliable minimum population estimate and a potential biological removal level. The Marine Mammal Protection Act requires that the Service update this stock assessment report every three years, and in 2007 the Center for Biological Diversity sued the Service for failing to do so. The Service expects to provide an updated report in 2009, although it is not clear whether it will include the final results of the population survey or new information on population productivity. In the absence of such information, scientists are presently unable to describe the current status of the Pacific walrus population or to evaluate the sustainability of current subsistence harvests. Recent reports from Native hunters and scientists indicate marked changes in walrus habitat, an increasing prevalence of animals in poor condition, reduced calf production, and poor calf survival, all of which raise important concerns about the population's future.

Ringed Seal *(Phoca hispida)*

Ringed seals are the most common and most ice-dependent of the Arctic seals. They comprise five subspecies. The most widely distributed *(P. h. hispida)* occurs throughout the Arctic Ocean. The others are *P. h. ochotensis* in the Sea of Okhotsk and Sea of Japan, *P. h. botnica* in the Baltic Sea, and two freshwater subspecies, *P. h. saimensis* in Lake Saimaa in eastern Finland and *P. h. ladogensis* in Lake Ladoga in Russia. Ringed seals can live for up to 30 years. Adults range from 115 to 136 cm in length and weigh 40 to 65 kg, males being slightly larger than females. Ringed seals play an especially important role in the Arctic, where they prey on Arctic cod and a variety of invertebrates and are themselves the primary prey

Figure 15. Alaska Natives attaching satellite transmitter on a ringed seal (Photograph courtesy of Kathy Frost)

of polar bears. Polar bears prefer fat to other parts of a seal. Ringed seal pups are approximately 50 percent fat by wet weight (Stirling 2002). In the eastern Beaufort Sea, up to 80 percent of polar bear diets may be young-of-the-year ringed seals. If ringed seal productivity declines, the health of the polar bear population is likely to suffer accordingly (Stirling 2002).

Status and Trends

Scientists have not surveyed Arctic ringed seals in all parts of their range, and current overall abundance is unknown. Educated guesses generally range from one to four million (e.g., Frost et al. 1988). The Arctic and Okhotsk subspecies are the most abundant (Table 10). A century ago, the Baltic subspecies numbered between 190,000 and 220,000, but by the late 1970s it had been reduced to as few as 5,000 (Harding and Härkönen 1999). The decline resulted from commercial harvesting, but reduced fertility from exposure to environmental contaminants also may have contributed (Harding and Härkönen 1999). The future status of this subspecies is unclear but likely will depend heavily on changes in ice habitat and contaminants. At the start of the twentieth century, the Ladoga subspecies numbered 20,000 animals, but by the 1970s it had been reduced to 10,000, in part by bounty hunting (Agafonova et al. 2007). Current bycatch of Ladoga ringed seals is as high as 10 to 16 percent (Verevkin et al. 2006), which clearly is unsustainable. The Saimaa ringed seal numbers in the low hundreds and is vulnerable to climate change, inbreeding, fisheries bycatch, and high pup mortality. Hence, conservation of this subspecies will require careful and steadfast management (Sipilä and Kokkonen 2008).

Effects of Climate Change

Ringed seals depend on ice and may decline greatly or even be extirpated throughout much of their range as a consequence of climate change. Arctic ringed seals in particular rarely haul out on land but rather stay with sea ice throughout much of the year to reproduce, molt, rest, feed, and avoid predators. For much of the winter and spring, they use shorefast ice (ice attached to land) or the pack ice, often in areas with greater than 90 percent ice coverage. In consolidated ice, which can be up to 2 or 3 m thick, they maintain breathing holes by abrading ice along the inside of the holes. Females excavate birth lairs in snowdrifts that form over their breathing holes to protect themselves from predators while they rest, give birth, and nurse their pups. Such lairs also must protect the females and their pups from exposure to harsh Arctic weather.

Changes in sea ice habitat undoubtedly will have a significant impact on ringed seals. If poor ice conditions or precipitation causes a lair occupied by a pup to collapse before the pup is capable of fending for itself, it may die from inclement weather or predation. Late ice formation, early break-up of shore-

Table 10. Current abundance and trends of ringed seal subspecies

Subspecies	Abundance	Year	Trend
Arctic[1]	~2.5 million	1970s	unknown
Okhotsk Sea[1]	>800,000	1971	unknown
Baltic Sea[2]	5,000–8,000	1990s	mixed
Lake Saimaa[3]	280	2005	increasing
Lake Ladoga[4]	3,000–5,000	2001	unknown

[1]Miyazaki 2002, [2]Karlsson et al. 2007, [3]Sipilä and Kokkonen 2008, [4]Agafonova et al. 2007

fast ice, and increased precipitation already have affected ringed seal denning behavior along the shorefast ice of the eastern Beaufort Sea, threatening female reproductive success and pup survival (Harwood et al. 2000). When summer sea ice has receded to the point that the Arctic is ice-free for periods, the seals will either have to remain at sea for the ice-free period or haul out on land. Ringed seals in the Baltic Sea, Sea of Okhotsk, and the freshwater lakes of Finland do haul out on land (Laidre et al. 2008), suggesting that seals of the Arctic subspecies may be able to do so as well, but they likely will be restricted to those areas that are not easily accessible to predators (i.e., polar bears, wolves, foxes, or grizzly bears). Ringed seals also are vulnerable to climate change because the loss of ice likely will alter the nature and extent of primary production and the food web based on that production. At present, ringed seals in the Arctic depend on Arctic and polar cod, species that associate with sea ice. Whether individual seals will cope with all these factors by changing their behavior or their populations will persist by virtue of strong selection on their natural history traits is not clear.

The ability of scientists to predict the effects of climate change on ringed seals will depend heavily on whether the necessary research is conducted to investigate their natural history, behavior, adaptability, and changes in abundance with receding ice habitat. Undertaking such studies will require collaboration and cooperation by all interested and concerned stakeholders. In recent years, Alaska Natives have participated in research efforts to tag and track ringed seals and collect samples for genetic research and stock identification (Figure 15). Such research provides information on seasonal movements, diving behavior, and habitat use.

Participation in research builds management capacity in Alaska Native villages through education and direct involvement in the research effort. It also provides cost-effective and practical support for researchers studying Arctic pinnipeds and promotes exchange between scientists and Alaska Natives, who contribute traditional ecological knowledge of the animals and their habitat. In October 2008 scientists and Alaska Natives tagged and/or sampled a number of seals in Alaska's Kotzebue Sound (Figure 16). Such collaboration benefits all persons, agencies, and organizations involved by providing information essential for conservation and management.

Subsistence Harvests

Historically ringed seals have been harvested for both commercial and subsistence purposes. Russian commercial harvests were as high as 72,000 animals per year between 1955 and 1965 (Kovacs et al. 2008). During the 1990s Canadian Inuit harvests were estimated in the tens of thousands (Reeves et al. 1998), and Greenland hunters harvested 70,000 annually (Teilmann and Kapel 1998). Household surveys during the 1980s and 1990s indicate that Alaska Natives took between 9,000 and 10,000 ringed seals per year (Alaska Department of Fish and Game 2000). None of these numbers include animals struck and lost.

In the Arctic, climate change undoubtedly will have a far greater impact on ringed seals than subsistence harvesting. Nonetheless, ill-managed harvests may compound the effects of climate change, contributing to local reductions in seals or possibly even extirpation in areas that might otherwise support some seals. Careful management of harvests will be essential to prevent such adverse effects.

Other Management Issues

Interest in offshore oil and gas development has rapidly increased within parts of the ringed seal's range. In June and July 2008 the Marine Mammal Commission reviewed applications from British Petroleum Exploration (Alaska) Inc., ConocoPhillips Alaska Inc., Shell Offshore Inc., and Petroleum Geo-Services Onshore, Inc., for incidental harassment authorizations under section 101(a)(5)(D) of the Marine Mammal Protection Act. The authorizations all relate to oil and gas development activities, including seismic surveys. The Commission consistently has recommended that the National Marine Fisheries Service consult with appropriate parties to develop and implement a broad-based population monitoring and assessment program where such activities occur. The purpose of the program would be to collect the baseline information sufficient to detect changes and identify their possible causes and to verify that planned activities, in combination with other risk factors, are not individually or cumulatively having any significant adverse population-level effects on

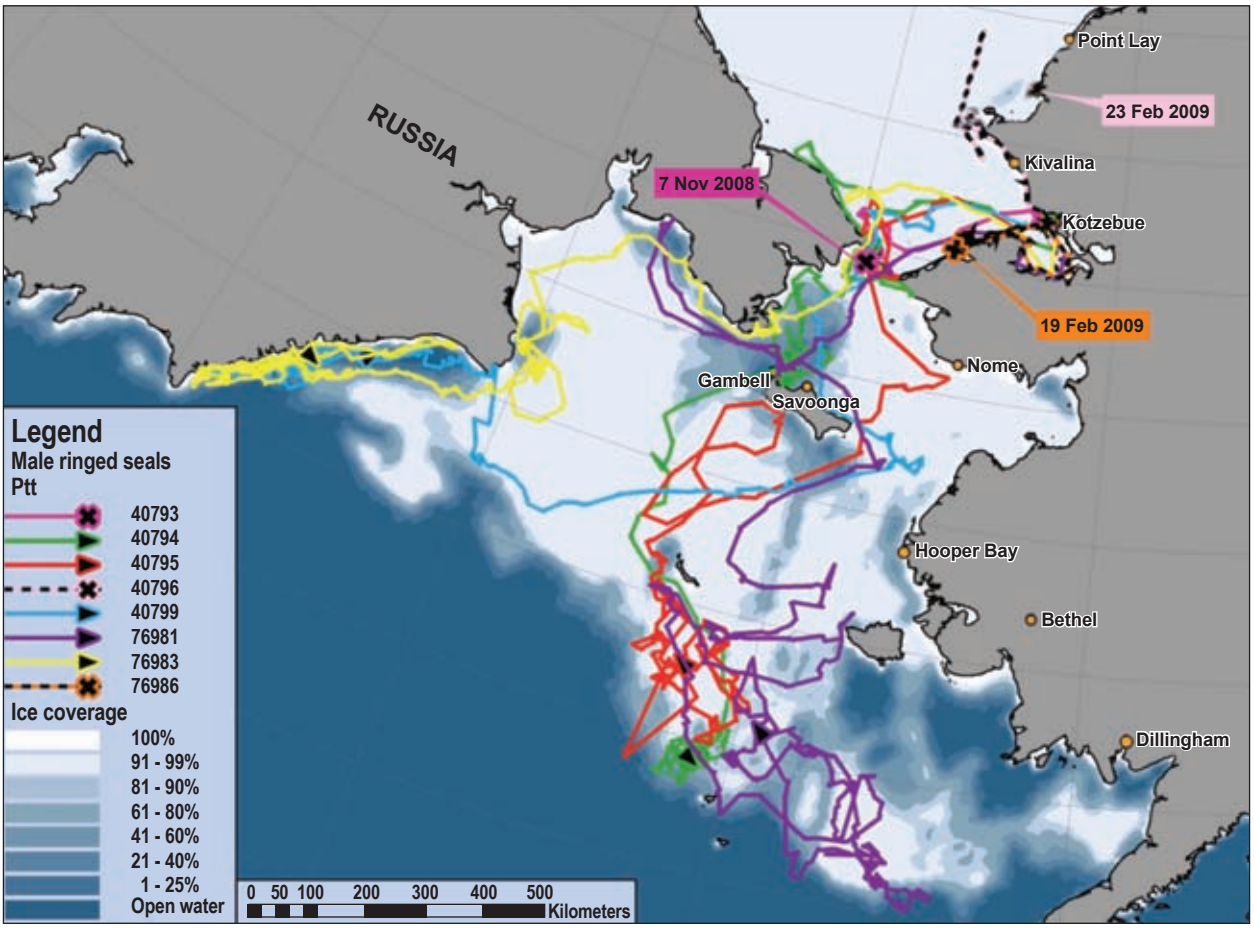

Figure 16. Movements of eight male ringed seals between 10 October 2008 and 27 April 2009. Cooperators include the Native Village of Kotzebue and the Alaska Department of Fish and Game with funding from the U.S. Fish and Wildlife Service, Tribal Wildlife Grant. Additional tags were funded by Shell. Adult movements are shown with dashed lines. The last known locations of seals that have not successfully transmitted a signal in more than three weeks are labeled with an X. Percent ice coverage as of 22 April 2009 is displayed with data from the National Snow and Ice Data Center.

ringed seals or having an unmitigable adverse effect on the availability of ringed seals for subsistence uses by Alaska Natives.

Oil and gas development in the Chukchi Sea is likely to be accompanied by construction of platforms and pipelines, vessel and aircraft traffic, and development of onshore infrastructure such as pipelines, docks, and support facilities. These developments may affect ringed seals in or near areas of related activity. As the seals depend on ice habitat, oil spills in the ice may be particularly hazardous for them. The fact that they tend to disperse widely rather than aggregate in large groups may reduce the population-level effects of such a spill.

Commercial fishing could affect ringed seals if it involves the use of gear that might catch or entangle the seals. At the end of 2008 the North Pacific Fishery Management Council was considering the development of a fishery management plan for U.S. Arctic regions that would place a moratorium on commercial fishing until the effects of climate change on the region could be assessed. If recommended by the Council and accepted by the Secretary of Commerce, this measure would contribute significantly to efforts to protect and conserve marine mammals and marine ecosystems in this region.

The effects of military activities cannot be predicted without better information on the nature

and extent of those activities. Presumably they will pose a risk of disturbance through the generation of noise and the presence/operation of different types of vessels and the conduct of various training exercises. Military accidents also may contaminate ringed seal habitat if they spill oil or fuel.

Stock Assessment Report

The National Marine Fisheries Service is responsible for management of ringed seals in U.S. waters. To that end, the Service completes a stock assessment report for ringed seals in Alaskan waters, the most recent being completed in 2006 (http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2006seri.pdf). The report does not include a minimum population estimate, a description of population trends, or an estimate of the subspecies' potential biological removal level. In the absence of such information, scientists are hampered in their ability to describe the current status of ringed seals in the Arctic, judge the sustainability of local subsistence harvests, or predict the future impacts of climate change.

Pacific Bearded Seal
(Erignathus barbatus nauticus)

Bearded seals are divided into an Atlantic subspecies (*E. b. barbatus*) and a Pacific subspecies (*E. b. nauticus*) that overlap in distribution in the Russian and Canadian Arctic (Figure 17). In the western North Pacific bearded seals use continental shelf habitat as far south as Hokkaido, Japan, and in Alaska they inhabit the continental shelf of the Bering, Chukchi, and Beaufort Seas. They generally are found in loose, mobile pack ice or along cracks in larger floes and shorefast ice. Spring surveys in Alaska suggest that they prefer areas of between 70 to 90 percent sea ice coverage, and are typically more abundant from 20 to 100 nmi offshore than within 20 nmi of shore, except for high nearshore concentrations in Kotzebue Sound (Bengtson et al. 2000, Bengtson et al. 2005, Simpkins et al. 2003). They sometimes maintain breathing holes but less frequently than ringed seals. Bearded seals in the Okhotsk, White, and Laptev

Figure 17. Bearded seal (Photograph courtesy of Kathy Frost)

Seas use terrestrial haul-out sites when sea ice is not available. However, seals in the Bering or Chukchi Seas rarely do so. Instead, those not migrating north with the sea ice remain in open waters.

Bearded seals can live for about 30 years. At full size, they attain 2.5 m in length and as much as 361 kg (female) to 390 kg (male) in weight (Kelly 1988). A dense "beard" of whiskers on the top lip and a relatively small head distinguish the species from other seals. They are especially vocal underwater, and their sounds have been used by Native hunters over millennia to locate them.

Bearded seals tend to be solitary, occurring in low densities throughout their range. They congregate in late winter in nearshore pack ice to give birth to pups on sea ice, nurse their pups for about 15 days before weaning them, and then mate. They do not excavate lairs like ringed seals, and pups can swim within a few hours of birth. Females with pups stay in the water more than 90 percent of the time, presumably to avoid predation by polar

Table 11. The most current estimates of abundance of bearded seals; trends are not known

Region	Abundance	Year
Bering and Chukchi seas[1]	250,000–300,000	1970s
Okhotsk Sea[1]	200,000–250,000	1968–1969
Canadian waters [2]	190,000	1958–1979
Atlantic and Russian Arctic	unknown	—

[1]Fedoseev 2000, [2]Cleator 1996

bears. They molt between April and August. They tend to remain in shallow waters over continental shelf areas and are primarily benthic foragers, preying on various invertebrates and demersal fishes. Killer whales, Greenland sharks, and occasionally walruses prey on bearded seals, and Alaska Natives harvest them for subsistence purposes.

Status and Trends

Population estimates from the 1970s suggested that the Pacific population of bearded seals living in the Bering and Chukchi Seas ranged from 250,000 to 300,000 animals (Table 11). Current population size and trends are not known.

Effects of Climate Change

Like the walrus, bearded seals use sea ice as a resting platform between benthic feeding bouts and depend on relatively shallow areas for feeding. An early northward retreat of spring sea ice over the Chukchi Sea continental shelf may reduce bearded seal foraging efficiency, thereby affecting their condition, health, and ability to survive and reproduce. As the ice edge moves out over deep water, bearded seals may be forced to haul out on land where they are more vulnerable to disturbance and predation. As generalist feeders, they may adapt more readily to changes in ecosystem food webs.

Subsistence Harvests

Bearded seals are one of the most important subsistence resources for Alaska Native communities along Alaska's western and northern coasts. The Alaska Department of Fish and Game (2000) estimated that Alaska Natives harvested between 6,500 and 7,000 bearded seals annually prior to 2000. Current harvest levels are not known.

As is the case with other Arctic marine mammals that are harvested, some unknown number of bearded seals are struck and lost each year. The loss rate for bearded seals in Greenland may be as high as 50 percent (Reijnders et al. 1993). If struck-and-lost rates are similar in Alaska, then a large and potentially significant number of bearded seals may be killed each year but not used for subsistence purposes. Here again, this Arctic marine mammal, and the human activities that affect it, cannot be managed without sufficient information.

Other Management Issues

As with other ice seals, interest in offshore oil and gas development has rapidly increased within parts of the bearded seal's range. As noted for those other species, the Marine Mammal Commission reviewed applications by BP Exploration (Alaska), Inc., ConocoPhillips Alaska, Inc., Petroleum Geo-Services Onshore, Inc., and Shell Offshore, Inc., for incidental harassment authorizations under section 101(a)(5)(D) of the Marine Mammal Protection Act. The authorizations all relate to oil and gas development activities, including seismic surveys. The Marine Mammal Commission has consistently recommended that the Service, in consultation with appropriate parties, promptly develop and implement a broad-based population monitoring and assessment program to collect baseline information sufficient to detect changes and identify their possible causes and to verify that planned activities, in combination with other risk factors, are not individually or cumulatively having significant adverse population-level effects on bearded seals or an unmitigable adverse effect on the availability of bearded seals for subsistence uses by Alaska Natives.

Oil and gas development in the Chukchi Sea is likely to be accompanied by construction of platforms and pipelines, vessel and aircraft traffic, and development of onshore infrastructure such as pipelines, docks, and support facilities. These developments may affect bearded seals in or near areas of related activity. As the seals depend on ice habitat, oil spills in the ice may be particularly hazardous for them. The fact that they tend to disperse widely rather than aggregate in large groups may reduce the population impact of such a spill. However, they are likely more vulnerable to an oil spill in the fall when they migrate south through the Bering Strait. Because they feed at or near the bottom, they could be vulnerable to spills that contaminate the bottom substrate. However, such contamination is not likely except in shallow waters that are sufficiently well mixed to entrain oil particles into the benthic substrate. Bearded seals are capable of diving to much greater depths (i.e., hundreds of meters) so ingestion of oil near a spill site may not be a signficant risk, depending on water depth.

Commercial shipping, tourism, and military activities could affect bearded seals through distur-

bance (noise or the presence of vessels and human activity) or contamination in the event of a spill of oil or fuel. Commercial fishing could affect the seals through direct and indirect interactions, but measures under consideration by the North Pacific Fishery Management Council at the end of 2008 would preclude such interactions. Coastal development conceivably could affect bearded seals if it caused a significant increase in vessel traffic or offshore activity, but available information is not sufficient to do more than speculate about such potential effects.

Stock Assessment Report

The National Marine Fisheries Service is responsible for management of the bearded seal, including completion of its stock assessment report. The Service completes a report only for the Pacific subspecies because, with rare exceptions, bearded seals occur in U.S. waters only in the North Pacific, Bering Sea, and Alaskan Arctic. The most recent stock assessment report for Pacific bearded seals was completed in 2006 (http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2006sebe.pdf). It did not include a minimum population estimate, description of population trends, or an estimate of the potential biological removal level. In the absence of reliable information about population abundance and demography, scientists are presently unable to describe the current status of the Pacific bearded seal, the impact of climate change on the population, or the sustainability of local subsistence harvests.

Ribbon Seal (*Phoca fasciata*)

Ribbon seals are one of the most recognizable of all pinnipeds because of the striking color pattern of adults. They are distributed primarily in the Okhotsk, Bering, East Siberian, and Chukchi Seas. They breed in two distinct areas, one in the Sea of Okhotsk and the other in the Bering Sea. They appear to use sea ice only during whelping, mating, and molting, all of which occur between March and June. As the ice retreats into the Chukchi Sea, some ribbon seals follow it while others remain in the Bering Sea. Those remaining in the Bering Sea do not haul out on land, and recent tracking data indicate they disperse throughout the Bering Sea and Aleutian Islands region. They tend to be solitary throughout much of their lives.

Ribbon seals can live for up to 30 years. Mature females usually produce a single pup every year and nurse the pup for 3 to 4 weeks before weaning. Ribbon seals appear to prefer marine habitat with broken sea ice covering 60 to 80 percent of the surface or less than 15 cm thick so they can break through to breathe. They use the ice for breeding and molting in the period from late March to early May. Ribbon seals feed on pelagic fish species such as walleye pollock but are thought to be relatively flexible in their foraging locations and habits.

Status and Trends

Burns (1981) estimated 240,000 ribbon seals worldwide in the mid-1970s, with 90,000 to 100,000 in the Bering Sea. Fedoseev (2002) estimated that ribbon seals in the Sea of Okhotsk increased from 200,000 (1968–1974) to 630,000 (1988–1990). The accuracy of these estimates is unknown. Ribbon seals are difficult to count because they are widely dispersed. However, they also may have varied markedly during this period due to fluctuations in harvesting. Current numbers and trends are unknown.

Effects of Climate Change

On 20 December 2007 the Center for Biological Diversity petitioned the National Marine Fisheries Service to list the ribbon seal as a threatened or endangered species under the Endangered Species Act. The petition was based on concerns that "global warming…is resulting in the rapid melt of this species' sea-ice habitat" and that existing regulatory mechanisms are not adequate to address this and other risks to ribbon seals.

On 30 December 2008 the Service announced its 12-month finding on the petition from the Center for Biological Diversity to list ribbon seals as threatened or endangered under the Endangered Species Act. It treated the species as a single, global population of more than 200,000 and concluded that the population likely would decline gradually as the extent, quality, and duration of ice degraded. However, it also concluded that the population is not presently in danger of extinction or likely to become so in the foreseeable future (by 2050)

throughout all or a significant portion of its range (http://www.nmfs.noaa.gov/pr/pdfs/fr/fr73-79822.pdf). The Service did add the ribbon seal to its Species of Concern list (http://www.nmfs.noaa.gov/pr/species/concern/#list) and further noted in its final rule that "there are no known regulatory mechanisms that effectively address global reductions in sea ice habitat at this time."

The Service's conclusions were based in part on the fact that the "summer" sea ice minimum, one of the more notable signs of climate change, generally occurs in September, whereas ribbon seals depend on the ice for reproduction and molting in the spring months. Sea ice will undoubtedly recede in the coming decades, but existing information is not sufficient to project the extent and quality of sea ice during the spring. The seals may be able to adapt by whelping, breeding, and molting earlier. In addition, changes in ice conditions likely will act as a strong selective force on the ribbon seal population, favoring those seals that reproduce earlier in the season or are more capable of whelping and rearing their young in poor ice conditions. Finally, the seals may be able to use terrestrial haul-out areas, but in many areas doing so will expose them to disturbance and predation.

Changes in the trophic structure of Arctic ecosystems also may affect ribbon seals and their ability to forage successfully. Here again, they may adapt by changing their foraging behavior and are already considered to be flexible foragers. Given their tendency to disperse widely and lead relatively solitary lives, they would appear to be less vulnerable to human activities. However, it remains to be seen whether and to what extent they are affected by oil and gas development, commercial shipping and fishing, and other human activities.

Subsistence Harvests

Russian commercial harvests removed as many as 20,000 ribbon seals per year in the 1950s, but current harvests are primarily for subsistence purposes. Household surveys in the 1980s and 1990s indicate that about 200 ribbon seals are harvested each year in Alaska (Alaska Department of Fish and Game 2000). That estimate does not include animals that are struck but lost.

Other Management Issues

As is the case for other ice seals, interest in offshore oil and gas development has rapidly increased within parts of the ribbon seal's range. As noted for those other species, in 2008 the Marine Mammal Commission reviewed applications by BP Exploration (Alaska) Inc., ConocoPhillips Alaska Inc., Petroleum Geo-Services Onshore, Inc., and Shell Offshore Inc. for incidental harassment authorizations under section 101(a)(5)(D) of the Marine Mammal Protection Act. The authorizations all relate to oil and gas development activities, including seismic surveys. The Marine Mammal Commission has consistently recommended that the Service, in consultation with appropriate parties, promptly develop and implement a broad-based population monitoring and assessment program to collect baseline information sufficient to detect changes and identify their possible causes and to verify that planned activities, in combination with other risk factors, are not individually or cumulatively having significant adverse population-level effects on bearded seals or an unmitigable adverse effect on the availability of bearded seals for subsistence uses by Alaska Natives.

Oil and gas development in the Chukchi Sea is likely to be accompanied by construction of platforms and pipelines, vessel and aircraft traffic, and development of onshore infrastructure such as pipelines, docks, and support facilities. These developments might affect ribbon seals in or near areas of such activity, but the effects likely would be minimized by the fact that ribbon seals generally are widely dispersed. During the period of the year when the seals depend on ice habitat, oil spills in the ice may be particularly hazardous for them. Here again, the fact that they tend to disperse widely may reduce the population-level impact of such a spill. As they do not appear to depend on benthic prey, exposure to contaminants in the substrate does not appear to pose a significant risk to ribbon seals.

Commercial shipping, tourism, and military activities could affect ribbon seals through disturbance (noise or the presence of vessels and human activity) or contamination in the event of a spill of oil or fuel. Commercial fishing could affect the seals through direct and indirect interactions. Ribbon seals in the Bering Sea appear to depend on pollock, and the

Bering Sea pollock fishery is the largest single-species fishery in the world. Available information is not sufficient to determine whether the fishery does, in fact, compete with ribbon seals. Coastal development conceivably could affect ribbon seals if it caused a significant increase in vessel traffic or offshore activity, but available information is not sufficient to do more than speculate about such potential effects.

Stock Assessment Report

The National Marine Fisheries Service is responsible for management of the ribbon seal, including completion of its stock assessment report, the most recent being completed in 2006 (http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2007serb.pdf). The report did not include a minimum population estimate, an indication of population trends, or an estimate of the potential biological removal level. The lack of such information has confounded the Service's ability to determine the status of ribbon seals, assess risks to them from climate change, and guide measures to ensure their conservation.

Spotted Seal
(Phoca largha)

Spotted seals are distributed along the western North Pacific continental shelf from as far south as the Yellow Sea and Sea of Japan to the Sea of Okhotsk and into the Bering, Chukchi, and Beaufort Seas (Figure 18). Their distribution overlaps that of closely related harbor seals (*Phoca vitulina richardsi*) and, like the harbor seal, they prey on a range of species in coastal waters and periodically haul out on shore to rest. They are more gregarious than ribbon and bearded seals, and groups of more than 10,000 have been reported hauled out on the Kamchatka coast (Lowry and Burkanov 2008). In the late fall when sea ice begins to advance southward, spotted seals leave their coastal haul-out sites and begin to use the ice as a resting and foraging platform. They are common on small ice floes close to the ice edge, although tracking data indicate that some animals can be found well within the ice pack, hundreds of kilometers from the ice edge.

Figure 18. Spotted seal (Photograph courtesy of Mike Cameron, National Marine Fisheries Service)

Adult spotted seals are between 1.5 and 1.7 m long and weigh 70 to 130 kg with little difference between the sexes. They can live for up to 35 years. They breed in late winter and most give birth in March. Weaning occurs after three to four weeks, and mating occurs shortly thereafter. Spotted seals use eight known breeding areas, three in the Bering Sea and five in the Sea of Okhotsk or Sea of Japan. They feed mostly on schooling fish (e.g., pollock, capelin, arctic cod, herring) and epibenthic fish (e.g., flounder, halibut, sculpin), as well as crab and octopus. In turn, they are preyed upon by Pacific sleeper sharks, killer whales, golden eagles, Steller's sea eagles, ravens, gulls, polar and brown bears, wolves, Arctic foxes, walruses, and Steller sea lions (Quakenbush 1988).

Status and Trends

Burns (1973) estimated that 200,000 to 250,000 spotted seals inhabited the Bering and Chukchi Seas in the early 1970s (of a world population of 335,000 to 450,000 animals). Fedoseev (1971) estimated that another 168,000 spotted seals were living in the Okhotsk Sea. Current abundance and trends in all these regions are unknown.

Effects of Climate Change

Of the so-called ice seals, spotted seals may be the least dependent on ice. For the most part, they appear to use the southern ice edge for pupping and foraging, but they also are capable of using coastal waters without ice, at least for a portion of their annual cycle. Still, the effects of climate change on this species are difficult to predict because of the limited information available regarding its natural history, adaptability, and tolerance of the new risks that may accompany climate change (e.g., exposure to new pathogens and parasites; Burek et al. 2008).

Subsistence Harvests

Historically the Russians harvested spotted seals for commercial purposes. In Alaska they are harvested for subsistence purposes, and household surveys indicate Alaska Natives took about 5,300 spotted seals per year in the 1980s and 1990s (Alaska Department of Fish and Game 2000). This estimate does not include animals struck and lost. Current harvest levels are unknown and, absent better information, the effect of subsistence harvests of spotted seals cannot be described on a local basis or for the North Pacific population as a whole.

Other Management Issues

Fisheries in the Okhotsk and Bering Seas target the prey of spotted seals and may compete with them. The Japanese regularly cull spotted seals to reduce such competition, and Kamchatka fishermen shoot them for the same reason (Lowry and Burkanov 2008).

Interest in offshore oil and gas development has rapidly increased within parts of the spotted seal's range, in both Russian and U.S. waters. These oil and gas operations pose a risk of disturbance to the seals from construction, drilling, and related operations; direct exposure to contaminants such as could result from a spill; and exposure through the food web if the foraging habitat and prey are contaminated. Oil and gas development also may lead indirectly to increased human activities in coastal areas used by the seals, with a range of possible adverse effects.

Stock Assessment Report

The National Marine Fisheries Service is responsible for management of the spotted seal, including preparation of its stock assessment report, the most recent being completed in 2006 (http://www.nmfs.noaa.gov/pr/pdfs/sars/ak2006sesp.pdf). The report did not include a minimum population estimate, indication of population trends, or an estimate of the potential biological removal level. In the absence of reliable information about population abundance and demography, scientists are presently unable to describe the current status of spotted seals in Alaska waters, the current or pending effects of climate change on them, or the sustainability of current subsistence harvests.

Cook Inlet Beluga Whale (*Delphinapterus leucas*)

The Cook Inlet beluga whale stock is one of five that occurs in U.S. waters. Its geographical isolation suggests—and mitochondrial DNA analyses confirm—that it is a distinct stock. Unlike other beluga stocks in U.S. waters, the Cook Inlet stock has experienced

a significant decline in recent years. Although the population is believed to have numbered more than 1,300 as recently as the late 1980s, it declined rapidly during the 1990s, primarily as a result of overharvesting by Alaska Native subsistence hunters. The current abundance is likely less than 400 whales.

Because of their proximity to Anchorage, belugas in Cook Inlet are potentially affected by a variety of activities that occur in the vicinity of Alaska's largest urban area. National Marine Fisheries Service analyses of beluga sightings in Cook Inlet over the past 30 years indicate that the stock's summer range has contracted substantially in recent years. Compared with sightings in the 1970s and 1980s, animals are now rarely seen in offshore waters or in the lower reaches of the inlet. In June, when the Service conducts aerial surveys of the population, belugas generally are concentrated in a few groups in the inlet's upper reaches around the Susitna River delta, Knik Arm, Turnagain Arm, and Chickaloon Bay.

Endangered Species Act Listing

On 31 May 2000 the National Marine Fisheries Service designated the Cook Inlet beluga whale stock as depleted under the Marine Mammal Protection Act. At that time, the Service declined to list the stock under the Endangered Species Act, primarily because it believed that overharvesting by subsistence hunters, which it had identified as the primary threat to the stock, had been adequately addressed. The Service concluded that, although the population had been reduced to a small size, it did not meet the Endangered Species Act's listing criteria because a stock with at least 300 individuals and a positive intrinsic growth rate was thought unlikely to go extinct due to stochastic events.

Contrary to the Service's expectations, the Cook Inlet beluga did not increase after harvest controls were established in 1999. In fact, it appears that the stock has continued to decline, despite the fact that subsistence hunters are reported to have taken only five whales in the past nine years. The point estimates of the population size for 2005 and 2006 were the lowest ever, with estimates of 278 and 302 whales, respectively, in those years. The point estimates of abundance derived from surveys conducted in 2007 and 2008 jumped to 375 but, given the uncertainty associated with these estimates, the difference when compared to other recent estimates is not statistically significant. Abundance estimates dating back to 1994, when the Service instituted its monitoring program, and the confidence limits around those estimates, are provided in Figure 19.

In light of these recent population trends and unanswered questions about the cause or causes of the observed decline, the Marine Mammal Commission recommended that the Service revisit its Endangered Species Act listing decision. On 24 April 2006 the Commission wrote to the Service reiterating its opinion that listing the stock as endangered was warranted. The Commission noted that the Cook Inlet beluga population numbered about the same as the

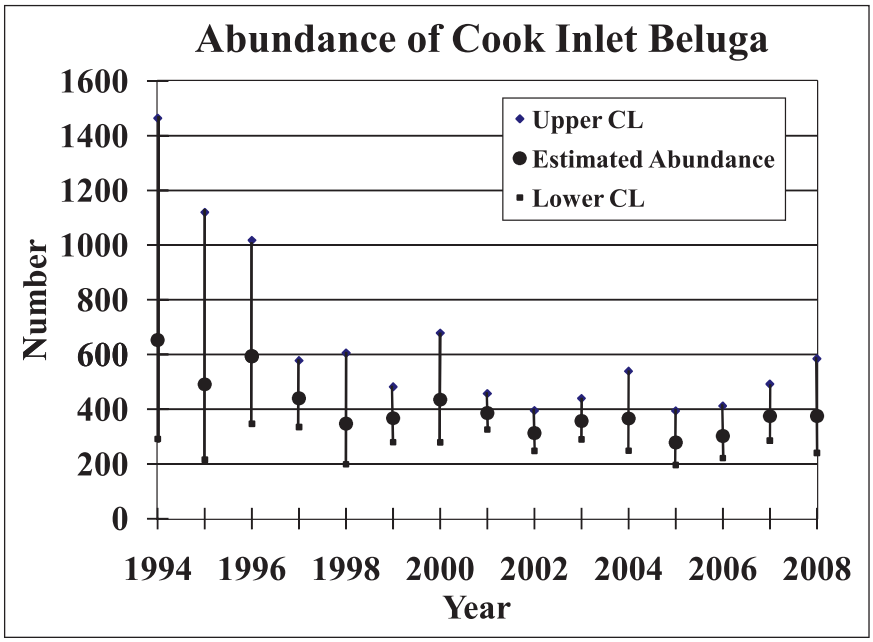

Figure 19: Abundance estimates (and upper and lower 95 percent confidence limits; CL) of Cook Inlet beluga whales, 1994–2008 (Data courtesy of National Marine Fisheries Service)

North Atlantic right whale population, which is generally considered by the Service and others to be among the most critically endangered cetacean species. The Commission also pointed to a recent IUCN Red List assessment of the Cook Inlet beluga population, which concluded that the stock qualified as "critically endangered" under the applicable IUCN criteria (Lowry et al. 2006). The Commission recommended that the Service expedite publication of a proposed listing determination, rather than going through the intermediate step of preparing a new status review. In fact, the Commission recommended that the Service consider using the emergency listing provisions of the Endangered Species Act as an interim measure.

The Commission also identified areas it thought qualified for designation as critical habitat for the stock, something that would be required if the stock were listed. The Commission noted that designating critical habitat was one of the most important actions that the Service could take to prevent the extinction of the Cook Inlet beluga population and recommended that such a designation include all areas identified as "high value" habitat in the draft conservation plan that the Service had prepared for the stock under the Marine Mammal Protection Act.

In addition, the Commission expressed concern that the lack of any detectable growth in the population since subsistence hunting was curtailed suggested strongly that some other factor or factors are operating to reduce survival or reproduction. As such, the Commission identified an urgent need to provide additional funding for an expanded research program to investigate those factors and identify possible remedial actions. The Commission suggested that such activities might include foraging and habitat-use studies, analyses of contaminant levels in beluga tissues and their environment, systematic surveys to determine the probability of detecting strandings, an improved stranding response program to maximize the potential for rescue, and a necropsy program to maximize the information obtained from any dead animals.

On 20 April 2006 Trustees for Alaska petitioned the Service to list the population as endangered, triggering deadlines by which certain findings were to be made. The Service published a finding on 7 August 2006 that the petition had presented substantial information that such a listing may be warranted and, because it had already initiated a status review of the population, did not separately solicit public comments on the merits of the petition.

On 20 April 2007, the deadline by which an initial decision was to be made, the Service published a proposed rule to list the Cook Inlet beluga whale as an endangered species. The proposed rule reaffirmed the Service's earlier determination that Cook Inlet belugas constituted a distinct population segment that could be considered for listing. It also summarized recent population trends and reviewed the factors that could be contributing to the observed decline. A population viability analysis prepared by the Service predicted a further decline of the population in 65 percent of the cases modeled and extinction within 300 years in 29 percent of the cases. Using the model with the best fit to observed population trends, the Service concluded that there was a 26 percent probability of the stock's extinction within 100 years. The Service noted that this risk of extinction would be considerably higher if any of the mortality rates used in the model were higher than assumed (e.g., if killer whale predation accounted for more than one death per year). In addition, the Service identified other factors—such as inbreeding and loss of genetic variability—that could further compromise a small population like this one. The proposed rule indicated that the Service would be considering the designation of critical habitat in a separate rulemaking.

The Commission commented on the proposed listing rule on 3 August 2007. The Commission noted that the justification and need for listing the Cook Inlet beluga whale under the Endangered Species Act had been apparent for several years. Thus, it strongly supported the proposed listing and recommended that the Service move swiftly to complete the listing process. In support of this view, the Commission noted, among other things, that addition of the 2006 population estimate to the trend analysis further strengthened the argument that the population is continuing to decline. When the 2006 estimate is added to the series, the probability that the population is declining increases from 71 percent to 81 percent. The Commission also reiterated its previous recommendations that the Service expand its research efforts to investigate the factor or factors that may be

having adverse effects on the population and to identify possible remedial actions.

Although the Service indicated that it intended to defer the designation of critical habitat until after a listing decision had been made, the Commission believed the scientific information currently available to be sufficient to identify areas that warrant designation. The Commission therefore recommended that the Service designate critical habitat for the Cook Inlet beluga as soon as possible and recommended a somewhat larger area for designation than it had identified in its 24 April 2006 letter. The Commission recommended that the designation include all waters of Cook Inlet from Kalgin Island northward to the headwaters of Knik and Turnagain Arms and all coastal waters less than 18 meters deep in the remaining portions of the inlet. The Commission noted that this corresponded to the three key habitat types identified in the draft conservation plan for Cook Inlet beluga whales: (1) high value/high sensitivity habitats, (2) high value habitats, and (3) winter habitat areas, secondary summering sites, and historic habitat sites. Upon reconsideration, the Commission determined that there was not only a need to protect "high value" summer habitat, but also other areas that were used historically and that likely would be reoccupied if and when the population recovers.

As a general rule, the Service has one year from the date of publication of a proposed listing action to complete the listing process. The deadline can be extended for up to six months if the Service determines that there is "substantial disagreement regarding the sufficiency or accuracy of the available data relevant to the determination…." On 22 April 2008 the Service published notice in the *Federal Register* that it was extending the decision-making deadline for an additional six months in response to comments received from the state of Alaska questioning the sufficiency of the available data. Noting that the 2007 count was the highest since 2001, the state contended that this was an indication that the population was beginning to recover. The Service noted that extending the deadline would allow it to complete another abundance survey, which would provide additional information to help resolve questions about the population trend.

This delay in the listing action prompted the Commission to write to the Secretary of Commerce recommending that the agency withdraw the six-month extension and proceed immediately with listing the Cook Inlet beluga whale as endangered. The Commission noted that the purported disagreement over the population trend was not scientifically credible. A population viability analysis published by Service scientists just days before the issuance of the extension—and using data up to and including the 2007 abundance estimate—concluded that there was a 1 percent probability of extinction of the stock within 50 years, a 39 percent probability of extinction within 100 years, and a 79 percent probability of extinction within 300 years. The Commission explained that the conclusion that the Cook Inlet beluga whale is at risk of extinction would not change even if the 2008 abundance estimate were abnormally high. In the Commission's view, the Service's assertion that a single additional data point might somehow change the conclusions about the population trend ignored the history of sustained decline, presented an unreasonable and avoidable risk to the population by delaying listing, was decidedly non-precautionary, and was contrary to customary practices for statistical analyses.

The Acting Administrator of the National Marine Fisheries Service responded to the Commission on behalf of the Secretary of Commerce by letter of 16 May 2008. The letter indicated that the Service continued to believe that substantial disagreement exists regarding the population trend and that the six-month delay in making a listing determination was warranted. However, the Service did not provide any additional justification that addressed the points raised by the Commission.

In September 2008 the Service completed its new abundance estimate, based on aerial surveys flown in June. The raw count of whales, which is based on the highest daily median count but does not reflect any correction for missed whales, was the lowest since the Service began conducting surveys in 1993. However, the whales generally occurred in one or two unusually dense groups, with few or no smaller groups being spotted, making it more difficult to estimate group size. When films from the 2008 surveys were studied and correction factors applied, the analysis resulted in a point estimate of 375 whales—the same as in 2007— with a coefficient of variation of 0.23.

Using this new population estimate, the Service prepared a supplemental status review and extinction assessment of Cook Inlet beluga whales (Hobbs and Shelden 2008). The outcome of the analysis changed very little. The likelihood that the population was continuing to decline dropped from 65 percent to 62 percent, but that remained the most likely trend. Despite the earlier expectation that the population would begin to grow at a normal rate for a small cetacean species (between 2 to 4 percent a year) once overharvesting had been eliminated, the updated analysis indicated that there was only a 5 percent probability that, since 1999, the population had been growing at a rate of 2 percent or greater a year. The likelihood that the population would go extinct within 100 years remained at 26 percent and, applying the model it thought the most realistic, the Service concluded that there was a 70 percent probability of extinction within 300 years. Consistent with results of the updated analyses, the Service published a final rule listing the Cook Inlet beluga whale as an endangered species on 22 October 2008.

The state of Alaska, which had submitted comments opposing the listing, indicated at the end of 2008 that it was contemplating a legal challenge to the listing action. One possible basis for such a challenge is the state's belief that the Cook Inlet beluga whale does not constitute a distinct population segment of the species and therefore is not eligible for listing.

The Service indicated in the final listing rule that it did not have sufficient information on the "primary constituent elements" of Cook Inlet beluga whale habitat or on the possible economic consequences of designating certain areas as critical habitat and therefore concluded that a designation of critical habitat was not then determinable. The Service indicated that it intended to designate critical habitat within one year of listing the species, that is, by 22 October 2009.

Conservation Plan

Section 115(b) of the Marine Mammal Protection Act directs the National Marine Fisheries Service to prepare a conservation plan as soon as possible for any stock that it designates as depleted unless it determines that such a plan will not promote the conservation of the species or stock. Conservation plans are to be modeled on recovery plans required under the Endangered Species Act. On 16 March 2005 the Service published a notice of availability of a draft conservation plan for the Cook Inlet beluga whale.

The draft plan reviewed the biology and life history of Cook Inlet beluga whales and assessed the natural and human-induced factors that are or could be influencing the population. The Service identified four natural factors that could be impeding the recovery of the stock: stranding events, predation, disease, and environmental change. The Service considered nine types of human-induced factors that could be affecting the stock. These were subsistence hunting, commercial fishing and its potential effect on prey availability, pollution, vessel traffic, tourism and whale-watching activities, noise, oil and gas exploration and development, other types of development within Cook Inlet, and the possible effects of research activities. The draft plan laid out proposed monitoring and research and a proposed conservation strategy based on the identified threats to the stock.

The Marine Mammal Commission provided extensive comments on the draft conservation plan by letter of 27 June 2005. A detailed summary of those comments was provided in the Commission's 2005 annual report. In short, the Commission recommended that the plan be reorganized into a more focused document that clearly describes the threats to the population, identifies specific actions to address those threats, discusses how those actions would contribute to the recovery of the stock, provides a budget for each action, and establishes clear priorities for undertaking those actions.

On 22 October 2008, the same day that it published the final rule listing the Cook Inlet beluga whale as an endangered species, the Service published a notice of availability of the final conservation plan. The plan is available on the Service's Web site at http://www.fakr.noaa.gov/protectedresources/whales/beluga.htm. The final plan incorporates some, but not all, of the changes recommended by the Commission. One of the most important improvements was restructuring the table of identified conservation actions to give a clearer picture of the potential threats faced by the population, the research needed to assess those threats, and the costs associated with carrying out those studies and related management actions. Although the Service has continued to carry

out those actions given the highest priority under the plan (i.e., surveying the population and monitoring its trends and regulating subsistence hunting), little progress has been made since the draft plan was released nearly four years ago to investigate the factors that are causing or contributing to the decline or the slower-than-expected growth of the population. The need to investigate and address these factors persists.

Once a species is listed under the Endangered Species Act, the Service is required to prepare a recovery plan unless it determines that such a plan will not promote the conservation of the species. In its listing rule, the Service indicated that it intended to prepare a recovery plan for the Cook Inlet beluga whale. Presumably, the conservation plan will provide the starting point for preparation of a recovery plan.

Regulation of Native Subsistence Hunting

Section 101(b) of the Marine Mammal Protection Act allows Alaska Natives to take marine mammals for subsistence purposes or for making and selling handicrafts, provided that the taking is not done in a wasteful manner. Other limits may be placed on such taking only through formal rulemaking and only if a stock has been designated as depleted or is considered depleted by virtue of being listed as endangered or threatened under the Endangered Species Act. Estimates derived from a variety of sources indicate that high levels of subsistence hunting of Cook Inlet beluga whales occurred throughout much of the` 1990s (Table 12). Part of the impetus for this hunting was the availability of commercial outlets in Anchorage for beluga muktuk (a popular Native food composed of the epidermis and underlying blubber of the whale). Such sales are generally allowed under the Marine Mammal Protection Act, which specifies that edible portions of marine mammals taken by Alaska Natives for subsistence purposes or for the creation of authentic Native handicrafts may be sold in Native villages and towns. Under the National Marine Fisheries Service's interpretation of the Marine Mammal Protection Act, Anchorage is considered a Native village.

Overhunting is generally considered to be the primary cause of the severe decline in the population observed in the 1990s. The overharvest and the precipitous decline of the Cook Inlet beluga whale stock led to a number of actions to limit hunting, thereby preventing further decline and promoting the eventual recovery of the stock. At first, action was limited to a decision by some hunters to refrain voluntarily from taking whales. Subsequently, a stopgap

Table 12. Reported Alaska Native subsistence take of Cook Inlet beluga whales, 1993–2008

Year	Reported total number taken	Estimated range of total take	Reported number harvested	Estimated number struck and lost
1993	30[1]	n/a	n/a	n/a
1994	21[1]	n/a	19[1]	2[1]
1995	70	n/a	42	26
1996	123	98–147	49	49–98
1997	70[2]	n/a	35[2]	35[2]
1998	42[2]	n/a	21	21
1999	0	0	0	0
2000	0	0	0	0
2001	1	–	1	0
2002	1	–	1	0
2003	1	–	1	0
2004	0	–	0	0
2005	2	–	2	0
2006	0	–	0	0
2007	0	–	0	0
2008	0	–	0	0

[1] Estimated value (see 2002 stock assessment report)
[2] Represents a minimum value
Data courtesy of National Marine Fisheries Service

legislative provision was enacted as part of the 1999 Emergency Supplemental Appropriations Act (Pub. L. 106-31). That provision prohibited, until 1 October 2000, subsistence taking of belugas from the Cook Inlet stock unless such taking was authorized by a cooperative agreement between the National Marine Fisheries Service and an Alaska Native organization. Congress passed a revised provision in December 2000 (section 627 of Pub. L.106-553) that extended indefinitely the prohibition on hunting Cook Inlet belugas unless authorized by the National Marine Fisheries Service through a cooperative agreement. Shortly before that, on 4 October 2000, the Service published proposed regulations on the hunting of Cook Inlet belugas under the Marine Mammal Protection Act. At about the same time, the Service issued a draft environmental impact statement reviewing federal actions associated with the management and recovery of Cook Inlet beluga whales. The preferred alternative identified in the statement was the issuance of regulations to establish an annual strike limit of two beluga whales until the Cook Inlet stock was no longer depleted. This alternative was reflected in the proposed rule. Although it had discretion under Public Law 106-553 to restrict subsistence taking by establishing harvest limits through cooperative agreements, the Service opted to proceed with the proposed rulemaking.

As discussed in previous annual reports, the Service convened rulemaking hearings in December 2000 and August 2004 to develop appropriate regulations. The Marine Mammal Commission participated as a party to that rulemaking. The major issues and the positions taken by the Commission at those hearings are discussed in past annual reports and are not repeated here.

At the conclusion of the 2000 hearing, the parties to the rulemaking agreed to interim subsistence hunting limits allowing the taking of an average of 1.5 whales per year from 2001 through 2004, with the authorized number of strikes alternating between one and two each year. The rulemaking parties reached a new tentative agreement in 2004 to govern subsistence hunting for the five-year period from 2005 to 2009. Under that agreement, the allowable number of takes would alternate between two in the odd-numbered years and one in the even-numbered years. It was expected that final regulations establishing a long-term harvest regime would be in place for 2010 and beyond.

For a variety of reasons, not all of the authorized strikes have been used. In 2004 no harvest was allowed because the level of "unusual mortalities" (e.g., from strandings) in 2003 exceeded a threshold that the parties had agreed to for shutting down the hunt. Although one strike was authorized in 2006, no hunting occurred. In 2007 and 2008 the Service and Alaska Native hunters agreed that hunting should not be authorized because of low population estimates that strongly suggest that the population is continuing to decline.

Based on testimony presented at the 2000 and 2004 hearings and submissions by the parties, the presiding administrative law judge issued a recommended decision in the matter on 8 November 2005. The recommended decision was made available for public comment in February 2006. The Commission provided comments on the recommended decision by letter of 8 March 2006. The Commission believed that the recommended harvest management regime (1) responded too slowly to instances when the beluga whale population is declining, remaining stable, or growing at an unusually slow rate, (2) did not fully satisfy the stipulations that the parties had agreed to that were to govern the development of the long-term regime, and (3) did not require that the current population monitoring effort be maintained or, alternatively, include mechanisms that respond adequately to any diminution in the quality of the data and the population estimates obtained. The Commission recommended that the Service retain flexibility to reconsider the interim harvest levels that would be established through 2009 under the recommended decision. In this regard, the Commission noted that, when the 2005 population estimate is considered, the five-year abundance average drops below the proposed 350-whale "floor" that would trigger a cessation of the harvest under the recommended long-term regime. The Commission did not advocate an immediate cessation of all hunting based on that single low estimate but thought that the final rule should afford the Service that option if low abundance estimates persist.

On 28 December 2007 the Service released a draft supplemental environmental impact statement on the long-term harvest regime. The Commission

provided comments on that document by letter of 4 March 2008. The Commission supported the Service's new preferred alternative of implementing the long-term harvest regime beginning in 2008, rather than 2010 as the Service had previously intended. Moving the timetable up by two years is needed to respond to the fact that the average five-year population abundance estimate remains below 350 whales, the level at which the Service proposed to suspend all harvest. The Commission again stressed the need for the Service to commit to maintaining its current population monitoring effort because the proposed management regime would be driven largely by the information derived from the population surveys. The Commission noted that any diminishment in the quality of those estimates could have profound implications for the stock's recovery and recommended that, if such a commitment were not made, the Service assess the impacts that might result from decisions based on less reliable data.

Noting that existing factors already seemed to be having adverse population-level effects, the Commission expressed concern about the numerous actions identified in the environmental impact statement that are planned in Cook Inlet and that could have adverse effects on the population. As such, the Commission believes that it is important for the Service not only to continue monitoring the status of the population, but to give high priority to investigating the possible causes of the observed trends.

The Commission also questioned the specifics of the Service's proposal to make adjustments to harvest limits in response to unusually high observed mortality based solely on data collected since 1999. Since 1999 the population has declined for unexplained reasons and mortality during these years may already have been unusually high. Tying harvest adjustments to these levels may serve to perpetuate an abnormal condition to the detriment of the population.

On 20 June 2008 the Service released its final supplemental environmental impact statement. On 15 October 2008 the Service published its final harvest regulations in the *Federal Register*. The key component of the regulations is a harvest table that sets forth the allowable harvest of Cook Inlet beluga whales according to estimated abundance levels and growth rates, and subject to adjustments based on whether observed mortality from sources other than subsistence hunting exceeds the expected number of mortalities for a population of its size. No harvest is allowed if the average population estimate over the previous five-year interval is less than 350. Once the average reaches 350, a limited number of strikes would be allowed (e.g., one strike per year under a low or intermediate growth rate). The number of allowed strikes would increase under other scenarios to a maximum of 32 strikes over five years at a population of 700 or greater if the population is experiencing a high growth rate. These regulations are codified at 50 C.F.R. § 216.23(f)(2)(v). Because the average population over the previous five years was below 350, no harvest is allowed for the years 2008 through 2012.

Although the Service did not adopt all recommendations made by the Commission during the rulemaking process, it slowly moved toward adopting a harvest management regime more in line with those recommendations and as more data indicated the beluga whale population was continuing its decline. In the preamble to the final rule, the Service rejected its original proposal to allow two whales to be taken per year, explaining that it "would not provide reasonable assurance that the harvest would result in an insignificant delay in recovery" and therefore would be inconsistent with one of the key principles adopted by the parties to the rulemaking.

Development Projects

Activities other than commercial fishing operations that incidentally take marine mammals generally require an authorization under section 101(a)(5) of the Marine Mammal Protection Act. This includes the Cook Inlet beluga whale. In addition, now that it is listed as an endangered species, activities that may affect Cook Inlet beluga whales are subject to the consultation requirements of section 7 of the Endangered Species Act. During 2008 the Commission provided recommendations on two development projects ongoing or planned in the area near Anchorage—a proposal to build a bridge across the Knik Arm in upper Cook Inlet and the renovation and expansion of the Port of Anchorage.

Knik Arm Bridge: The state of Alaska established the Knik Arm Bridge and Toll Authority in 2003 for the purpose of overseeing the construction

of a bridge across Knik Arm in upper Cook Inlet. The bridge would connect the municipality of Anchorage with the Mat-Su Borough. In September 2006 the bridge authority, in conjunction with the Federal Highway Administration, published a draft environmental impact statement (DEIS) under the National Environmental Policy Act to consider alternatives for the proposed bridge project and their impacts.

The Commission, in consultation with its Committee of Scientific Advisors, reviewed the DEIS and provided comments to the Federal Highway Administration in November 2006, focusing on the potential effects on beluga whales. The Commission believed that the DEIS had identified most of the possible sources of impact, including disturbance from construction activities, increased vessel operations, and increased human use of the Knik Arm area; masking of sounds used by beluga whales for communication, navigation, and predator avoidance; alteration of habitat-use patterns, particularly in transit corridors into and out of Knik Arm; changes in the distribution and abundance of prey; and increased risk of strandings. However, the analyses in the DEIS largely discounted the significance of these potential effects. The Commission questioned several conclusions that it believed were overly optimistic and thought that some of these might stem from a misunderstanding on the part of the drafters as to how imperiled the Cook Inlet population of belugas is. The Commission found the assessment of possible cumulative impacts in the DEIS to be especially wanting, particularly in light of the fact that the population seems to be experiencing an ongoing decline for undetermined causes, even in the absence of the additional stressors likely to result from construction and operation of the bridge.

In its comments, the Commission also questioned whether the mitigation measures proposed in the DEIS would be sufficient to bring the bridge construction project into compliance with the Marine Mammal Protection Act's requirement that any resulting incidental taking have no more than a negligible impact on the affected marine mammal populations. This point had been raised by the Commission in a separate letter to the National Marine Fisheries Service commenting on a request from the bridge authority for an incidental take authorization. Among other things, the Commission had noted the need for site-specific information and questioned whether data from a single season, which were all that had been collected, provided a sufficient basis to draw generally applicable conclusions about beluga whale habitat-use patterns in and around Knik Arm.

The Knik Arm Bridge and Toll Authority and the Federal Highway Administration published a final environmental impact statement on 20 December 2007, essentially confirming the conclusions of the DEIS. This prompted the Commission to submit follow-up comments to these agencies. The Commission noted that, although a number of potential risks to Cook Inlet beluga whales had been identified, a rigorous research and management program had yet to be established. Absent the needed research, any conclusion that the effect of construction and operation of the planned bridge on the whales would be negligible is based on mere speculation. The Commission noted that the level of uncertainty about the impacts to this stock was evident from the lack of definitive information in both the draft and final impact statements. As such, the Commission recommended that the agencies refrain from making any irreversible or irretrievable commitment of resources related to bridge construction until the uncertain, but potentially significant, impacts can be evaluated and the agencies have an adequate basis for concluding that the effects on beluga whales of building and operating the bridge, in conjunction with other stressors, will be negligible. In the Commission's view, the benefits of delaying construction to resolve the uncertainties concerning the factors causing or contributing to the decline of beluga whales far outweigh the potential costs.

The Commission also called attention to the proposed listing of the Cook Inlet beluga whale under the Endangered Species Act and recommended that the agencies initiate a conference under applicable regulations (50 C.F.R. § 402.10) to evaluate the potential effects of the bridge project on this stock. A thorough review under this provision would help ensure eventual compliance with section 7 of the Act, if and when the listing was finalized.

At the end of 2008 it remained unclear if the bridge project would receive the funding and authorizations necessary to go forward.

Port of Anchorage: On 18 March 2008 the National Marine Fisheries Service published a notice in the *Federal Register* proposing to issue a one-year incidental harassment authorization to the Port of Anchorage to cover the taking of beluga whales and other marine mammals incidental to a terminal redevelopment project. The Service also solicited comments as to whether it should issue regulations to authorize incidental taking for an additional five-year period.

The Commission provided comments by letter of 17 April 2008, noting that the planned redevelopment had the potential to affect beluga whales in at least three ways: (1) by disturbance from sounds during construction, (2) by permanently altering beluga habitat, and (3) by increasing vessel traffic that could disturb and possibly injure belugas during and after port expansion. Because Cook Inlet beluga whales already have been reduced to a dangerously low level and are continuing to decline for undetermined reasons, the Commission did not see how the Service could conclude that activities that would increase the level of disturbance in an important feeding area—even if that increase were relatively small—would not have more than a negligible impact on the population and its chances for recovery. In light of the relatively high density of beluga whales in the project area, the uncertainties about the factors causing or contributing to the stock's recent decline, and the absence of an adequate analysis of the potential effects of port construction and operation on the whales, the Commission believed a negligible impact determination to be premature and overly speculative. The Commission therefore recommended that the Service defer issuance of the requested authorization until it had further evaluated the uncertain but potentially significant impacts of the planned activities and could provide a well-supported basis for making a determination that the activities, once mitigated, would not have more than a negligible impact on the Cook Inlet beluga whale stock.

The Commission further recommended that the Service enter into a conference under the applicable Endangered Species Act regulations in anticipation of listing the Cook Inlet beluga whale as endangered. Because the Service had previously calculated a nearly 75 percent probability that the population would continue to decline under current conditions, the Commission did not believe that the Service could reasonably conclude that additional takes expected to result from port construction and operation would not jeopardize the stock's prospects for survival and recovery.

Despite the Commission's concerns, the Service issued the proposed incidental harassment authorization. Notice of the authorization was published in the *Federal Register* on 18 July 2008. The Service found that the project "will not result in increased disturbance to marine mammals or their habitat such that [it] would result in more than a negligible impact to the stock." The Service concluded that pile-driving is the only activity associated with the project with the potential to harass marine mammals and, in its view, the anticipated reactions of beluga whales would be short-term and only consist of mild or moderate stress responses. The Service also believed that beluga whales would habituate to the sounds and that reactions would diminish over time.

The *Federal Register* notice provided the Service's response to the Commission's general concern that the cumulative impacts of the port redevelopment project, in combination with other risk factors, would have more than negligible impacts on beluga whales. The Service acknowledged "some uncertainty" in the factors that were inhibiting recovery of the Cook Inlet beluga whale stock but nevertheless determined that, because of their natural tendency to avoid or habituate to loud sounds, the availability of a "harassment-free" migration route to prime feeding ground, and the mitigation measures that would be implemented (e.g., soft-starts for pile-driving, stopping activities if marine mammals are sighted within safety zones, and not allowing pile-driving in conditions with poor visibility within the project area), issuance of the authorization would have a negligible impact to marine mammals.

The Service also declined to follow the Commission's recommendation to initiate a conference under the Endangered Species Act. The Service stated that a conference is required only when a proposed project is likely to jeopardize the continued existence of a species proposed for listing and, in its view, port construction is not likely to jeopardize Cook Inlet beluga whales.

As anticipated, the Service published a notice in the *Federal Register* on 18 December 2008 that it had received an application from the Port of Anchorage seeking a five-year incidental take authorization under section 101(a)(5)(A) of the Marine Mammal Protection Act for the port redevelopment project to cover activities from July 2009 to July 2014. The Commission expects to comment on the application by 20 January 2009, the close of the comment period. In its comments, the Commission expects to raise many of the same points it made regarding the 2008 incidental harassment authorization.

Southern Resident Killer Whales (*Orcinus orca*)

Killer whales inhabit all the world's oceans. They are classified as a single species with no identified subspecies although some scientists consider this monotypic taxonomic structure to be incorrect and in need of revision (Reeves et al. 2004, Krahn et al. 2004). Killer whales occur in "ecotypes" that may warrant subspecies or even full species status. They can be distinguished genetically and on the basis of color patterns, vocalizations, prey, and foraging behavior. In the northeastern North Pacific Ocean, scientists have identified three ecotypes: a transient ecotype that ranges widely along the coasts of Canada and the United States, an offshore ecotype that occurs principally in pelagic offshore waters, and a resident ecotype that occurs seasonally in specific inshore bays and sounds. Although the ranges of different ecotypes may overlap, their members rarely, if ever, interbreed, and each typically specializes on exploiting a different segment of the available prey base. Each ecotype may consist of multiple populations with each population composed of one or more pods that form close-knit social groups organized around matrilineal relationships.

In the northeastern North Pacific Ocean, scientists have identified four populations of the resident ecotype (Krahn et al. 2004). One is the southern resident killer whale population, which summers in Puget Sound and the adjacent inland waters of Washington State and southern British Columbia, where they feed on migrating salmon. From September to May, the whales apparently use coastal waters between British Columbia and central California. They comprise three pods that researchers have labeled J, K, and L pods. Historically, the population is thought to have numbered more than 200 whales. Between the late 1960s and early 1970s, about 50 whales were removed for purposes of public display and research, and by 1976 the population had declined to about 70 whales. Such removal is no longer permitted in U.S. waters, but the population has not recovered as expected (Figure 20).

The major factors that may be impeding recovery are all human-related. Human activities have dramatically reduced the salmon stocks that constitute the prey base for this population. Human

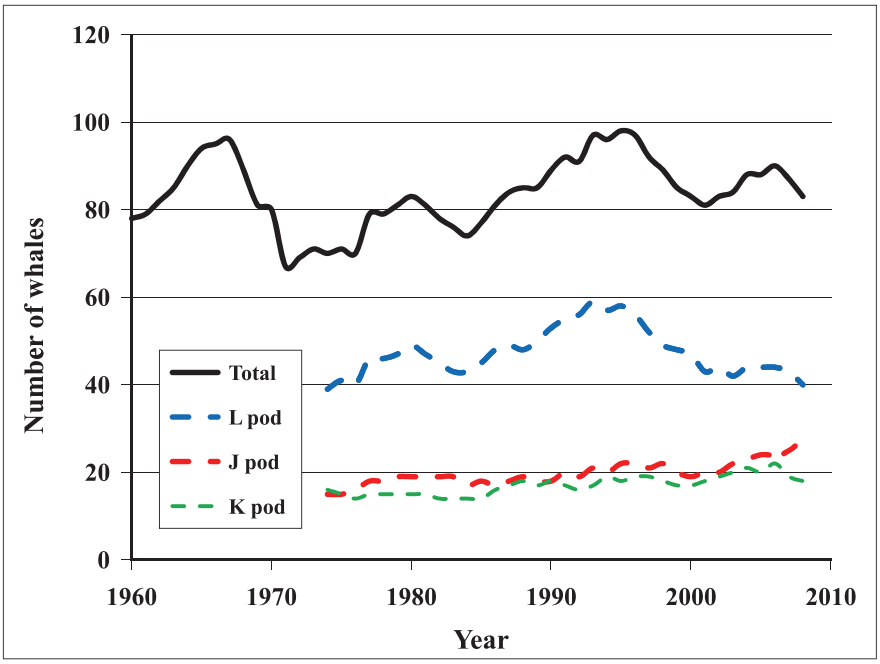

Figure 20. Southern resident killer whale abundance from 1960 to 2008 based on the number of whales present in each pod at the end of the calendar year. Data courtesy of National Marine Fisheries Service and Center for Whale Research

activities also have introduced high levels of contaminants into the marine environment (e.g., polychlorinated biphenyls or PCBs and polybrominated diphenyl esters, a relatively new class of chemicals used in flame retardants), which the whales have accumulated through the food web. Such contaminants may compromise reproductive or immune function. Human disturbance also may be impeding recovery of the southern resident population, as these animals are the focus of an intensive whale-watching industry. The presence of these boats and the noise they cause may be a significant source of stress for the whales, causing them to alter their behavior in ways that may compromise their ability to survive or reproduce. Finally, collisions with vessels may be another factor impeding population recovery.

In 2001 the Center for Biological Diversity petitioned the National Marine Fisheries Service to list southern resident killer whales as endangered or threatened under the Endangered Species Act. In 2002 the Service determined that the action was not warranted because the population did not constitute a distinct population segment as defined under the Act. The Service did, however, initiate steps that led to the population's designation as depleted under the Marine Mammal Protection Act in 2003 (68 Fed. Reg. 31980). The Center for Biological Diversity challenged the legal basis for not listing the population under the Endangered Species Act in U.S. District Court, and in 2003 the court instructed the Service to reevaluate the population's status relative to the Act's definition of a distinct population segment. After doing so, in 2004 the Service proposed that southern resident killer whales be listed as threatened (69 Fed. Reg. 76673), and in 2005, after considering comments on its proposal, the Service adopted a final rule classifying the population as endangered rather than threatened (70 Fed. Reg. 69903). In 2001 Canada's Department of Fisheries and Oceans also designated the southern resident killer whale population as endangered under the Canadian Species at Risk Act.

Population Status in 2008

In 2007 the population numbered 87 whales. In 2008 three calves were born, but only one survived. Two adult females disappeared and were thought to have died; one was estimated to have been 98 years old and the other 56 years old. The loss of killer whales at those ages is not considered unusual. However, two other adult females, one age 32 and the other age 35, and a 5-year-old juvenile male also disappeared and are thought to have died. Their deaths are considered unusual. Scientists were not able to examine the carcasses and therefore were not able to determine the causes of these deaths. The loss of the two reproductively active females, one from L pod and the other from J pod, could have a significant effect on the future growth of those pods. By 2008 the population had declined to 83 whales.

Adoption of a Southern Resident Killer Whale Recovery Plan

In November 2006 the National Marine Fisheries Service circulated a proposed recovery plan for southern resident killer whales for public and agency comment (71 Fed. Reg. 69101). The Commission commented in March 2007, noting that it believed that the draft plan thoroughly evaluated the population's status, the factors likely to be impeding its recovery, measures to address those factors, and necessary research activities. To improve the plan, the Commission recommended that the Service develop more explicit and measurable criteria for downlisting and delisting decisions. In particular, the Commission recommended the Service delist or downlist the population only if each of the three pods has at least two adult males. The Commission also recommended that the Service assign a high priority to monitoring the population's biological status and trends and evaluating the effectiveness of recovery actions. Finally, the Commission recommended that the Service clarify in the plan the relationships between downlisting and delisting criteria, recovery measures, and research activities to ensure internal consistency in the recovery program.

On 24 January 2008 the Service finalized the recovery plan (National Marine Fisheries Service 2008a) (73 Fed. Reg. 4176). In response to the Commission's comments, the Service developed more specific downlisting and delisting criteria where possible but noted that certain criteria must remain qualitative until more is learned about specific threats (Table 13). The Service revised the delisting standard based on reproduction by requiring more than two

Table 13. Criteria for downlisting southern resident killer whales from endangered to threatened status and for removing the population from the list of species protected under the Endangered Species Act; based on National Marine Fisheries Service (2008)

Criteria for Downlisting	Criteria for Delisting
Biological Criteria	
Average annual population growth rate is at least 2.3 percent for 14 years Population demographics are consistent with an increasing or stable population: • Representation from at least three pods • Each pod has at least two males of reproductive age or available information indicates that one male is sufficient.	Average annual population growth rate is at least 2.3 percent for 28 years Population demographics are consistent with an increasing or stable population: • Representation from at least three pods • Each pod has more than two males of reproductive age or available information indicates that one male is sufficient • Ratio of sex/age classes is similar to northern resident population (i.e., 47 percent juveniles, 24 percent reproductive females, 11 percent older females, 18 percent adult males) • Inter-birth intervals are sufficient for population growth • Mortality for any age or sex class has not increased significantly.
Threats Criteria – Factor A: Destruction or Curtailment of Habitat or Range	
Salmon recovery or management plan is in place Research is underway on whale foraging ecology to inform fishery management programs Baseline information is available on contaminant levels in whales, prey, or surrogate populations, and trends can be determined Voluntary guidelines and education programs are in place to reduce vessel disturbance, auditory masking, and ship strikes	Prey availability is not believed to be a limiting factor Knowledge of foraging ecology is sufficient to determine that fisheries are not limiting recovery Contaminant levels in whales, prey, or surrogate species are declining or accumulation rates are slowing Management measures are in place to reduce vessel disturbance, auditory masking, and ship strikes
Threats Criteria – Factor B: Overutilization for Commercial, Recreational, or Educational Purposes	
No whales permanently removed for public display; sufficient information available on incidental take in fisheries to inform management programs responsible for addressing incidental takes	Impacts of whale-watching activities have been reduced or the available evidence indicates such activities do not cause population-level effects No whales are removed permanently for public display or by incidental take in fisheries
Threats Criteria – Factor C: Disease or Predation	
Effects of disease on reproduction and survival do not threaten population sustainability	Evidence is sufficient to determine that disease is not a limiting factor
Threats Criteria – Factor D: Inadequacy of Existing Regulatory Mechanisms	
Regulations to limit harmful contaminants are being evaluated Guidelines and regulations to reduce potential impacts of vessels have been evaluated to determine if additional action needed	Emerging contaminants in whales, prey, and surrogate populations are not limiting population recovery and sustainability Regulations are in place to limit introduction of contaminants and evidence indicates they are decreasing or are not harmful Whale-watching impacts have been reduced or evidence shows they are not causing population-level effects
Threats Criteria – Factor E: Other Natural or Manmade Factors	
Effective oil spill prevention plans are in place Annual censuses are being conducted Effective research program is in place to evaluate risks Research is underway on distribution, habitat use, and potential risks in coastal portion of range	Effective oil spill response plans are in place Effective oil spill prevention plans are in place Annual censuses are being conducted Knowledge of distribution, habitat use, and potential risks in coastal portion of range has increased, and risks have been determined not to affect population sustainability

adult males or information indicating that fewer whales are sufficient for reproductive purposes. The Service also attempted to harmonize its research and management priorities, but its efforts were constrained because priority levels are defined differently for research and management activities.

In March 2008 Canada's Department of Fisheries and Oceans completed a recovery strategy for the southern resident killer whale (Canada Department of Fisheries and Oceans 2008). National Marine Fisheries Service staff participated on the Canadian recovery team, and the Canadian recovery strategy complements the U.S. recovery plan, focusing on problems related to prey availability, contaminants, and disturbance.

Actions to Implement the Recovery Plan

In 2008 the Service initiated, continued, or expanded a range of activities intended to promote recovery of the southern resident killer whale population. Those activities included measures to promote recovery of threatened and endangered runs of salmon that are prey for the whales and various measures to improve ecosystem conditions by reducing contaminants, noise, and disturbance. The Service developed an oil spill response plan, evaluated the need for vessel regulations, and worked with outreach groups to increase public awareness of the whales, the threats facing them, and actions people can take to contribute toward recovery. In December 2008 the Puget Sound Partnership, a community-based coalition of citizens, government agencies, tribes, scientists, and businesses, published an Action Agenda identifying a strategy for cleaning up, restoring, and protecting Puget Sound by 2020. The agenda recommends implementing the actions identified in the southern resident killer whale recovery plan.

Preparing for and responding to oil spills is among the highest priorities in the recovery plan. In Washington State, the Northwest Area Contingency Plan provides guidance for responding to oil spills. In 2008 the National Marine Fisheries Service completed a draft appendix to that plan identifying alternative actions to monitor and haze killer whales at risk from a spill. The draft appendix describes the types of monitoring and reconnaissance necessary to generate real-time data on the location and activity of the killer whales. It also reviews the advantages and disadvantages of various hazing techniques, including banging of pipes, broadcasting killer whale vocalizations to attract whales away from high-risk areas, herding by vessels, and use of acoustic deterrent devices, airguns, mid-frequency sonar, noise and disturbance by helicopters or low-flying planes, fire hoses, strobe lights, bubble curtains, and booms. The appendix also describes the lines of authority for deciding whether and which techniques might be used in a given situation and various sources of assistance during response activities. Completion of this plan fulfills a recovery plan objective and one of the criteria for downlisting and delisting.

In March 2007 the Service published a request for information regarding regulations or other measures that should be instituted to protect killer whales from significant interactions with vessels (72 Fed. Reg. 13464). In 2008 the Service was still evaluating the potential impact of regulations on natural resources (e.g., marine mammals, fish, the marine ecosystem) and the human environment (e.g., economics, recreation, transportation). At the end of 2008 the Service had not yet published a proposed regulation.

Many organizations—such as local museums and aquariums, non-profit advocacy groups, researchers, and schools—are working with the Service to raise awareness and educate the public on actions they can take to recover the whales. In 2008 research and management efforts focused on matters related to killer whale status and trends, taxonomy, behavior, ecology, and health, as well as human impacts on the whales and their socioeconomic importance. The results are intended to help inform and set priorities for future recovery efforts.

North Pacific Right Whale (*Eubalaena japonica*)

North Pacific right whales once occurred across the North Pacific Ocean and southern Bering Sea from North America to Asia. From the mid-1800s through the early 1900s, commercial whalers hunted them to near-extinction. In 1935 the League of Nations adopted a ban on commercial hunting of all right whales. The ban has continued to the present under the 1946 International Convention for the Regulation of Whaling. The ban provided the spe-

cies a respite from most whaling and may have allowed right whale numbers in the North Pacific to begin to increase. However, an illegal take of 372 whales off Alaska by Soviet whalers between 1963 and 1967 (Brownell et al. 2001) again pushed the species close to extinction.

The species likely consists of two separate populations: one in the western North Pacific off China, Korea, Japan, and Russia and the other in the eastern North Pacific and southeastern Bering Sea from Alaska to Mexico (Brownell et al. 2001). Abundance of the western population is unknown but is estimated to be in the hundreds, at most. The eastern population may now number far fewer than 100 (Brownell et al. 2001).

From the late 1960s to the mid-1990s, right whale sightings in the eastern North Pacific were rare and widely scattered between Baja California and Alaska, with a few sightings near Hawaii. In the summer of 1996, however, scientists observed four whales feeding together in the southeastern Bering Sea (Goddard and Rugh 1998). Each year since then, the National Marine Fisheries Service has surveyed the area, with the largest number sighted in 2001 when scientists counted 24 whales. Photo-identification records and genetic analyses of biopsy samples from those surveys suggest that at least a few dozen right whales occur in the southeastern Bering Sea in summer.

Major threats to the population are poorly known. However, in recent years the Minerals Management Service has taken steps to lease areas of the southeastern Bering Sea for oil and gas development. Oil spills, vessel traffic, and noise associated with exploration and development could pose risks to right whales and their prey in that area in the near future. Entanglements in fishing gear and collisions with ships kill and injure North Atlantic right whales. Right whales in the North Pacific may be equally vulnerable to those threats although existing records do not reveal any such interactions to date.

Research Activities

To help assess risks associated with oil and gas exploration and development in the southeastern Bering Sea, the Minerals Management Service is funding a multiyear study by the National Marine Fisheries Service to assess right whale distribution, movements, and ecology in that portion of its range. With those funds, the Fisheries Service conducted both aerial and shipboard surveys during the summer of 2008 and focused additional research on acoustic and visual detection, photo-identification, collecting biopsy samples for genetic analyses, foraging ecology, and satellite telemetry. The North Pacific Research Board also funded research using satellite telemetry. Preliminary results included sightings of 11 to 14 individual right whales, at least 5 of which had been seen in previous years. All sightings in 2008 occurred in the Bering Sea area designated as critical habitat (see later discussion). One whale, tagged and tracked for 58 days, remained in the southeastern Bering Sea from late August through early October. In 2009 the National Marine Fisheries Service was planning to continue such research, pending further support from the Minerals Management Service.

Taxonomic Status

Until recently, the National Marine Fisheries Service managed North Pacific right whales and North Atlantic right whales as one species, the northern right whale (*Eubalaena glacialis*), which was listed as endangered throughout its range. Recent genetic studies indicate that these are separate species; *E. japonica* (North Pacific) and *E. glacialis* (North Atlantic) (Rosenbaum et al. 2000, Gaines et al. 2005). On 27 December 2006 the Service proposed separate listings as endangered for the two species. The Commission supported the change in a 22 January 2007 letter, and the Service finalized the change on 6 March 2008 (73 Fed. Reg. 12024).

Designation of Critical Habitat

In response to a petition by the Center for Biological Diversity, the National Marine Fisheries Service designated two areas as critical habitat for the northern right whales off Alaska in 2006 (71 Fed. Reg. 387227) (Figure 21). The two areas total 95,324 km^2 (35,800 mi^2) and encompass most right whale sightings in the eastern North Pacific since northern right whales were first listed as endangered in 1970. Because the Service proposed to list North Pacific right whales separately in 2006, on 29 October 2007 it also proposed to designate

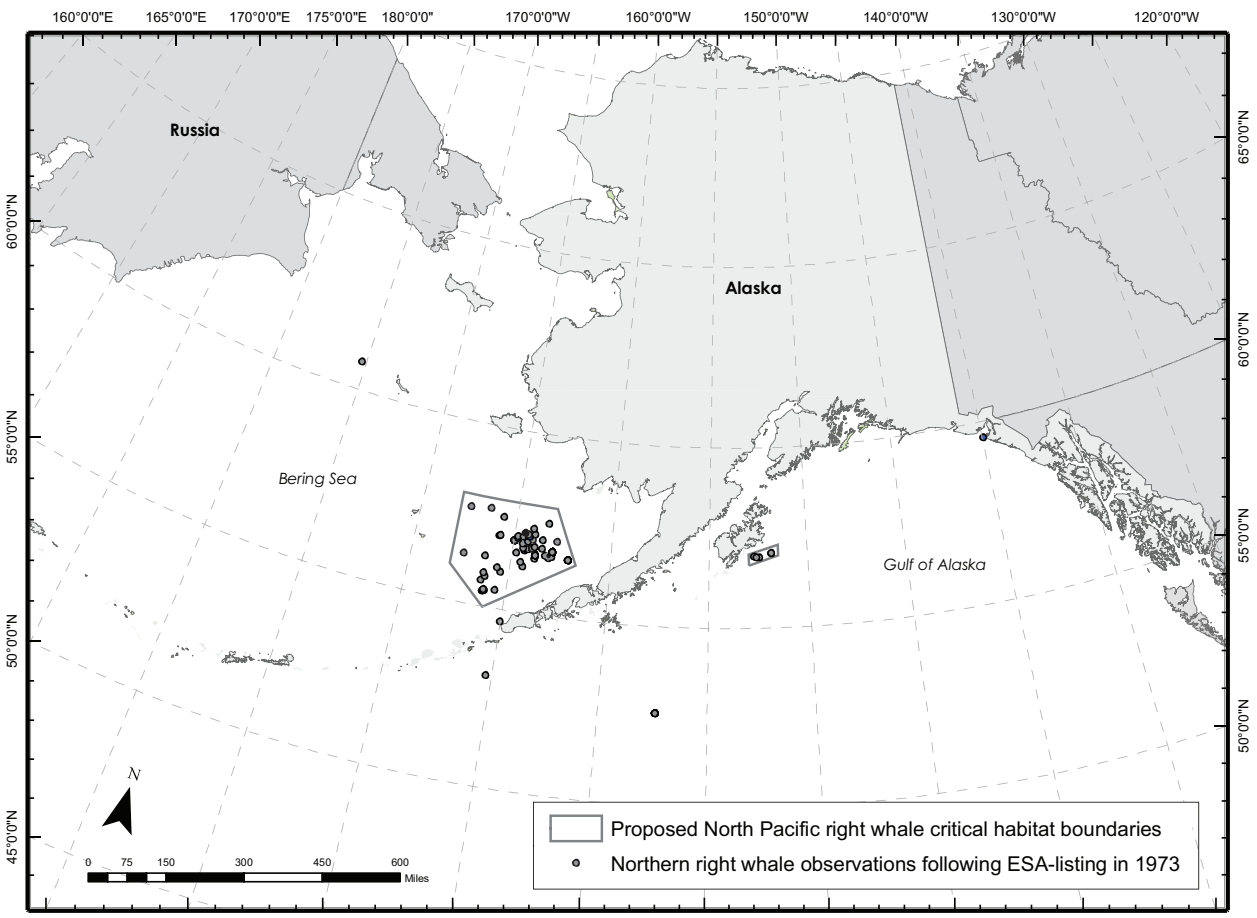

Figure 21. National Marine Fisheries Service's proposed critical habitat for North Pacific right whales

the same two areas as critical habitat for the newly recognized species. The Service finalized the rule on 8 April 2008 (73 Fed. Reg. 19000).

North Atlantic Right Whale (*Eubalaena glacialis*)

The North Atlantic right whale now exists as a single population in the western North Atlantic off the coasts of the United States and Canada. The population migrates between winter calving grounds off Florida and Georgia and four feeding areas off New England and southeastern Canada (e.g., the Great South Channel east of Cape Cod, Massachusetts; Cape Cod Bay; the Bay of Fundy near the U.S.-Canada border; and Roseway Basin off the southern tip of Nova Scotia) (National Marine Fisheries Service 2008b). Late in 2008 scientists from the National Marine Fisheries Service's Northeast Fisheries Science Center discovered large numbers of whales in an area of the central Gulf of Maine that also may be important winter habitat. In addition, waters within 30 nmi of shore between Georgia and New England are important to whales migrating between feeding and breeding grounds in the spring and fall (Knowlton et al. 2002, National Marine Fisheries Service 2008c).

Commercial whaling extirpated right whales in the eastern North Atlantic population and reduced the western population to the low hundreds. Currently the western population numbers 350 to 400 animals, and the species is listed as endangered under the U.S. Endangered Species Act. Commercial whaling for right whales has been banned for decades, but collisions with ships and entanglements in commercial fishing gear—principally lines from lobster trap and pot fisheries and gillnets—have prevented recovery. Since 1990 scientists and man-

agers have documented 56 right whale deaths, including 21 from ship strikes and 7 from entanglements in fishing gear (Figure 22).

Documented Right Whale Deaths and Injuries in 2008

In 2008 scientists and managers involved in right whale recovery efforts documented three whale deaths and eight new entanglements. All three deaths were of newborn calves, two that washed ashore in northeastern Florida in the first two months of the year and one that stranded alive late in December on North Carolina's Outer Banks and was euthanized. None showed signs of interactions with fishing gear or vessels. The year 2008 was the first since 1999 with no documented deaths attributable to ship strikes or entanglements. However, the eight new entanglement cases in 2008 exceeded the average rate of documented entanglements (4.9 whales per year) for the period 2000 through 2007 and equaled the previous one-year high in 2002. Right whale aerial research teams were the first to report the entangled whales, which included two adult females, two adult males, two juveniles, and two whales of unknown age.

The first new entanglement in 2008 involved an adult female seen gear-free on 17 September 2007 in the Bay of Fundy but observed trailing line from its mouth and past its flukes on 12 January 2008 in Cape Cod Bay. A disentanglement team attempted unsuccessfully to remove the line. In March observers resighted the whale in Cape Cod Bay, and the disentanglement team was able to remove a small piece of trailing line. Patches of cyamids, or "whale lice," on its head suggest that the animal's health had deteriorated since it was first seen entangled. On 13 November it was resighted in the central Gulf of Maine with no gear attached and in improved condition.

On 29 January 2008 observers documented two cases of right whale entanglement off northern Florida. The first involved a five-year-old male trailing line from both sides of its mouth and exhibiting extensive scarring along its caudal peduncle. It was resighted on 8 May and had shed the entangling gear. The second case involved a male of unknown age observed in the Gulf of Maine on 19 December 2007 gear-free and apparently in normal health but observed a month later with extensive and severe entanglement-related scarring on its back and caudal peduncle (Figure 23). Despite the severity of the scars, this whale survived at least a year and was last sighted on 18 December 2008 off South Carolina.

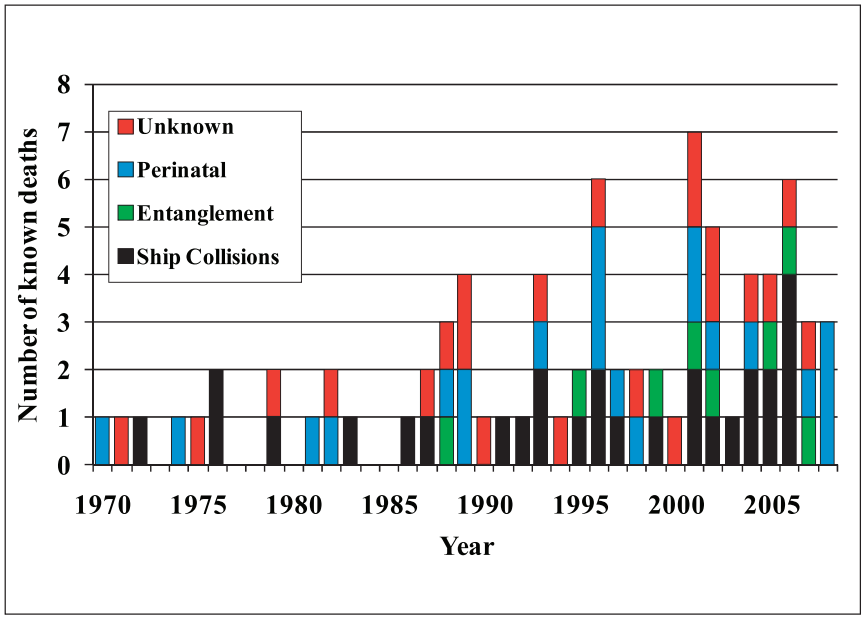

Figure 22. Known mortality of North Atlantic right whales by cause of death, 1970–2008 (unpublished data compiled by the Marine Mammal Commission)

The fourth entanglement involved an adult male seen off North Carolina on 3 February with line trailing from its mouth and fresh wounds on its caudal peduncle. A subsequent sighting revealed that the line was deeply embedded in the rostrum, and the whale was in poor condition. Disentanglement attempts were unsuccessful, and observers last sighted the whale still entangled on 16 April 2008 off Cape Cod.

The fifth entanglement involved an adult female seen in poor condition on 6 March 2008 in Cape Cod Bay. The female trailed line from its mouth past its tail flukes. Dis-

Figure 23. A juvenile right whale (#3530) with extensive entanglement scars sighted on 29 January 2008 off Florida about a month after being seen gear-free with no scars in the Gulf of Maine. White patches beneath the whale are on the belly of a third whale swimming upside down. (Photograph courtesy of the New England Aquarium)

entanglement attempts were unsuccessful, and the animal was still entangled when last seen on 14 March 2008. This female has produced at least six calves since she was first identified in 1981.

The sixth new entanglement involved an adult male photographed on 7 May in the Great South Channel. Observers detected the entangling debris when they inspected the photographs and found what appeared to be line trailing from the whale's mouth to its peduncle. On 12 October 2008 the whale was resighted gear-free off New Hampshire.

Observers on the calving grounds off Florida documented the other two entanglements. One involved a whale of unknown age and sex observed on 8 December 2008 with rope wrapped tightly around its body and trailing about 200 m of line. The whale's skin was in poor condition, especially posterior to the rope. On 18 December a disentanglement team was able to remove about 100 m of line and attach a telemetry buoy to the remaining trailing line to help relocate the whale for further disentanglement attempts. The next day, observers found the buoy floating with an additional 300 ft of line attached. They did not observe the whale and could not determine whether it was still entangled. The last documented entanglement in 2008 involved a juvenile born in 2007. Observers first sighted this whale on 26 December, trailing line from both sides of the mouth across the back and behind the whale. Disentanglement efforts on 26 and 27 December successfully removed all gear from the whale, and the animal appeared to be in good condition.

In addition to the eight new entanglements, a ninth whale exhibited injuries of an undetermined nature that might have been related to entanglement. On 24 September 2008 a whale research team photo-

graphed an adult male near Jeffreys Ledge off New Hampshire. The whale was in poor condition with a heavy load of cyamids on its head and tail stock and signs of a recent entanglement injury. This whale was born in 1991, experienced three minor entanglements between 1992 and 2000, and in 2001 was hit by a ship, leaving a series of serious propeller wounds on its tail stock and flukes. During its previous sighting in September 2006 in the Bay of Fundy, the propeller wounds appeared to be healing, and the whale was considered to be in good condition.

Between 2000 and 2007 observers documented 32 other entanglement cases (Marine Mammal Commission unpubl. data). Combined with the eight observed in 2008, they involve about 10 percent of all remaining right whales. The fate of the whales has varied (Table 14). Disentanglement teams have removed at least some gear from many of those animals, but some freed animals subsequently died from their injuries. About half of the 40 whales were in good condition when last sighted. In at least three cases, animals first seen entangled prior to 2008 were resighted in 2008. Two whales seen entangled in 2007 were either gear-free or apparently gear-free and in good condition in 2008. The third, first seen entangled in 2004, was still entangled and in fair condition when resighted in 2008.

Management

The National Marine Fisheries Service has lead responsibility for conserving the North Atlantic right whale in U.S. waters. Despite urgent needs, the Service has been slow to develop, implement, and demonstrate the effectiveness of protective measures. The only demonstrably effective management activity to date has been the disentanglement of entangled whales, which is not consistently effective and is an inherently hazardous activity for both the whales and the disentanglement teams. Efforts are also underway in some parts of the right whale range to replace floating line connecting pots or traps with neutrally buoyant or negatively buoyant line. The change is expected to reduce the amount of line floating up into the water column (as opposed to lying on the bottom) where it is most likely to entangle whales.

In 2008, after months of deliberation within the Administration, the Service implemented major new regulatory measures intended to increase the level of protection for right whales.

Regulatory Measures to Reduce Entanglement in Fishing Gear

Section 118 of the Marine Mammal Protection Act requires that the National Marine Fisheries Service develop and implement take reduction plans for marine mammals taken incidentally in fishing gear when such takes exceed a marine mammal stock's potential biological removal (PBR) level. The Act defines PBR as "the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population." For purposes of calculating takes relative to PBR, removals include animals

Table 14. Fate of North Atlantic right whales observed entangled between 2000 and 2008 (unpublished data compiled by the Marine Mammal Commission)

Status as of last sighting	No gear removed	Some gear removed	All or most gear removed	Total
Gear free in good condition	9	6	2	17
Gear free – poor, fair, or uncertain condition	4	-	1	5
Entangled in good condition	2	1	1	4
Entangled - poor, fair, or uncertain condition	4	2	-	6
Known or assumed dead	3	1	1	5
Unidentified right whales not resighted	2	-	1	3
Total	**24**	**10**	**7**	**40**

either killed or seriously injured incidental to fishing activity. To help develop take reduction plans, the Service may establish take reduction teams composed of representatives of involved fisheries, environmental groups, federal and state agencies, fishery organizations, and the scientific community. These teams recommend measures to the Service intended to reduce incidental take to levels below PBR within six months of a plan's implementation and to levels approaching a zero mortality and injury rate goal (currently considered to be 10 percent of PBR) within five years.

The Service has established a PBR of zero for the North Atlantic right whale because of the population's small size and its failure to recover. The Service established the Atlantic Large Whale Take Reduction Team in 1996 to address incidental takes of right whales and several other large whale species in East Coast gillnet and lobster fisheries, and in 1997 it adopted the Atlantic Large Whale Take Reduction Plan. Based on team recommendations, the Service has modified the plan several times in ensuing years. Its whale protection measures have relied largely on gear modifications believed by the Service to reduce the likelihood of entangling large whales. They include weak links placed at various positions on vertical lines and net panels, knotless lines, neutrally buoyant or sinking groundlines in place of floating groundlines, and time/area management zones employing various combinations of these measures.

In 2003 observers documented a right whale badly entangled in fishing gear equipped with a weak link, demonstrating that gear that had been approved for the lobster trap fishery still posed an entanglement threat. This entanglement and the undiminished number of reports of entangled whales indicated that the take reduction measures were not adequate to prevent entanglements. Therefore, the Service consulted with its Large Whale Take Reduction Team and began planning a major revision of the take reduction plan.

Modifications to the Take Reduction Plan: In February 2005 the Service developed and circulated a draft environmental impact statement examining alternative take reduction strategies based on advice from the large whale team. In June 2005 the Service published a proposed rule calling for application of a complex set of gear modifications that were similar to those used under previous rules but that would be applied to more fisheries in more areas. The complexity of the proposal reflected efforts to accommodate local fishing practices and gear characteristics by incorporating area-specific and fishery-specific measures. The most significant and controversial change required all trap and pot fisheries to use sinking or neutrally buoyant line for groundlines used to connect individual pots into strings of 2 to 20 or more. The proposal also included a requirement for gillnet fishermen to use sinking line on their groundlines or on the line connecting a gillnet or gillnet bridle to an anchor. The Service thought that the rule would effectively eliminate thousands of miles of floating groundline that could entangle whales swimming or feeding at depth.

As described in previous annual reports, the Marine Mammal Commission supported the requirement for sinking or neutrally buoyant groundlines but noted that other measures being proposed would do little to reduce the entanglement risks posed by vertical lines linking fishing gear on the bottom to surface buoys. Research data suggest that vertical lines pose the greatest entanglement risk to large whales (Johnson et al. 2005). Therefore, the Commission recommended, as it had many times in the past, that the Service adopt an additional or alternative take reduction strategy. Specifically, it recommended that the Service seasonally prohibit all gear that could entangle right whales in areas where whales are known to aggregate in large numbers, such as in designated critical habitats. As in the past, the take reduction team was unwilling to consider such measures, and the Service dismissed them with no meaningful evaluation.

The Service's 2005 proposal elicited strong opposition from the Maine lobster industry, which asserted that use of sinking groundlines in rocky habitat off the Maine coast would cause a safety hazard and excessive loss of traps. They argued that sinking groundlines would snag on rocks causing lines to break during hauling, and that sinking groundlines would rub along rocky bottoms in the high currents characteristic of the Maine coast. This would cause lines to abrade more quickly, require frequent and costly line replacement, and increase loss of traps. After considering those and other comments, the

Service prepared a draft final rule for clearance by the Administration. Based on comments received during that review, the Service deferred publication of a final rule pending further evaluation. After a delay of more than a year, the Humane Society of the United States and the Ocean Conservancy filed suit in February 2007. The plaintiffs asserted that the Service was violating the Marine Mammal Protection Act by failing to adopt revised take reduction measures within applicable time frames. To meet the terms of a settlement agreement on the suit, the Service released a final environmental impact statement on the proposed revisions to the large whale plan on 30 June 2007 and on 5 October 2007 published a final rule in *Federal Register* (72 Fed. Reg. 57104).

The final rule retained the requirement for sinking or neutrally buoyant groundlines for most areas off the East Coast but exempted most Maine state waters (i.e., most waters within three miles of the coast). The Service deemed the exemption appropriate based on a conclusion that right whales spend only brief periods in the nearshore bays, harbors, and inlets along the Maine coast. That conclusion, however, is poorly supported. Scientists have conducted few studies to assess the occurrence of right whales along the Maine coast. In addition, Maine lobster gear has comprised a significant portion of the gear removed from entangled whales that could be identified to its source. The final rule also deferred the effective date for requiring sinking or neutrally buoyant groundlines to 5 October 2008 to allow additional time for fishermen to switch from floating to sinking groundlines.

In its 21 September 2007 comments on the final environmental impact statement for the new rule, the Marine Mammal Commission again noted that entanglement risks for whales in vertical lines had not been adequately addressed and again recommended that all hazardous fishing gear be seasonally prohibited in right whale critical habitats for reasons noted in past letters. The Commission also noted that in its opinion, the failure to consider such an alternative in the final environmental impact statement was inconsistent with the Service's statutory obligation under the National Environmental Policy Act to examine all reasonable alternative measures. The Service, however, concluded that its impact statement satisfied the requirements of the Act.

Most of the other measures in the final rule took effect late in 2007 and early in 2008. The rule phased out certain existing area-specific requirements to use sinking or neutrally buoyant groundline in dynamic area management zones (i.e., temporary zones established at locations where right whale feeding aggregations were sighted) and in seasonal area management zones (i.e. locations where right whales are known to aggregate seasonally). Provisions establishing dynamic area management zones expired on 1 April 2008, when most gear modification requirements other than those for sinking groundlines went into effect, while provisions for seasonal area management zones were to expire on 5 October 2008, coincident with the scheduled effective date for the use of sinking groundlines.

However, on 24 April 2008 the Maine Lobstermen's Association wrote to the National Marine Fisheries Service asking for further deferral of the sinking groundline requirement until June 2009. The letter noted that the delay was needed to give the Service and the Maine lobster industry an opportunity to ensure that lobstermen could fish safely while minimizing the amount of line in use during the coming fishing season. In addition, members of Maine's congressional delegation urged the Service to defer the proposed rule. In response to those concerns, the Service published a proposed rule on 6 June 2008 (73 Fed. Reg. 32278) to modify the large whale plan by further deferring the 5 October 2008 deadline for broad use of sinking groundlines for Atlantic trap and pot fisheries until 5 April 2009. The Service's notice advised that it had concluded that a six-month delay would have a minimal impact on whales for five reasons. The notice also proposed eliminating the term "neutrally buoyant" groundline from the take reduction plan because its regulatory definition (i.e., line with a specific gravity of 1.03 or greater) was identical to that for sinking groundline and the use of both terms had caused some confusion.

On 1 July the Commission commented to the Service on its proposed rule. It supported the proposal to delete the term "neutrally buoyant" from the take reduction plan but opposed deferring imposition of the sinking groundline requirement. The Commission found all five reasons for the delay to be inadequate and unsupported.

First, the Service's notice stated that the majority of new conservation measures under the revised plan would already be in place by 5 October. The Commission noted, however, that the requirement for broad use of sinking groundlines was the most important provision in the revised plan. It also noted that most other measures simply expanded the use of previous measures that were widely recognized to be inadequate to prevent entanglement in vertical lines.

Second, the notice stated that special right whale management areas already had converted to sinking groundline. In response, the Commission noted that the special areas included dynamic area management and seasonal area management zones that had been or would be phased out by the time the deferral was to begin. Thus, the geographic area in which sinking groundlines would be required during the six-month deferral period would actually be less than under the previous rule.

Third, the Service stated that impact on whales would be minimal because most trap and pot gear is out of the water from October to April. In response, the Commission noted that the Service had provided no information or analyses identifying when, where, or how much trap or pot gear was likely to be removed from or remain in the water between October and April. Further, the Commission cited clear evidence that right whales become entangled during this period. For example, during the previous winter at least two right whales became entangled during the October to April period.

Fourth, the notice stated that the seasonal arrival of large whales in the northeast occurred mostly before the proposed effective date. The Commission pointed out that this explanation made little sense because whales aggregate off New England both before and after the exemption period and because large numbers of right whales remain in the Gulf of Maine through the winter (see later discussion).

Finally, the notice stated that the impact of the deferral would be minimal because previous gear buyback programs from Maine to North Carolina had already promoted the conversion of floating groundlines to sinking lines and that large amounts of floating groundline had already been removed from the ocean. On this point, the Commission argued that no information had been provided on the proportion of gear that had already been converted, but if that proportion was indeed significant, it would demonstrate that fishermen were already well aware of the impending sinking groundline requirement and had already taken steps to address it, and that the reported confusion used to justify the deferral must not be widespread. Thus, the Service's own reasoning refuted the stated need for the deferral.

On 2 September 2008 the Service published a *Federal Register* notice (73 Fed. Reg. 51228) announcing it had adopted its proposed rules with no changes. The term "neutrally buoyant" was deleted and the deadline for complying with the sinking groundline requirement was deferred to 5 April 2009. The notice stated that, while many commenters disagreed with the Service's conclusion that the deferral would have a minimal impact on whales, the Service continued to believe that was the case. The Service based this conclusion on the reasons stated in the preamble to its proposed rules and in an accompanying regulatory impact review and on what it knew about the affected fishing gear, right whales, and past gear buyback programs.

On 16 September 2008 Defenders of Wildlife and the Humane Society of the United States filed suit seeking to overturn the Service's decision to defer the sinking groundline requirement. The lawsuit asserted that the Service's action violated terms of the earlier settlement agreement with the Humane Society. In that agreement, the Service agreed to publish a final rule in October 2007. With the 2 September 2008 rule, however, those provisions were modified before they could go into effect. The lawsuit also asserted that the Service failed to carry out required impact analyses pursuant to the National Environmental Policy Act and that any further delay in implementing necessary protection was contrary to the Service's early analyses of protection needs and requirements under the Endangered Species Act and the Marine Mammal Protection Act. On 26 September the court found in favor of the plaintiffs and ordered that the Service reinstate the prior plan's provisions for establishing dynamic area management zones in areas north of the preexisting seasonal area management boundaries off eastern Massachusetts pending the court's resolution on the merits of the case or implementation of the sinking groundline requirement.

As a result of the court order, in October 2008 the Service reinstated the process of establishing dynamic area management zones off eastern New England. The basis for triggering these zones is a reliable right whale sighting by a qualified individual (e.g., marine mammal observers in the Service's Northeast Fisheries Science Center). Based on sightings from the Center's right whale aerial survey program, several dynamic area management zones were established late in 2008. Two of the Center's surveys produced results of particular interest. On 3 December 2008 observers sighted 44 right whales in the Jordan Basin in the central Gulf of Maine about 70 miles south of Bar Harbor, Maine. On 16 December observers sighted 41 whales a few miles west of the initial sighting location. Based on those sightings and previous right whale sightings in the area, the Science Center announced that the area may be an important, previously unrecognized wintering ground and a potential breeding area for North Atlantic right whales.

Deliberations by the Atlantic Large Whale Take Reduction Team: On 28 April–1 May 2008 the Service convened the Atlantic large whale team to develop more effective measures to prevent whale entanglements in vertical lines and to address concerns about the new sinking groundline requirement. However, the team spent most of the meeting reviewing proposals by fishing representatives for possible exemptions or modifications to the new sinking groundline requirement adopted in October 2007. They suggested trap fishermen might avoid using sinking groundline by converting strings of two or more traps per buoy to one trap per buoy or using shorter strings than they had in the past. This strategy could increase the number of vertical lines and associated entanglement risks. The Service did not consider this possibility in its analysis of sinking groundline requirements. However, little data exist on current gear configurations (i.e., the number of traps per buoy line), confounding any predictions as to whether the fishermen would change their strategy.

During the take reduction team's meeting, the North Carolina set-gear fishing industry, the Maine Department of Marine Resources (on behalf of coastal lobstermen in Maine), the Atlantic Offshore Lobstermen's Association, the Garden State Seafood Association, and the southeastern U.S. Atlantic shark gillnet fishery sought exemptions from the sinking groundline requirement. All but the shark gillnet fishery sought local exemptions in exchange for using low-profile groundlines that would keep lines from rising more than three feet off the bottom by such means as attaching weights at evenly spaced intervals. They argued such lines would be less likely to entangle whales and that fishermen would be less inclined to reduce the number of traps strung together, thereby keeping vertical lines to a minimum. The Maine Department of Marine Resources described its efforts to develop and test low-profile line and, based on the results, fishermen shifted their focus to exploring ways to reduce the amount of line in the water column by increasing the number of traps per buoy line.

Most team members were supportive of a new proposal from North Carolina representatives. That proposal called for exempting an area off Cape Fear from the sinking groundline requirement while requiring a minimum of three traps per buoy (as opposed to two in current practice).

The team reviewed results of recent research on measures to reduce entanglement risks in vertical buoy lines (e.g., time-tension line cutters, glow rope, a new trap-hauler design to reduce rope wear, and whale distribution models to identify high-risk entanglement areas). The team, however, did not put forward any consensus recommendations on vertical lines but agreed to consider the topic more fully at its next meeting.

On 16 July 2008 a subgroup of the team met to consider a revised proposal by the Maine Department of Marine Resources. The proposal sought additional area exemptions (i.e., in addition to areas already exempted in the 5 October rule) based on the use of low-profile line or adjusting the number of traps per buoy to reduce the overall length of line in the water column. During the meeting, various alternative approaches were reviewed, including limits on singles (one trap per buoy), limits on the number of buoy lines, and trade-offs between restrictions on vertical lines and groundlines. Participants concluded that they did not have sufficient data to compare these alternatives, and the Maine Department of Marine Resources withdrew its proposal.

Efforts to Reduce Collisions between Right Whales and Ships

The largest single source of documented human-related right whale mortality is collisions with ships (21 of 56 deaths since 1990). To date, the National Marine Fisheries Service has relied on voluntary efforts by vessel operators to reduce the chances of hitting whales. Among other things, the Service has advised mariners on right whale protection needs, how to avoid whales, and the locations of recent right whale sightings. Location information has been transmitted to vessel operators via telex, broadcasts to mariners, Internet postings, e-mails, and direct radio contact. Nonetheless, vessel-related right whale deaths and injuries do not appear to have been reduced. In 2000 the Service recognized the need for stronger measures and began developing and evaluating a new ship-strike reduction strategy.

After extensive consideration of possible options, the Service published a proposed rule on 12 June 2006 (71 Fed. Reg. 36299) to establish a 10-knot speed limit for vessels 65 ft or longer at certain times and in certain areas where right whales are known to occur. An accompanying draft environmental impact statement was circulated in July 2006. The areas subject to seasonal speed restrictions included the species' calving grounds off Florida and Georgia, feeding grounds in and around Cape Cod Bay, the Great South Channel, and coastal waters 30 nmi around major port entrances along the right whale migratory corridor between Georgia and Rhode Island.

To protect whales outside of established seasonal areas, the proposed rule also called for the establishment of temporary dynamic management areas around reliable sightings of (1) a right whale feeding aggregation (defined as three or more right whales within a 75 nmi^2 area) or (2) one or more right whales remaining within 30 nmi of a major port entrance or in a designated shipping lane. The source of such sightings must be reliable (e.g., a right whale aerial survey team or a trained government marine mammal observer) and announced to mariners as soon as possible over established channels. The boundaries were to be a rectangular area set 15 nmi around the core sighting area. Within that area, vessel speeds were to be limited to 10 knots for periods of up to 15 days unless whales were confirmed to have left the area before then.

As described in previous annual reports, on 15 August 2006 the Commission wrote to the Service, commending it for the constructive approach reflected in the proposed rule. With some minor modifications, the Commission recommended that the proposed rules, including the 10-knot speed limit, seasonal management area boundaries, and effective seasonal time frames, be adopted. The Commission also recommended that, when establishing dynamic management areas, speed restrictions be made effective immediately after a single reliable sighting of right whales that satisfied the identified criteria.

After the comment period on the proposed rule closed, the Service considered comments received, and in February 2007 the Department of Commerce submitted a draft final rule to the White House Office of Management and Budget. Established procedures specify that the office has 90 days to coordinate an interagency review and decide whether to clear such rules. In this case, however, the draft rule elicited extensive debate within the Administration, particularly the Maritime Administration within the Department of Transportation. After a year passed without final clearance, representatives in Congress and the media began citing the delay as an example of high-level political interference by the White House Council of Economic Advisers and the Vice President's Office with science-based agency decisions on environmental protection measures. High-level officials in the Department of Commerce and the Council on Environmental Quality seeking to finalize the rule were met by repeated requests for analyses and re-analyses of data concerning effects of the rule and possible alternatives. Ultimately, senior Administration officials negotiated the contents of a final rule near the end of the Administration's term. In August 2008, after nearly 18 months of review, the Office of Management and Budget cleared the description of a revised final rule to allow completion of the associated final environmental impact statement. The Service amended the description of the preferred alternative in the impact statement distributed on 29 August 2008 (National Marine Fisheries Service 2008b). By letter of 20 August 2008, the Service advised the Commission

that there would be a 30-day public comment period on the final statement (73 Fed. Reg. 50962)

The new preferred alternative retained the 10-knot speed limit as a regulatory standard but altered other measures in several significant ways, some of which had not been considered in the draft impact statement or proposed rules. First, the preferred alternative included a new five-year sunset provision for the rule. According to the statement, this provision was added because of concerns expressed by some members of the maritime community and senior Administration officials about the cost and effectiveness of the speed restrictions in reducing collisions. During the five-year effective period, the Service would be required to gather and evaluate data on the rule's success. Second, the new preferred alternative reduced the size of regulated areas around ports along the migratory corridor from 30 nmi to 20 nmi offshore. Based on analyses showing that 83 percent of all past right whale sightings off the mid-Atlantic states were within 20 nmi of shore, compared to 90 percent within 30 nmi, the final statement concluded that the regulatory burden for the rule was not justified beyond 20 nmi. However, the new preferred alternative also expanded seasonal protection along the southeast coast from limited zones immediately surrounding the region's major ports to a continuous 240 nmi (443 km) management area within 20 nmi of shore between Wilmington, North Carolina, and Savannah, Georgia. Third, the new preferred alternative changed speed limits in dynamic management areas from a requirement to a voluntary action and eliminated sightings of individual whales off ports or in shipping lanes as one of the criteria for designating such temporary areas.

On 29 September 2008 the Commission commented to the Service on the preferred alternative in the final statement, recommending that the Service adopt a final rule more in line with the proposed rule. In particular, it recommended that the five-year sunset clause be abandoned because of uncertainty that funding would be available for research necessary to evaluate the effectiveness of the measures adopted and because time would be insufficient to develop and analyze data and prepare revised management measures in a five-year period. It also recommended that the boundaries of seasonal management areas off the mid-Atlantic states be set at 30 nmi, rather than 20 nmi, because data on right whale sightings along the migratory corridor are limited, most sighting effort has been within 20 nmi, and analyses cited in the final statement had not been corrected to account for differences in sighting effort at different distances from shore. Finally, the Commission recommended that dynamic management areas be made mandatory, rather than voluntary, and that, for areas south of Rhode Island, the single whale sighting criterion be retained as initially proposed but that the length of time that a dynamic management area designation would be in effect should be shortened to less than 15 days from the initial sighting.

On 10 October 2008 the Service published final rules for implementing the speed restrictions as described in the final environmental impact statement (73 Fed. Reg. 60173). The rule became effective on 9 December 2008. The Service provided general responses to comments on the final environmental impact statement in its Record of Decision but did not specifically respond to the Commission's comments and recommendations.

Hawaiian Monk Seal (*Monachus schauinslandi*)

The Hawaiian monk seal is one of three species in the genus *Monachus*. The Caribbean monk seal (*Monachus tropicalis*) is extinct, and the Mediterranean monk seal (*Monachus monachus*) is on the verge of extinction, numbering between 400 and 600 animals. Fewer than 1,100 Hawaiian monk seals remain, and it is one of the world's most endangered seals. The Hawaiian monk seal population has declined by about two-thirds since the first comprehensive counts were made in the late 1950s, and it currently is declining at a rate of about 4 percent per year (National Marine Fisheries Service 2007).

The Hawaiian monk seal is endemic to the Hawaiian archipelago. Before the 1990s monk seals occurred almost exclusively in six main breeding colonies around the small, largely uninhabited islets and atolls of the Northwestern Hawaiian Islands (NWHI) (Figure 24). In 2007 the estimated abundance in that portion of the species' range fell below 1,000 animals for the first time, and in 2008

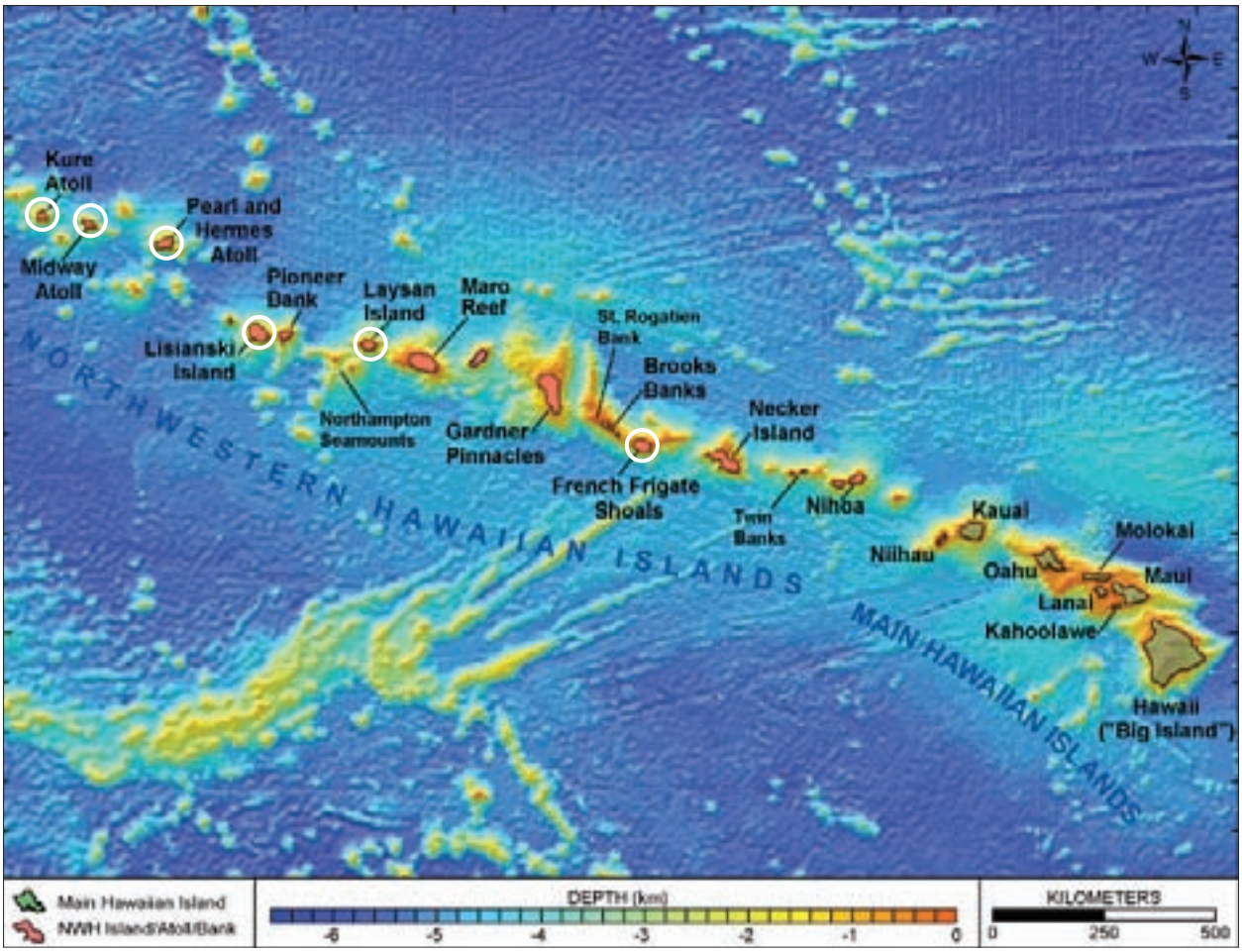

Figure 24. The Hawaiian Archipelago (major breeding colonies are circled)

it continued to decline to only 914 seals (National Marine Fisheries Service unpubl. data). Individual breeding colonies are so small that they are vulnerable to stochastic environmental events (e.g., poor pup survival because of severe storms or tsunamis) and biological factors (e.g., skewed male-female sex ratios, inbreeding, or disease outbreaks) that exacerbate the risk of extinction. Those risks increase with every additional year of decline.

Causes of the species' decline have varied over time. Following the arrival of Europeans in the 1800s, seal numbers in the NWHI were reduced by commercial hunters and by visitors and shipwrecked sailors who killed seals for food. From the late 1800s to the late 1900s, some NWHI atolls were occupied for periods of time by people engaged in commercial and military activities. Those activities and the presence of pet dogs introduced a chronic source of disturbance that displaced seals, particularly pups and juveniles, from preferred resting and nursing beaches, which likely increased shark predation and contributed to the species' further decline.

Recent management actions have eliminated sources of human disturbance in the NWHI. However, other threats persist, principally affecting monk seal pups and juveniles. Known and potential factors contributing to the decline include starvation due to a reduced food supply resulting from commercial fishing and variations in ocean productivity; entanglement in marine debris; predation by sharks; aggressive behavior by adult male seals toward pups, juveniles, and adult females; naturally occurring biotoxins; and the loss of pupping beaches, likely from rising sea levels.

In view of the decline in the NWHI, the species' recent reoccupation of the main Hawaiian Islands may be essential for its recovery and long-

term persistence. Monk seals were extirpated from this portion of their range sometime after the arrival of the first Polynesians about 2,000 years ago. Before the 1990s seal sightings in the main Hawaiian Islands were rare, but recent surveys indicate that about 100 seals now occupy this area, and births have increased from only one documented before 1990 to 18 in 2008 (National Marine Fisheries Service unpubl. data). However, seals in the main Hawaiian Islands are vulnerable to additional threats, including disturbance by people and dogs, interactions with recreational fishing gear, and transmission of disease from pets or feral animals.

The National Marine Fisheries Service has lead responsibility for monk seal recovery under provisions of the Endangered Species Act and the Marine Mammal Protection Act. As discussed in previous annual reports, the Service adopted a revised Hawaiian Monk Seal Recovery Plan in 2006 to guide and strengthen recovery efforts. The Service cooperates extensively with the Hawaii Department of Land and Natural Resources, the Fish and Wildlife Service, the National Marine Sanctuaries Program, the Coast Guard, the Hawaii Wildlife Fund, the Marine Mammal Center, the Marine Conservation Biology Institute, and lifeguards and networks of local volunteers who help monitor and protect seals that haul out on public beaches.

Promoting Recovery in the NWHI

Recovery efforts in the NWHI are focused primarily on three objectives: increasing survival rates for juvenile monk seals; eliminating shark predation on monk seal pups; and removing entangling marine debris from beaches and lagoons.

Increasing Juvenile Survival: Since the late 1980s a significant number of monk seal pups and juveniles in the NWHI have been found dead or observed alive in underweight or emaciated condition. Juvenile survival declined first at French Frigate Shoals but more recently also has declined at other breeding sites. Prey availability appears to have been a significant contributing factor, and managers and scientists have attempted a variety of measures to prevent juvenile deaths and maximize recruitment of females to breeding age. In the 1980s and 1990s small weaned female pups were captured at French Frigate Shoals, transported to Oahu for captive care to improve their physical condition and subsequent chance of survival, and then transported to Kure Atoll or Midway Atoll for release. Other seals were moved directly to Kure or Midway Atolls without a period of captivity on Oahu. These efforts contributed significantly to recovery of the Kure Atoll population but were not effective at Midway Atoll. However, the persistently poor survival of young animals appears to be the most important threat to the NWHI population, and managers and scientists are now reconsidering potential options for bolstering survival, including holding seals in captivity and relocating them to sites with better environmental conditions.

In 2008 scientists from the Service's Pacific Islands Fisheries Science Center moved six weaned pups from French Frigate Shoals to Nihoa Island, about 450 km [280 mi] to the southeast, to test and refine protocols for relocating seals. All six seals were instrumented with satellite tags and released directly from the transport vessel. One seal disappeared at sea after leaving Nihoa Island, but the others stayed near the island and to date have exhibited movement and foraging patterns consistent with those of eight resident seals tagged for comparison purposes. A similar effort is planned for 2009 and, if successful, these trials could be expanded to include older animals that are closer to reproductive maturity.

These types of measures are intended to salvage the reproductive potential of young females, which is crucial to the persistence and recovery of the species. Such measures are complicated by issues related to animal care and husbandry and require close veterinary oversight, suitable holding facilities, means of transportation, and close monitoring in the field. They also consume considerable resources, including staff time and funding. Nonetheless, existing trends strongly indicate that, without an effective management strategy for addressing poor juvenile survival, the NWHI population will continue its persistent decline.

Shark Predation: Between 1997 and 1999 shark predation caused an abrupt increase in pup mortality at French Frigate Shoals where, in the late 1980s, nearly half of all monk seal pups were born. A decade later, half of all pups born at this site were

either observed being attacked by Galapagos sharks or disappeared suddenly, suggesting that they had been killed by sharks. Most disappearances involved pre-weaned pups born on Trig Island, one of the atoll's small islets. In response to the mortality, Service field teams began to remove Galapagos sharks that were seen patrolling the pupping beach on Trig Island and attacking pups.

At the time, scientists speculated that the sudden increase in shark attacks reflected a behavior learned by a few individual sharks and that removal of those individuals would reduce or eliminate the problem. In the late 1990s field teams began tagging and harassing the sharks patrolling Trig Island, and between 2000 and 2005, 12 Galapagos sharks were caught and killed. Thereafter, shark predation at French Frigate Shoals declined significantly, but it has continued to be an important source of mortality. Furthermore, Galapagos sharks learned to avoid field teams as removal efforts continued. In 2007 scientists modified their methods for catching sharks and began to use longline fishing gear set in the reef channels used by sharks approaching and leaving Trig Island. Several sharks were caught in 2007, but none were Galapagos sharks.

In January 2008 the Service's Pacific Islands Fisheries Science Center held a workshop to review efforts to reduce shark predation at French Frigate Shoals and to identify possible alternative approaches. Based on the workshop discussions, the Service suspended efforts to kill sharks and instead deployed an array of non-lethal deterrents along the Trig Island shoreline. These included installing a field of tethered floats with magnets off the pupping beach and placing a set of battery-operated "shark shields" perpendicular to the beach to create a weak electric field that would discourage sharks from cruising along the water's edge. Service scientists also anchored a workboat near the shore and broadcast recordings of boat engine noise at random intervals from underwater speakers to simulate noise similar to what the sharks had learned to avoid. In addition, researchers from the University of Hawaii Marine Biological Institute placed sonic tags on Galapagos and tiger sharks and placed hydrophones at different locations around French Frigate Shoals to track movement and behavior patterns. This work was funded in part by the National Marine Sanctuaries Program (which serves as a co-manager for the Papahānaumokuākea Marine National Monument in the Northwestern Hawaiian Islands; see later discussion) and the National Marine Fisheries Service.

Scientists reviewed preliminary results from the 2008 field season at a second shark predation workshop held 4–5 November 2008. In 2008, 20 percent of the pups born at French Frigate Shoals (8 of 41) were either confirmed or suspected victims of shark attacks. The efficacy of the tested deterrents was equivocal. Four of the eight shark-related deaths occurred at times when some of the electronic shark shields were not operating. The other four deaths occurred at another islet within the atoll where shark predation has been uncommon but appears to be increasing. Shark predation on monk seal pups may be spreading from Trig Island to other atoll areas, perhaps because some sharks were displaced by the deterrents.

In 2008 pups that survived to weaning were moved from Trig Island to Tern Island, another islet at French Frigate Shoals with a permanently occupied field station and no record of shark predation. As in previous years, none of the relocated pups died or disappeared before the end of the field season.

During the November 2008 workshop, participants suggested ways to improve or expand deterrent efforts, including the installation of temporary physical barriers to keep sharks away from the Trig Island shoreline and maintaining a field team on Trig Island to harass sharks on a more regular basis and collect more complete data on the problem. Participants also provided advice regarding the expansion of tagging studies to confirm the hypothesis that predation is caused by a few sharks and to provide information on methods for catching individual sharks. Management efforts for 2009 had not yet been planned at the end of 2008.

Marine Debris: Since the early 1980s monk seal field teams have disentangled more than 200 seals in the Northwestern Hawaiian Islands. The vast majority have been juveniles, and the most common entangling debris is line and webbing from derelict trawl nets that drift into the NWHI from fisheries around the North Pacific. Whenever possible, field teams capture entangled seals and remove debris unless they consider that the seals

are likely to free themselves. Despite these efforts, marine debris likely is a significant source of juvenile mortality. Field teams are present at NWHI breeding atolls for only a few weeks or months of each year, and seals entangled in net debris drifting at sea or snagged on reefs may not be able to return to shore where they could be disentangled. Several dead and live seals have been found in large pieces of trawl net caught on reef outcrops in atoll lagoons. Such deaths cannot be recorded by scientists monitoring seals on land.

In addition to disentangling seals, monk seal field teams routinely remove hazardous debris from beaches. In 1996 federal, state, and local agencies led by the National Oceanic and Atmospheric Administration expanded clean-up efforts to include removal of debris submerged in atoll lagoons. Funding provided by Congress to the National Ocean Service allowed a significant increase in clean-up efforts between 2000 and 2005, and divers removed more than 400 metric tons of netting from NWHI atoll lagoons during that period. In 2006 funding and debris removal were scaled back to a "maintenance" level believed to be adequate to keep up with debris accumulation rates. Recent studies indicate that net accumulation rates are higher than previously thought, but funding and clean-up work have remained at a reduced level. In 2008, 57 metric tons of net debris were removed, primarily from Midway Atoll, Pearl and Hermes Reef, Maro Reef, Lisianski Island, and French Frigate Shoals.

Clean-up efforts have undoubtedly prevented some entanglements, but the number of entangled seals seen on shore has not decreased noticeably (Figure 25). In 2008 the length of field seasons for monk seal work in the NWHI was significantly reduced because of funding limitations. Five seals were found entangled: four in the NWHI were disentangled and released, and one in the main Hawaiian Islands off Kauai later shed the entangling material unassisted.

Recent studies suggest that the amount of fishing debris and number of monk seal entanglements in the NWHI increase during El Niño events due to a shift in the North Pacific subtropical convergence. This convergence is a boundary between ocean currents and, in normal years, it concentrates floating debris north of the Hawaiian archipelago. During El Niño events, the convergence moves south toward the NWHI, bringing more derelict nets into the region and increasing entanglement risks. The National Marine Sanctuary Program has been funding research to test remote-sensing technology that might locate concentrations of drifting debris and allow interception before they reach the NWHI. Results to date have shown some promise, but further work is needed to determine whether scientists and managers can detect and clean up at-sea debris in a cost-effective manner.

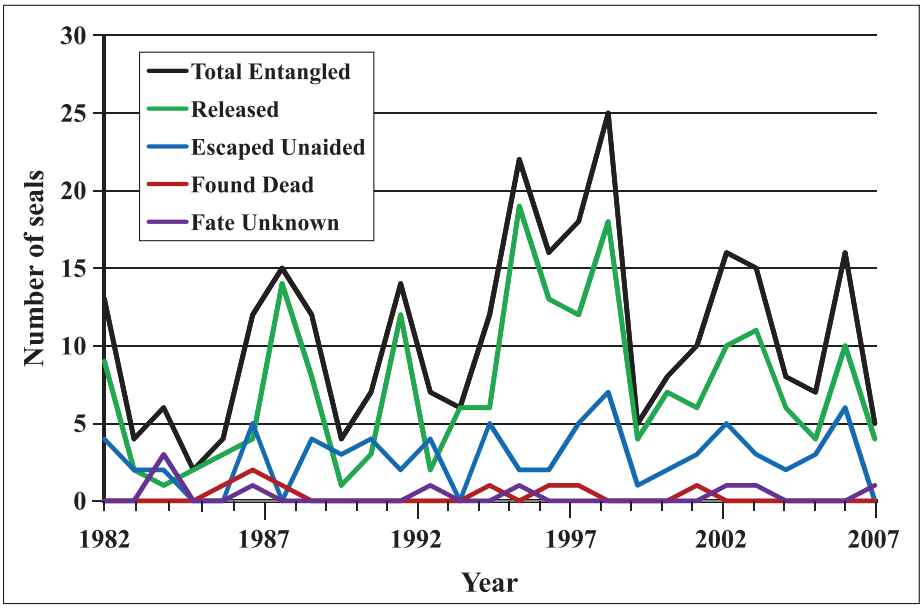

Figure 25. Number of entangled Hawaiian monk seals observed from 1982 through 2008 (Data provided by the National Marine Fisheries Service, Pacific Islands Fisheries Science Center)

Promoting Recovery in the Main Hawaiian Islands

Although the monk seal's reoccupation of the main Hawaiian Islands may contribute signifi-

cantly to the species' recovery, it also raises new challenges. Monk seal interactions with sunbathers, swimmers, surfers, and fishermen on popular recreational beaches are increasing, and seals face increased risk of exposure to diseases from domestic pets, livestock, and feral animals. Managers are increasingly called on to respond to reports of hooked, entangled, or injured seals; orphaned pups; incidents of seal harassment by people or dogs on beaches; seals that have been fed by people and become a nuisance or threat to swimmers and beach-users; and seals that pup on popular tourist beaches and require round-the-clock protection.

The Service's regional office has only one full-time staff position—and no dedicated funding—for managing monk seal issues in the main Hawaiian Islands. Instead, it has reprogrammed funds and staff and relied on assistance from the Pacific Islands Fisheries Science Center; other federal, state, and local agencies (particularly the Hawaii Department of Land and Natural Resources, the Coast Guard, the Hawaiian Islands Humpback Whale National Marine Sanctuary); environmental groups; and lifeguards and networks of volunteers on each of the islands.

Monk seal/fishery interactions are increasing. In 2008 the Service received reports of nine seals with fish hooks or lures caught in their lips or elsewhere on their bodies. Most of these appear to involve seals taking bait or fish from recreational fishing gear. In three of the nine cases, the Service and the state's Division of Aquatic Resources cooperated to catch and remove the hooks, in two others, the seal could not be caught, and in two cases no intervention was attempted because the hooks were not in a critical location on the animal. In all five cases in which hooks were not removed, subsequent sightings revealed that the seals had shed the hooks on their own. A tenth seal was found on Kauai with line extending from its mouth. After catching and examining the animal, it was determined that the seal must have swallowed the hook. Expert veterinary care, transportation, and a treatment facility were not readily available at that time so the animal was fitted with a telemetry tag, released, and recaptured nine days later once arrangements for treatment had been made. X-rays and a thorough medical exam revealed that no hooks or other dangerous gear had been swallowed, and the seal was released in good health. To minimize interactions with recreational fishing, the Service and its partner agencies—particularly the Hawaii Division of Aquatic Resources—increased their public outreach efforts to urge recreational fishermen to (1) use barbless circle hooks less likely to snag or catch seals or sea turtles and (2) abide by restrictions on setting gillnets in areas used by monk seals.

On 2 May 2008 an orphaned pup born on Kauai was brought into captivity for hand-rearing at the Kewalo Research Facility in Honolulu. In September the pup developed a corneal opacity similar to the undiagnosed eye condition documented in 10 pups in captive care in 1996. Extensive medical tests were negative for a viral or bacterial infection, suggesting that the cause might have been due to environmental factors such as water quality or light conditions at the facility. Officials at the Marine Corps Air Base in Kaneohe, Oahu, allowed construction of a temporary shore pen on base land, and the seal was moved there in early October (Figure 26). The Marine Mammal Center, a non-profit marine mammal rehabilitation facility in Sausalito, California, donated veterinary services and flew in staff to care for the seal. After being moved to the pen, the eye opacity began to clear and the pup gained weight steadily. On 15 December, after further disease screening proved negative, the pup was fitted with a satellite transmitter to help monitor its adaption to the wild, transported by the Coast Guard to a secluded site on Molokai, and released. As of the end of 2008 the pup had been observed foraging and appeared to be doing well.

Illegal feeding by people has conditioned a few seals to adopt behaviors that pose threats to both people and the seals themselves. Those seals may follow or chase swimmers or attempt to climb onto surfboards. In 2008 a seal was captured and relocated four times because of concern that it might bite or injure swimmers. To prevent such behavior, the Service and its partners have intensified public outreach efforts and developed educational materials urging people to avoid feeding or otherwise interacting with seals.

The most widespread management need in the main Hawaiian Islands, however, is minimizing harassment of seals that haul out to rest, molt, or pup on beaches used intensively for human recreation.

Figure 26. Orphaned Hawaiian monk seal pup found on Kauai and held in captivity in a shore pen at the Kaneohe Marine Corps Air Base, Oahu, prior to release in December 2008 (Photograph courtesy of David Schofield, NMFS PIRO)

The Service and the Hawaii Department of Land and Natural Resources have worked together to develop and guide volunteer response networks on each of the main islands. When seals haul out on beaches where they could be disturbed, network volunteers establish a perimeter of posts with yellow caution tape and signs around the animals to keep people from disturbing them. At crowded beaches or in special circumstances, such as births, volunteers monitor the seals and distribute brochures making clear the species' endangered status and the regulations against disturbing seals. Nevertheless, law enforcement officers have had to respond to incidents of harassment by people or pet dogs. In 2008 four harassment cases were prosecuted, resulting in $9,000 in fines.

Papahānaumokuākea Marine National Monument

In December 2000 President Clinton designated all federal waters within 50 nmi of the NWHI as the Northwest Hawaiian Islands Coral Reef Ecosystem Reserve. Executive Orders creating the reserve established protective regulations and directed the National Marine Sanctuary Program in the National Ocean Service to take steps to designate the area as a national marine sanctuary. As that process was underway, President Bush signed Presidential Proclamation 8031 on 15 June 2006 designating all islands and surrounding waters in the NWHI—an area covering nearly 140,000 nmi^2—as the Northwestern Hawaiian Islands Marine National Monument (71 Fed. Reg. 36443). The new designation, the first marine national monument to be established, created one of the world's largest marine protected areas and obviated the need for sanctuary designation. Subsequently renamed the Papahānaumokuākea Marine National Monument, its boundaries overlay several preexisting federal and state-managed areas, including the Midway Atoll and Hawaiian Islands National Wildlife Refuges, the NWHI Coral Reef Ecosystem Reserve, and the state of Hawaii's NWHI Marine Refuge.

The 2006 proclamation directed the Secretaries of the Interior and Commerce and the chair of the Hawaii Board of Land and Natural Resources to serve as co-trustees to administer the monument. Day-to-day management is carried out by a monument management board under a memorandum of agreement signed in 2006. The board includes co-managers appointed on behalf of the National Marine Sanctuaries Program (for the National Oceanic and Atmospheric Administration), the Fish and Wildlife Service, the Hawaii Department of Land and Natural Resources, and the state's Office of Hawaiian Affairs, which represents the interests of Native Hawaiians.

The 2006 proclamation also set forth strong measures to protect natural resources within the monument's expansive boundaries. It set strict limits on commercial fishing, called for a phase-out of all commercial fishing by June 2011, and imposed a ban on exploration for or extraction of oil, gas, or mineral resources. It also prohibited the removal, harvest, damage, or possession of any living or

non-living resources from the monument unless otherwise permitted for purposes of research, education, conservation, and management, Native Hawaiian practices, certain recreational activities, or special ocean use. To guide management decisions, the proclamation directed the co-trustees to prepare and circulate for public review a draft management plan based on a previous draft plan that had been developed for sanctuary designation purposes by the National Marine Sanctuary Program.

Development of a Monument Management Plan: On 23 April 2008 the Fish and Wildlife Service, the National Oceanic and Atmospheric Administration, and the Hawaii Department of Natural Resources circulated for public review a draft monument management plan (73 Fed. Reg. 21975). The draft plan included vision and mission statements to guide management decisions. The vision statement proposes that "the health, diversity, and resources of the vast NWHI ecosystems and the wildlife they support—unique in the world—be protected forever." The stated mission is to "carry out seamless integrated management to achieve strong, long-term protection and perpetuation of NWHI ecosystems, Native Hawaiian traditional and customary cultural and religious practices, and heritage resources for current and future generations." To achieve this vision, the draft plan set forth 11 guiding principles, 8 monument goals, and 22 action plans to (1) improve understanding of the NWHI ecosystem, (2) conserve wildlife and habitats, (3) reduce threats to the ecosystem, (4) manage human uses, (5) facilitate collaboration and partnerships, and (6) achieve effective monument operations.

On 15 July 2008 the Commission submitted comments on the draft plan, commending the authors for preparing a coherent and insightful plan despite the complex and sometimes competing challenges associated with protecting both natural and cultural resources, differing legal and jurisdictional mandates, and previous draft and interim planning documents originally designed to meet somewhat different goals. The Commission found the draft plan to be a solid foundation for developing what could become one of the world's best examples of large-scale ecosystem-based management. The Commission recommended that the draft be adopted, subject to several modifications.

Although the NWHI retain much of their natural heritage, the Commission noted that past human activities have introduced exotic species, contaminated some areas with various pollutants, and depleted or extirpated certain living resources. The Commission noted that needed restoration work would require managers to balance short-term or minor impacts and risks against prospects for restoring and perpetuating natural and cultural resources for future generations. For example, short-term impacts are inherent in some Hawaiian monk seal recovery activities, the removal of alien species, contaminant clean-ups, and the restoration and use of cultural or historic resources. The need to consider and accept short-term, minor impacts in pursuit of long-term management objectives was not reflected in the guiding principles. The Commission therefore recommended that a new principle be added to manage resources in a manner that "perpetuates and, where possible, restores natural and cultural resources over the long term, while ensuring that impacts and risks inherent in research and management activities are no more than short-term or minor and clearly outweigh potential adverse effects."

The Commission also recommended expanding the draft plan to note that the most urgent recovery needs for Hawaiian monk seals in the NWHI include the development of methods to increase juvenile survival, minimize shark predation at French Frigate Shoals, and prevent entanglement in marine debris. In this regard, the Commission recommended adding two new activities to one of the action plans to (1) improve and apply monk seal care capabilities and interventions for increasing juvenile survival, and (2) reduce shark predation on monk seal pups. Concerning cetaceans, the Commission recommended that the plan include a passive acoustic monitoring system to detect calls of endangered whales, other marine mammals, and fishes and establish an ambient underwater sound budget for natural and anthropogenic sound sources.

The draft plan called for establishment of a Monument Interagency Coordinating Committee with representatives of other agencies involved in managing and protecting monument resources to help direct management activities. Because of its past and ongoing involvement in research and management actions on monk seals and other resources

in the NWHI, the Commission recommended that the Committee include a Commission representative. To help build public support and involvement, the Commission also recommended that the plan include provisions to convene a monument advisory council comparable to the Coral Reef Ecosystem Reserve Advisory Council to provide advice and recommendations to co-trustees on research and management activities.

Finally, the Commission noted that the Memorandum of Agreement for managing the monument should be updated to reflect recent developments, such as the new name for the monument and completion of the draft management plan. It therefore recommended that the signatory agencies update the agreement to include modifications to the mission statement and guiding principles, including those recommended by the Commission, and provisions for periodic updating of the monument management plan.

On 21 November the co-trustee from the state of Hawaii, in consultation with the other two co-trustees, provided a detailed response to the Commission's letter. The response noted that most of the Commission's recommended changes had been adopted or reflected in the final plan. Among other things, it noted that the final plan would include a revised mission statement expressing intent to "ensure ecological integrity…and perpetuation of NWHI native ecosystems." Its goals would be reworded to reflect the need for restoring habitats modified by past human activity. The letter also noted that the final plan would add activities related to the mitigation of shark predation and improvement of juvenile survival to the list of monk seal-related activities and that the Commission would be invited to participate in deliberations related to marine mammals. It also noted that the co-trustees planned to establish an advisory body similar to the coral reef reserve advisory council to provide community and stakeholder advice on research and management. Finally, the letter noted that the cooperative agreement among the three agencies responsible for monument management would be revised as necessary. In late December 2008 monument co-trustees released the final monument management plan incorporating these and other changes made in response to comments received from public agencies and others.

Vessel Management: In April 2007 the International Maritime Organization, a body chartered by the United Nations to manage international vessel traffic, approved a U.S. proposal to designate waters around the NWHI as a "Particularly Sensitive Sea Area." Such designations help ensure that vessel operators exercise extra precaution in areas especially vulnerable to vessel-related impacts and accidents. At the time of that approval, the United States agreed to establish a mandatory ship reporting system for vessels transiting near the NWHI and to consolidate the boundaries of six previously designated "Areas to Be Avoided" (i.e., areas that vessel operators should avoid due to local hazards or risks) into four areas. The purpose of both measures is to make vessel operators aware of navigation hazards posed by shallow reefs in the NWHI and of the need to avoid oil spills and other vessel-related impacts. On 7 July 2008 the National Oceanic and Atmospheric Administration and the Fish and Wildlife Service published proposed rules to implement those obligations (73 Fed. Reg. 38375).

The proposed regulations would require all U.S. vessels and all foreign vessels greater than 300 gross tons entering or leaving a U.S. port to contact a shore station when entering or leaving the area within 10 miles of the Papah□naumoku□kea Marine National Monument. Upon entering that area, vessel operators would contact the shore station using a satellite communication system operated by the Coast Guard and provide the ship's name, contact information, route and speed, planned course through the area, categories of hazardous cargo, and certain other information. When exiting the area, they would have to report any pollution incidents or loss of cargo that occurred while transiting the monument or reporting area. They also would be required to report as soon as possible if they experienced an emergency situation.

On 4 August 2008 the Commission commented in support of the proposed rules and recommending one addition. As drafted, it was not clear which vessels would be required to report emergency situations, whether pollution incidents or losses of cargo were considered emergencies, and precisely what information would be provided when reporting emergencies. The Commission therefore recommended that the regulations be modified to clarify

those points. To enhance potential benefits from the reporting system, the Commission also recommended that a brief return message be sent automatically to each ship reporting through the system. Such reply messages have been built into mandatory ship reporting systems to protect right whales along the U.S. East Coast and, for the NWHI, the Commission noted that reply messages might describe why special precautions are needed in the area, provisions for areas to be avoided, and other relevant measures or information, such as permit requirements for any activity other than uninterrupted travel through monument waters.

On 3 December 2008 the two agencies published final regulations for the mandatory ship reporting system and new area to be avoided (73 Fed. Reg. 73592). The final regulations adopted the proposed measures with no changes. In response to the Commission's comments, the preamble to the final rules noted that co-trustees would consider issues related to reporting emergencies as part of a separate rulemaking action that would apply to all vessels entering the monument. It also noted that the reporting system would include a return message with information on necessary precautions and other related matters to all vessels reporting through the system.

Petition to Expand Critical Habitat

On 9 July 2008 the National Marine Fisheries Service received a petition from the Center for Biological Diversity, the Ocean Conservancy, and KAHEA: The Hawaiian-Environmental Alliance, an organization representing Native Hawaiian interests. The petition requested that the Service expand the critical habitat designated for Hawaiian monk seals under section 4(b) of the Endangered Species Act. The current critical habitat boundaries, designated in 1987, include all beaches and all adjacent waters of the NWHI (except on and around Sand Island at Midway Atoll) out to the 20-fathom depth contour (36.6 m). Under provisions of the Endangered Species Act, federal agencies are required to consult with the National Marine Fisheries Service (or the Fish and Wildlife Service for species other than seals and whales) to determine if proposed actions might destroy or adversely modify a species' critical habitat. If such effects are possible, the action agency is required to identify and undertake reasonable and prudent alternatives necessary to avoid such effects.

The petition to expand monk seal critical habitat proposed the addition of beaches and surrounding waters around Sand Island at Midway Atoll and all marine areas within the 500-m isobath throughout the NWHI. It also proposed designation of all beaches and adjacent waters out to the 200-m depth contour around the main Hawaiian Islands. The proposed areas were based on results of numerous satellite tracking and depth-of-dive studies on monk seals carried out since 1987 that show monk seals routinely use areas within the cited depth contours.

On 3 October 2008 the Service published a *Federal Register* notice (73 Fed. Reg. 59583) announcing that the petition contained sufficient scientific information to suggest the expanded designation may be warranted and requesting public comment. The Marine Mammal Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, responded on 2 December 2008. Based on its review of available information, the Commission recommended that the Service develop proposed rules to designate all beaches on Sand Island at Midway Atoll, as well as all waters within the 500-m isobath in the NWHI as critical habitat for monk seals. For the main Hawaiian Islands, it recommended that the Service review recent sighting and birth records, as well as recent telemetry studies, and include all areas with regular habitat-use patterns in the proposed rules. In this regard, the Commission recommended that the proposed rules include all beach areas regularly used by more than one seal, areas where births have occurred, and all waters out to the 200-m isobath that are within the home range of all seals tracked to date using satellite telemetry.

Interagency Hawaiian Monk Seal Summit

As the Service was completing the revised Hawaiian Monk Seal Recovery Plan, the Marine Mammal Commission wrote to the National Marine Fisheries Service on 12 March 2006. The Commission noted that the status of the Hawaiian monk seal had reached a crisis and that increased support for monk seal recovery work is essential. The most

urgent needs are (1) developing a monk seal care facility to enhance survival of young female seals, (2) mitigating shark predation on pups at French Frigate Shoals, (3) reducing entanglement in marine debris, and (4) promoting monk seal recovery in the main Hawaiian Islands. Given limitations in Service funding and staff, the Commission emphasized that interagency cooperation would be essential to undertake all that needs to be done. To promote such cooperation, the Commission suggested that high-level decision-makers in key agencies and organizations assisting with recovery be brought together to coordinate and direct their resources and activities toward each of these issues.

In response, the Service noted that such a meeting could be helpful and asked that Commission and Service staff meet to discuss its merits. During those discussions, the Commission offered to help convene a meeting of high-level officials of the National Marine Fisheries Service, the Fish and Wildlife Service, the National Ocean Service, the Hawaii Department of Land and Natural Resources, and the Commission to identify and agree on cooperative actions that each might take on the four identified issues. Participants in the discussion agreed that the meeting should be held after the Revised Hawaiian Monk Seal Recovery Plan was adopted and a new recovery team had been convened and given a chance to consider the approach. The revised recovery plan was adopted in August 2007, and in February 2008 the reconstituted Hawaiian Monk Seal Recovery Team agreed with the four priority concerns in the Commission's letter and endorsed the proposed high-level interagency meeting.

Subsequently, the Commission consulted with the staff of the National Marine Fisheries Service and invited the administrators of the National Marine Fisheries Service and the National Ocean Service, the director of the Fish and Wildlife Service, and the chair of the Hawaii Board of Land and Natural Resources to participate in a Hawaiian Monk Seal Summit to identify and agree on specific efforts each agency could pursue to complete essential recovery tasks. The Commission and Service scheduled the meeting in November 2008 and circulated a draft white paper to prepare for the meeting.

On 8 October 2008 the Service wrote to the Commission recommending that the objective of the meeting be revised from a commitment-making summit to the initiation of an interagency coordination process to plan a future summit in the fall of 2009. The Service noted that the continuing resolution passed by Congress in late September to fund federal agencies in the first half of Fiscal Year 2009 did not allow sufficient budget flexibility for new efforts. It also noted that postponing the meeting to a date after the presidential election would be useful to ensure that new administration officials be involved. In the interim, the Service suggested that key agency officials meet in the fall to form an interagency working group to draft a summit framework.

In response to the Service's request, the Commission wrote to the Service on 14 October 2008 noting that it had postponed the November meeting and suspended work on the summit white paper. The Commission noted that it continued to believe a meeting of high-level agency officials was a constructive and appropriate approach to address priority issues in a cost-effective manner, and it suggested that Commission and Service leaders meet to discuss how best to move ahead with the interagency planning group. The Service agreed, and agency leaders met on 5 December. Participants, including the director of the National Marine Sanctuaries Program, agreed that a summit would be helpful and that representatives of the National Marine Fisheries Service, the National Ocean Service, the Fish and Wildlife Service, the state of Hawaii, and the Commission should meet early in 2009 to continue planning.

Northern Sea Otter, Southwest Alaska Stock *(Enhydra lutris kenyoni)*

Sea otters (*Enhydra lutris*) were originally distributed in nearshore waters around the rim of the North Pacific Ocean from Baja California, Mexico, to northern Japan. They were nearly extirpated by hunting in the late 1700s through the 1800s. When hunting was finally banned in 1911, only a few isolated stocks remained at scattered locations throughout the species' original range. With protection from hunting, however, sea otter numbers recovered in much of their former range, including Alaska.

The Fish and Wildlife Service recognizes three stocks of northern sea otter (*Enhydra lutris kenyoni*) in the coastal regions of Alaska. The southwest stock inhabits nearshore waters from Kamishak Bay on the western side of Cook Inlet, to Attu Island at the western tip of the Aleutian Islands, along the northern coast of the Alaska Peninsula, and around Kodiak Island southwest of Cook Inlet (Figure 27).

By the 1980s the southwest Alaska stock was thought to have approached or equaled its pre-exploitation abundance. A 1976 survey indicated an abundance of 94,050 to 128,650 otters in southwestern Alaska. Since then, the stock has plummeted, and surveys between 2000 and 2004 produced an estimate of 47,676 otters (U.S. Fish and Wildlife Service 2008). Although methods differed between the early and recent surveys and between different areas, the estimates suggest an overall stock decline of 49 to 64 percent. However, the extent of decline varied in different parts of the range, and declines of 70 percent or more have occurred along the southern part of the Alaska Peninsula and Aleutian Islands (Doroff et al. 2003). Sea otters may have disappeared completely at some small islands in the central Aleutians, whereas they have declined to a lesser extent along the northern coast of the Alaska Peninsula and in the Shumagin Islands south of the peninsula.

The cause or causes of the decline are uncertain. Evidence gathered to date does not indicate that reproduction or prey availability is causing the decline. Pupping rates appear to be normal and, at least in some areas, the body condition of otters and the prey base appear to have improved during the period of decline (Laidre et al. 2006, Estes et al. 1998). Some animals near Kachemak Bay in southeastern Cook Inlet have died from bacterial endocarditis (caused by *Streptococcus infantarius*), but the available evidence does not suggest a wider role for this disease (U.S. Fish and Wildlife Service 2008). The leading hypothesis to explain the decline, particularly in the central Aleutian Islands, is increased predation by killer whales (Estes et al. 1998). Support for this hypothesis includes observations of killer whale attacks on otters, an overall shift in sea otter distribution to areas closer to shore where access by killer whales is more limited, and sustained otter densities in areas inaccessible to killer whales.

Southwest Alaska Sea Otter Recovery Team and Recovery Plan

In 2005 the Fish and Wildlife Service declared the southwest Alaska sea otter stock as threatened under the Endangered Species Act. In 2006 the Service convened the Southwest Alaska Sea Otter Recovery Team and instructed the team to draft a recovery plan. The team began work on the plan in 2006, and that work was ongoing in 2008. On 15–17 April 2008 the team met to discuss potential for stock recovery, a recovery strategy and goals, specific recovery actions, and criteria for removing the stock from the list of threatened and endangered wildlife.

On 18–20 November 2008 the team met again to review progress on recovery activities and to discuss remaining parts of the plan and unresolved issues. The team again focused on delisting and reclassification criteria. The criteria were based on estimates of population viability and management actions needed to minimize the effects of oil spills. The team also focused on steps needed to

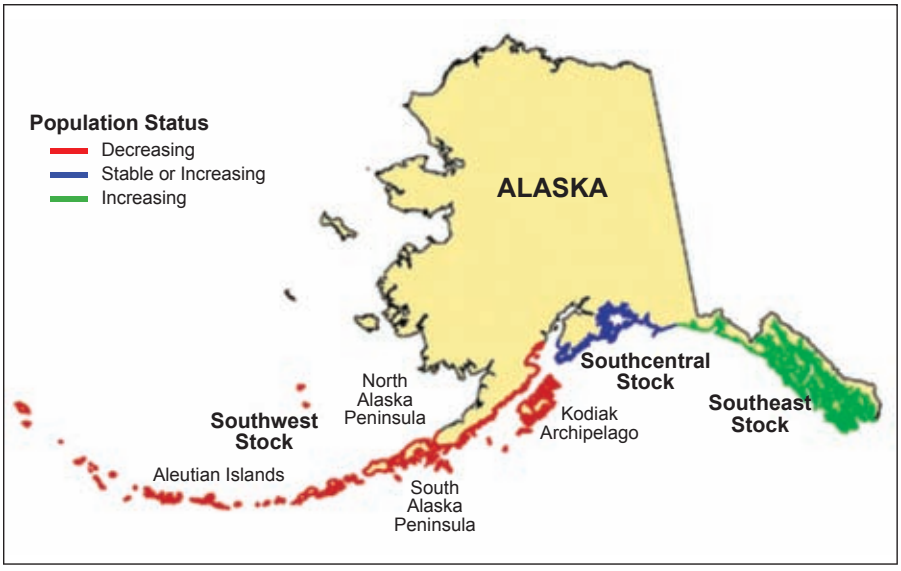

Figure 27. Range of the three stocks of northern sea otters in Alaska

complete the draft plan for submission to the Service in 2009.

Research Activities

The Marine Mammals Management Office of the Fish and Wildlife Service's Alaska Region and the U.S. Geological Survey's Biological Resources Division share responsibility for research on the southwest Alaska sea otter stock. Funding for research has been limited and inconsistent in recent years. In 2008 most of the research focused in Kachemak Bay and the waters off Katmai National Park in Cook Inlet at the eastern end of the stock's range. The research included monitoring of otter movement patterns using radio transmitters, a small study of foraging behavior and diet, and aerial and skiff surveys of most park areas. For other areas of the stock's range, the Service was able to provide support only for continuing stranding response efforts and for an aerial survey conducted by the Aleut Marine Mammal Commission for sea otters in the Shumagin and Pavlof Islands south of the Alaska Peninsula.

Lack of funding has been a persistent problem, and in December 2006 the recovery team wrote to the Service's Regional Director emphasizing the importance of an adequate survey program for the stock. The team noted that it had developed a detailed monitoring plan and budget for the next 10 to 15 years but that, to date, limited progress has been made in implementing the plan. At the end of 2008 the Service had not determined what steps would be taken to address this and other research priorities in 2009.

Critical Habitat

With certain exceptions, the Endangered Species Act requires the designation of critical habitat that contains those physical or biological features essential to the conservation of a listed species that may have special management needs. Federal agencies are required to consult with the Service to determine if any actions they might take, authorize, or fund could destroy or adversely modify such critical habitat. If so, the Service and agency must identify reasonable and prudent alternatives to avoid such effects. Although the Act requires that critical habitat be designated concurrent with listing, the Service believed that it was unable to do so at that time. On 19 December 2006 the Center for Biological Diversity sued the Service for failing to meet the designation requirement. In response, the Service agreed either to propose a rule designating critical habitat by December 2008 or to publish a finding explaining why doing so for this stock would not be prudent.

On 16 December 2008 the Service published a *Federal Register* notice (73 Fed. Reg. 76454) proposing critical habitat boundaries for the southwest Alaska sea otter stock. The proposed area incorporates about 15,225 km^2 (5,879 mi^2), including almost all nearshore waters from Kamishak Bay in Cook Inlet, around Kodiak Island, and along both sides of the Alaska Peninsula and all of the Aleutian Archipelago. The area extends from the mean-high-tide line out to the 20-m isobath or to a distance of 100 m from shore, whichever is greater. It also includes additional areas in certain coastal bays on the north side of the Alaska Peninsula and around island groups off the south side of the peninsula. The only areas excluded from the proposal are developed sites with existing piers, docks, harbors, marinas, jetties, breakwaters, etc., which, in this undeveloped part of Alaska, amount to a very small percentage of the area where otters may occur.

In part, the Service based its proposed boundaries on the observation that killer whale predation appears to be the leading cause of the stock's decline. Waters less than 20 m deep and within 100 m of shore often include kelp forests that provide resting habitat and refuge from predation. Accordingly, the proposed boundary was based on one of the primary constituent elements (i.e., cover or shelter) that must be considered under the regulations governing the designation of critical habitat.

At the end of 2008 the Marine Mammal Commission was preparing comments on the proposed rule and expected to submit them to the Service early in 2009. Based on a preliminary review, the Commission agreed that all areas identified by the Service warranted designation. It therefore expected to recommend that all of the proposed area be designated as critical habitat. It also noted that recent sea otter foraging studies in southeast Alaska suggest that male otters feed mainly in waters deeper than 20 m and that perhaps 80 percent of feeding by all ages and sexes combined occurs at depths between

2 and 30 m (Bodkin et al. 2004). Food and other nutritional or physiological requirements are identified as a primary constituent element of a species' habitat in the regulations governing critical habitat designation. Considering these points, the Commission expected to recommend that the Service either (a) expand the proposed seaward boundary from the 20-m to the 30-m isobath off all shoreline areas identified in the proposed rule or (b) explain why foraging areas between the 20-m and 30-m isobaths do not need protection to ensure adequate prey resources are available for recovery of this sea otter population.

Northern Sea Otters in Washington State

Commercial hunting in the 1700s and 1800s eliminated sea otters (*Enhydra lutris kenyoni*) from coastal waters of Washington State. To reestablish the species in this part of its historical range, in 1969 and 1970 the U.S. Fish and Wildlife Service captured 59 northern sea otters from a recovering population on Amchitka Island, Alaska, and released them along the Washington coast. Most of the animals died soon after release, but a few survived to form the nucleus of a new population that now occupies an 80-km (50-mi) stretch along the outer coast of Washington's Olympic Peninsula. The population has steadily increased since the 1970s, numbering at least 1,125 animals by 2007 and growing at 20 percent per year in the southern half of its range. In recent years, a few animals have been sighted as far south as northern Oregon.

The Washington sea otter population is listed as endangered under state law but, as an introduced population, is not listed as endangered or threatened under the U.S. Endangered Species Act. The Fish and Wildlife Service, the Washington Department of Fish and Wildlife, the Olympic National Park, the National Marine Olympic Coast Sanctuary, and local Indian tribes share responsibility for its protection and management. Fish and Wildlife Service funding is more limited for species that are not listed under the Endangered Species Act, so conservation support for Washington sea otters is also limited.

The Marine Mammal Commission reviewed information on conservation efforts for sea otters in Washington State at its 2007 annual meeting in Vancouver, Washington, and on 23 November 2007 wrote to the Fish and Wildlife Service to recommend research and management actions and to offer support for certain high-priority needs. The Service responded on 21 April 2008. The topics considered in this exchange were as follows.

Stranding Response

The remote location of sea otter habitat in Washington hinders the development of an effective program for responding to stranded otters and recovering carcasses. Data from such efforts are important for detecting and monitoring causes of injury and mortality. In its November 2007 letter, the Commission recommended that the Service consult with federal, state, and tribal authorities (as much of the otter's habitat is adjacent to the homelands of several Native American tribes) to strengthen cooperative volunteer stranding response efforts. In light of funding constraints for such work, the Commission offered to help cover certain costs for responding to Washington sea otter strandings. In its April 2008 response, the Service agreed with the Commission's stranding recommendations, promised its continued consultation with U.S. and tribal authorities on stranding response needs, and welcomed Commission assistance with funding. In 2008 the Commission transferred funds to the Service to purchase stranding response equipment, analyze tissue samples from stranded carcasses, and train volunteers and agency partners on stranding response protocols (see Chapter VI, Research and Studies Program). This work was ongoing at the end of 2008.

Oil Spill Response

The greatest potential threat to the population is from oil spilled by ships entering and leaving Puget Sound through the Strait of Juan de Fuca on the U.S.–Canadian border. The Commission recommended that the Service consult with the Washington Department of Fish and Wildlife, the U.S. Coast Guard, and regional shipping companies to establish equipment caches and prepare for the treatment and care of otters in the event of an oil

spill. The Service agreed with this recommendation and noted its intent to participate in development of an oil spill response plan for Washington sea otters as resources allow.

Fisheries Interactions

The Commission noted the growing potential for fishery interactions as the Washington sea otter population increases. Gillnet and trap fisheries, similar to those that have taken sea otters in California, occur in the range of the Washington population. At its 2007 annual meeting and again in its November 2007 letter, the Commission questioned whether fisheries observers should be deployed to document fishery–sea otter interactions. Section 117 of the Marine Mammal Protection Act requires that the Service update its stock assessment reports with such information at least every three years, but at that time the Service had failed to update the original report, which was completed in 1995. Therefore, the Commission recommended that the Service take immediate steps to update its stock assessment report for northern sea otters in Washington; that it consult with the National Marine Fisheries Service, tribal authorities, and other relevant groups to ensure adequate oversight of gillnet and trap fisheries off the Washington coast; and that it place observers aboard fishing vessels that may pose a risk to sea otters. The Service's April 2008 reply noted its agreement with the Commission's recommendations and, although it has no authority under the Marine Mammal Protection Act to impose oversight of fisheries that may take sea otters, the Service promised to work with other agencies and groups on the issue.

On 17 April 2008 the Service requested comments on a draft revised stock assessment report for northern sea otters in Washington State (73 Fed. Reg. 20931). The Commission commented on the draft on 11 June 2008. It recommended that the Service adopt the draft revision subject to modifications to (1) clarify that the next revised stock assessment would be prepared within three years and (2) update the estimated minimum population size and potential biological removal level using results of the 2007 survey of Washington sea otters. Consistent with its 2007 letter, the Commission again urged the Service to consult with involved agencies about placing observers aboard trap and gillnet fishing vessels most likely to take sea otters incidentally in Washington waters. In August 2008 the Service released a final stock assessment report that reflected the Commission's recommendations.

Southern Sea Otters in California

Sea otters once inhabited coastal waters around much of the North Pacific Rim from Baja California, Mexico, north through Alaska and the Aleutian Islands, and south to Japan. The species was nearly eliminated by commercial hunters in the 1700s and 1800s. In 1911 an international treaty banned sea otter hunting, but by then sea otters along the U.S. West Coast had been reduced to a small isolated colony of a few tens of animals along the remote Big Sur coast of central California. This remnant was the last of the southern sea otter (*Enhydra lutris nereis*) subspecies, which is distinct from the northern subspecies (*E. l. kenyoni*) now found from Washington State around the North Pacific Rim to the Kamchatka Peninsula. As yet, biologists disagree as to whether sea otters along the eastern coast of Asia comprise a third subspecies.

After the ban on hunting, the southern sea otter population slowly increased in abundance and distribution although, with one exception, it still occurs only in the coastal waters of central California (Figure 28). The exception is a small population at San Nicolas Island, one of the Channel Islands off southern California. This population was established by the Fish and Wildlife Service in the late 1980s to provide a source population in case the coastal population was decimated by an oil spill or other catastrophic event.

The spring 2008 survey of southern sea otters yielded a total count of 2,760 individuals, including 2,396 independent otters and 364 pups (Figure 29). This is less than the record high count of 3,026 in 2007 but does not necessarily indicate a population decline because survey conditions and results vary from year to year. For that reason biologists use three-year average counts to indicate population trends. The 2006–2008 three-year running average count is 2,826 otters, approximately the same as the previous three-year average, suggesting that the population may be leveling off (Hatfield and Tinker

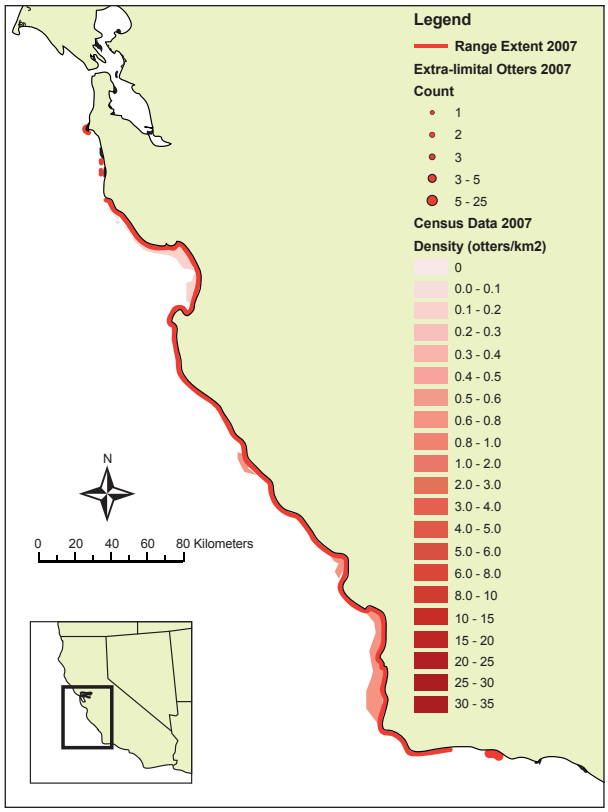

Figure 28. Current range of the southern sea otter population (Source: U.S. Fish and Wildlife Service)

2008). During 2008 the range of the mainland population continued to expand, particularly to the south.

The Fish and Wildlife Service listed southern sea otters as threatened under the Endangered Species Act in 1977. The Service has primary responsibility for recovery of the species but works closely with the U.S. Geological Survey and the California Department of Fish and Game. The Service revised the recovery plan in 2003. The revised plan lists the major threats to the population as oil spills, commercial gillnets and fish traps, contaminants from coastal development, and parasites and disease.

The Commission reviewed recovery efforts for the southern sea otter at its annual meeting in 2007 and wrote to the Service with recommendations on 23 November 2007. The recommendations pertained to population monitoring; contaminant, biotoxin, and disease studies; fisheries interactions; and the future of the San Nicolas Island translocation project. The Service responded on 21 April 2008. The nature of the exchange was as follows.

Population Monitoring

The revised Southern Sea Otter Recovery Plan of 2003 identifies population criteria for reclassifying southern sea otters under the Endangered Species Act. The criteria indicate that the Service should consider reclassifying the population from threatened to endangered if the three-year running average count falls below 1,850 animals. Alternatively, the Service should consider delisting the population if the average exceeds 3,090 animals. In its November 2007 letter, the Commission expressed concern regarding the southern sea otter's slow population growth rate (less than 5 percent per year) compared to populations in Alaska and Washington (20 percent or more per year; U.S. Fish and Wildlife Service 2003, Lance et al. 2004, Estes 1990). Based on that concern, the Commission recommended that the Service continue its annual counts of the mainland population and the colony at San Nicolas Island. In its April 2008 reply, the Service agreed with the recommendation and indicated that it would continue to work with

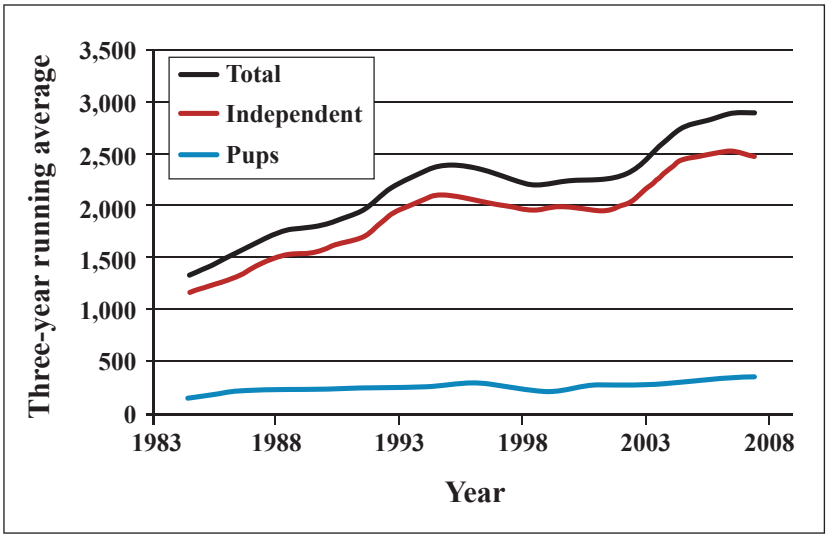

Figure 29. Population trends for southern sea otters in California

the U.S. Geological Survey, the state of California, the Monterey Aquarium, and volunteers to survey the population annually.

Contaminant, Biotoxin, and Disease Studies

Recent studies of sea otter carcasses recovered along the California coast implicate toxins and pathogens as possible causes of mortality and slow population growth (Miller et al. 2007). Foraging research also links prey in certain areas with pathogens and toxins that may be causing sea otter mortality. The Commission's November 2007 letter noted the importance of such studies and the value of using sea otters as sentinel species for monitoring the health of coastal ecosystems. The Commission recommended that the Service provide adequate funding for continued studies of the role of contaminants, biotoxins, and pathogens in the deaths of stranded otters and for complementary area-specific foraging studies.

The Service responded that it shared the Commission's view on the importance of these studies and that it relied on the California Department of Fish and Game, the U.S. Geological Survey, and scientists with the University of California to continue the ongoing disease studies and to identify links between population ecology and disease. To that end, the Service plans to continue awarding grants to the state under section 6 of the Endangered Species Act if funds are available.

Fisheries Interactions

Gillnets, lines, and traps used in commercial fishing may entangle and drown sea otters. The Marine Mammal Protection Act requires the Fish and Wildlife Service to manage such interactions, in part, through the preparation of stock assessment reports and, for endangered and threatened marine mammals, the updating of those reports annually. For any such species, the report describes its status and level of incidental takes by fisheries. Such information is used to set priorities for fisheries observer programs. Despite the annual reporting requirement, the Service had not updated the southern sea otter report since it completed the original report in 1995. The Commission's November 2007 letter recommended that the Service immediately review and adopt a revised southern sea otter stock assessment report. It also recommended that the agency consult with the National Marine Fisheries Service regarding the use of fisheries observers at the northern and southern ends of the sea otter population range, which now extend beyond the current protection zone. The Service's April 2008 reply noted it was preparing a draft revised stock assessment and that it would work with the National Marine Fisheries Service to improve fisheries observer coverage and reporting of incidental taking throughout the southern sea otter's range.

On 10 June 2008 the Service requested comments on its draft revised stock assessment for California sea otters (73 Fed. Reg. 32732). The Commission responded on 28 August 2008, recommending that the population estimate be updated to reflect 2008 counts and that the minimum population size estimate of 3,036 be replaced with an estimate derived from the average of counts over the last three years. This approach better addresses uncertainty in individual year counts and reflects the Service's stated precautionary approach of using a three-year running average as a population benchmark. The Commission also recommended that the stock's potential biological removal level be recalculated using the revised minimum population estimate. Consistent with its November 2007 letter, the Commission also urged the Service to arrange for observer coverage of trap fisheries for lobster, crab, and fish in those areas where sea otters occur south of Point Conception.

On 30 December 2008 the Service announced availability of a final revised California sea otter stock assessment report. The revised report incorporated all of the Commission's recommended changes: the minimum population estimate was revised from 3,036 to 2,723 otters and the potential biological removal level was recalculated to be 8, rather than 9, otters.

Future of the San Nicolas Island Translocation Project

Between 1987 and 1990 the Fish and Wildlife Service moved 140 southern sea otters from the mainland California population to San Nicolas Island, 60 miles off the southern California coast. The primary goal of this effort was to establish a new reserve colony safe from major oil spills in

the population's mainland range. The Service also established a "no-otter management zone" south of the mainland population range. Most animals translocated to San Nicolas Island disappeared or returned to the mainland, and the new colony failed to thrive as expected. In 2008 counts revealed only 37 independent otters at San Nicolas. Based on poor translocation results and difficulties in capturing and moving otters out of the no-otter zone, in 2005 the Service initiated steps to declare the translocation project a failure through preparation of a draft supplemental environmental impact statement (70 Fed. Reg. 58737). In its November 2007 letter, the Commission recommended that the Service publish its final supplemental environmental impact statement and record of decision on this matter as soon as possible. The Service's April 2008 reply noted that it had received more than 20,000 comments on the draft supplemental statement. Although the Service expected to complete a final statement by the end of 2008, it did not do so. The Commission anticipates a final environmental impact statement and decision on the future of the San Nicolas Island translocation projection 2009.

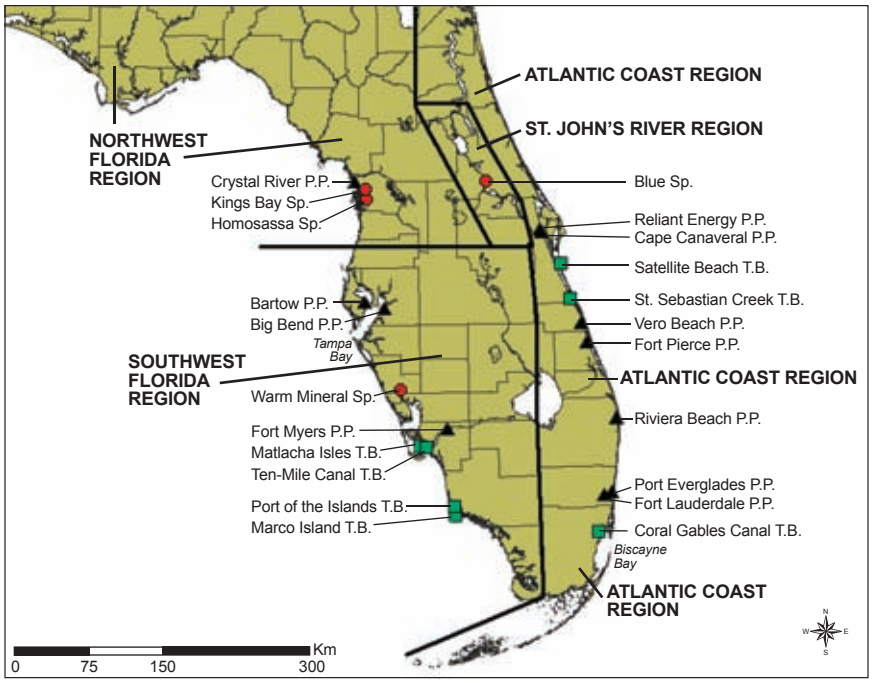

Figure 30. Distribution of manatee subpopulations and warm-water refuges (T.B. = thermal basin; P.P. = power plant). Source: Fish and Wildlife Service 2001, Laist and Reynolds 2005

Florida Manatee (*Trichechus manatus latirostris*)

The Florida manatee is a subspecies of the West Indian manatee, which is listed under the U.S. Endangered Species Act as endangered throughout its range. The U.S. Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission share responsibility for research, management, and recovery of the Florida subspecies, although many other agencies and groups assist by funding or carrying out recovery activities.

The Florida manatee occurs almost entirely in Florida's coastal and inshore waters (Figure 30). Demographically, the subspecies comprises four relatively discrete subpopulations (Table 15).

The Florida Fish and Wildlife Research Institute organizes annual statewide counts based primarily on manatees observed at 22 warm-water refuges. The Institute and collaborators conduct the counts

Table 15. Manatee subpopulations, number of manatees counted in 2005 (the year of the highest total count in the last five years), and the estimated annual subpopulation growth rates (Laist 2008)

Subpopulation	Count in 2005 (percent of total)	Estimated annual growth rate
Upper St. John's River	154 (5)	6.2
Atlantic coast	1,379 (44)	3.7
Southwest	1,287 (41)	-1.1
Northeast	323 (10)	4.0

during the coldest winter periods, and the results provide an estimate of minimum population size. The counts are less reliable for other purposes (e.g., for indicating short-term trends) because they vary markedly between years. The highest total count to date is of 3,300 animals in January 2001 (www.floridamarine.org). The Institute did not complete a count in 2008 becauses winter temperatures were unusually mild, and manatees are less inclined to aggregate under such conditions.

The Threat of Cold Stress and the Potential Loss of Warm-Water Refuges

The strategy for counting manatees is based on the observation that in winter months animals generally are confined to the southern two-thirds of the Florida peninsula because they are unable to survive long periods in cold water. On the coldest days, most manatees seek waters with temperatures above 20–22ºC (68–72ºF) (Bossart et al. 2002). Statewide counts from 1997 to 2007 indicate that about 48 percent seek warm water at power-plant outfalls, 18 percent use natural springs, 14 percent use passive thermal basins, and 21 percent use other locations that may include small springs, thermal basins, or industrial outfalls (Laist 2008). In the southern third of the state, manatees depend primarily on passive thermal basins, which include dredged basins or naturally deep holes that retain heat from various sources such as solar radiation or biogenic decay of organic matter (Laist and Reynolds 2005). Power-plant outfalls create most of the major warm-water refuges along the Atlantic coast, providing refuges for about two-thirds of the manatees in the Atlantic coast subpopulation. As water temperatures rise in the spring, manatees disperse to rivers and coastal waters. The majority remain within Florida waters, but some on the Atlantic coast migrate north through inshore bays and lagoons to Georgia and South Carolina and, on rare occasions, as far north as Massachusetts. On the Gulf of Mexico coast, a few manatees move as far west as Louisiana and Texas (Lefebvre et al. 2001).

The dependence of manatees on warm-water refuges places them at significant risk in the foreseeable future because those refuges may be lost when aging power plants are closed or replaced, particularly those along Florida's east coast. The Clean Water Act prohibits construction of new plants with once-through cooling water systems. Those systems have created artificial warm-water refuges that manatees depend on during periods of cold temperatures. Most of the power plants where manatees aggregate are oil-fired facilities. Electric companies may retire at least some plants in the near future because they are becoming outdated, incur high fuel costs, and emit excessive carbon byproducts. The companies may refurbish other plants, which may continue to discharge warm water, at least through the next generation of plants. Existing natural springs and thermal basins are not sufficient to sustain the current Atlantic subpopulation, and the closure of existing power plants could cause significant mortality if manatees that previously used a closed site are not able to find and adapt to alternative sites. This problem could be aggravated by additional coastal development that may destroy or alter other natural refuges or prevent manatees from using them.

To address this impending threat, the Marine Mammal Commission has supported studies of solar-heated warm-water refuges to temporarily replace key power plants scheduled for retirement (Gu 2005, 2007). The Commission has worked with Reliant Energy, the operator of a power plant used by manatees near Cape Canaveral, Florida, to help develop an approach that might be implemented when electric utilities decide to retire plants currently used by large numbers of manatees. As described in its 2007 annual report, the project involved developing a conceptual design, drawings, and cost estimates for constructing an enclosure that would maintain water temperatures at 22ºC (the temperature of natural springs used by manatees) and support perhaps 50 animals during the winter. The project estimated that construction of a test enclosure would cost $1.5 million.

The Marine Mammal Commission forwarded the results of its studies to the Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission, and the governor of Florida on 21 April 2008. The Commission recommended that the agencies work with Florida's electric utilities to establish a fund to support research and management efforts to prevent manatee mortality resulting from power plant closures and to improve the availability of alternative natural springs and passive thermal

basins. The Commission also recommended that the agencies work with Reliant Energy to construct a test facility at the earliest possible date. On 4 June 2008 the Fish and Wildlife Service replied, noting that it shared the Commission's concern about potential power plant retirements and stating that it intended to continue working with state agencies and electric utilities to identify potential management alternatives and to secure the resources needed to implement them.

Shortly after the Commission sent its letter regarding a test refuge, Florida Power & Light Company announced a decision to repower two of its Atlantic coast power plants, one near Cape Canaveral and the other in Riviera Beach. Repowering the two plants will involve switching the fuel source from oil to natural gas. The refurbished plants may continue to discharge thermal effluents under permits issued by the Florida Department of Environmental Protection pursuant to section 316 of the Clean Water Act. Florida Power & Light already has repowered a plant in southeast Florida, and its decision to repower the two additional plants reduces—but does not eliminate—the risk to manatees in the Atlantic coast subpopulation over the next few decades.

That being said, modernizing a power plant still requires that it be closed for about three years—long enough to have a significant impact on manatees. To address this concern, Florida Power & Light Company invited involved agencies and interested non-governmental organizations to meet to consider its plans for repowering the two plants and ways of avoiding impacts on manatees. In a 4 June 2008 letter to the Commission, the Fish and Wildlife Service indicated that it would participate in the meeting and provide advice regarding regulatory and biological information needed to design and implement protective measures during the repowering process.

At the September 2008 meeting, Florida Power & Light Company advised participants that repowering work would likely require closing the Cape Canaveral plant from spring 2010 to spring 2013 and the Riviera Beach plant from spring 2011 to spring 2014. The company said it planned to install water heaters at both plants to create warm-water refuges during remodeling. The company indicated that it would work closely with the Fish and Wildlife Service, the Florida Fish and Wildlife Conservation Commission, and other interested parties to ensure that the size and temperature of the temporary outfalls would be adequate to avoid cold-related manatee deaths. The company subsequently contracted for modeling studies to design a temporary manatee refuge at the Cape Canaveral plant and is expected to undertake a similar effort in 2009 for its Riviera Beach plant.

Other Risk Factors

Manatees are threatened by other natural and human-related risk factors in addition to cold stress and the loss of warm-water refuges (Table 16).

Watercraft: In 2008 managers and scientists documented 90 manatee deaths due to watercraft collisions, the second highest annual total on record. Annually the number of such deaths has increased steadily over the past three decades, likely because of increases in the numbers of both boats and manatees. Managers have regulated boat speeds in certain areas (e.g., around warm-water refuges) to minimize watercraft-related deaths and injuries, although the effectiveness of this measure has been difficult to quantify (Laist and Shaw 2006).

In 2008 the Marine Mammal Commission reviewed a Fish and Wildlife Service biological opinion completed under section 7 of the Endangered Species Act to evaluate the potential impact of a proposed marina development on the Orange River. The project would improve two adjacent marinas that together had a total of 156 boat storage slips, some wet (in the water) and others dry (on land). The Service concluded that the proposed project would result in fewer boats in the marina and less vessel traffic using the waterway because it involved 128 wet slips only. That conclusion did not take into account a recent inspection of the existing marinas by the Army Corps of Engineers, which found that less than half of the existing wet slips were serviceable. For that reason, the new development would functionally increase the number of boat slips and vessel traffic. The Service considered the 2002 survey constituted the best available information on the current size of the existing marinas and concluded that the proposed project was unlikely to jeopardize manatees or adversely modify their critical habitat.

Table 16. Number and percentage of known annual mortality of Florida manatees in the southeastern United States (excluding Puerto Rico); 1978–2008

Year	Watercraft No. (%)	Floodgate And Locks No. (%)	Other Human Related No. (%)[1]	Perinatal No. (%)	Cold Stress No. (%)	Other [2] No. (%)	Total
1978	21 (25)	9 (11)	1 (2)	10 (12)	--	43 (51)	84
1979	24 (31)	8 (10)	9 (12)	9 (12)	--	28 (36)	78
1980	16 (24)	8 (12)	2 (3)	13 (19)	--	28 (42)	67
1981	25 (21)	2 (2)	4 (3)	13 (11)	--	75 (63)	119
1982	20 (17)	3 (3)	2 (2)	14 (12)	--	81 (67) 3	121
1983	15 (19)	7 (9)	5 (6)	18 (22)	--	36 (44)	81
1984	34 (26)	3 (2)	1 (1)	26 (20)	--	67(51)	131
1985	35 (27)	3 (2)	5 (4)	25 (20)	--	60 (47)	128
1986	33 (26)	3 (2)	1 (1)	27 (22)	12 (10)	49 (39)	125
1987	39 (33)	5 (4)	4 (3)	30 (25)	6 (5)	34(29)	118
1988	43 (32)	7 (5)	4 (3)	30 (22)	9 (7)	41 (31)	134
1989	51 (29)	3 (2)	5 (3)	39 (22)	15 (8)	63 (36)	176
1990	51 (23)	3 (1)	5 (2)	45 (21)	50 (23)	64 (29)	218
1991	56 (31)	9 (5)	7 (4)	53 (29)	2 (1)	54 (30)	181
1992	38 (23)	5 (3)	7 (4)	48 (29)	1 (1)	69 (41)	168
1993	35 (24)	7 (5)	7 (5)	39 (26)	2 (1)	58 (39)	148
1994	51 (26)	16 (8)	5 (3)	46 (24)	4 (2)	72 (37)	194
1995	43 (21)	8 (4)	5 (2)	56 (28)	0 (0)	91 (45)	203
1996	60 (14)	10 (2)	1 (0)	61 (15)	17 (4)	267 (64) 3	416
1997	55 (22)	8 (3)	9 (4)	61 (25)	4 (2)	109 (44)	246
1998	67 (27)	9 (4)	6 (2)	53 (22)	12 (5)	97 (40)	244
1999	83 (30)	15 (5)	8 (3)	54 (20)	6 (2)	107 (39)	275
2000	79 (28)	7 (3)	9 (3)	58 (21)	14 (5)	112 (45)	279
2001	82 (24)	1 (0)	7 (2)	63 (19)	32 (10)	151 (45)	336
2002	98 (31)	5 (2)	9 (3)	53 (17)	18 (6)	132 (42) 3	315
2003	75 (20)	3 (1)	7 (2)	72 (19)	48 (13)	178 (46) 3	383
2004	69 (24)	3 (1)	4 (1)	72 (26)	52 (18)	82 (29)	282
2005	80 (20)	5 (1)	9 (2)	89 (22)	29 (7)	186 (47) 3	398
2006	87 (21)	5 (1)	4 (1)	70 (17)	21 (5)	233 (55) 3	420
2007	75 (23)	2 (1)	5 (2)	59 (18)	19 (18)	162 (50)	322
2008	90 (27)	3 (1)	6 (2)	101 (30)	25 (7)	112 (33)	337

Data provided by the Florida Fish and Wildlife Research Institute, Florida Fish and Wildlife Conservation Commission; data for 2008 are preliminary.

[1] Includes deaths from entanglement or ingestion of marine debris, drowning in shrimp nets, poaching, vandalism, etc.

[2] Includes deaths due to other natural and undetermined causes

[3] Includes a large number of known or suspected red tide related deaths in southwestern Florida: 39 in 1982, 151 in 1996, 37 in 2002, 96 in 2003, 92 in 2005, 62 in 2006, 38 deaths in 2007, and 3 in 2008

The Save the Manatee Club questioned those conclusions, based on aerial photographs taken during manatee surveys in the late 1970s. The photographs provide evidence consistent with the Army Corps of Engineer report—that is, a number of slips at the proposed development site had been abandoned for several decades, presumably with a corresponding decrease in boats and vessel traffic. The club also noted that from the 1970s to the present time, manatee use of the site significantly increased.

The Commission reviewed the biological opinion and provided comments to the Service on 23 May 2008. Among other things, it noted that the opinion did not provide a complete analysis of either the current value of the site to manatees or the effects of the proposed development on them. The Commission referenced winter manatee surveys over the past 30 years confirming that the basin in question has become one of the most important winter resting areas for manatees on the Orange River. The Commission also pointed out that the 2002 marina survey cited by the Service (1) contained no information as to whether the boat slips counted at the two marinas were actually in use or were useable at the time of the survey and (2) was not sufficiently clear in its comparison of existing and planned slips to draw firm conclusions on impacts. The opinion also did not indicate whether the Service had reviewed historical aerial photographs of the site to compare past use by boaters and by manatees. Finally, the opinion did not assess the extent to which vessel trips and vessel sizes might change as a result of the project.

Therefore, the Commission concluded that the analyses in the biological opinion did not justify its stated findings that the project was unlikely to affect manatees and that vessel traffic would decline as a result of the project. The Commission noted that authorization of a project that would promote an increase in vessel traffic and cause increased manatee disturbance in the middle of one of the state's most important warm-water refuges was inconsistent with protection needs for the species. It recommended that the Service reinitiate consultations with the Army Corps of Engineers and provide a more thorough assessment.

In its reply to the Commission on 15 July 2008, the Service reiterated its conclusion that the 2002 marina survey represents the best scientific and commercial data available on the size of the existing marinas. It also stated that the Commission's letter identified no new information to support reinitiation of consultations with the Army Corps of Engineers and that the Service considered its analyses of data on manatees, manatee habitat, and vessels in the area to be adequate. On this basis, the Service took no action to reinitiate consultations. The Corps of Engineers subsequently issued a permit authorizing the project, and the developer began construction.

Red Tides: Red tides are a growing threat to manatees, particularly in southwest Florida. Red tides off Florida are usually caused by blooms of the planktonic dinoflagellate *Karenia brevis*, which produces a neurotoxin (i.e., brevetoxin) that can either be ingested or inhaled by manatees, causing their death. Thirty-five or more red-tide-related deaths have been recorded in five of the seven years between 2000 and 2007, with a high of 96 deaths in 2003. In 2007, 38 deaths associated with a red-tide event in southwest Florida led the National Marine Fisheries Service to declare a marine mammal unusual mortality event pursuant to section 404 of the Marine Mammal Protection Act. In 2008, three manatee deaths were attributed to red tides. The cause of the increase in red-tide events in Florida is unknown.

Entrapment: Reports of manatee entrapment and death in water control structures such as floodgates and navigation locks began increasing in the early 1990s. To address this problem, the responsible government agencies (i.e., the South Florida Water Management District and the Army Corps of Engineers) developed and have been installing automatic gate-reversing mechanisms that are functionally equivalent to the safety devices on elevator doors. These devices appear to have significantly reduced the number of related manatee deaths.

Human-Manatee Interactions and a Conservation Plan for the Crystal River National Wildlife Refuge

In 2008 the Marine Mammal Commission also addressed the problem of humans swimming with manatees in manatee winter refuges and the potential for such activities to disturb or displace manatees or result in human injury. Kings Bay is a roughly circular basin about one mile wide at the

head of Crystal River on Florida's west coast. The regular presence of manatees and the warm, clear water has made this bay an increasingly popular destination for swimmers and divers seeking to view wild manatees underwater. Snorkeling and dive tours featuring such opportunities have become a major attraction for the area. The number of divers has increased steadily, and a number of them have grabbed, chased, kicked, ridden, or otherwise harassed manatees in the bay.

Kings Bay is fed by numerous warm-water springs and is the largest natural warm-water refuge for manatees in Florida. On cold winter days, scientists have counted more than 300 manatees in the bay and its adjacent waterways. In the mid-1980s the Fish and Wildlife Service purchased several undeveloped islands in the bay as well as some adjacent submerged lands and designated the area as the Crystal River National Wildlife Refuge. The primary purpose of the refuge is to protect the manatees that rely on the springs. Within the refuge, the Service has established several small manatee sanctuaries totaling about 45 acres where all human activity is prohibited. These sanctuaries provide havens where manatees can retreat to avoid disturbance by people and boats.

Early in 2007 a concerned citizen posted a video on the Internet showing incidents of blatant harassment involving people chasing and stepping on animals. This report and others like it suggest that such incidents are not uncommon. On 14 March 2007 the Commission wrote to the Service to urge that regulations be developed to prohibit people from touching manatees. The Commission noted that since establishment of the refuge the Service has allowed people to pet and scratch manatees that approach them. Given the thousands of divers visiting Kings Bay annually and the fact that many animals shun approaches by divers, the Commission has repeatedly expressed concern that this policy instills an expectation in divers that they will have an opportunity to touch manatees. On 18 April 2007 the Service responded to the Commission's letter, stating that it had taken steps to encourage "passive" manatee watching. The Service also attempted to address violations through investigations by law enforcement officers (site visits, undercover investigations, review of videos, etc.). It also advised that it planned to begin work on a conservation plan for the refuge in 2009. This would provide an appropriate process to consider new regulatory measures of the sort proposed by the Commission.

On 2 January 2008 the Fish and Wildlife Service published a *Federal Register* notice (73 Fed. Reg. 203) requesting comments on information and issues to be considered in preparing a Crystal River National Wildlife Refuge Conservation Plan. The goal of such plans, which are now required for all national wildlife refuges, is to provide refuge managers with a 15-year strategy for achieving the purposes for which a refuge was established. On 29 April 2008 the Commission responded, emphasizing the importance of this refuge for manatee protection and recommending that a core management objective should be to enhance and implement measures to conserve manatees in Kings Bay and its adjacent waters. As part of the proposed conservation plan, the Commission recommended development and implementation of regulations prohibiting swimmers and divers from touching manatees or from approaching them closer than a specified distance (e.g., 10 ft). The Commission also recommended that the Service evaluate the need for a permit system to limit and distribute the number of tour boats and people allowed to swim at any one time in popular dive locations during peak viewing periods. It also recommended that the Service develop an ongoing monitoring program, including underwater video surveillance to document interactions between manatees and people. The Commission further recommended that the plan include provisions for the purchase of lands to add to the refuge and improve protection and conservation of manatees in Kings Bay. At the end of 2008 the Service was considering these and other comments as part of its process to develop a proposed refuge conservation plan.

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Chapter V

SPECIAL PROJECTS AND EMERGING ISSUES

In 2008 the Marine Mammal Commission completed a number of special projects and reports on emerging issues in marine mammal research, management, and conservation. The report on the biological viability of the most endangered marine mammals and the cost-effectiveness of recovery programs was completed in response to a congressional directive. Other reports were initiated by the Commission to fulfill its responsibilities under the Marine Mammal Protection Act. A brief summary of each report follows.

The Biological Viability of the Most Endangered Marine Mammals and the Cost-effectiveness of Protection Programs

As set forth in the Marine Mammal Protection Act and the Endangered Species Act, the citizens of the United States have placed great importance on preserving wild species and on maintaining marine mammal populations at levels well above what would place them at risk of extinction. Consistent with that concern, in 2004 Congress directed the Marine Mammal Commission to "review the biological viability of the most endangered marine mammal populations and make recommendations regarding the cost-effectiveness of current protection programs."

The Commission reviewed 22 marine mammal taxa (species, subspecies, or population stocks) that occur regularly or entirely within U.S. waters and that are either listed as endangered or threatened under the Endangered Species Act or designated as depleted under the Marine Mammal Protection Act. The review considered methods for identifying taxa at elevated risk of extinction, evidence regarding their viability, threats to their conservation, and the current status and funding for recovery programs. The review also included a case study of the cost-effectiveness of recovery efforts for the North Atlantic right whale.

Of the 22 taxa, 2 are not considered to be viable: the Caribbean monk seal has been determined to be extinct, and the AT1 population of killer whales appears to be on the verge of extinction. The remaining 20 taxa are considered viable; that is, they can persist and recover if human-related threats are identified and addressed effectively. Historical data indicate that many wild species, including a number of marine mammal taxa, have been able to recover from low numbers when human-related threats were managed effectively.

Recovery programs for endangered, threatened, and depleted taxa depend heavily on information on population structure and dynamics, population ecology and health, factors that act with special force on small populations, and the nature and severity of threats. Population viability analysis provides a mechanism for integrating the available data into an analysis of extinction risk. However, viability analyses have been conducted for relatively few taxa because of the lack of critical data and insufficient emphasis on the use of such tools to enhance risk assessment.

Intentional killing was undoubtedly the greatest threat to marine mammals in the 1800s and early to mid-1900s. Since the early 1900s the passage, implementation, and enforcement of several key domestic laws and international treaties have contributed to the conservation of many marine mammal taxa by limiting and or prohibiting such

killing. The Fur Seal Treaty, the International Convention for the Regulation of Whaling, the Marine Mammal Protection Act, and the Endangered Species Act may well have prevented the extirpation of some populations and possibly even the extinction of some species.

The primary human-related threats to marine mammals in U.S. waters have now shifted from intentional killing to incidental taking and degradation of habitat. Recovery efforts generally have been less successful at addressing degradation of habitat, which includes competition with fisheries for prey; introduction of contaminants, disease, and noise; coastal development; and climate change.

The indirect threats posed by human activities often increase in proportion to human population size, economic growth, and consumption patterns. The consequences of "economic growth and development untempered by adequate concern and conservation" were incentives for Congress to pass both the Marine Mammal Protection Act and the Endangered Species Act in the early 1970s. With regard to indirect threats, the findings, purposes, and challenges of the Marine Mammal Protection Act and the Endangered Species Act are more germane now than they were three decades ago.

Much remains to be learned about the threats facing marine mammals and about the actions needed to allow endangered taxa to recover. Unfortunately, even under the best circumstances the recovery of marine mammals is limited by their inherently slow population growth rates, which means that recovery for some species will require decades or longer. To be successful, marine mammal recovery programs must determine what critical information is lacking, obtain that information, and select or adjust recovery actions in response to the information. In the absence of critical information, a precautionary management approach is necessary to ensure conservation even though it may impose a risk of overprotection. Furthermore, as environmental and other conditions change, so too do some of the threats and options for recovery strategies. Strategies must be adapted as more is learned about the animals and the risks they face, and this adaptation must occur at a pace consistent with the adverse effects of socioeconomic development, climate change, and similar human-related phenomena.

Each year Congress allocates a substantial budget for marine mammal recovery programs, with two reasonable expectations. The first is that those funds will be used effectively and cost-effectively in accordance with the conservation framework established in the Marine Mammal Protection Act and Endangered Species Act. The second is that the funded programs will be adequate to achieve the goals of the Acts. In fact, recovery programs have achieved mixed results with regard to their effectiveness and cost-effectiveness. The inconsistency is due in part to insufficient information to assess extinction risks and guide recovery actions and in part to inadequate implementation of some programs. Nonetheless, no marine mammal taxon in U.S. waters has gone extinct during the time that the Acts have been in place, and many taxa have demonstrably benefited from the programs and protections implemented under the Acts. In contrast, during the same period, the Yangtze River dolphin appears to have become extinct, and several marine mammal species or stocks not under U.S. jurisdiction have declined to a precarious state.

The agencies responsible for recovery programs have used congressional funding to balance competing interests and respond to a range of priorities, all under the constraint of a limited budget. Congressional earmarks for specific species, threats, or conflicts may limit the agencies' discretion and their ability to prioritize recovery efforts.

In the end, certain at-risk taxa have received relatively high levels of attention in the form of specifically directed funding (e.g., western Steller sea lions), while certain other taxa have not received enough attention to prevent or even understand their ongoing decline (e.g., Cook Inlet beluga whales). Absent a more integrated, coherent national system for determining funding needs, setting priorities, and determining how the limited funds should be allocated, the Marine Mammal Commission is concerned that recovery efforts for certain taxa will deteriorate into a patchwork of reactive crises, increasing the risk of extinction for those taxa, inflating the long-term costs required to bring about their recovery, and undermining the nation's goal of maintaining the health and stability of the marine ecosystem.

Therefore, the Marine Mammal Commission concluded that the national strategy for setting en-

dangered marine mammal funding priorities—in an informed manner and cognizant of recovery needs—is not yet sufficiently coherent and consistent, and undermines the effectiveness and cost-effectiveness of recovery efforts. To address this problem, the Marine Mammal Commission made a single recommendation to Congress, as follows.

The Marine Mammal Commission recommended that Congress require the development and implementation of a comprehensive national strategy for determining (a) the annual funding requirements for research, monitoring, and recovery actions for endangered, threatened, and depleted marine mammals and (b) how those funds should be distributed to ensure that recovery efforts are optimally effective and cost-effective. The strategy should be developed and updated at least annually by a standing committee consisting of representatives of the responsible agencies. The primary agencies serving on the committee would be those responsible for research and management of endangered, threatened, and depleted marine mammals: the National Marine Fisheries Service, U.S. Geological Survey, Fish and Wildlife Service, and the Marine Mammal Commission. *Ex officio* members of the committee would include representatives of the Council on Environmental Quality, the Smithsonian Institution, and the National Academy of Sciences. The Marine Mammal Commission would chair the committee. The strategy should include the following elements.

Funding for recovery: The comprehensive national strategy would include a separate fund for the specific purpose of addressing research and management needs for endangered, threatened, and depleted marine mammals. Funding levels would be determined annually and provided to Congress for its consideration during the budget process.

Prioritizing recovery efforts: The strategy would be based on clear, objective criteria for assessing recovery needs including, among other things, risk of extinction, critical information gaps, expected conservation benefits, competing conservation needs, and related socioeconomic concerns. Prioritization would be based on structured and transparent risk/benefit analysis.

Monitoring, reporting, and evaluation: On an ongoing basis, the types of information sought by the Commission to complete its report on biological viability and cost effectiveness should be readily available for consideration by all interested parties, including Congress, the responsible agencies, and non-governmental stakeholders. To that end, expenditures, activities, and results of the committee would be reported annually in the Marine Mammal Commission's annual report to Congress. The purpose of such information is to inform and adapt recovery processes by assessing past effectiveness, adjusting for existing shortcomings, and setting future directions. By measuring progress and identifying successes, problems, and inefficiencies, the strategy would provide a mechanism for holding the relevant agencies, including the Marine Mammal Commission, accountable for marine mammal and marine ecosystem conservation.

Adjusting total budget to needs: As the world's human population grows, the demands placed on ocean resources will increase. So too will the threats to many endangered, threatened, and depleted marine mammals and the ecosystems of which they are a part. Consequently, the total budget needs for conservation of endangered, threatened, and depleted taxa will change over time. Costs might decrease if recovery programs are successful and taxa recover. Alternatively, costs might increase if recovery programs are not successful or additional taxa are listed. A risk-based and effectiveness-based assessment process will provide an orderly guide for appraisal and adjustment of overall budgetary needs.

The Marine Mammal Commission believes that the activities undertaken to satisfy this single recommendation will lead to more effective and cost-effective implementation of recovery programs within the conservation framework defined in the Marine Mammal Protection Act and the Endangered Species Act. More effective implementation is essential to address growing conservation challenges in a rapidly changing world.

Climate Change and Arctic Marine Mammals

Climate change may become the most profound human cause of global environmental change. It poses risk to habitats from the equator to the poles, altering the very nature of the earth-air-water system that sustains life on earth. Although the earth's cli-

mate varies naturally over ecological and geological time scales, human activities are now adding to and interacting with that variability with implications that are largely unknown but potentially severe for future generations. Climate change is amplified in polar regions by oceanic and atmospheric currents that carry heat toward the poles, but its consequences are and will be evident in virtually all ecosystems. And those consequences are and will continue to interact with numerous other risk factors (e.g., pollution) that threaten marine ecosystems and the earth's biota generally. The lag between cause and effect means that the consequences of climate change will persist well after efforts to address its causes are initiated.

Climate change is but one of multiple crises facing societies in 2008. The national and global economy, war and social unrest, energy needs, education, and health care all compete for attention by decision-makers seeking to manage these crises and address social priorities. The results of their decisions depend, in part, on whether they are well informed about the nature and consequences of each of these crises.

To that end, the Marine Mammal Commission sponsored a multidisciplinary, multinational effort to describe the potential consequences of climate change on Arctic marine mammals, a group of species occurring primarily or entirely in the Arctic and subject to the rapid changes in Arctic habitat. Those species include bowhead whale (*Balaena mysticetus*), beluga, or white whale (*Delphinapterus leucas*), narwhal (*Monodon monoceros*), bearded seal (*Erignathus barbatus*), ringed seal (*Phoca hispida*), walrus (*Odobenus rosmarus*), and polar bear (*Ursus maritimus*). Nine other species occur seasonally or occasionally in the Arctic or have some association with sea ice, including harp seal (*Phoca groenlandica*), hooded seal (*Cystophora cristata*), ribbon seal (*Phoca fasciata*), spotted seal (*Phoca largha*), gray whale (*Eschrichtius robustus*), killer whale (*Orcinus orca*), minke whale (*Balaenoptera acutorostrata*), fin whale (*Balaenoptera physalus*), and humpback whale (*Megaptera novaeangliae*).

The results of the review were published in a supplemental edition of *Ecological Applications* in 2008. Following an introduction by the editors and lead authors, the first four chapters provide a broad-scale description of the Arctic climate over geologic time, the evolution of marine mammals within the region and their patterns in distribution and abundance over time, and historical perspectives to be gleaned from their modern genetic composition. The following four chapters focus on the potential effects of climate change based on ongoing and expected ecosystem changes (e.g., changes in prey availability), the natural history of Arctic marine mammals, their vulnerability to rapid climate change, expected changes in patterns of marine mammal health due to changes in both exposure and susceptibility to disease, and expected changes in the relationships between Arctic marine mammals and humans, including the subsistence cultures that depend on marine mammals as well as other human activities such as oil and gas development. A case study on walruses illustrates the impact on subsistence cultures. The final two chapters consider the resilience of marine mammals in the face of climate change and various conservation measures that may be used to address the secondary effects of increasing human activities in the Arctic as the climate warms. Taken together, the supplement was intended to summarize current knowledge of Arctic marine mammals, to establish a baseline for future assessments, and to provide a basis for further research and conservation efforts.

A Framework for Monitoring Arctic Marine Mammals

Scientists cannot describe the status of most Arctic marine mammals. They have recognized the shortcomings in research and long-term monitoring efforts for years but have made relatively little progress. Resources have been inadequate, working in the Arctic is logistically difficult and expensive, and managers have chosen to focus on competing priorities. Climate change likely will cause profound changes in the distribution and abundance of Arctic marine mammals, but, absent a change in policy and priority, those changes will go unrecorded and management and conservation efforts will be ill-informed.

To promote more rigorous assessment and management of these species, the Marine Mammal Commission and the Fish and Wildlife Service convened an international workshop in Valencia,

Spain, on 4–6 March 2007. Workshop participants included 53 scientists and members of Arctic indigenous communities who contributed expertise on a range of topics, including marine mammal biology and ecology, Arctic oceanography and climate, sea ice, marine mammal health, subsistence harvesting and biosampling, and monitoring techniques.

The purpose of the workshop was to begin development of a long-term, pan-Arctic strategy for monitoring Arctic marine mammals. The discussions were framed around case studies of ringed seals and beluga whales and emphasized the need to describe the population dynamics of Arctic marine mammals as well as the key factors that drive those dynamics (e.g., changes in behavior, health, trophic dynamics, habitat quality and availability, and the effects of human activities).

Participants of the workshop emphasized a number of points and recommendations, including—

The need for multi-disciplinary studies and partnerships. Participants recommended the formation of international working groups of experts to develop detailed monitoring plans for Arctic marine mammals and coordinate relevant research and monitoring efforts throughout the Arctic. These groups would identify parameters and tools needed to monitor marine mammal status, prioritize monitoring efforts by topic and geographic region, coordinate multinational and multidisciplinary data collection and data sharing, help secure research funding, and ensure that monitoring efforts are adapted to changing environmental conditions.

The importance of integrating new research efforts with those already underway or in the planning stage. For example, the Study of Environmental Arctic Change (SEARCH) science and implementation plans (SEARCH 2005) provide a general vision and direction for Arctic research by U.S. federal agencies. These efforts are coordinated by the Interagency Arctic Research Policy Committee (IARPC), which is developing an Arctic observing network that will gather data necessary to observe, understand, and guide responses to climate change and its impacts on Arctic ecosystems and societies (IARPC 2007). The Arctic Council also is actively engaged in planning and coordinating research and monitoring efforts through its various working groups, including the Arctic Monitoring and Assessment Program, the Arctic Contaminants Action Program, Conservation of Arctic Flora and Fauna, and Protection of Arctic Marine Environment.

The need to develop and integrate local monitoring networks and traditional ecological knowledge as part of a comprehensive monitoring framework. Many coastal Arctic peoples have relied on subsistence harvests of marine mammals for centuries, and their cultures are rich with traditional ecological knowledge of marine mammals, including insights into their behavior, movements, natural history, and habitats. Such knowledge can guide or augment research, management, and conservation efforts for marine mammals.

The importance of identifying funding sources, including governmental, industry, and environmental agencies and organizations. Workshop participants were unaware of any existing sources of sustained funding for long-term monitoring of Arctic marine mammals, but finding such resources is central to effective monitoring.

The importance of adapting to rapidly changing conditions in the Arctic. Research and monitoring designs must be sufficiently flexible and robust to adapt to, and take advantage of, changing environmental conditions and regional variation in environmental trends.

The importance of consistency in methods and comparability of results. Current research methods used to study marine mammals are not consistent across the Arctic, and common protocols must be developed for data collection and sharing. A broad-based organization is needed to maintain and administer partnerships and promote collaboration and coordination.

At the end of 2008 the Commission was reviewing additional means to promote effective assessment, monitoring, and conservation of Arctic marine mammals in the face of climate change.

Review of Co-management Efforts in Alaska

The 1994 amendments to the Marine Mammal Protection Act added a new section intended to enhance conservation and management of marine mammal population stocks that are taken by Alaska Natives for subsistence purposes. Section 119 allows the

Secretaries of Commerce and the Interior to "enter into cooperative agreements with Alaska Native organizations to conserve marine mammals and provide co-management of subsistence use by Alaska Natives." To assess progress toward those goals over the past decade and to identify productive ways forward in the coming decade, the Marine Mammal Commission sponsored a co-management review in Anchorage, Alaska, on 6–8 February 2008.

Review Topics

Virtually all aspects of co-management have progressed significantly since 1994, and the review provided an opportunity to recognize that progress. Since 1994 the Indigenous Peoples' Council for Marine Mammals (IPCoMM), the National Marine Fisheries Service, and the Fish and Wildlife Service have negotiated and revised a broad umbrella agreement setting forth a framework for co-management agreements. Various Alaska Native organizations (ANOs) and either the National Marine Fisheries Service or the Fish and Wildlife Service have entered into 14 agreements involving 12 species. The agreements vary in content by species, ANO, and agency but generally describe harvest monitoring methods, collaboration on research and education/outreach projects, required funding, conflict resolution, and procedures for terminating agreements.

Co-management efforts also have integrated the field skills and knowledge (i.e., traditional ecological knowledge, or TEK) of Alaska Native hunters with the scientific and technological expertise of agency scientists to enhance understanding of marine mammals in Alaska, including their stock structure, status, trends, movement and habitat-use patterns, responses to climate change, and animal health, condition, contaminants, and disease. Sampling of Native-harvested animals for scientific purposes (often referred to as biosampling) has provided tissues for a variety of research studies. Education and outreach efforts have successfully trained hunters in best hunting practices and biosampling and educated youth in Alaska on Native cultural and subsistence traditions. Such efforts contribute significantly to marine mammal conservation and the maintenance of subsistence cultures.

The review also examined the structure of co-management efforts to date and possible modifications in three areas. The first pertains to regional-based versus species-based approaches to co-management and whether one approach is preferred. Both have advantages and disadvantages, and neither appears to be more appropriate in all cases, given variation in the practices and needs of Alaska Native hunters and the varying life histories and movement patterns of the marine mammals taken for subsistence. Difficulties may arise and must be resolved when regional and species-based ANOs overlap and have different management goals, objectives, or methods.

The second area pertains to IPCoMM's role as a central body representing ANOs. Here the questions are whether and how to modify IPCoMM's operating procedures to maintain the delicate balance between furthering the collective purposes of ANOs without usurping or undermining the authorities granted to them by various tribal governments. Important areas for further consideration by ANOs include the role of IPCoMM in promoting funding for co-management and possible revision of bylaws to consider formal mechanisms for alternating leadership (e.g., term limits). IPCoMM also may facilitate resolution of possible conflicts among ANOs, such as may occur when species-based and region-based ANOs overlap.

The third area is funding to support co-management efforts and, particularly, the capacity-building necessary for ANOs to meet their responsibilities as set forth in co-management agreements. Stable, sufficient funding is needed for basic administrative tasks (e.g., planning, maintaining, and staffing an office; preparing proposals and reports; holding meetings and communicating with hunters and co-management partners; travel to meetings) and for special projects (e.g., monitoring harvests, conducting research, carrying out education and outreach activities).

Pervasive Themes

Four underlying themes pervaded the Commission's review. The first was trust. Co-management cannot function or perhaps even survive without a greater willingness by involved parties to build trusting relationships. Trust is essential and requires further development in all co-management relationships, that is, within and among hunters, ANOs,

IPCoMM, and government agencies. The existing lack of trust in some relationships encumbers efforts to realize the full potential of co-management. The poor relationship between ANOs and the state of Alaska exemplifies this lack of trust and impedes the maintenance of subsistence traditions and conservation of the affected marine mammals.

The second pervasive theme was the need for ANO capacity-building. Effective co-management in the future will require that Alaska Natives and their communities develop or expand the skills needed to relate to and work with their co-management partners in the context of the complex federal bureaucracy established to conserve marine mammals. Under the best circumstances, capacity-building will require decades. Despite concerted efforts by many, that transition cannot be accomplished on a volunteer basis, and it cannot advance if it is not supported.

The third pervasive theme, closely related to capacity-building, was the need for funding and its counterpart, accountability. ANOs are not federal organizations and maintain their own distinct identities. However, they have relied heavily on support from the federal government. Federal funding is essential for promoting capacity-building by ANOs and thereby allowing them to fulfill their co-management responsibilities. At the same time, the use of federal funding by ANOs and their federal partners should result in demonstrable benefits to management. Accountability (e.g., demonstrating such benefits) may be relatively straightforward in some areas and more difficult in others but should be possible in virtually all areas (e.g., harvest monitoring, research, education, outreach). Because resources available for marine mammal research and management are limited, use of federal funds will require co-management partners to set priorities and then demonstrate progress through various performance measures.

The fourth pervasive theme was that Alaska Native subsistence cultures face enormous threats from climate change. Located thousands of miles from the activities that are driving these changes, Alaska Natives will experience some of the most severe consequences, including changes in the abundance and distribution of marine mammals and an increase in human activities in sub-Arctic and Arctic regions. To the extent that Alaska Natives might exert any influence on society's response to climate change and management of its effects, that influence will be stronger if Alaska Natives can speak with one voice. In this regard, one of the challenges for Alaska Natives is to achieve the necessary harmony to do so.

Recommendations

Information presented at the review demonstrated that much has been done by Alaska Natives, the Fish and Wildlife Service, and the National Marine Fisheries Service to implement section 119 of the Marine Mammal Protection Act since 1994. Nonetheless, the Commission believes that further progress is essential to satisfy the goals of section 119 specifically and the Marine Mammal Protection Act generally. To build on the achievements of the past 14 years and promote further development in the coming decade, the Marine Mammal Commission makes the following recommendations.

1. ***Joint co-management funding proposal to ensure funding stability: (a)*** To provide an essential foundation for co-management, ANOs and their federal agency partners should develop a joint co-management funding proposal that promotes capacity-building, identifies and prioritizes co-management tasks, describes and justifies a budget needed to support both administrative functions and project activities, and sets forth the objectives to be accomplished and measures of accountability for both the ANOs and their federal partners. The proposal also should include funding to support IPCoMM activities; Alaska Native leaders should not be required to volunteer their time to maintain ANOs and IPCoMM. ***(b)*** The Fish and Wildlife Service and the National Marine Fisheries Service should seek a funding base that is both stable and sufficient for supporting co-management, including support to build co-management capacity among ANOs and to meet their own co-management needs. The Fish and Wildlife Service provides some level of stability by including a line item in its budget for co-management; the National Marine Fisheries Service should do the same.

2. ***IPCoMM review***: To encourage greater participation and instill greater confidence of ANOs from around the state, IPCoMM should conduct a formal review of its bylaws and operating procedures. The review should focus on mechanisms to ensure that all ANOs are treated equitably and fairly, all IPCoMM activities are transparent to member ANOs, and IPCoMM leadership is rotated (e.g., through term limits) to avoid any perception of bias, share the burden of leadership activities, and promote development of Alaska Native leaders from all member ANOs.
3. ***Conflict resolution***: To resolve conflicts in a more effective and timely manner, ANOs and their federal agency partners should develop detailed protocols and timelines for conflict resolution. IPCoMM may serve a useful purpose in addressing conflicts that involve multiple ANOs or multiple co-management agreements. Co-management likely will fail without an effective means of resolving conflicting perspectives.
4. ***Harvest monitoring***: To instill greater confidence in the accuracy and thoroughness of harvest monitoring and put longstanding disagreements about monitoring results to rest, the National Marine Fisheries Service and Fish and Wildlife Service should work with their co-management partners and the Alaska Department of Fish and Game's Divisions of Subsistence and Wildlife Conservation to (1) identify sources of potential bias in existing monitoring strategies, (2) develop scientifically based methods for quantifying the biases, and (3) implement practical methods for correcting those biases that are considered excessive.
5. ***Statutory authority for managing harvests***: To prevent depletion of subsistence species, ANOs, IPCoMM, and federal agency partners should continue to advocate for amendments to the Marine Mammal Protection Act that would authorize co-management partners to adopt enforceable harvest limits in appropriate circumstances.
6. ***Research collaboration***: To expand research collaboration, ANOs and agency partners should establish research plans describing research priorities, responsibilities of the parties and means of cooperation, and resources required to conduct the research. To promote more effective marine mammal research and management in Alaska waters, these plans should be integrated with marine mammal studies being conducted in Alaska by other research agencies and organizations (e.g., the Alaska Department of Fish and Game, the University of Alaska).
7. ***Education and outreach***: To strengthen support for and participation in co-management, ANOs and their federal agency partners should continue to develop education and outreach projects related to subsistence, traditional ecological knowledge, and co-management. Such projects should focus on youth from grade school through college, hunters, their communities, scientists, and the general public. As part of this effort, scientists working for or conducting research on behalf of the National Marine Fisheries Service, Fish and Wildlife Service, or other federal agencies on topics and in areas covered by co-management agreements should be required to inform those communities of their results by returning to those areas and making presentations, contributing to community newsletters, or finding other suitable means of communicating with community members. Co-management committees should lead the effort to coordinate presentations by scientists and other persons knowledgeable about related matters of interest to affected communities. Education and outreach are vital to maintaining traditions while also identifying and adapting to the pending changes in the Arctic.
8. ***Traditional ecological knowledge***: To enhance co-management efforts, ANOs and their federal agency partners should continue to infuse TEK into all aspects of co-management (e.g., harvest monitoring, research, education and outreach) as appropriate.
9. ***Climate change and other future threats*****:** To prepare for future threats, ANOs and their federal agency partners should seek ways to anticipate the possible consequences of climate change on Alaska Native subsistence cultures and consider possible actions to manage those

effects as possible. Doing so will require the considerable adaptability of Alaska Natives with respect to their way of life.

Continued Involvement by the Marine Mammal Commission

In 2008 the Marine Mammal Commission sponsored a National Research Council post-doctoral research associate to further review co-management and mechanisms for promoting its success. The ongoing review will summarize co-management efforts in other regions, such as Canada (Inuvialuit, Nunavut, and Nunavik Land Claims Regions) and Australia (Great Barrier Reef World Heritage Area and Torres Strait).

Australia, Canada, and the United States have developed systems for governing co-management that are similar in some respects but different in others. Each country's system seeks to conserve marine mammals while honoring indigenous peoples' rights to harvest animals for subsistence. However, the involved indigenous communities may enter into co-management to fulfill a variety of goals, not necessarily focusing on marine mammal conservation as a priority. A better understanding of the conditions that facilitate co-management should enhance conservation of a variety of harvested marine mammals in many parts of the world. To that end, the Marine Mammal Commission is seeking to characterize those conditions.

Underwater Sound and the Marine Mammal Acoustic Environment: A Guide to Fundamental Principles

Marine mammal scientists and managers did not recognize human-generated sound as a potential risk factor until the 1970s when questions were raised regarding the possible effects of noise from icebreakers and oil and gas operations in the U.S. Arctic on bowhead whales and ringed seals. Since then, the adverse effects of human-generated sound on marine life have become a matter of considerable concern, involving a number of activities deemed crucial to national defense, commerce, energy, food, recreation, and coastal development. Marine mammals have been at the center of the controversy because of their charismatic nature and because they use sound for a variety of functions, including foraging, predator detection, navigation, and social communication. Concern has been heightened by observations that human-generated sound can cause changes in marine mammal behavior and physiology, can cause injury of a temporary or permanent nature, and—under certain conditions—can initiate events leading to death. Much remains to be learned about the occurrence of such events before the significance of human-generated sound in the marine environment can be described with confidence.

The controversy over the potential effects of sound has been confounded by the complexity of sound generation, propagation, and its impact on the marine environment. Sound is a physical phenomenon with various properties such as frequency, bandwidth, pressure, intensity, and constancy. It is produced by a variety of sources including large commercial shipping vessels; seismic airguns used in exploring the earth's crust for evidence of oil and gas deposits or geophysical studies; sonar systems used for military and commercial purposes, including fishing; and a range of activities related to coastal development, such as dredging and construction. The movement of sound through the marine environment may be affected by a range of factors including ocean depth, topography, temperature, and salinity. The biological impacts of sound may vary depending on the receiving organism and its sensitivity to sound.

For all these stated reasons, the Commission expects a debate over the effects of sound. Such a debate helps focus research and management efforts on key considerations to reduce the uncertainties and facilitate more effective management with fewer risks to marine mammals and fewer unnecessary constraints on the sound-generating activities. However, the discussion should not be clouded by misunderstanding of sound and its behavior in the marine environment. Such misunderstanding may occur because many of the participants in the debate, including most marine mammal scientists, do not have formal training in the science or physics of sound in the marine environment.

To avoid disagreement borne of misunderstanding, the Marine Mammal Commission asked Professors David Bradley and Richard Stern of Penn State University to produce a primer on sound in the marine environment. The result of that effort, "Under-

water Sound and the Marine Mammal Acoustic Environment: A Guide to Fundamental Principles," was published by the Commission in 2008 and can be obtained by contacting the Commission directly or by downloading from the Commission's Web site (http://www.mmc.gov). Chapter 1 of the primer describes sound and its properties. Chapter 2 describes the ocean environment and the properties that influence the travel of sound through the environment. Chapter 3 discusses various sources of sound, including biotic (i.e., made by various forms of marine life), abiotic (i.e., non-living sources), and various human activities. Chapter 4 provides a more detailed look at sound generation, propagation (travel), and reception. Chapter 5 gives an overview of hearing in humans and marine mammals, and Chapter 6 gives a brief and general description of the kinds of impacts that human-generated sound may have on marine mammals. As was described in a National Research Council report (National Research Council 2005), determining the population-level consequences of human-generated sound in the marine environment will take considerable research. The Commission hopes that the primer produced by Bradley and Stern will lead to a more informed debate and give better direction to that effort.

Effects of Tagging Large Whales

Technology has revolutionized the study of marine mammals, providing the means to investigate their distribution in time and space, their behavior at and below the water's surface, their physiology, and features of their environment. Nonetheless, the difficulty of attaching devices to marine mammals has been a significant obstacle for certain kinds of studies with certain types of marine mammals. The underlying goal of such studies is to gather data without interfering with or harming the animals being studied. The technology has evolved over time to maximize information gained while minimizing the associated costs to the animals. In the United States, the Marine Mammal Protection Act imposes limits on those costs, requiring that research be for a bona fide scientific purpose, that lethal methods are not used when feasible non-lethal methods are available, and that research on depleted stocks will benefit those stocks or fulfill a critically important research need.

Few would question the benefits that have been derived from technology-based marine mammal studies over the past four decades. However, many have questioned the costs of such research, particularly those resulting from the methods used to attach the instruments. Attachment methods have included harnesses, tethers, glues, suction cups, bolts through fins and flippers, surgical implantation, and injection through the skin into blubber, fascia, and muscle.

To carry out its statutory duties regarding the issuance of research permits, the Marine Mammal Commission must evaluate such matters on a regular basis. Determining the effects of tagging has been particularly difficult with large whales. To facilitate such evaluation, the Commission held a one-day workshop in conjunction with the 2005 biennial meeting of the Society for Marine Mammalogy in San Diego, California. The workshop used presentations and discussions to explore the potential effects of tagging large cetaceans, the scientific evidence regarding such effects, and future studies to address remaining uncertainties.

Invasive tagging methods (i.e., those that break the skin of the whales) may cause inflammation and infection. Such effects may be short-lived or long-lived and may cause local as well as systemic complications. In addition, tagging may cause a stress response or impose added energetic requirements to heal a wound or compensate for hydrodynamic drag. At least hypothetically, the act of approaching a whale in the wild to attach an instrument may cause disturbance, disruption of social behavior (such as between mother-calf pairs), or abandonment of important habitat. To be significant with regard to population conservation, such effects must reduce the whale's chances of survival or reproduction, which is difficult to determine.

Relatively few studies have attempted to investigate these kinds of concerns. Godfrey and Bryant (2003) found that only 10 percent of 836 tagging studies on a variety of species provided information on potential tagging effects. With regard to marine mammals, three reports are of particular value in this regard. Quinn et al. (1999) reported the results of a workshop to examine the effects of tagging efforts on North Atlantic right whales. A total of 55 tags were attached to 49 right whales between 1988 and 1997. Workshop participants reviewed the in-

cidence of divots, scarring, the occurrence of cyamids, and local or regional swelling. Observations of swelling raised the most concern. Because right whales (and all large cetaceans) are long-lived, a review of the whales instrumented during this period could be particularly useful in determining whether tagging had long-term effects on an animal's reproduction or survival.

Mate et al. (2007) provided a thorough review of the development of tag technology and application methods and summarized observations from extensive tagging studies. Much of the refinement of tag technology over time has been aimed at reducing tagging effects and providing longer data records. As a result, any evaluation of tagging effects should be based on current technology. These authors also described short-term responses of different whale species to tagging efforts, suggesting that responses vary by species. Best and Mate (2007) assessed sighting records and reproductive intervals of tagged female southern right whales off South Africa. Although their sample size of resighted whales was relatively small, the results suggested no lasting tagging effects.

These and other studies were discussed at the 2005 workshop, and participants agreed that more studies like these were essential. To that end, they identified a number of whale populations that would be particularly useful subjects for such studies because individual animals are likely to return to the same general area over time, allowing serial, long-term observations. Such populations include humpback whales in southeast Alaska, gray whales off western North America, North Atlantic right whales, southern right whales off South Africa, and blue whales off California. Participants also recommended further studies of alternative attachment methods (e.g., suction cups, tethering) and development of attachment guidelines, particularly when studies involve depleted, threatened, or endangered populations. Participants also urged that researchers using such techniques place greater emphasis on assessment of tagging effects by incorporating follow-up observations into their studies and their funding proposals. Similarly, funding agencies and organizations must be willing to provide support for such studies if the current uncertainties are to be resolved.

The report of the workshop was completed by a joint effort of the Marine Mammal Commission and the International Union for Conservation of Nature (IUCN). IUCN has been particularly interested in tagging effects because of the potential value of tagging animals from the western population of North Pacific gray whales, which numbers about 130 animals, is at a high risk of extinction, and has been poorly studied in all parts of its range except its feeding grounds of Sakhalin Island, Russia (see Chapter III). The report is available on the Commission's Web site, http://www.mmc.gov/reports/workshop/.

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Chapter VI

RESEARCH AND STUDIES PROGRAM

The Marine Mammal Protection Act requires that the Marine Mammal Commission continually review research programs conducted or proposed under the Act. Further, the Act authorizes the Commission to undertake or cause to be undertaken studies that it deems necessary or desirable in connection with marine mammal conservation and protection. To accomplish these tasks, the Commission convenes meetings and workshops to review, plan, and coordinate marine mammal research. It also awards grants for studies to characterize threats to marine mammals and their habitats and to identify possible solutions or mitigation measures. In its research-related activities, the Commission seeks to facilitate and complement activities of the National Marine Fisheries Service, the Fish and Wildlife Service, and other federal agencies while preventing unnecessary duplication of research.

Workshops and Planning Meetings

During 2008 the Commissioners, members of the Committee of Scientific Advisors on Marine Mammals, and Commission staff helped organize and participated in meetings and workshops on a variety of topics, including—

- climate change in the Arctic and international consideration of the social, environmental, economic, and legal implications for the region's inhabitants and resources
- research and conservation in the Antarctic
- the organizational structure, collaboration strategies, and research needs and priorities for the U.S. Geological Survey's new National Climate Change and Wildlife Science Center
- co-management of subsistence harvests by Alaska Natives and related research
- assessing the ecological effects of fishing on marine mammals
- research sponsored by the oil and gas industry's Joint Industry Program and possible future directions for this program
- research programs and future directions of oil and gas development in the marine environment
- the use of power plant warm-water outflows by Florida manatees (*Trichechus manatus latirostris*), the possible effects of power plant closures, and possible measures to ameliorate the consequences of such closures
- technologies to reduce ship collisions with North Atlantic right whales (*Eubalaena glacialis*)
- reducing shark predation on Hawaiian monk seals (*Monachus schauinslandi*)
- methods for improving juvenile survival of Hawaiian monk seals, including captive care
- genetics of manatee populations and the implications for conservation
- the use of data obtained from tagged marine animals in oceanographic models and model testing
- the effects of ocean noise from various sources on marine mammals
- interactions between pinnipeds and endangered and threatened salmonids in the Pacific Northwest
- interactions between oyster farming and harbor seals on the U.S. West Coast
- the incorporation of acoustic survey data into the OBIS-SEAMAP (Ocean Biogeographic Information System–Spatial Ecological Analysis of Megavertebrate Populations) database

- the development of risk analysis and decision-support tools based on geospatial animal distribution and density data, using OBIS-SEAMAP
- research conducted with support from the National Whale Conservation Fund
- preparation for meetings of the International Whaling Commission
- defining the health and stability of marine ecosystems
- conservation of migratory species, including marine mammals
- the status of marine mammals in Russian waters, 5th International Conference on Marine Mammals of the Holarctic
- development of a Caribbean Marine Mammal Action Plan
- the status and conservation of the vaquita (*Phocoena sinus*), including launching and implementation of the North American Conservation Action Plan for the vaquita
- conservation of populations of small cetaceans, especially Indo-Pacific bottlenose dolphins (*Tursiops aduncus*), subject to live capture and export
- the processes, methods, and information needed to formulate non-detriment findings under the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)

In addition, Commission staff participated on or with several interagency committees, teams, and working groups focused on issues of concern for marine mammals, including—

- recovery teams for endangered species, including the Hawaiian monk seal and southern sea otter (*Enhydra lutris*)
- (Atlantic) pelagic longline, Atlantic large whale (and Maine subgroup), Gulf of Maine/mid-Atlantic harbor porpoise, and bottlenose dolphin take reduction teams
- Scientific Review Groups convened under the Marine Mammal Protection Act to review annual updates of stock assessments and marine mammal–fishery interactions
- Joint Subcommittee on Ocean Science and Technology and its working groups on ocean partnerships, ocean observations, and harmful algal blooms, hypoxia, and human health
- Arctic Policy Group convened by the Department of State
- Interagency Coordinating Group on Acoustics
- interagency task force convened by the Interagency Committee on Ocean Science and Resource Management Integration and the Joint Subcommittee on Ocean Science and Technology on Anthropogenic Sound and the Marine Environment
- Interagency Marine Debris Coordinating Committee
- Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve Advisory Council
- the Scientific Working Group on Marine Mammal Unusual Mortality Events
- North Pacific Research Board Science Panel

Commission-Sponsored Research Projects

The Marine Mammal Commission supports research to further the purposes of the Marine Mammal Protection Act. As funding allows, the Commission convenes workshops and awards grants for research to identify, characterize, and minimize threats to marine mammals and their habitats. Research ideas originate from within the Commission, from unsolicited proposals submitted by scientists outside the Commission, and from responses to Commission requests for proposals. Since it was established in 1972, the Commission has funded more than 1,000 projects ranging in amounts from several hundred dollars to $150,000. Final reports of most Commission-sponsored studies are available from the National Technical Information Service or directly from the Commission.

In 2008 the Commission issued a request for proposals specific to either of two topics: (1) conservation of critically endangered marine mammal species or populations and (2) indirect effects of fisheries on marine mammals. The Commission received 79 proposals, and 52 were forwarded for review (39 in the former category and 13 in the latter). A subcommittee of members of the Committee of Scientific Advisors on Marine Mammals, staff, and external reviewers with scientific expertise in select areas reviewed the responsive proposals, and the Commission awarded research grants for two projects

on critically endangered species and four projects on the indirect effects of fisheries. In addition, the Commission awarded 21 other grants on a variety of topics. The 27 grants funded by the Commission in 2008 totaled approximately $629,000. One grant helped offset publication and distribution costs for *SireNews*. Brief descriptions of the other 26 projects follow.

Marine mammal consumption of key prey fishes and invertebrates in the Northeast United States: Modeling, magnitude, and sensitivity analysis (National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole, Massachusetts)

This study is intended to assess relationships between marine mammal foraging and commercial fisheries removals to better understand the potential for competition and its effects on marine ecosystems. The investigators are compiling and integrating data to estimate consumption by marine mammals of such fish as herring, mackerel, and butterfish and invertebrates such as krill and squid in continental shelf waters from the Gulf of Maine to Cape Hatteras, North Carolina. They will scale per capita consumption estimates by population abundance and residence time in northeastern U.S. waters to evaluate the total biomass of food necessary to support marine mammal populations. They also will partition consumption data by diet composition to evaluate the levels at which a broad range of selected forage species are removed. Summing the removal levels across all predators of a particular prey species and comparing the results to levels of commercial fishery removals will enable the investigators to compare relative mortality levels of prey species and the potential for competition between marine mammals and fisheries. The investigators will estimate total landings of selected forage species by commercial fisheries and will analyze spatial and temporal overlap of marine mammals and fishing activities in the northeastern United States to ascertain the extent to which forage species are shared. Sensitivity analyses on all parameters and variables of each component will indicate where further studies would be most useful in characterizing potential competition. The goal is to understand the significance of potential competition between marine mammals and fisheries, which is essential for effective management of marine ecosystems.

Assessing the relative risk to marine mammal stocks from indirect effects of fishing (Duke University, Durham, North Carolina)

The Marine Mammal Protection Act establishes a framework to ensure that marine mammal populations remain at or above the maximum net productivity level, which is defined for practical management purposes as 60 percent of the environmental carrying capacity for a particular species. However, this framework does not take into account human-driven changes in carrying capacity that may result from fishing. If fisheries reduce carrying capacity below historical levels, they likely also will reduce the apparent level at which the maximum net productivity occurs, potentially confounding an assessment of population status. The indirect effects of fisheries on marine mammals generally have not been incorporated into marine mammal management, primarily due to the difficulty of characterizing such effects. How marine mammal predators respond at the population level to prey population dynamics and varying harvest levels by fisheries generally is unknown, but the issue has been at the center of several controversies over fisheries effects. The investigators will examine these relationships using simulation modeling, evaluate the utility of macro-ecological theory to make inferences about indirect fisheries impacts in the absence of sufficient data, identify related research priorities, and evaluate modifications to the existing management framework to account for such indirect effects.

Assessing the effects of a gillnet ban on two Florida resident populations of bottlenose dolphins (Chicago Zoological Society, Brookfield, Illinois)

Effective 1 July 1995 an amendment to the constitution of the State of Florida banned commercial gillnet fishing in Florida state waters. The action provided a unique opportunity to document the results of the removal of a fishery on the feeding ecology of two well-studied populations of bottlenose dolphins (*Tursiops truncatus*) residing in Sarasota Bay and Indian River Lagoon. The investigators will analyze stomach contents and stable isotopes (carbon, nitrogen, and sulfur) from muscle tissue of dolphins that stranded before and after gillnets were banned. The objective is to reconstruct the

animals' feeding history, including the composition and size classes of consumed fish and the trophic level and habitats in which dolphins were foraging. The investigators also will analyze data on population parameters of free-ranging dolphins in Sarasota Bay to determine whether changes occurred in abundance and vital rates (reproduction, survival, emigration, immigration) following the net ban. The goal of the study is to determine if the ban on fishing led to changes in foraging that, in turn, had a positive effect on the status and trends of the dolphin populations.

Transient killer whale predation in southeastern Alaska (Dena Matkin, Gustavus, Alaska)

This project is a continuation of a valuable long-term time series of studies on transient killer whales in Glacier Bay and Icy Strait in southeastern Alaska. Data on these whales have been collected annually since 1987, with a focus on their feeding ecology, behavior, and movements. Individual whales are identified using photographs that are shared with other researchers maintaining catalogues of killer whales in Prince William Sound, Alaska, and British Columbia, Canada. The ultimate goal of the study is to understand the role of these top-level predators in eastern North Pacific ecosystems.

An integrated approach to community-based monitoring of killer whales around the Pribilof Islands, Alaska (St. George Island Institute, St. George Island, Alaska)

For unknown reasons, northern fur seals (*Callorhinus ursinus*) are declining in abundance at the species' largest breeding site, which is on the Pribilof Islands in the Bering Sea. Predation by transient killer whales (*Orcinus orca*) has been suggested as a possible cause, but scientists have neither documented nor quantified the occurrence and rate of such predation. The goal of this project is to create a long-term, community-based observation network to collect baseline information on the distribution, behavior, and trophic interactions of killer whales around the Pribilof Islands. The St. George Island Institute and the Aleut Community of St. Paul Island–Tribal Government will implement a killer whale monitoring program on both St. George and St. Paul Islands. The program will entail consistent shore-based visual monitoring of areas adjacent to fur seal rookeries; autonomous hydrophone deployments for passive acoustic monitoring of killer whale vocal activity; a logbook program to encourage local fishermen to record killer whale sightings, predation events, and gear interactions; and use of a standardized survey to collect baseline historical data and traditional ecological knowledge on the spatial and temporal nature of killer whale predation on fur seals near these islands.

Status and conservation of the Cook Inlet beluga whales and criteria for assessing marine mammal status using population viability analysis (Daniel Goodman, Bozeman, Montana)

This grant consists of two parts—a technical analysis of the status of the Cook Inlet beluga whale (*Delphinapterus leucas)* stock and potential recovery measures, and criteria for assessing marine mammal status using population viability analysis. The Cook Inlet beluga whale stock, which numbers 300–400 animals, was listed as endangered under the Endangered Species Act in 2008. The population declined from an estimated 1,300 individuals in the 1970s, largely due to an ill-managed subsistence harvest in the 1990s. Since 1999 the documented taking of beluga whales for subsistence purposes has totaled only five animals, but the population has failed to respond as expected, and one or more other risk factors may be preventing population recovery. The Commission has been directly involved in management discussions since the late 1990s and uses the analytical services of the investigator to ensure the best possible understanding of the population's status and trends.

In a separate project, the investigator is providing the Commission with expertise on the use of population viability analysis to assess the status of marine mammal populations, including their respective risks of extinction. This information is useful for a variety of management purposes, including decision-making regarding the listing of various populations under the Endangered Species Act.

Support for a health and stranding response program and oil spill response plan for northern sea otters in Washington State (U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, Lacey, Washington)

The northern sea otter (*Enhydra lutris kenyoni*) population in Washington State is increasing but remains small and vulnerable to the effects of oil spills, pollution, disease, fisheries, and other human-related and natural risk factors. Funding for research on and management of this population has been low, as it is not listed as endangered or threatened under the Endangered Species Act. To address conservation needs for this population, the Marine Mammal Commission provided funding to support a stranding network along the Olympic Peninsula to retrieve and analyze carcasses and tissue samples from stranded sea otters. The funding will promote outreach and training for volunteer responders and veterinarians, provide equipment needed to respond to strandings and obtain samples and cover necropsy and laboratory costs. The funds also will be used to purchase supplies for oil spill responses and to train Service personnel to respond to an oil spill.

Gray seal tagging on Muskeget Island, Massachusetts (University of New England, Biddeford, Maine)

The gray seal (*Halichoerus grypus*) population in New England has fluctuated greatly over time. Once common, these seals were hunted to low numbers throughout the early to mid-twentieth century. The bounty on this species was lifted in the 1960s, allowing the population to recover. The species' largest and southernmost breeding population is on Muskeget Island in Nantucket Sound. At that site, the number of pups born has increased from 5 in 1988 to an estimated 2,000 in 2008. The population has been poorly studied, partially due to the risks associated with traveling to remote sites via boat in the rough coastal waters during the winter. Nonetheless, assessment of this population is necessary because the expanding gray seal population likely will interact with fisheries and compete with other marine mammal species in the area in the near future. The investigators intend to tag as many weaned pups as possible on Muskeget Island during the winter of 2008. They also plan to measure each pup and collect various samples for use in population and disease studies. This study is intended to initiate a long-term investigation of breeding behavior, demography, and ecology of gray seals at Muskeget Island.

Developing a strategic plan for a cooperative disease center for marine animal health (The Regents of the University of California on behalf of the University of California, Davis)

Despite growing recognition of mortality events and disease outbreaks associated with pollutants, pathogens, and biotoxins, the United States currently does not have a nationally coordinated approach for surveillance and investigation of marine animal health. In particular, the United States does not have a designated laboratory to analyze marine animal samples, respond to analytic needs during unusual mortality events, and evaluate the effects of changing environmental conditions on the health of marine animals, all of which would promote more effective marine ecosystem management. This grant provided support for the investigators to convene a two-day workshop to identify the necessary elements of a national marine animal health program. To address these needs, the participants developed a strategy for a Cooperative Center for Marine Animal Health—a "virtual" center or alliance of existing agencies and organizations for guiding health-related research and response activities. The center would include a National Marine Mammal Health Program that would coordinate research activities among regional entities to maximize use of existing funding and resources. The investigators are drafting a strategic plan for this center, including its organizational structure, program goals and objectives, and steps needed to bring it to fruition.

Non-lethal deterrence to minimize pinniped-fishery interactions at Gold Beach, Oregon (Port of Gold Beach, Gold Beach, Oregon)

At the Marine Mammal Commission's 2007 annual meeting in Vancouver, Washington, the Commission learned about a developing pinniped-fishery interaction problem at Gold Beach, Oregon, and steps being taken to address the situation. The

number of California sea lions (*Zalophus californianus)* in the Gold Beach area has increased considerably in recent years, and in 2005 the Curry Sportfishing Association requested the assistance of the Service and the Oregon Department of Fish and Wildlife to work with local business owners, sport fishermen, and the Port of Gold Beach to reduce sea lion interactions with the lower Rogue River salmonid sport fisheries. The association believed that businesses were suffering economic losses as a result of interactions with sea lions and that the fishermen's frustration was putting individual sea lions at risk. In 2006 these parties initiated a project to (1) modify moorage and dock structures to prevent sea lions from hauling out on them, (2) eliminate the dumping of fish carcasses into the estuary to avoid attracting sea lions, and (3) use non-lethal deterrence measures to dissuade sea lions from taking hooked salmon from sport fishermen. The association deemed these actions to be highly effective at deterring pinniped-fishery interactions in 2006 and 2007 and sought funds to continue this work in 2008. The Commission provided a small grant to hire trained personnel to implement safe and effective non-lethal deterrence measures at the Port of Gold Beach to minimize interactions between California sea lions and fishermen.

Support of the Second International Conference on Acoustic Communication by Animals (Oregon State University, Corvallis)

In 2008 Oregon State University and the Acoustical Society of America convened the Second International Conference on Acoustic Communication by Animals in Corvallis, Oregon. The conference was organized to emphasize acoustic communication patterns across taxa and examined not only detection, production, and use of sounds but also the role of acoustic communication in animal evolution, ontogeny and learning, ecology, behavior, and social interactions. Portions of the conference also focused on animal adaptation to life in complex acoustic environments, an important topic in view of increasing levels of anthropogenic sound in the marine environment. The Marine Mammal Commission contributed funds to support student attendance at this conference and encourage involvement in this growing field.

A new species of beaked whale near Palmyra Atoll? (National Marine Fisheries Service, Southwest Fisheries Science Center, La Jolla, California)

In 2007 scientists suggested the possible occurrence of a new species or subspecies of beaked whale based on examination of the skulls of two *Mesoplodon* specimens stranded at Palmyra Atoll (a U.S. territory in the central Pacific Ocean) and genetic analyses of a tissue sample from a *Mesoplodon* stranded at Kirabati (Christmas) Island (Dalebout et al. 2007). Shortly thereafter, experts examined photographs of a pair of beaked whales just off Palmyra Atoll but were unable to identify these animals as their head and dorsal fin shapes did not match those of the two species (*Mesoplodon densirostris* and *M. peruvianus*) most likely to occur in the area. Acoustic data collected from hydrophones in 2007 also indicated that beaked whales were present around Palmyra Atoll and were vocalizing year-round, with peak vocalizations occurring from October to November. Based on this evidence, the investigators hypothesized that the beaked whales sighted near Palmyra Atoll could be members of an undescribed species or subspecies. They visited Palmyra Atoll in the fall of 2008 to investigate this hypothesis using photo-identification, biopsy-sampling, and acoustic data. Their observations are being compared to those for the two *Mesoplodon* species known to occur near Palmyra Atoll to either confirm similarity or support the hypothesis of a distinct subspecies or species in this area.

Review of present offshore oil and gas industry activities and potential future directions (Oceanic Environmental Solutions, Spring, Texas)

The investigator will review the areas where the offshore oil and gas industry is focusing its current efforts and where, based on current conditions, it is most likely to direct future efforts. The review will include current, projected near-term (less than 10 years), and long-term (10 to 20 years) activities in both U.S. and international waters. It will also include information on seismic exploration, development and production, marine transportation and shipping, pipelines, liquified natural gas terminals, and the most current technology for preventing, preparing for, and cleaning up oil spills. The review will provide insights regarding the process of

locating new areas for oil and gas exploration, the typical timeline for development and production, and various factors that may affect where and when exploration and development occur. Information in this report should promote proactive resolution of conservation-related problems stemming from the activities of the oil and gas industry.

Support for "Historical Perspectives," a new feature of the journal *Aquatic Mammals* (Aquatic Mammals, Moline, Illinois)

In 2008 *Aquatic Mammals* celebrated its 35th year. It is the longest-running, peer-reviewed journal focused on the science, veterinary care, husbandry, research, and training of aquatic mammals. To commemorate this milestone, the editors of *Aquatic Mammals* are publishing a series of essays on the history of marine mammal science. These papers feature scientists who have worked in various disciplines and shaped this field of study. In addition to the essays developed by each scientist, the journal will provide accompanying videos of interviews with the authors, as well as additional images and other archival materials. The goal is to capture the scientific knowledge and insights of these individuals and preserve this information for contemporary and future marine mammal scientists. The inaugural essay of the "Historical Perspectives" feature was published in 2008 (Volume 34, Issue 2), and one or two essays will be published in every issue over the next few years. Announcements will be posted on the *Aquatic Mammals* Web site when DVDs of each interview become available, and short trailers also will be available. This grant provides financial support to offset the costs of publishing the essays.

Human dimensions of marine mammal management in the Arctic: Implications for policy in a changing North (University of Alaska Fairbanks, Fairbanks, Alaska)

Inhabitants of Arctic coastal communities share a close relationship with their environment, and for many communities marine mammals constitute a large portion of their subsistence diet, contribute to the economy though the production of handicrafts and clothing, and attract tourism. As such, marine mammals are a key part of the social-ecological system consisting of the communities, their environments, and the social institutions developed to sustain them. Within this social-ecological system, tensions arise from the demands of conforming policy to national and international laws and norms while maintaining flexible, adaptive institutions rooted in an understanding of the ecological and social drivers of wildlife use, nature and significance of human-wildlife interactions, and the likelihood of successful conservation. The investigators for this project are exploring these tensions using a series of case studies involving policy conflicts in marine mammal management around the circumpolar North. The investigators convened a panel to explore these case studies in a special session on "Human dimensions of marine mammal management in the Arctic," held during the International Congress of Arctic Social Scientists VI Conference in Nuuk, Greenland in 2008. The investigators will submit for publication a volume including a manuscript for each case study and a synthesis paper analyzing the themes and findings of the case studies.

Improving acoustic survey methods for detecting the highly endangered vaquita (Oceanides Conservacion y Desarrollo Marino, Ensenada, Baja California, Mexico)

The vaquita (*Phocoena sinus*), endemic to Mexican waters, numbers only about 150 individuals and is one of the most critically endangered marine mammals in the world. The population has been decimated by entanglement in fishing gear (primarily gillnets), and available visual and acoustic survey data indicate that it is continuing to decline. Both the Mexican government and the North American Commission for Environmental Cooperation have developed plans for conserving the species, the central feature being the removal of gillnets and trammel nets from the distribution range of the vaquita. The plans also call for investments to help fishermen develop alternative, safe fishing gear or shift to alternative livelihoods, improved monitoring and enforcement, and research to monitor the status of the species and guide recovery efforts.

Because of the vaquita's elusive behavior, acoustic surveys appear to provide the most effective way to monitor the population. In this study, the principal investigators deployed autonomous acoustic detectors in the northern Gulf of Cali-

fornia during a 6 October to 25 November 2008 cruise conducted by the National Marine Fisheries Service's Southwest Fisheries Science Center. The deployment tested the utility of the acoustic gear in areas subject to natural forces (e.g., strong tidal currents) and anthropogenic impacts (e.g., fishery trawl and gillnet gear). The investigators also conducted visual surveys to compare visual and acoustic results, and they towed acoustic arrays behind a small sailboat to extend monitoring into shallow water areas. The ultimate goal is to develop a reliable system for monitoring the population's status, trends, and habitat-use patterns.

Support to convene a meeting of the IUCN Species Survival Commission's Pinniped Specialist Group and update the Pinniped Action Plan (International Union for Conservation of Nature, Gland, Switzerland)

The International Union for Conservation of Nature reconvened its Pinniped Specialist Group in 2007 after approximately a decade of inactivity. In 2007 the group updated status reports for all pinniped species as part of a global mammal assessment. Sixteen of the 35 recognized pinniped species now are included on the IUCN Red List of Threatened Species. In 2008 the Marine Mammal Commission and the National Marine Fisheries Service's Office of International Affairs provided matching funds to convene the specialist group for the purpose of updating the Pinniped Action Plan to address important conservation issues.

Support for translation services at the Fifth International Conference on Marine Mammals of the Holarctic (North Pacific Wildlife Consulting, Anchorage, Alaska)

Since 2000 scientists from Russia and other countries across the Northern Hemisphere have shared information at a series of biennial conferences on marine mammals of the Holarctic. These conferences provide an important opportunity to exchange the results of recent marine mammal and ecosystem studies in the western portions of the North Pacific Ocean, Bering Sea, and Chukchi Sea. At the 2006 conference in St. Petersburg, Russia, more than 200 participants from 13 countries heard 170 presentations about research on various marine mammal species. The Marine Mammal Commission provided support for translation of these presentations from Russian to English. The Commission provided similar support for the 2008 conference in Odessa, Ukraine, as well as real-time translation (Russian to English) of conference presentations and dual-language printings of conference proceedings.

Support for publication of the monograph, "Cetaceans of the Southern Hemisphere: Biology and the prospect of population recovery" (North Pacific Wildlife Consulting, Anchorage, Alaska)

Whaling fleets from nations including the Union of Soviet Socialist Republics and Japan killed as many as 50,000 whales per year through the mid-twentieth century. Following World War II, technological developments such as the advent of factory trawlers led to increased numbers of whales being killed. Beginning with the 1949–1950 whaling season, Soviet fleets falsified data submitted to the International Whaling Commission (IWC) on the number of whales taken annually to hide their illegal whaling activity. Y. Mikhalev was a member of the science crew and a whale observer on many Soviet whaling expeditions that occurred from 1964 through 1975 in the Southern Ocean and adjacent Indian Ocean. He collected data on the number of whales killed by species, their distribution, and certain biological parameters. For example, he created maps of whale distribution based on sightings of more than 200,000 individuals, and described pre-natal growth based on measurements of 16,433 fetuses. Dr. Mikhalev also measured the overall body, organ, and tissue mass of the whales and collected teeth samples from 1,877 odontocetes and ear-plug layers from 12,800 mysticetes for age determination. He compared the actual whaling data with those submitted to the IWC by the Soviet Union. He sought to correct the Soviet Union's data and to promote whale conservation during a time when doing so was unpopular. He also developed a monograph entitled "Cetaceans of the Southern Hemisphere: Biology and the prospect of population recovery" to document the information he had collected during whaling expeditions. This grant will fund publication (in Russian) of the monograph to ensure the information is available to current and future biologists.

Ecological studies of sea otters in the Commander Islands, Russia (University of California, Santa Cruz)

In 2006 scientists from the University of California, Santa Cruz, initiated a long-term field study on sea otters and coastal ecosystems of the Commander Islands, Russia, to (1) characterize the behavior, demography, and ecosystem dynamics of a system in which sea otters are at or near equilibrium density, and (2) compare those results with observations of the sea otter population in southwest Alaska, which has collapsed. The scientists have been conducting annual surveys to document sea otter population density and trends in the Commander Islands and analyzing beach-cast carcasses to determine sex and age structure, possible causes of death, and mortality patterns at Bering Island, one of the Commander Islands. They also have conducted tagging and radio telemetry studies, including deployment of archival time-depth recorders, on animals at Bering Island to investigate sea otter movements, diving behavior, reproduction, weaning success, and adult mortality. This grant provides support for fieldwork in 2008 to recover instruments from the 20 surviving animals that were tagged in 2006 and document their activities, diet and foraging behavior, movement patterns, and habitat distribution.

Genetic differentiation, individual dispersal, and effective population size of the New Zealand Hector's and Maui's dolphins: Implications for management (Oregon State University, Corvallis)

The Hector's dolphin (*Cephalorhynchus hectori*) and the recently proposed Maui's dolphin subspecies (*C. h. maui*) are endemic to the coastal waters of New Zealand. Both exhibit low abundance and genetic diversity, regional fragmentation, low reproductive rates, and high rates of fisheries-related mortality. The Maui's dolphin population consists of approximately 100 individuals. The International Union for Conservation of Nature has classified the Maui's dolphin as critically endangered and the Hector's dolphin as endangered. The discontinuous or fragmented distribution of these populations increases their risk of low genetic diversity and eventual extinction. In August 2007 the New Zealand Ministry of Fisheries and Department of Conservation published the Hector's and Maui's Dolphin Threat Management Plan and listed the investigation of dispersal and gene flow as one of the four highest research priorities for the species.

The principal investigator will estimate genetic differentiation, sex-biased gene flow, individual dispersal, and effective population sizes of local and regional groups around the South Island (east, west, and south coasts) and the single surviving local population of Maui's dolphin from the west coast of the North Island. These estimates will be based on the largest genetic dataset assembled to date for these subspecies, with samples from 335 Hector's dolphins and 48 Maui's dolphins. The research will focus on levels of short-term dispersal and long-term gene flow among these groups to improve understanding of and make recommendations for recovery of these populations by protecting habitat and managing fisheries-related mortality.

Review of literature on the Okhotsk Sea bowhead whale population (Yulia V. Ivashchenko, Seattle, Washington)

The current status of and threats to the Okhotsk Sea population of bowhead whales (*Balaena mysticetus*) are poorly understood. Whalers hunted this population intensively in the mid-1800s and then continued sporadic whaling until about 1913. Whaling resumed in 1967 when the Union of Soviet Socialist Republics began taking bowheads illegally. The number of whales killed in this later period remains unknown. The International Union for Conservation of Nature lists the population as endangered, noting that "the available, albeit tentative information on abundance suggests that the mature population size is below 250 individuals." In 2008 the International Whaling Commission expressed great concern about this stock because of the effects of hunting, its apparent low population size, and potential risks from human activities (including entanglement in fishing gear). The International Whaling Commission recommended additional studies to assess its status.

Responding to the need for better information, the principal investigator will conduct a comprehensive review of existing Okhotsk Sea bowhead whale literature, including original papers and other materials written in Russian. Topics will include

abundance, distribution and seasonal movements, habitat use, population structure, whaling history, and anthropogenic threats. The resulting information will inform the design of future sighting surveys to better determine the current abundance and distribution of this population and assess its status and conservation needs.

Southern right whale stranding response at Península Valdés: Monitoring right whale health and building Argentine capacity (Whale Conservation Institute–Ocean Alliance, Lincoln, Massachusetts)

The Southern Right Whale Health Monitoring Program is a joint effort of government agencies and non-profit organizations to monitor southern right whale strandings at Península Valdés, Argentina. Península Valdés is an important nursery ground for the Patagonian population of southern right whales (*Eubalaena australis*) and has been the site of a number of right whale strandings, including one in 2007. Between June and December 2007, 31 percent (42 of 136) of the calves recorded in Golfo Nuevo died in that bay. Scientists from the United States worked with members of the Argentine stranding team to collect tissue samples and conduct necropsies. Sample collection was limited by the lack of local resources. As a result, the laboratory results were inconclusive and could not be used to determine the cause of the die-off. The Commission provided support to help build monitoring and response capacity at Península Valdés. Specifically, the funds were provided to create a program coordinator position to oversee the monitoring and stranding response program; support aerial and land-based surveys of beaches; support response efforts; reduce response time to ensure collection of adequate samples; ensure mechanisms for storing, transporting, and analyzing samples and summarizing results to inform regional managers regarding potential stressors to right whales; and convene the first annual meeting of wildlife biologists and officers, local government officials, and members of the response program to discuss health monitoring techniques and the health issues faced by animal populations in the region.

Foraging behavior and dietary preferences of the South American sea lion (*Otaria flavescens*): Resource competition with artisanal and coastal bottom trawl fisheries in Uruguay (Federico Riet Sapriza, Cetáceos Uruguay, Montevideo)

The South American sea lion (*Otaria flavescens*) population in Uruguay has declined dramatically during the last decade. Risk factors include interactions with and illegal killing by local artisanal fisheries, bycatch in trawl fisheries, and resource competition with commercial fisheries and the sympatric South American fur seal (*Arctocephalus australis*). Neither the South American sea lion nor the threats to it have been well studied to date. The Commission provided a grant for studies of the sea lion's diet and foraging behavior and the potential impacts of fisheries on them. The investigator will use a number of standard scientific methods to characterize their diet and foraging habits and movement patterns to determine the degree of spatial and temporal overlap with fisheries in the coastal regions of Uruguay.

Retrospective investigation of and report on two marine mammal mass strandings in southern Iran (Downstream Research Group, LLC, Macon, Georgia)

In 2007 two dolphin mass mortality events occurred off the southern coast of the Islamic Republic of Iran. The events were approximately one month and 170 km apart. The first event was reported on 20 September when 79 dolphins, all dead and decomposed, washed ashore along 13 km of coastline approximately 125 km east of Jask. Subsequent examination of carcass features indicated that these likely all were spinner dolphins (*Stenella longirostris*). The second event, on 24 October, involved at least 73 live striped dolphins (*Stenella coeruleoalba*) in the mouth of Kangan Bay near the village of Kuh Mobarak (45 km west of Jask). Despite the villagers' best attempts to return these animals to the sea, all had died by the end of the day. These mortality events were considered to be unusual in Iran and attracted much interest from the public and the government. The Iran Department of Environment

and the Regional Organisation for the Protection of the Marine Environment (ROPME), based in Kuwait, both asked the International Union for Conservation of Nature's Cetacean Specialist Group for assistance in investigating the causes of these events. Two members of the specialist group visited Iran on 21–25 November 2007 and met with representatives from the Department of Environment, Iranian Fisheries Research Organisation, Fisheries Department (Shilat), research and diagnostic laboratories and veterinary institutes, the captain of a purse-seining vessel in Bandar Abbas port, and local fishermen from the stranding locations. They obtained and examined the available information, including photographs and video recordings from each event and biological samples from the animals. The Marine Mammal Commission supported the specialist group members for the purpose of developing a report on the investigation and potential causes of the two dolphin mass mortality events.

Meeting on marine mammal mass strandings with environmental experts from ROPME member states (Downstream Research Group, LLC, Macon, Georgia)

Following two dolphin mass mortality events along the southern coast of the Islamic Republic of Iran in 2007, member states of the Regional Organization for the Protection of the Marine Environment (ROPME) convened a meeting in Tehran on 16–19 November 2008 to discuss the strandings and consider development of regional stranding networks. ROPME is comprised of the eight coastal states (Bahrain, the Islamic Republic of Iran, Iraq, Kuwait, Oman, Qatar, Saudi Arabia and the United Arab Emirates) surrounding the Persian Gulf and Gulf of Oman. Iran's Department of Environment hosted the meeting and provided logistic support. The Marine Mammal Commission supported travel for a cetacean biologist and veterinary pathologist to attend the meeting and provide technical expertise. Both are members of the International Union for Conservation of Nature's Cetacean Specialist Group, and both had traveled to Iran in 2007 to investigate the two stranding events. The meeting included discussions of marine mammal biology, ecology, and identification, as well as potential causes of stranding and the benefits of stranding networks to respond to such events and investigate their causes. All participants agreed that national stranding networks should be established to address future strandings. To that end, the participants agreed to develop plans detailing the roles of each agency and the persons responsible for fulfilling these roles and to submit that information to ROPME early in 2009.

Survey of Federally Funded Research

From 1974 to 2000 the Marine Mammal Commission conducted an annual survey of federally funded marine mammal research and studies. The survey provided information on the species, geographic regions, and research topics and issues investigated, as well as the supporting and performing agencies, offices, and organizations. In 2006 and 2007 the Commission created a relational database for these funding data and analyzed funding trends between 1980 and 2000. The database allows analyses of funding by specific research topics, geographic regions, and species or species groups.

In 2008 the Commission consulted with representatives of other federal agencies and then worked with Washington Consulting Government Services, a subsidiary of Alion Science and Technology, to develop a Web-based survey form. The survey will be tested in the spring of 2009 and will go online shortly thereafter. Subsequently, the Commission will conduct the survey annually to enable it to track federal investment in marine mammal science, identify trends in funding, detect duplicate research efforts, prevent unnecessary spending, evaluate the effectiveness and cost-effectiveness of marine mammal research and conservation efforts, and monitor the government's success in meeting the goals of the Marine Mammal Protection Act.

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Chapter VII

MARINE MAMMAL HEALTH AND STRANDING RESPONSE

A large number of bottlenose dolphins (*Tursiops truncatus*) stranded along the U.S. Atlantic coast in 1987 and 1988. To address concerns related to this event, the 1992 amendments to the Marine Mammal Protection Act called for a Marine Mammal Health and Stranding Response Program. The National Marine Fisheries Service subsequently established the program for the purposes of (1) facilitating the collection and dissemination of reference data on the health of marine mammals and health trends of marine mammal populations in the wild; (2) correlating the health of marine mammals and marine mammal populations in the wild with available data on physical, chemical, and biological environmental parameters; and (3) coordinating effective responses to unusual mortality events (UMEs) by establishing a process in the Department of Commerce in accordance with section 404 of the Act.

Furthermore, the 1992 amendments directed the Secretary of Commerce to—

- establish an expert working group, the Working Group on Marine Mammal Unusual Mortality Events, to provide advice on measures necessary to better detect and respond appropriately to future UMEs involving marine mammals,
- develop a contingency plan for guiding responses to such events,
- establish a fund to compensate people for certain costs incurred in responding to UMEs,
- develop objective criteria for determining when sick and injured marine mammals have recovered and can be returned to the wild,
- continue development of the National Marine Mammal Tissue Bank, and
- establish and maintain a central database for tracking and accessing data concerning marine mammal strandings.

Marine Mammal Health and Stranding Response Program

On 16 March 2007 the Service published a notice of availability of a draft programmatic environmental impact statement for its health and stranding program. The draft statement describes four proposed actions:

(1) issuance of final guidance for *Policies and Best Practices for Marine Mammal Stranding Response, Rehabilitation, and Release*;
(2) issuance of a new Endangered Species Act / Marine Mammal Protection Act permit to authorize the program to take marine mammals while responding to stranding events involving endangered marine mammal species, disentangling marine mammals from fishing gear and marine debris, conducting biomonitoring projects, and importing and exporting marine mammal tissue samples;
(3) continuation of current program operations, including response, rehabilitation, release, and research activities involving marine mammals, as well as renewal and authorization of stranding agreements and other Service activities referenced in the draft statement; and
(4) continuation of the John H. Prescott Marine Mammal Rescue Assistance Grant Program.

The draft programmatic statement evaluated three alternatives (no action, status quo, and preferred) based on six key considerations. Under

the preferred alternative, the National Marine Fisheries Service would (1) establish stranding agreement criteria and develop a new stranding agreement template; (2) recommend that carcasses of chemically euthanized animals be transported offsite for disposal; (3) issue new stranding authorizations, continue to authorize rehabilitation activities, and implement new standards for rehabilitation facilities; (4) issue new stranding agreements, continue release activities, and implement final release criteria; (5) continue the current activities of the disentanglement network on the East Coast, but modify those authorized on the West Coast, and implement disentanglement guidelines and training prerequisites; and (6) issue a new Endangered Species Act/Marine Mammal Protection Act permit to include current and future biomonitoring and research activities.

On 30 May 2007 the Marine Mammal Commission wrote to the National Marine Fisheries Service, commending the program for developing the draft programmatic environmental impact statement, coordinating responses to stranding events nationwide, providing care for stranded marine mammals, and examining carcasses and collecting tissue samples to assess possible causes of morbidity and mortality. The Commission noted, however, that certain issues in the draft statement warrant more discussion and other important issues not addressed warrant inclusion. The Commission's comments are covered in detail in the Commission's 2007 annual report and will not be repeated here. The final programmatic analysis had not been released at the end of 2008 but is expected early in 2009.

Unusual Mortality Events in 2008

The Working Group on Marine Mammal Unusual Mortality Events considered five UMEs that began in 2007 to be ongoing in 2008 and further recommended to the National Marine Fisheries Service that it declare three new events. The group also voted to close and accept final reports on six other events that occurred in 2006 and 2007. Accounts of all 14 events follow, beginning with those declared 2008 and ending with those that were closed in 2008. The Office of Protected Resources in the National Marine Fisheries Service administers the UME program and posts reports on these events on its Web site (http://www.nmfs.noaa.gov/pr/health/mmume/). These reports may not be final and may reflect inconsistencies in interim field reports and draft summaries. Figure 31 shows the number of UMEs per year by cause for the period 1991–2007. Figure 32 breaks out the UMEs by (a) geographic area, (b) species affected, and (c) cause. Determining the actual number of animals that stranded and were processed for further analysis can be confusing when large numbers of strandings occur over a short period of time, a variety of analyses must be conducted, and numerous response organizations and laboratories are involved. The numbers reported here should be considered approximate, provisional, and contingent on a final update and verification by the Service.

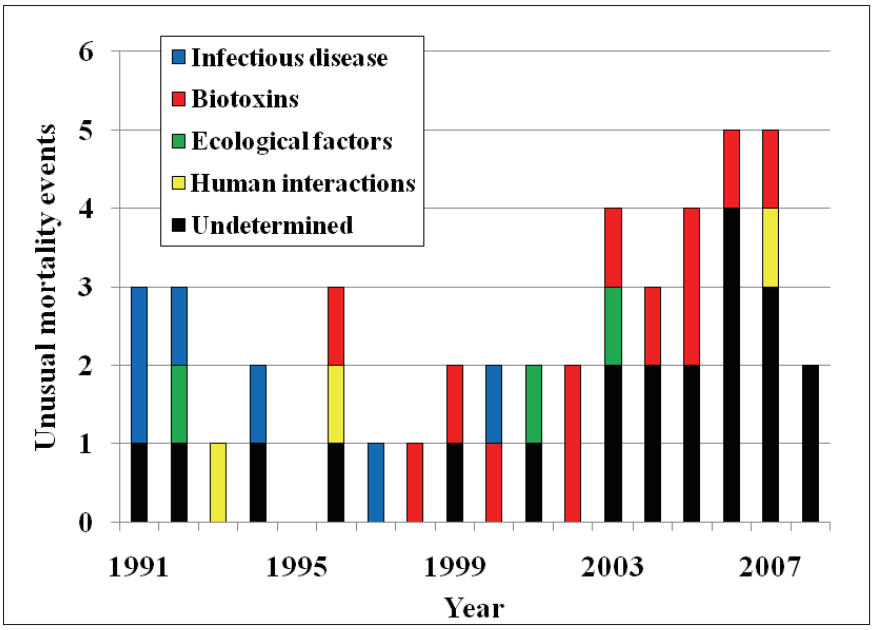

Figure 31. Number of marine mammal unusual mortality events per year by cause, 1991–2007

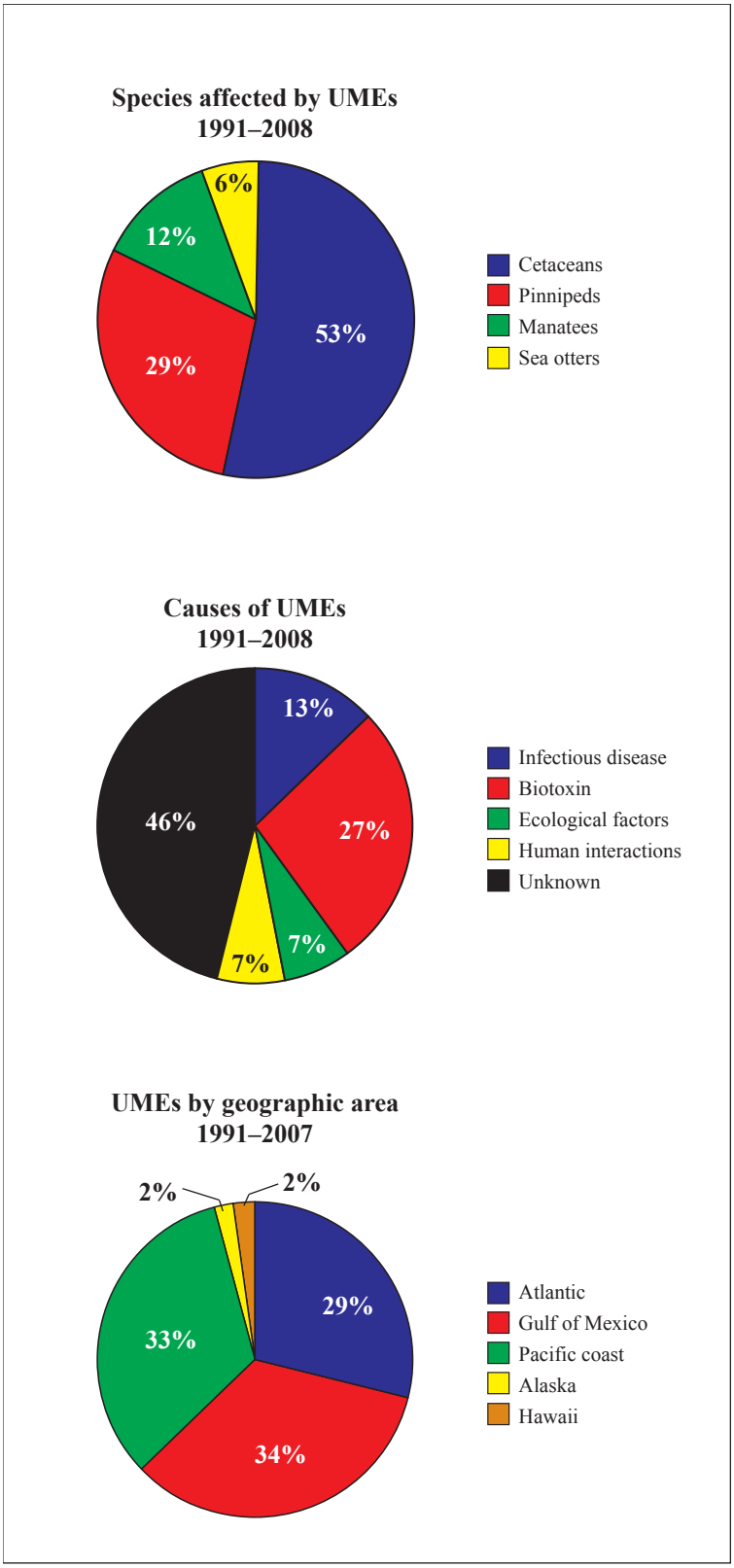

Figure 32. Unusual mortality events by species affected, causes, and geographic area

Indian River Lagoon Dolphins in Florida

From 3 May through August 2008 at least 40 bottlenose dolphins died in Florida's Indian River Lagoon. The investigating team determined that 6 of the 40 deaths involved direct human interactions: four involved ingestion of recreational fishing gear or trash and two involved entanglement in fishing gear. The National Marine Fisheries Service declared this a UME on 1 August 2008 because of the high mortality of males and calves. Potential causes include contaminants, biotoxins (possibly lingering effects of brevetoxins), or an infectious agent. Tests for harmful algal bloom toxicity were negative, but investigators planned to conduct additional testing. Moderate blooms of the dinoflagellate *Pyrodinium* occurred in the area but peaked in mid-July, well after the first dolphin deaths. The investigation was ongoing at the end of 2008. This is the second UME for this species in this location since 2001.

Mid-Atlantic Offshore Delphinids

Between 1 January and 26 April 2008 at least 31 common dolphins (*Delphinus delphis*) and 4 female Atlantic white-sided dolphins (*Lagenorhynchus acutus*) stranded along the Atlantic coast from New Jersey to North Carolina. Of these, 14 were known to be alive when they stranded, but responders euthanized all 14 because of their poor condition. The Service declared the strandings to be a UME on 8 April 2008 because the number of strandings was high relative to observations in previous years. Scientists performed necropsies on 23 of the 35 carcasses. Biotoxin tests were negative based on samples from five carcasses. The event was declared over on 6 August 2008, but the investigation was ongoing at the end of 2008, pending analyses for contaminants, his-

topathological exams, and evaluation of potentially relevant environmental parameters for the mid-Atlantic region, such as water temperature, changes in fishery effort, and changes in prey availability.

Bottlenose Dolphins in Texas

Between February and March 2008 at least 129 bottlenose dolphins and one melon-headed whale (*Peponocephala electra*) stranded along the Texas coast, with the majority of strandings in Galveston and Jefferson Counties. Most, if not all, of the bottlenose dolphins likely were from the coastal stock although scientists have not conducted the genetic analyses needed to confirm that assumption. The Service declared a UME on 20 March 2008. Responders conducted necropsies on 39 carcasses. Eleven of those dolphins were tested for the presence of algal biotoxins, and low levels of okadaic acid and domoic acid from toxic plankton were present in the feces and stomach contents in three dolphins. Water samples taken before and during the event contained okadaic acid, and on 7 March 2008 officials in Texas closed some bays to shellfish harvesting because of the presence of *Dinophysis* sp., a toxic alga that causes diarrhetic shellfish poisoning in humans. Although the limited evidence suggests a harmful algal bloom may have caused this event, as well as a 2007 event involving 64 bottlenose dolphins in the same area and season, the working group was still conducting its investigation at the end of 2008. The event has not been officially closed, but the unusual mortalities apparently did not continue past August 2008.

Cetaceans in California

Between April 2007 and September 2008 at least 96 individuals of the following species stranded along the California coast: 51 common dolphins, 31 harbor porpoises (*Phocoena phocoena*), five bottlenose dolphins, four gray whales (*Eschrictius robustus*), two sperm whales (*Physeter macrocephala*), one minke whale (*Balaenoptera acutorostrata*), one Risso's dolphin or grampus (*Grampus griseus*), and one unidentified small cetacean. Scientists attribute most of these strandings to domoic acid, a toxin that is produced by diatoms of the genus *Pseudo-nitzschia* and that causes amnesic shellfish poisoning in humans. However, 5 of the 51 common dolphins had gunshot wounds.

Since the 1990s domoic acid toxicity has caused the death and stranding of many cetaceans and pinnipeds along the California coast. Pinniped strandings presenting evidence of domoic acid toxicity are now categorized as "repeat events." Similar cetacean mass stranding events have been documented in 2002, 2003, 2007, and 2008. To avoid straining the resources available for large stranding events, cetacean strandings presenting evidence of domoic acid toxicity also may be categorized as repeat events in the future. Whether classified as UMEs or repeat events, they are important biological and ecological phenomena indicative of marine ecosystems under stress. For that reason, responders should continue to investigate and document these events.

Guadalupe Fur Seals in Oregon and Washington

On 16 November 2007 the Service declared a UME for Guadalupe fur seals (*Arctocephalus townsendi*) based on the stranding of 15 seals on the beaches of Oregon and Washington in June and July 2007. The Guadalupe fur seal is listed as threatened under the Endangered Species Act and depleted under the Marine Mammal Protection Act. Guadalupe fur seals breed almost exclusively on Guadalupe Island, Mexico, but forage more widely in waters west of Mexico and California. The population has been recovering from hunting and scientific collections that continued through the 19th century, bringing the species to near-extinction by the early 20th century. Approximately six stranded Guadalupe fur seals are recorded each year in southern California, but the event in 2007 was unusual because more than twice as many animals also stranded in Oregon and Washington where only one individual, a yearling, had been reported in previous years. An additional live stranding in Homer, Alaska, and two other live strandings in northern California were not included in the official tally for the UME but may be part of the same process that produced the Oregon-Washington strandings. The three live-stranded animals found off Oregon and Washington were all successfully rehabilitated by

the Alaska SeaLife Center, Seward, Alaska, or the Marine Mammal Center, Sausalito, California, and released back into the wild in southern California later in 2007. The one animal that stranded alive in Oregon was not considered suitable for release back into the wild and is housed at SeaWorld in San Diego. Of the 14 animals that stranded dead, 11 were recovered for examination and sampling. Responding officials conducted necropsies on six carcasses and froze five others for later examination. Investigators suspect that malnutrition caused these strandings, as the animals involved were well north of their usual range during a 2006–2007 El Niño event. Protozoan infections from *Toxoplamsa gondii* and/or *Sacrocystis neurona* also could have contributed to the poor condition and eventual stranding of some or all of the animals. Tests for biotoxins were negative. The working group had not closed this event at the end of 2008.

Blue Whales along the Southern Coast of California

On 11 October 2007 the Service declared an unusual mortality event based on observations of three dead blue whales (*Balaenoptera musculus)* floating near the Channel Islands off southern California. Later the group added a fourth dead blue whale found on the coast of San Miguel Island, one of the Channel Islands. All four carcasses exhibited injuries indicative of a vessel strike. Investigators determined that the distribution of krill (the primary food of blue whales) was closer to the surface and farther east than in previous years, which may have led to the whales spending more time near the surface and closer to designated shipping lanes where they were more vulnerable to a vessel strike. Shortly after the whales were discovered, the Port of Los Angeles, U.S. Coast Guard, and National Marine Fisheries Service issued various notices to warn mariners of the presence of the whales in or near shipping lanes. More recently, the Channel Islands National Marine Sanctuary Advisory Council recommended that the National Marine Fisheries Service and the U.S. Coast Guard issue such warnings as soon as blue whales are seen in the Santa Barbara Channel. On 26 June 2008 the Coast Guard did issue another notice warning mariners of the need for caution when blue or other whales might be feeding or traveling through the area in summer and early fall. The Service was still investigating the 2007 event at the end of 2008.

Harbor Porpoises in the Pacific Northwest

In 2006 at least 64 harbor porpoises (*Phoca vitulina*) stranded along the coasts of Oregon and Washington. On 3 November 2006 the Service declared these strandings a UME beginning on 11 January 2006. In 2007 another 50 porpoises stranded, bringing the total to 114. The number of adult and subadult strandings was similar to prior years, but the number of calf and yearling strandings increased greatly during 2006 and 2007. During that period, responders found only six of the stranded porpoises alive. They released four back to the sea and euthanized the other two for humane reasons. The investigating team conducted detailed postmortem exams of 82 porpoises. The team found evidence of accidents and traumas, including interaction with fishing gear, in approximately one-third of the animals examined but were unable to determine a cause in another third of the cases. For the remaining third, the investigators found evidence of nutritional stress, toxicity, and a variety of symptoms indicative of disease or parasite infestation. The investigators are analyzing tissue samples for chemical contaminants, biotoxins, and evidence of disease. The investigators are also examining potentially relevant environmental data, such as sea surface temperatures and currents. The number of reported standings could have increased as a result of population growth or a shift in population density or distribution, and it could have increased because more people are using these beaches and stranded animals are more likely to be observed and reported. In 2008 the working group recommended that the Service declare this event closed, but the Service had not acted on that recommendation or finalized the event report at the end of 2008.

Alaska Sea Otters

As described in the Commission's 2007 annual report, the frequency of sea otter (*Enhydra lutris*) strandings in south-central Alaska began to increase in 2000, or perhaps earlier, and by the summer of 2006 the rate exceeded one stranding per day in Cook Inlet's Kachemak Bay. Up until 2006 the annual

number of strandings ranged from 16 to 67. On 24 August 2006 the Service declared a UME. From 2006 to 2008 the annual number has been between 99 and 111. The total reported strandings for 2002 through 2008 reported was 449. Some of the increase in 2006–2008 may reflect increased effort to find and recover dead and stranded animals, particularly in the more populous region of Homer and Kachemak Bay. However, the age and gender of the dead animals and early necropsy findings suggest that the increase in mortality was not due to increased effort alone. Prime-age adult males made up an unexpectedly large proportion of the carcasses. Responders have thus far recovered more than 336 carcasses and conducted partial or full necropsies on 304 of them, including 64 cases for which final histopathology reports have been completed. The investigating team found evidence of vegetative endocarditis and signs of sepsis in 52 percent of the 64 cases that were subjected to full histopathological exams. The team found the bacteria *Streptococcus bovis* complex or *Streptococcus infantarius* subsp. *coli* in these cases. Most of the stranded otters were from the south-central Alaska stock, particularly Kachemak Bay, but about 10 percent were from the southwest stock, which is listed as threatened under the Endangered Species Act. The working group considered this event to be ongoing at the end of 2008.

Humpback Whales along the Atlantic Coast

Between 1 January 2006 and 31 December 2007 scientists documented 48 deaths of humpback whales (*Megaptera novaeangliae*) along the Atlantic coast: 46 were in U.S. waters, 1 was in Canadian waters, and 1 in waters off Bermuda. Twenty-nine were found floating at sea, making sampling difficult. Responders conducted full or partial necropsies on 16 carcasses. Seven showed signs of entanglement in fishing gear, and four others showed signs of a vessel strike. One calf appeared to have died from starvation, possibly after becoming separated from its mother. Responders sampled four carcasses for biotoxins. One tested positive for domoic acid and another for saxitoxin, but the detected levels were likely too low to have caused mortality. In July 2008 the working group recommended that the Service declare this event closed.

Pinnipeds in the Northeastern United States

In 2006 more than 1,100 pinnipeds, mostly subadult and adult gray seals (*Halichoerus grypus*) and harbor seals, stranded along the northeastern U.S. coast. The number of strandings was considerably greater than the average from previous years (about 230, mostly pups), and the Service declared a UME. Early investigations revealed evidence of morbillivirus in a few stranded animals, which led to concern about a large die-off like those in northern Europe when approximately 20,000 seals died in 1988 and 2002. In 2006, investigators took samples and conducted tests for morbillivirus, herpes virus, *Brucella*, leptospirosis, avian flu, biotoxins and chemical contaminants. In 2007 the number of strandings was lower than average, but sampling and testing for morbillivirus continued because of concern about a pandemic. In total, investigators tested samples from 853 individuals, most of which were harbor seals because historical records indicate gray seals are not as vulnerable to morbillivirus. Results from those tests are not yet available.

Recent increases in gray and harbor seal populations from the Gulf of Maine south to Cape Cod complicate the interpretation of this event. Many of the animals involved were subadults or adults, suggesting the cause was not a simple function of population growth. Although humpback whale strandings along the Atlantic coast overlapped this event in space and time, the existing evidence does not indicate a link between them. In June 2008 the Service concluded that the event occurred between 20 April 2006 and 31 October 2007 and therefore declared the UME to be over. At the end of 2008 a final report had been drafted but not reviewed and distributed.

Southwest Florida Manatees

From 7 March to 28 April 2007 a total of 44 manatees (*Trichechus manatus*) stranded dead in southwest Florida, 43 along the coast of Lee County and 1 in neighboring Glades County. In addition, six manatees stranded alive with evidence of brevetoxicosis. Five of the latter group swam away after being refloated, and their fate is unknown. Responders took the sixth manatee to a rehabilitation facility where it died. Investigators conducted nec-

ropsies on 45 carcasses and concluded that 38 had died from exposure to brevetoxins produced by the dinoflagellate *Karenia brevis*, three from watercraft collisions, one from cold stress, and three from undetermined causes.

This event coincided with a red tide event that began in late June 2006 and continued through the winter with patches persisting to early spring 2007. By April the red tide was no longer detectable in Lee County, and manatee deaths returned to normal levels. This was the fourth red tide-induced mortality event for Florida manatees since 2002 (see the following section on the Everglades UME). At the end of 2008 the working group was considering whether to classify future manatee die-offs from brevetoxicosis as repeat events rather than UMEs.

Florida Manatees in Everglades National Park

Between 9 November and 31 December 2006 a total of 24 manatee carcasses were reported in the Everglades National Park between the Broad River and the border between Monroe and Collier Counties. The Service declared a UME on 27 December 2006. Investigators conducted necropsies and sampled 10 of the 24 carcasses for brevetoxins. They concluded that nine had died of brevetoxicosis caused by *Karenia brevis* and, based on circumstantial evidence, they also concluded that the remaining animals, including four found dead outside the event area, also died from brevetoxicosis. The Service declared the event closed on 14 April 2008.

Texas and Louisiana Bottlenose Dolphins

From February to March 2007 at least 64 bottlenose dolphins stranded along the coasts of Texas and Louisiana. Investigators considered biotoxins to be the most likely cause, although the evidence was not sufficient to confirm that diagnosis. Stranding levels returned to normal after March 2007, and the working group concluded that the time frame of the event was from 25 February to 27 March 2007.

Multiple Species along Florida's West Coast

Between March 2005 and December 2006 at least 130 manatees and 173 dolphins stranded along the west coast of Florida. Seabirds, sea turtles, and fish also stranded or washed ashore in this region. The manatee mortalities preceded the dolphin mortalities. The working group recommended that the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Florida Fish and Wildlife Conservation Commission, and related agencies combine their efforts into one comprehensive investigation, which was implemented by November 2005. The agencies determined that the event likely was caused by brevetoxicosis from a red tide and were preparing a final report at the end of 2008.

Prescott Grant Program

The Marine Mammal Rescue Assistance Act of 2000 amended Title IV of the Marine Mammal Protection Act and instructed the Secretaries of Commerce and the Interior to conduct a grant program to be known as the John H. Prescott Marine Mammal Rescue Assistance Grant Program. The program, which is subject to the availability of appropriations, provides financial assistance for participants of marine mammal stranding networks to carry out critical activities including recovery or treatment of stranded marine mammals, collection of data from living and dead stranded marine mammals, and payment of operational costs directly related to those activities. Each award has a maximum of $100,000 and may be granted for a period of up to three years. An applicant may receive no more than two awards per competition.

The National Marine Fisheries Service administers the grant program for species under its management jurisdiction. The Fish and Wildlife Service has neither requested nor received Prescott funds since the program's inception in 2001. The National Marine Fisheries Service, on the other hand, consistently has requested Prescott funds and awarded Prescott grants. For fiscal year 2008 technical and merit review panels evaluated 70 eligible proposals and selected 39 for funding. The National Marine Fisheries Service distributed $3.7 million among those 39 projects and one additional grant to the National Fish and Wildlife Foundation for use in emergencies. In July 2008 the National Marine Fisheries Service solicited proposals for grants to be awarded in fiscal year 2009 and received 84 proposals.

Chapter VIII

MARINE MAMMAL/FISHERY INTERACTIONS

Interactions between marine mammals and fisheries are widespread and growing. These are often described as either direct or indirect. Direct fishery interactions may involve the bycatch of marine mammals in fishing gear, entanglement in active or discarded fishing gear, depredation of fish catch (marine mammals taking bait or catch from the gear), and measures to harass marine mammals to protect gear and catch. Indirect interactions (equivalent to operational or ecological; see Northridge and Hofman 1999) involve such things as competition for prey or changes to ecosystem trophic structure brought about by the removal of fish from the ecosystem.

Management efforts under the Marine Mammal Protection Act have been far more successful at addressing direct interactions although those also have at times been difficult to resolve. Direct fishery interactions still result in the deaths of thousands of marine mammals each year in U.S. fisheries (Read 2005), despite the considerable protections afforded by the Act. The number of marine mammals killed worldwide is in the hundreds of thousands (Read 2005). Indirect effects may have equally or more severe consequences, but they are only recently beginning to receive fishery management attention. Movement toward ecosystem-based management should promote better assessment of indirect fishery effects.

In 2008 the Marine Mammal Commission requested proposals for study of indirect fishery effects; the results of work carried out under the resulting awards will be discussed in the Commission's 2009 annual report. All of the interactions, direct and indirect, can reasonably be expected to increase in the foreseeable future as marine mammal populations recover from previous states of depletion and human populations continue to grow, thereby increasing demand for seafood and coastal habitat. In addition, because fisheries for wild stocks have more or less peaked, aquaculture is expected to increase significantly in the coming decades (FAO 2009) and will undoubtedly be a source of interactions, particularly with pinnipeds.

This chapter describes efforts during 2008 to improve stock assessments and the data on fishery interactions needed to make informed management decisions about those stocks. It also describes the activities of take reduction teams created to address incidental taking of marine mammals in fisheries, the status of dolphin populations in the eastern tropical Pacific Ocean, and events related to interactions between California sea lions and salmonids at the Bonneville Dam.

Stock Assessments and Fishery Interactions

The Marine Mammal Protection Act establishes the framework for managing the incidental take of marine mammals in commercial fisheries. The Act requires federal resource agencies to (a) assess the status of all marine mammal stocks in U.S. waters, (b) monitor the incidental take of marine mammals by commercial fishing operations, (c) classify fisheries based on their relative level of incidental take, and (d) implement fishery management measures or explicit take reduction plans to address situations where incidental take is not sustainable. With regard to stock assessment, the Act requires the Na-

tional Marine Fisheries Service and U.S. Fish and Wildlife Service to prepare and periodically update stock assessment reports for each stock of marine mammals occurring in U.S. waters under their respective jurisdictions[1]. Each stock assessment report is required to describe the geographic range of the stock and provide estimates of the stock's minimum population size, population trend, current and maximum net productivity rates, and potential biological removal level[2] (PBR). This level is calculated based on the stock's minimum population estimate, maximum net productivity rate, and a recovery factor that is designed to provide additional protection based on the relative status of the stock. Each stock assessment report also is required to describe commercial fisheries that interact with the stock and to estimate human-caused mortality and serious injury of the stock. Finally, each report is required to categorize each stock as strategic or not strategic. Stocks that are listed as threatened or endangered under the Endangered Species Act or depleted under the Marine Mammal Protection Act are considered to be strategic by default. Other stocks are categorized as strategic if the estimate of human-caused mortality and serious injury for the stock exceeds its PBR level.

On 13 June 2008 the National Marine Fisheries Service published its proposed List of Fisheries for 2009. The Marine Mammal Commission reviewed the list and concurred with the Service's decision to describe and evaluate high-seas fisheries and include them in the List of Fisheries, split and reclassify the category I Hawaii-based longline fishery into category II shallow-set and category I deep-set fisheries and reclassify the California halibut/white sea bass set net fishery from category I to category II. The Commission recommended that the Service reclassify all currently recognized West Coast trap and pot fisheries as category II until additional information is available to implicate a specific fishery as exceeding 50 percent of a stock's PBR level (which would warrant a category I classification) or to exonerate a fishery that does not operate in areas where and when humpback whales are present. The Commission also reiterated its longstanding concerns about stock assessments and fishery interactions in the Gulf of Mexico. Specifically, the Commission recommended that the Service (1) expedite its investigation of bottlenose dolphin stock structure in the Gulf of Mexico, (2) expand its efforts to collect reliable information on serious injury and mortality rates of marine mammals incidental to Gulf of Mexico fisheries, and (3) reevaluate the classification of Gulf of Mexico fisheries as information becomes available. Finally, the Commission reiterated another longstanding recommendation that the Service describe the level of observer coverage for each fishery as part of the List of Fisheries. This last step is essential for evaluating the reliability of take estimates, which, as just described, are the basis for categorizing fisheries.

On 14 July 2008 the National Marine Fisheries Service announced that its draft stock assessment reports were available for review (73 Fed. Reg. 40299). On 24 October 2008 the Commission provided comments on those reports, recommending that the Service—

- invest in the development of technologies and methods that will help address questions about population status and habitat use and thereby guide management strategies, particularly those aimed at avoiding adverse human effects;
- work with other agencies conducting research related to marine mammals for the purpose of coordinating scientific efforts and sharing data and results;
- convene a comprehensive review of its stock assessment efforts to identify the obstacles to completing stock assessments, assign priorities, and identify needed resources;
- work with federal and state fishery management agencies and industry to develop a funding strategy that will support more effective observer programs for collecting data on incidental fishery-related mortality and serious injury of marine mammals;
- formally recognize 12 stocks of harbor seals in Alaska and proceed with research and manage-

[1] The National Marine Fisheries Service is responsible for all species of cetaceans and most pinnipeds. The Fish and Wildlife Service is responsible for manatees, sea otters, polar bears, and walruses.

[2] The potential biological removal level is an estimate of the number of individuals that could be taken as a result of human activities while still allowing the stock to recover to or remain at its optimum sustainable population size.

ment of those stocks as set forth in the Marine Mammal Protection Act;
- convene a take reduction team to address pelagic longline fishery interactions with the Hawaii false killer whale stock; and
- develop and implement a systematic and comprehensive approach for incorporating and considering all risk factors into stock assessment reports.

On 29 October 2008 the Commission wrote to the Service regarding an environmental assessment for a specific fishery, the deep-set longline fishery for pelagic tuna in the eastern Pacific Ocean (i.e., outside the U.S. Exclusive Economic Zone). Here, too, the Commission emphasized the need for better management of fisheries in international waters. To that end, the Commission recommended that the Service—
- retain all existing management measures for this fishery, including 100 percent observer coverage;
- limit entry to the fishery to no more than one new vessel per year, up to a total of five new vessels, with any such additions contingent upon fishery observer data confirming that take levels do not exceed the PBR level for any marine mammal stock;
- expand the draft assessment on the California/Oregon/Washington stock of short-finned pilot whales to include all available information, including the fisheries that might take them;
- expand its preferred alternative to prohibit West Coast vessels from fishing west of 140ºW longitude to prevent any additional incidental take from the Hawaiian stocks of false killer whales; and
- expand the assessment to summarize available information on longline vessels that actually fish in the eastern Pacific Ocean, their numbers, where they fish, their incidental catch rates, and the protected species taken (including marine mammals).

Despite Service efforts to improve stock assessments, the status of many stocks (e.g., ice seals, beaked whales, and pelagic dolphins) cannot be assessed adequately because of insufficient data on stock status and trends, mortality, or both. In some cases, the necessary data have not been collected, whereas in others the existing data are outdated and unreliable. These shortcomings are exacerbated by the lack of a consistent process across regions for identifying critical data shortfalls and then crafting a tailored programmatic response. Stock assessments can be particularly difficult for marine mammals in remote areas and with certain natural history traits (e.g., ice-breeding seals and deep-diving pelagic species). However, a number of problems stem from what the Commission believes are inappropriate conclusions formed in the absence of essential information. For example, the Service's assessments of marine mammal stocks in the Gulf of Mexico fail to reflect strong evidence of past serious injuries and deaths and conclude that there are no takes in fisheries that have not been covered by recent observer effort. This approach is clearly inconsistent with what is intended by the Marine Mammal Protection Act to be informed decisionmaking to protect marine mammals. These and other problems suggest that the stock assessment framework incorporated in the 1994 amendments to the Act is ripe for review to determine how well it is working overall and to identify and address the most glaring shortcomings. For these reasons, the Commission plans to evaluate stock assessment efforts nationwide in 2009.

A number of methods are available for improving stock assessment efforts. The Service's report of the National Oceanic and Atmospheric Administration's 2006 National Passive Acoustics Workshop ("Developing a Strategic Program Plan for NOAA's Passive Acoustics Ocean Observing System," available at http://www.nefsc.noaa.gov/nefsc/publications/tm/tmspo76.pdf) describes the utility of acoustic data for that purpose. The Service's Northeast, Southeast, and Southwest Fisheries Science Centers have already started to use this technology although more work is needed to generate population estimates from acoustic data, consistent with established sampling methods for visual surveys. Stock assessments also could be enhanced by better information from passive acoustics on the distribution and habitat-use patterns of marine mammal populations.

Stock assessment efforts also could be improved by sharing data among agencies, including the Na-

tional Marine Fisheries Service, Navy, Minerals Management Service, and National Science Foundation. The latter three agencies conduct research necessary to investigate and reduce the conservation risks associated with their planned actions or actions that they regulate and to monitor the effects of actions already under way. Some of that research is referenced in stock assessment reports, such as the Minerals Management Service's Sperm Whale Seismic Study in the Gulf of Mexico (Jochens et al. 2008), but much of it is not included, even when it might improve assessments considerably.

Stock assessments also could be improved significantly by increasing observer coverage for a number of fisheries. The Commission has raised this topic in its letters on stock assessment matters for the last four years (e.g., see any of the Commission's 2005, 2006, or 2007 SARs comment letters available at http://mmc.gov/letters/), recommending that the Service increase both the number of fisheries observed and the level of observer coverage. The Service could do so by working with federal and state fisheries management agencies and the fishing industry to develop a funding strategy that will support more effective observer programs.

Finally, the Service could improve stock assessment efforts by consistently incorporating other risk factors into its estimation of PBR levels. For many stocks, this level is derived solely from estimates of fisheries-related take. Ignoring other sources of serious injury and death is equivalent to assuming that no other risk factors are affecting a stock when that often is not the case. Ship strikes, entanglement in marine debris, contamination by oil spills or other chemical releases, climate change, harmful algal blooms, diseases related to humans or livestock and pets, and underwater sound all have such potential, but these factors are not treated consistently in stock assessments. The Service could improve stock assessments by incorporating information from various environmental assessments and environmental impact statements, as well as from applications for incidental harassment authorizations and scientific research permits. In addition, authorization to take animals during research or incidentally during other activities typically requires annual reporting of actual takes, which should be incorporated into the stock assessment reports. At some point, an ecosystem-based management system will require such information to balance multiple risk factors. In its 24 October 2008 letter, the Commission recommended that the Service develop and implement a systematic and comprehensive approach for incorporating and considering all risk factors into stock assessment reports.

Take Reduction Teams

The Marine Mammal Protection Act directs the National Marine Fisheries Service to prepare take reduction plans for each strategic marine mammal stock interacting with a category I or II fishery in U.S. waters. Such plans also may be developed when a category I fishery causes a high level of mortality and serious injury involving one or more non-strategic marine mammal stocks. In practice, individual plans often address multiple marine mammal stocks and fisheries with similar or related incidental take problems. The goals of a take reduction plan are to (1) reduce serious injury and mortality to less than the PBR level within six months of the plan's implementation date and (2) reduce serious injury and mortality to insignificant levels approaching zero within five years. The zero mortality rate goal is defined by the Service as less than 10 percent of the PBR level (69 Fed. Reg. 43338). The Act also directs the Service to use take reduction teams to monitor the implementation of plans until the Service has determined that the goals have been met. Team members include representatives of relevant fisheries, conservation groups, the academic community, fishery management organizations, and the involved federal and state agencies. A representative of the Marine Mammal Commission participates on most of the teams.

The Service has convened eight take reduction teams since enactment of the 1994 amendments to the Marine Mammal Protection Act. One team, the Atlantic offshore cetacean team, was disbanded after regulatory action largely eliminated takes by the fisheries of concern. In 2007 two other teams—the Gulf of Maine harbor porpoise team and mid-Atlantic harbor porpoise team—were merged to form a single harbor porpoise team. Thus, six teams were in place during 2008 (Table 17). In addition, incidental take in the Hawaii longline fishery exceeded

Table 17. Take reduction teams established under the Marine Mammal Protection Act that were in place in 2008

Take Reduction Team	Date Established	Team Focus
Atlantic Harbor Porpoise	1997	Take of harbor porpoises in various Atlantic coast set gillnet fisheries for groundfish (e.g., haddock, cod, and flounders), coastal finfish, spiny dogfish, and monkfish
Atlantic Large Whale	1996	Take of right, humpback, and fin whales in various Atlantic coast gillnet and trap fisheries for lobster, crabs, conchs/whelks, groundfish, monkfish, sharks, hagfish, and other finfish
Pacific Offshore Cetacean	1996	Take of short-finned pilot, sperm, pygmy sperm, humpback, and beaked (Cuvier's Baird's and *Mesoplodon* spp.) whales in Pacific drift gillnet fisheries for sharks and swordfish
Bottlenose Dolphin	2001	Take of bottlenose dolphins in various mid-Atlantic set gillnet, trap, seine, and pound net fisheries for coastal finfish, dogfish, and crabs
Atlantic Pelagic Longline	2005	Take of long- and short-finned pilot whales and Risso's dolphins in Atlantic coast pelagic longlines for swordfish, sharks, and tuna
Atlantic Trawl Gear	2006	Take of long-finned and short-finned pilot whales, common dolphins, and white-sided dolphins in Atlantic coast trawl nets for various finfish, squid, and shellfish

the PBR level for killer whales. The Service generally cites lack of funding as the primary impediment to establishment of needed teams.

Government Accountability Office Review

During 2007 and 2008 the Marine Mammal Commission consulted on several occasions with the Government Accountability Office, which was conducting a review of take reduction efforts by the National Marine Fisheries Service. The review (http://www.gao.gov/new.items/d0978.pdf) was undertaken at the request of the chairman of the House of Representatives' Committee on Natural Resources. In December 2008 the Government Accountability Office published the results of its review in a report entitled "National Marine Fisheries Service: Improvements Are Needed in the Federal Process Used to Protect Marine Mammals from Commercial Fishing." The report found that limited data currently makes it difficult for the Service to determine which marine mammal stocks meet the statutory requirements for establishing take reduction teams. The report observed that, for most stocks, the agency was relying on incomplete, outdated, or imprecise data on stocks' population size or mortality to calculate the extent of incidental take. "As a result," the report concluded, "the agency may overlook

some marine mammal stocks that meet the MMPA's requirements for establishing teams or inappropriately identify others as meeting them." Service officials advised the Government Accountability Office that they were aware of the data limitations but lack funding to improve the data.

Based on the available information, the report identified 30 marine mammal stocks that have met Marine Mammal Protection Act requirements for establishing a take reduction team and determined that the Service has established six teams that cover 16 of the stocks but has not complied with the Act's requirements for the other 14 stocks. As an example, the report noted that the false killer whale stock off Hawaii has met the statutory requirements since 2004 but that the Service has not established a take reduction team for the stock because it lacks sufficient funds. In other cases, Service officials told the Government Accountability Office that it has not established teams because (1) data on these stocks are outdated or incomplete and the agency lacks funds to obtain better information or (2) causes other than fishery-related incidental take, such as human-generated ocean noise, may be a contributing cause of injury or death; therefore changes to fishing practices would not solve the problem.

The report further noted that, for the five take reduction teams subject to the Act's deadlines, the Service has had limited success in meeting the deadlines for establishing teams, developing draft take reduction plans, and publishing proposed and final plans and regulations to implement them. For example, the Service established three of the five teams—the Atlantic Large Whale, Pelagic Longline, and Bottlenose Dolphin Take Reduction Teams—from three months to more than five years past the deadline. Service officials attributed the delays in establishing one of the teams to a lack of information about stock population size and mortality, information that teams need before developing draft take reduction plans.

The report concluded that the Service lacks a comprehensive strategy for assessing the effectiveness of take reduction plans and regulations that have been implemented. It noted that the agency has taken some steps to define goals, monitor compliance, and assess whether the goals have been met, but shortcomings in its approach and limitations in its performance data weaken its ability to assess the success of its take reduction regulations. "For example, without adequate information about compliance, if incidental takes continue once the regulations have been implemented, it will be difficult to determine whether the regulations were ineffective or whether the fisheries were not complying with them," the report concluded.

To address these shortcomings the Government Accountability Office suggested that Congress consider the following actions:

- direct the National Marine Fisheries Service to report on major data, resource, or other limitations that make it difficult for the agency to accurately determine which marine mammals meet the statutory requirements for establishing take reduction teams, establish teams for stocks that meet these requirements, and meet the statutory deadlines for take reduction teams;
- amend the statutory requirements for establishing a take reduction team to stipulate that not only must a marine mammal stock be strategic and interacting with a Category I or II fishery but that the fishery with which the marine mammal stock interacts causes at least occasional incidental mortality or serious injury of that particular marine mammal stock; and
- amend the Marine Mammal Protection Act to ensure that its deadlines give the Service adequate time to publish proposed and final take reduction plans and implementing regulations while meeting all the requirements of the federal rulemaking process.

The Government Accountability Office further recommended that the agency "develop a comprehensive strategy for assessing the effectiveness of each take reduction plan and implementing regulations, including, among other things, establishing appropriate goals and steps for comprehensively monitoring and analyzing rates of compliance with take reduction measures."

Team Activities during 2008

The following is a discussion of the teams that were active in 2008, with the exception of the Atlantic Large Whale Take Reduction Team. That team is discussed in the right whale section in Chapter IV.

Bottlenose Dolphin Take Reduction Team: In the late 1990s the National Marine Fisheries Service's observer data indicated that more than 200 coastal bottlenose dolphins (*Tursiops truncatus*) were being caught annually in various fisheries along the U.S. Atlantic coast. The highest bycatch levels occurred off North Carolina. The Service has had difficulty characterizing the significance of those takes to individual populations because the stock structure of Atlantic coast bottlenose dolphins is poorly understood. To address this deficiency, the Service conducted genetic analyses, photo-identification studies, and telemetry studies to track individual animal movements. The results indicated the presence of at least eight separate seasonal or year-round dolphin management units along the U.S. East Coast. Based on that information and evidence of dolphin bycatch, the Service believed that take levels were exceeding the PBR level for at least some dolphin groups. The threat of a lawsuit by the Humane Society of the United States prompted the Service to convene a Bottlenose Dolphin Take Reduction Team in 2001.

Although the team met a number of times in the following years, the Bottlenose Dolphin Take Reduction Plan was not finalized until August 2006. In its final form, the plan established a variety of fishing restrictions within five Atlantic coast regions: New Jersey through northern Virginia, southern Virginia, northern North Carolina, southern North Carolina, and South Carolina through eastern Florida. The Commission's 2006 annual report provides additional details on the plan and the specific measures aimed at reducing the take of bottlenose dolphins.

In June 2007 the Service reconvened the team to review the status and implementation of the take reduction plan. At that meeting, the team was presented with new fishery bycatch estimates derived from observer efforts in 2005 and 2006. The results, which largely covered the months before the plan went into effect, indicated that recorded bycatch levels were lower than earlier estimates and below the calculated PBR levels for most, but not all, dolphin management units. The decline in bycatch appeared to be related primarily to restrictions on gillnet fishing for spiny dogfish that had been imposed in the early 2000s to rebuild the overfished spiny dogfish stock. However, bycatch estimates for North Carolina either could not be determined because of inadequate observer coverage or remained above the PBR level. Furthermore, new research indicated the need to revise stock structure. This latter finding was particularly important because it would require reapportionment of bycatch (both past and future) among management units.

In an 18 March 2008 teleconference, the Service updated team members with the results of a new draft stock structure report. The report provided evidence for a previously unidentified offshore stock, refuted previously assumed migratory ranges, and proposed revision of the bottlenose dolphin management units along the Atlantic coast. The Service advised the team that it planned to recalculate the PBR level for these units for incorporation into the 2009 stock assessment. In response, the team recommended that additional analyses of photo-identification data be factored into analyses of stock structure. The Service also suggested possible approaches to address limited data on fishing effort, observer coverage, and the calculation of bycatch estimates. In this regard, the team recommended the Service explore the possibility of using electronic logbooks to collect additional data on fishing effort. Finally, given the impending changes in stock structure and need for further analysis of data, the team suggested the Service consider delaying the next team meeting until after the new stock assessment report was available in 2009.

With regard to management measures, the team was advised that a nighttime ban on gillnet fishing off North Carolina would expire in 2009. That measure had been incorporated into the 2006 plan based on a finding that nets deployed for longer than 12 hours had significantly higher bycatch rates. The team recommended that the Service extend the ban for at least three years. The recommendation was based on the observation that bycatch levels remained high off North Carolina and could increase if fishing for spiny dogfish increased in that area. The expectation of increased fishing stemmed from a new spiny dogfish assessment indicating that it was recovering from previous overfishing. On 12 August 2008 the Service published a proposed rule to extend the nighttime ban on gillnet fishing off North Carolina through 26 May 2012. The Marine Mammal Commission wrote in support of the pro-

posed rule on 10 September 2008, and on 19 December 2008 the Service finalized the extension.

Harbor Porpoise Take Reduction Team: The Gulf of Maine/Bay of Fundy stock of harbor porpoise (*Phocoena phocoena*) is a discrete migratory population of harbor porpoises. In summer it concentrates principally in the Bay of Fundy and northern Gulf of Maine, but in winter its range expands to include coastal waters from Maine to North Carolina. As noted in previous annual reports, thousands of harbor porpoises were caught and killed annually in the early1990s incidental to gillnet fishing in the Bay of Fundy, Canada, and adjacent U.S. waters. To reduce takes in U.S. waters, the National Marine Fisheries Service initially convened two harbor porpoise take reduction teams—one for New England sink gillnet fisheries and the other for mid-Atlantic gillnet fisheries. Based on their advice, the Service adopted a Harbor Porpoise Take Reduction Plan in 1998 (63 Fed. Reg. 66464) with measures that differed significantly for the two U.S. regions.

Off the New England states, the plan relied principally on seasonal time-area management zones in high bycatch areas. Fishing in those zones was either prohibited seasonally or limited to fishing with nets equipped with pingers, small electronic devices that emit pulses of sound at set frequencies. Research indicates that pingers can be an effective means of reducing bycatch by warning or otherwise diverting harbor porpoises away from nets. For waters off the mid-Atlantic states, the take reduction team recommended gear modifications and seasonal closures and restrictions rather than use of pingers. Those restrictions included minimum net twine diameter; limits on net length, nets per gillnet string, and nets per vessel; soak times; and use of tie-downs to reduce the height of nets between the float and lead lines.

After implementation of the plan, bycatch levels declined substantially, falling to levels well below the population's PBR level by 1999. In 2001, however, bycatch estimates began increasing and in 2004 they again exceeded the PBR level (Waring et al. 2007) (Table TRT-2). In response the Service combined the two take reduction teams into one team and convened a meeting of that team on 17–19 December 2007. As described in the previous annual report, the team developed a new set of regional recommendations for waters off the mid-Atlantic states, southern New England, and the Gulf of Maine. The Service indicated it would use those recommendations to prepare a proposed rule and an accompanying environmental assessment to revise the take reduction plan by early 2009.

On 31 January 2008 the Service held a teleconference to address unresolved aspects of the team's recommendations from the December 2007 meeting, including the bycatch levels that would trigger more restrictive measures off New England, the boundaries of an area off southern New England that would be closed to fishing if bycatch was excessive, and whether to exempt a winter striped bass gillnet fishery in Virginia state waters from the take reduction plan's seasonal large mesh gillnet closure. These issues were not fully resolved during the call.

Although the Service solicited additional solutions to these issues, it also chose to proceed with preparation of a proposed rule and accompanying environmental assessment to revise the Harbor Porpoise Take Reduction Plan without reconvening the team in 2008. At the end of 2008 the Service had not yet circulated a proposed rule or an environmental assessment. With regard to the Virginia striped bass gillnet fishery, no action was taken to modify the harbor porpoise plan in 2008 because team members could not reach consensus solutions.

Atlantic Pelagic Longline Take Reduction Team: The National Marine Fisheries Service established the Atlantic Pelagic Longline Team in June 2005 as part of a 2003 settlement of a lawsuit filed by the Center for Biological Diversity. The team was charged to reduce the take of three strategic stocks—common dolphins (*Delphinus delphis*) and long-finned and short-finned pilot whales (*Globicephala melas* and *Globicephala macrorhynchus)*—taken in longlines set for swordfish, tunas, and sharks along the Atlantic coast, in the Gulf of Mexico, and the Caribbean Sea region. The two pilot whale species were combined into a single management complex for purposes of a take reduction team because they are visually indistinguishable in the field and overlap seasonally between Cape Hatteras and northern New Jersey.

New information collected since 2003 has led the service to reclassify the two pilot whale stocks

Table 18. Estimates of Gulf of Maine harbor porpoise bycatch in sink gillnet fisheries in the Bay of Fundy (Canada), and in waters off New England and U.S. mid-Atlantic states, 1990–2006 (dashes indicate that data are inadequate or unavailable)

Year	New England	Bay of Fundy	Mid-Atlantic	Other[1]	Total	PBR
1990[2]	2,900	–	–	–	–	–
1991[2]	2,000	–	–	–	–	–
1992[2]	1,200	–	–	–	–	–
1993[2]	1,400	424	–	–	–	–
1994[2]	2,100	101	–	–	–	–
1995[2]	1,400	87	103	–	1,590	403
1996[2]	1,200	20	311	–	1,531	403
1997[2]	782	43	572	–	1,397	403
1998[2]	332	38	446	–	816	483
1999[2]	270	32	53	19	374	483
2000[2]	507	28	21	1	557	483
2001[2]	53	73	26	3	155	747
2002[2]	444	–	–	2	–	747
2003[2]	592	–	76	9	–	747
2004[2]	654	–	137	6	–	747
2005[2]	630	–	470	–	–	747
2006[2]	514	–	511	–	–	610

[1] This column includes strandings showing evidence of fishery interactions (e.g., net marks) with unknown gillnet fisheries in areas where there was no observer coverage.

[2] U.S. Atlantic and Gulf of Mexico Marine Mammal Stock Assessments, 1995–2007 series published by the National Marine Fisheries Service, Northeast Fisheries Science Center, Woods Hole MA; available at www.nefsc.noaa.gov/pr/sars/region.htm.

as non-strategic and to add Risso's dolphins (*Grampus griseus)* to the scope of this team. As no further common dolphin takes have been observed, additional measures to protect this species have been considered unnecessary. In 2008 incidental takes of Risso's dolphins, common dolphins, and the combined pilot whale stock complex were all estimated to be below their respective PBR levels. However, takes of Risso's dolphins and pilot whales continue to exceed the zero mortality rate goal so the Service has continued efforts to develop a take reduction plan.

On 24 June 2008 the Service published a proposed rule to establish a 5,927-km^2 (2,288-mi^2) research area along the edge of the continental shelf off Cape Hatteras, the area where bycatch levels are highest. Under the rule, all longline vessels fishing in that area would be required to carry fishery observers or to participate in a government-sponsored pilot whale research program if requested. In addition, the proposed rule would limit the length of pelagic longlines to 20 nmi in the Mid-Atlantic Bight (between North Carolina and Rhode Island) although it would not limit the number of 20-nmi longlines fished. Finally, the proposed rule would require posting marine mammal handling and release guidelines on placards aboard all longline vessels fishing in Atlantic waters.

On 8–9 September 2008 the Service reconvened the longline team to review recent research results and the proposed regulatory and non-regulatory elements of the plan. The team recommended

several additional analyses and changes to the proposed rule. It recommended that the Service assess the effect of emerging fixed-gear fisheries on pelagic longline fishing effort in the North Carolina research area, specify penalties for non-compliance with the special research area provision, and extend the placard requirement to vessels in the Gulf of Mexico and Caribbean Sea. The Service advised the team that observer effort over the past five years was below the levels necessary to accurately estimate pilot whale bycatch off the Atlantic coast, and the team urged the Service to provide additional funding to increase observer coverage to recommended levels. The team also recommended (1) holding fishery certification workshops in the Caribbean and Gulf of Mexico and along the Atlantic coast to ensure that longline fishermen are aware of applicable requirements, (2) updating marine mammal handling and release guidelines to reflect new guidelines for defining serious injuries to marine mammals, and (3) improving communication between longline vessels regarding protected species sightings and bycatch to discourage fishing in areas where bycatch is more likely.

The Service also advised the team on the use of genetic studies and water temperature data to better characterize the distribution of long-finned and short-finned pilot whales. Additional genetic sampling is needed to understand their stock structure and draw reliable conclusions about their respective distributions, abundances, and levels of bycatch. On 22 September 2008 the Marine Mammal Commission commented to the Service on the proposed rule and recommended that the Service increase funding for the research and observer coverage needed to manage these species separately and reliably. The Service is expected to publish its final rule in 2009. Given the time required to implement and evaluate the plan, the Service may not reconvene the team until late in 2010 or early in 2011.

Atlantic Trawl Gear Take Reduction Team: The Atlantic trawl gear team was established in 2006 in response to the same 2003 settlement agreement that led to the Atlantic pelagic longline team. The purpose of the Atlantic trawl gear team is to reduce incidental take of long-finned and short-finned pilot whales, common dolphins, and white-sided dolphins (*Lagenorhynchus obliquidens*) in various mid-water and bottom trawl fisheries off the mid-Atlantic and northeastern coastal states. As noted previously, by the time the team first met in 2006, the two pilot whale stocks had been reclassified as non-strategic and fisheries takes were below PBR levels but above the zero mortality rate goal. At the team's first meeting in 2006, the Service was unsure whether the mid-Atlantic mid-water trawl fishery should be listed as a category I fishery, and the team questioned whether a take reduction plan was required under the Marine Mammal Protection Act.

In March 2007 the Service changed the mid-Atlantic mid-water trawl fishery to Category II. At the team's meeting in April 2007, the National Oceanic and Atmospheric Administration's Office of the General Counsel advised that the Act's deadlines for preparing a take reduction plan did not apply. Nevertheless, the team agreed that efforts should be made to identify research activities and voluntary measures that should be taken to reduce bycatch below the Act's zero mortality rate goal. The team established two subgroups, one to recommend research activities and the other to develop education and outreach recommendations, in support of an overall strategy to reduce marine mammal bycatch in the trawl fisheries. These two groups pursued those objectives in 2007 and 2008.

On 16 December 2008 the Service convened a teleconference to review the final draft Atlantic trawl gear take reduction strategy. The draft document noted that further research is needed to improve information on the marine mammal behavior and mechanisms leading to bycatch in trawl fisheries. It also identified two immediate voluntary steps to reduce bycatch: (1) reducing the number of turns made while trawling and the length of nighttime tows and (2) increasing communication between vessels on marine mammal sightings and the timing and location of incidental takes. The strategy also called for implementation of education and outreach efforts, including distribution of placards listing voluntary actions that can reduce bycatch; maintaining a Web site with up-to-date bycatch estimates, research results, and other relevant information; preparing and distributing fact sheets and maps identifying Marine Mammal Protection Act requirements and incidental take hotspots; dissemi-

nating relevant information through workshops, conferences, and trade shows; and developing outreach materials on the fisheries observer program.

The draft strategy also recommended research on the status and stock structure of affected marine mammals and on marine mammal behaviors and environmental cues that might cause them to interact with trawl gear. It also recommended a review of bycatch reduction techniques tested and used in other domestic and international trawl fisheries; a phased research program to identify and test potential gear modification and alternative fishing methods to reduce bycatch (e.g., tow speed and reducing the number of turns); and workshops to (a) determine gear configurations and operational practices used by the various Atlantic trawl vessels and (b) review ongoing bycatch reduction research worldwide. The team is expected to provide the Service its recommendations on the strategy early in 2009.

Pacific Offshore Cetacean Take Reduction Team: As discussed in the previous annual report, the Pacific offshore cetacean team met in April 2007 and provided the Service with recommendations to improve a Pacific Offshore Cetacean Take Reduction Plan adopted in 1997. The team did not meet in 2008, and as of the end of 2008 the Service had not yet advised the team as to what actions had been taken since the April 2007 meeting to follow up on the team's recommendations.

The Tuna-Dolphin Issue

For reasons not fully understood, schools of large yellowfin tuna (those greater than 25 kg, or 55 lbs) tend to associate with dolphin schools in the eastern tropical Pacific Ocean. This area covers more than 18.1 million km^2 (5 million mi^2) 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 fishermen to release the dolphins unharmed, some animals became trapped in the nets and were killed or injured. Estimated dolphin mortality in the early years of the fishery was in the hundreds of thousands per year (Wade 2005), resulting in the sharp reduction of several stocks.

Efforts to reduce the incidental mortality of dolphins in this fishery have been a primary focus of the Marine Mammal Protection Act since its enactment in 1972. As a result of these efforts, direct incidental mortality now averages fewer than 2,000 dolphins per year. Nevertheless, at least two dolphin stocks that had been heavily impacted by the fishery—the northeastern offshore spotted dolphin (*Stenella attenuata*) and the eastern spinner dolphin (*Stenella longirostris*)—have not exhibited the population growth rates one would expect, given the reduction in observed mortality, and the stocks remain depleted. More recently, efforts have focused on identifying the possible insidious effects of chasing and encircling large numbers of dolphins in the tuna fishery each year—effects that may not be reflected in the reported mortality figures but that may be impeding the recovery of depleted dolphin stocks (Reilly et al. 2005).

The Eastern Tropical Pacific Tuna Fishery

The eastern tropical Pacific tuna fishery was once dominated by U.S. vessels but has evolved into one largely carried out by foreign fleets. As such, efforts to conserve the marine mammal stocks affected by the fishery have taken on an increasingly international focus. Those efforts include the development and implementation of international agreements and the enactment of domestic legislation that ties access to the still-substantial U.S. tuna market to compliance with those agreements. In addition, and perhaps more important, U.S. legislation establishes standards as to what tuna may be labeled as being "dolphin-safe," a label reflecting the preferences of U.S. consumers.

The Inter-American Tropical Tuna Commission manages the fishery and, since 2002, has maintained a registry of vessels licensed to participate in the fishery (see http://www.iattc.org/VesselRegister/VesselList.aspx?List=AcPS&Lang=ENG). During the mid-1970s more than 110 large purse seine vessels flagged in the United States set on dolphins to catch tuna (Sakagawa 1991). By the mid-1980s that number had dropped to fewer than 50. Currently only three large U.S. purse seine vessels appear on the vessel registry, and no U.S. vessel has intentionally set on dolphins since 1994. Although some accidental marine mammal mortali-

Table 19. Estimated incidental kill[1] of dolphins in the tuna purse seine fishery in the eastern tropical Pacific Ocean, 1972–2008

Year	U.S. Vessels	Non-U.S. Vessels	Year	U.S. Vessels	Non-U.S. Vessels
1972	368,600	55,078	1990	5,083	47,448
1973	206,697	58,276	1991	1,002	26,290
1974	147,437	27,245	1992	439	15,111
1975	166,645	27,812	1993	115	3,601
1976	108,740	19,482	1994	105	4,096
1977	25,452	25,901	1995	0	3,274
1978	19,366	11,147	1996	0	2,547
1979	17,938	3,488	1997	0	3,005
1980	15,305	16,665	1998	24	1,852
1981	18,780	17,199	1999	0	1,348
1982	23,267	5,837	2000	0	1,636
1983	8,513	4,980	2001	0	2,140
1984	17,732	22,980	2002	0	1,499
1985	19,205	39,642	2003	0	1,492
1986	20,692	112,482	2004	0	1,469
1987	13,992	85,185	2005	0	1,151
1988	19,712	61,881	2006	0	886
1989	12,643	84,403	2007	0	838
			2008	0	1,171[2]

[1] 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.

[2] Preliminary estimate

ties may occur when purse seine nets are deployed on schools of tuna that are not associated with large schools of dolphins, none were reported in 2008 in conjunction with U.S. fishing operations. The most recent mortalities attributed to the U.S. fleet involved five rough-toothed dolphins (*Steno bredanensis*) in 2002 (National Marine Fisheries Service staff, pers. comm.).

The United States also placed a voluntary limit on the aggregate active capacity of U.S. purse seine vessels in the area to 8,969 metric tons per year, the equivalent of about 25 vessels with a capacity of 363 metric tons each. However, up to 32 U.S. vessels licensed to fish for tuna in the western Pacific Ocean are each allowed to make a single fishing trip of not more than 90 days in the eastern tropical Pacific without being counted against the fleet capacity limit.

In 1980 the foreign fleet was comprised of about 80 large purse seine vessels (those greater than 425 cubic meters in well volume—roughly 400 short tons/363 metric tons or more in capacity; Sakagawa 1991). Currently the foreign fleet is comprised of about 155 large purse seine vessels. The largest numbers of participating vessels are from Ecuador (43 vessels), Mexico (39), Panama (22), Venezuela (20), and Colombia (10). The growth in overall fleet capacity during the 1990s prompted the Inter-American Tropical Tuna Commission to adopt a resolution in 2002 capping the size of the international fleet and establishing a vessel registration requirement. Under that resolution, only ves-

sels that participated in the fishery prior to 28 June 2002 may be registered, except for new registrants that replace vessels removed from the register. However, replacement vessels cannot exceed the capacity of the vessels being replaced.

Not only has overall fleet capacity increased since the 1980s, but so too has the number of sets on schools of dolphins (Figure 33). In 2003 a total of 13,760 sets were made on dolphins, the largest number in any year. The number of such sets remained high through 2005, but then declined to 8,923 sets in 2006, 8,871 sets in 2007, and 9,201 in 2008 (Inter-American Tropical Tuna Commission staff, pers. comm.).

The decline in the number of sets since 2006, coupled with the low reported incidental mortality rate (about 0.1 dolphin per set), resulted in record low numbers of reported dolphin deaths (<900) incidental to the fishery in 2006 and 2007 (Inter-American Tropical Tuna Commission staff, pers. comm.). Dolphin mortality increased to about 1,170 in 2008 as a result of the increased number of sets on dolphins and a somewhat higher incidental mortality rate (about 0.13 dolphin per set). Nevertheless, reported dolphin mortality remains well below the aggregate dolphin mortality limit of 5,000 per year allowed under the Agreement on the International Dolphin Conservation Program (Table 19). Although this level of mortality is not believed to be biologically significant to the affected dolphin stocks, stress from the chase and capture of dolphins in the course of catching tuna may be adversely affecting the ability of depleted dolphin stocks to recover. As such, the general increase in the number of sets on dolphins over the last several decades remains a cause for concern.

Another issue that has garnered increasing attention in recent years is the size of vessels that are capable of making sets on schools of dolphins and therefore should be covered by dolphin protection programs. Historically, the regulatory agencies and Congress believed that only vessels of greater than 400 short tons carrying capacity could successfully set on dolphins. This is reflected both in domestic legislation and in international agreements. For example, in its regulations implementing the dolphin-safe labeling requirements of the Marine Mammal Protection Act, the National Marine Fisheries Service has used the 400-short-ton threshold to define what constitutes a large purse seine vessel, which in turn determines whether documentation is required as to how tuna were caught before it can be labeled as dolphin-safe. Also, the general requirement to carry observers applies only to vessels of greater than 400 short tons carrying capacity. However, a growing body of evidence indicates that some smaller vessels have been setting on dolphins. According to the Inter-American Tropical Tuna Commission, approximately 300 sets on dolphins have been made by vessels smaller than 400 short tons since 1987. In response to this concern, parties to the Agreement on the International Dolphin Conservation Program adopted a resolution in October 2002 specifying that any vessel of 400 short tons or less carrying capacity identified as having intentionally set its nets on dolphins will be required to carry an observer on subsequent fishing trips.

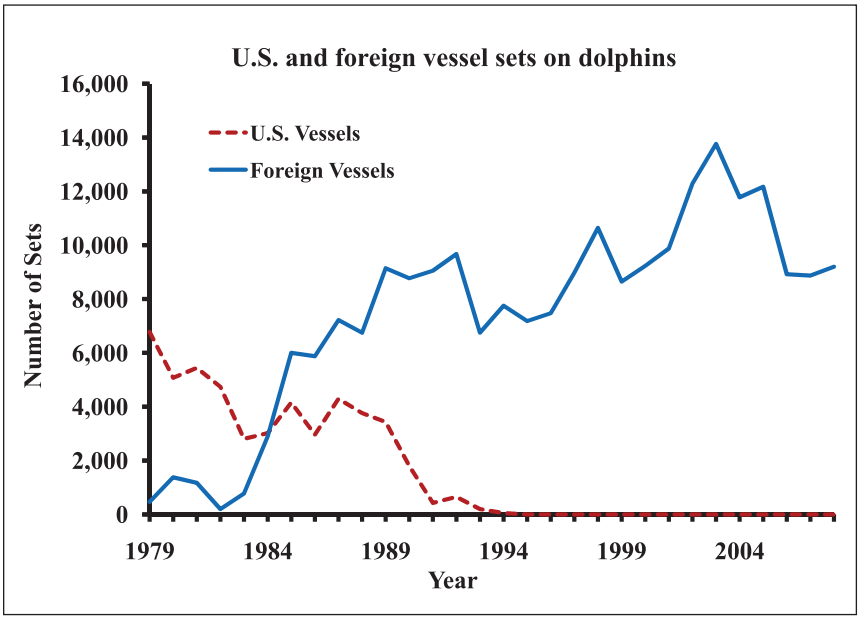

Figure 33. Sets on dolphins by U.S. and foreign fleets, 1979–2008

The 2004 Consolidated Appropriations Act (Pub. L. 108-447) funded the National Marine Fisheries Service's 2005 tuna-dolphin program and directed the Service to dedicate some of that funding toward "revising downward its definition of a vessel that is not capable of setting on or encircling dolphins to reflect the fact that vessels smaller than 400 short tons are known to engage in this practice." The capability of a vessel to fish for tuna by setting on dolphins depends on more than just its carrying capacity. A preliminary analysis prepared by the Inter-American Tropical Tuna Commission in 2005 examined the potential for developing a statistically based system for identifying which smaller vessels may have set on dolphins. Such a system would look not only at vessel size but also would consider information on fishing practices, gear characteristics, catch composition, location of fishing operations, and environmental variables. Although considerable work has been done to pursue this matter, the study has yet to be completed and the regulatory definition has not been changed.

The International Dolphin Conservation Program Act

In 1995 representatives of the United States and 11 other nations signed the Declaration of Panama, which set forth their intention to formalize and make binding some of the steps that had been taken voluntarily to reduce incidental dolphin mortality in the tuna fishery. Implementation of the declaration included a commitment by the United States to seek enactment of changes in U.S. law to, among other things, open its market to all tuna caught in compliance with the agreement, whether caught by setting on dolphins or not, and to redefine "dolphin-safe" tuna to include tuna caught in the eastern tropical Pacific by a purse seine vessel in a set in which no dolphin deaths were observed. The formal international agreement envisioned under the Declaration of Panama, the Agreement on the International Dolphin Conservation Program, was concluded in May 1998 and entered into force in February of the following year. Prior to concluding this agreement, the United States enacted some, but not all of the changes identified in the Declaration of Panama. Most notably, the International Dolphin Conservation Program Act (Public Law 105-42) made changes to the definition of dolphin-safe tuna contingent on the results of research into the effects of the chase and encirclement that occurs in the course of purse seine fishing on the affected dolphins and dolphin stocks. Only if the National Marine Fisheries Service determined that chase and encirclement were having no significant adverse effects would the definition of dolphin-safe tuna be changed to include all tuna harvested in sets in which no dolphin mortality or serious injury was observed. On 31 December 2002 the Service issued a finding that deploying purse seine nets and encircling dolphins in the fishery are not having a significant adverse effect on any depleted dolphin stock. (Further information on the finding and the research program upon which it was based can be found on the Service's Web site (http://swfsc.noaa.gov/textblock.aspx?Division=PRD&ParentMenuId=228&id=1408)). However, as discussed in previous annual reports, that finding was invalidated by the U.S. District Court for the Northern District of California in *Earth Island Institute* v. *Evans*, a finding upheld by the Ninth Circuit Court of Appeals in *Earth Island Institute* v. *Hogarth* on 27 April 2007. Under these rulings, tuna marketed in the United States only can be labeled as being "dolphin-safe" if none of the tuna were caught on a trip in which purse seine nets were intentionally set on dolphins and no dolphins were killed or seriously injured during the sets in which the tuna were caught.

Proposed Regulations: The National Marine Fisheries Service published interim regulations to implement the International Dolphin Conservation Program Act in January 2000. These were superseded by final regulations published by the Service on 13 September 2004. On 11 July 2008 the Service published a proposed rule to revise those regulations to update and clarify certain provisions and to reflect resolutions adopted by the Inter-American Tropical Tuna Commission and the parties to the Agreement on the International Dolphin Conservation Program.

The Marine Mammal Commission submitted comments on the most recent proposed regulatory changes by letter of 11 August 2008. The Commission recommended that the Service decline to adopt a proposed change in the definition of the term "tuna product" that would specify that the term applies only to a product processed for retail sale and

intended for human consumption. The Commission pointed out that the proposed definition would be inconsistent with the legislative history of the term and its statutory definition. Specifically, the legislative report that accompanied the House bill that led to adoption of the enacted definition clearly indicated the intent to include pet food within the scope of that definition.

Noting that the International Dolphin Conservation Program Act draws a distinction between large purse seine vessels and those of a size or type not capable of setting on dolphins, the Marine Mammal Commission believed that the proposed rulemaking provided an appropriate opportunity for the Service to revise its regulations to provide more precise standards for making this distinction. In particular, the Commission called the Service's attention to the directive set forth in the Consolidated Appropriations Act, 2005 (Pub. Law 108-447) that it revise downward the standard for distinguishing these two categories of vessels from the current threshold of 400 short tons carrying capacity. Nonetheless, the proposed rule did not respond to this congressional directive or even mention that it exists.

The proposed rule included a provision that would specify the types of high-intensity floodlights that must be carried by U.S. vessels that are issued a dolphin mortality limit. Although the Commission agreed with including such a provision in the regulations to enable fishermen to address unanticipated problems, it also thought that the Service should clarify that the availability of this equipment in no way changes the prohibition set forth in the Marine Mammal Protection Act and elsewhere in the Service's regulations on making sundown sets or initiating sets at night.

The Commission also identified certain provisions of the Act that no longer were applicable and recommended that they be deleted. Publication of a final rule was pending at the end of 2008.

World Trade Organization Consultation

On 24 October 2008 Mexico contacted the World Trade Organization to initiate consultations with the United States to resolve alleged violations of the Marrakesh Agreement Establishing the World Trade Organization. Mexico identified three measures that it considers to be inconsistent with U.S. obligations under that agreement—the Dolphin Protection Consumer Information Act, the dolphin-safe labeling requirements of the Marine Mammal Protection Act, and the ruling in *Earth Island Institute* v. *Hogarth* relating to those standards. Mexico alleges that these measures prohibit the labeling of its tuna as being dolphin safe even though the tuna are harvested in ways that comply with the dolphin-safe standard established by the Inter-American Tropical Tuna Commission. Mexico believes that its tuna products are accorded less favorable treatment than like products of the United States and other countries and that those differences are not based on an existing international standard. Mexico therefore contends that the U.S. measures present an unnecessary obstacle to trade and are inconsistent with the General Agreement on Tariffs and Trade. Developments in this trade dispute can be tracked on the World Trade Organization's Web site at http://www.wto.org/english/tratop_e/dispu_e/cases_e/ds381_e.htm.

Affirmative Findings and Embargoes

The regulations implementing the International Dolphin Conservation Program Act set forth procedures and criteria for making affirmative findings for tuna-harvesting nations. Only countries with such a finding are permitted to import yellowfin tuna and yellowfin tuna products harvested in the eastern tropical Pacific into the United States. An affirmative finding is made for a five-year period but is subject to annual review to determine whether the exporting country is continuing to meet its obligations under the International Dolphin Conservation Program [see 50 C.F.R. §216.24(f)(8)] and the Inter-American Tropical Tuna Commission. In 2005 the National Marine Fisheries Service issued new findings for Ecuador, Mexico, and Spain, giving them access to the U.S. market through 31 March 2010, contingent on annual renewals. The Service published renewal notices in the *Federal Register* for all three countries on 9 May 2008. The only other country with an affirmative finding is El Salvador. The Service published a notice in the *Federal Register* on 10 July 2008 that it had made a new five-year finding for El Salvador. Subject to annual review, that finding will remain valid until 31 March 2013. Embargoes remain in place for the other countries that fish for tuna in

the eastern tropical Pacific Ocean—Belize, Bolivia, Colombia, Guatemala, Honduras, Nicaragua, Panama, Peru, Vanuatu, and Venezuela. Tuna embargoes also are to be imposed against nations that import yellowfin tuna from harvesting countries embargoed from importing tuna directly to the United States. Such embargoes prevent nations from gaining access to the U.S. market for their tuna by shipping through a secondary nation. Currently, no embargoes are in place for any intermediary nation.

Pinniped-Fishery Interactions: Bonneville Dam

Certain seal and sea lion populations in U.S. waters have increased substantially since passage of the Marine Mammal Protection Act. Reports of seal and sea lion interactions with commercial fisheries and protected stocks of salmon also have increased, especially on the West Coast of the United States. To address concerns about predation on depleted salmonid stocks, Congress added section 120 to the Marine Mammal Protection Act in 1994. Section 120 allows states to apply to the Secretary of Commerce to obtain authority for lethal taking of individually identifiable pinnipeds that are having a significant negative impact on the decline or recovery of salmonid fishery stocks. These fish stocks must either be (1) listed under the Endangered Species Act, (2) approaching threatened or endangered status, or (3) migrating through the Ballard Locks at Seattle, Washington. Section 120 requires the National Marine Fisheries Service to review a state's application and, if the application contains sufficient information, establish a Pinniped-Fishery Interaction Task Force. The task force evaluates the situation, determines whether the pinnipeds are having a significant negative impact on the decline or recovery of the particular fish stocks, and provides recommendations regarding research and management needs.

Application from Washington, Oregon, and Idaho

In recent years, increased numbers of pinnipeds have been observed at Bonneville Dam where some individuals have learned to take advantage of the artificial situation created by the dam and prey on spring runs of adult salmonids as they are slowed before passing through fish ladders. In 1997 the Oregon Department of Fish and Wildlife, with support from the National Marine Fisheries Service and the state of Washington, began capturing and marking California sea lions near the mouth of the Columbia River at Astoria. In spring months from 2002 to 2007, the Army Corps of Engineers' Fisheries Field Unit assessed the presence and abundance of pinnipeds in the Bonneville Dam tailrace, including observations of pinnipeds consuming salmonids.

In 2004 the Service, Corps, Washington Department of Fish and Wildlife, Oregon Department of Fish and Wildlife, and Columbia River Inter-Tribal Fish Commission met to discuss non-lethal deterrent actions to stop pinniped predation on salmonids at Bonneville Dam. The agencies decided to test the effectiveness of existing non-lethal methods for excluding sea lions from the fish passage facility and deterring them from entering the tailrace at Bonneville Dam. Preliminary efforts began in 2005 and more extensive hazing programs were attempted in 2006. Based on that experience, the states concluded that non-lethal hazing methods carried out in the vicinity of Bonneville Dam had very limited success at reducing California sea lion numbers and predation rates and that foraging by sea lions was having a significant negative impact on the decline and recovery of Columbia River salmonid stocks.

On 5 December 2006 the states of Washington, Oregon, and Idaho submitted an application to the National Marine Fisheries Service seeking authorization for lethal taking of California sea lions at Bonneville Dam and urging the Service to form a task force to consider that request. The application contended that predation by California sea lions is having a significant impact on the recovery of eight different Pacific salmon and steelhead stocks listed as threatened or endangered under the Endangered Species Act. The states sought authority to remove by lethal means up to 1 percent of the potential biological removal level for California sea lions (about 85 animals per year) between 1 January and 30 June for an unspecified number of years. The states also sought authority to remove any California sea lion seen above navigation marker 85, about five miles downstream from Bonneville Dam. Finally, the states

sought authority to remove individually marked sea lions known to have fed on salmonids at Bonneville Dam whenever and wherever they occur.

The Service published a notice in the *Federal Register* on 30 January 2007 (72 Fed. Reg. 4239) announcing receipt of the application and finding that the application presented sufficient evidence to warrant establishing a pinniped-fishery interaction task force. The notice requested comments on the application, solicited additional information concerning the presence and behavior of California sea lions in the vicinity of Bonneville Dam and elsewhere in the Columbia River, and sought recommendations for possible members of the task force.

Commission Comments on the States' Application

On 2 April 2007 the Commission provided comments in response to the Service's *Federal Register* notice. The Commission underscored that the primary objective of the Marine Mammal Protection Act is to maintain the health and stability of the marine ecosystem and that actions to recover and conserve endangered and threatened salmonid stocks are essential to meeting that objective. The Commission noted that the Columbia River ecosystem is sufficiently disrupted that the removal of some sea lions may be necessary to achieve the conservation of those salmonid stocks. The Commission emphasized that, if the conflict comes down to a choice between the conservation of endangered and threatened salmonids versus the removal of individual sea lions from healthy stocks that are contributing significantly to the problem, the Marine Mammal Protection Act directs that the conservation of the salmonid stocks take precedence.

The Commission cautioned, however, that lethal taking authority should be issued only after a rigorous review to ascertain whether the Marine Mammal Protection Act's requirements have been fully met, including safeguards designed to minimize the risk of killing animals unnecessarily. In particular, the Commission recommended that the Pinniped-Fishery Interaction Task Force provide a detailed explanation to support any finding that sea lion predation is having a significant negative impact on salmonid stocks in the Columbia River. That explanation should, among other things, consider the impact of sea lion predation in the context of the overall threats faced by endangered and threatened salmonids and explain the basis for selecting a measure of significance that differs from that used at Ballard Locks, in Seattle, Washington, the only other situation in which section 120 has been invoked. The Commission also advised the task force to review all available information on the presence of the various salmonid stocks in the Columbia River and their temporal overlap with the occurrence of sea lions to try to differentiate predation on those salmonid stocks listed under the Endangered Species Act and those that are not and predation on wild run versus hatchery-raised fish.

The Commission expressed concern about whether the states' proposal to target all California sea lions occurring above navigation marker 85 was consistent with the statutory requirement that only "individually identifiable pinnipeds" be subject to lethal removal and whether allowing the removal of identified animals in other locations and at other times of the year was consistent with section 120. The Commission therefore recommended that the task force be asked to describe more specifically the animals that could be taken and to draw a closer connection between those animals and the predation of listed salmonids in the vicinity of Bonneville Dam.

The Commission also recommended that the task force be asked to review the justification for the number of removals being sought by the states. The Commission noted that 1 percent of the potential biological removal level for California sea lions approximated the estimated number of individuals observed at the dam each year. It was not clear to the Commission, however, that all of these animals should be targeted for removal regardless of the amount of time they spend in the area or the contribution they make to the predation problem. The Commission suggested that, to the extent that such information was available, the task force should look at the predation history of specific individuals as well as more general patterns of sea lion presence and behavior near the dam.

Consistent with the requirements of the Marine Mammal Protection Act, the Commission also recommended that the task force assess the feasibility of employing non-lethal alternatives to solve the predation problem. The Commission noted, for

example, that, because of the relatively small number of sea lions eating steelhead at Ballard Locks, it was possible to capture and maintain all of the "problem animals" in captivity as an alternative to lethal removal. Whether or not temporarily or permanently holding sea lions feeding on salmonids at Bonneville Dam would be feasible depends largely on the number of sea lions to be removed. A report referenced in the state's application (Stansell 2004) indicated that a few animals account for the majority of the salmonid predation at Bonneville Dam, which suggests it may be sufficient to remove only those sea lions that eat the most fish.

Task Force Recommendations

The task force met three times in Portland, Oregon, to review the application from Washington, Oregon, and Idaho; to develop additional information; and to formulate recommendations for consideration by the National Marine Fisheries Service. Meetings were held on 4–5 September, 9–10 October, and 30–31 October 2007. The meetings were attended by the chairman of the Commission's Committee of Scientific Advisors on Marine Mammals, who served as a member of the task force, and by a member of the Commission's staff, who attended as an observer. The task force provided its recommendations in a report transmitted to the Service on 5 November 2007. The report and related documents are available on the Service's Web site at http://www.nwr.noaa.gov/Marine-Mammals/Seals-and-Sea-Lions/Sec-120-TF-Rpt.cfm.

The majority of the task force thought that California sea lions are having a significant negative impact on the recovery of threatened and endangered salmonids in the Columbia Basin, although the task force was unable to specify a quantifiable measure of significance. Consistent with this finding, the majority recommended that the Service authorize lethal removals of sea lions, outlining two alternative proposals. Under the first option, which was preferred by 10 of the 18 task force members, lethal removal would be authorized for three years and continue thereafter only if the rolling, three-year average of predation of salmonids by sea lions exceeds 1 percent of the run size between 1 January and 31 May. Identifiable sea lions (those that have been branded or tagged or that have other identifiable marks) could be removed if they were seen catching a salmon in the area below Bonneville Dam or if they are seen in that area and are on a list of sea lions with a history of eating salmon in the vicinity of the dam. In addition, any sea lion that enters a fish ladder, is seen within 50 ft of a fish ladder, or is observed eating a salmon in the area below the dam would be subject to immediate removal. Also, any sea lion observed in the area above navigation marker 85 for a total of seven days or in three different years or observed eating 30 or more salmon would be subject to removal anywhere it is found except on a sea lion rookery. In the event that the predicted run size of upriver spring chinook salmon drops to 82,000 or fewer fish, any sea lion observed above marker 85 would be subject to lethal removal.

Seven members of the task force preferred a second option with the goal of eliminating the presence of all California sea lions above navigation marker 85 and reducing predation on salmonids in the area below Bonneville Dam to 0.5 percent of the run size. To accomplish this, they recommended that all sea lions observed above marker 85 between 1 January and 31 May be subject to immediate lethal removal. Under this option, the number of lethal removals in a given year would be capped at 2 percent of the potential biological removal level, which would be twice the number the states had requested. Lethal taking authority under this option would initially be for six years.

One member of the task force filed a minority report recommending that lethal removal not be authorized. This member thought that the information available to the task force failed to demonstrate that predation on salmonid stocks by pinnipeds was having a significant effect, particularly when compared to "much higher rates of take that [the Service] itself allows for fisheries and other extractive users." The minority report also cast doubt on whether removing up to 85 sea lions per year would provide any appreciable benefit to the fish stocks or would merely create a vacated foraging niche for other sea lions to exploit.

The task force, by consensus, identified the need to continue and expand programs to monitor and evaluate pinniped predation, not only at Bonneville Dam but throughout the lower Columbia River. Its members believed that better data are needed

to resolve uncertainties about the best choices for management actions to address the pinniped-fishery conflict. Members also generally agreed that managers should continue to pursue non-lethal deterrence of pinnipeds in the vicinity of Bonneville Dam, recognizing that this could be an effective means of preventing "naïve" sea lions from replacing animals that are removed.

Commission Comments on the Task Force Report

The Regional Director of the National Fisheries Service's Northwest Region transmitted the task force report to the Commission by letter of 6 November 2007. He invited the Commission to comment on the report and to identify any issues or information that it wanted the Service to consider in making a determination or preparing documentation under the National Environmental Policy Act.

The Commission provided detailed comments to the Service on 23 November 2007. The Commission reviewed the criteria for making a finding under section 120 of the Marine Mammal Protection Act and recommended that the Service adopt a two-part standard for applying those criteria. First, the Service should consider whether pinnipeds collectively are having a significant negative impact on the salmonid stocks of concern. If they are, the Service should then determine whether the individual sea lions targeted for removal are significant contributors to the overall level of predation.

The Commission stressed the importance of supporting any affirmative finding under section 120 with a clear explanation of why predation by those pinnipeds is having a significant negative impact on salmonids. Although the task force had, by a substantial margin, found the impact to be significant, it had not provided a clear rationale. The Commission therefore recommended that the Service undertake additional analysis that relates the observed predation rates by pinnipeds to a population-level impact on the fish stocks, such as an increased risk of extinction or delay in recovery time.

The situation concerning the conservation of Columbia River salmonids is complex and involves multiple risk factors ranging from migration barriers, habitat loss and degradation, fisheries takes, and predation by birds and marine mammals. The Commission therefore recommended that the Service, as part of its decision-making process, conduct a comprehensive analysis that compares pinniped predation with authorized take levels from other sources and explains why some are considered significant while others are not.

The Commission also noted that the task force did not reach agreement on the goal of the recommended lethal removal of pinnipeds. Although making a finding that pinnipeds are having a significant negative impact on salmonid stocks is an explicit determination under section 120, the Commission believed that it was equally important for the Service to establish the point at which sea lion predation would no longer be considered significant. The Commission observed that reducing predation by sea lions to below that significance threshold should be the goal of the pinniped removal program and recommended that the Service seek to quantify that level.

The Commission did not believe that the information available to the task force supported a conclusion that all pinnipeds in the area below Bonneville Dam are significant contributors to the predation problem and should be subject to removal. Consistent with this view, the Commission noted that the option proposed by some task force members to authorize removal of all California sea lions above a certain point in the river, absent a showing that they are preying on salmonids to a degree that can be considered significant, would be inconsistent with the statutory criteria. The Commission therefore recommended that the second option proposed by the task force be rejected.

With certain exceptions, the Commission supported the more finely tuned selection criteria that would be established under the first alternative identified by the task force. Although recognizing the difficulties in detecting all incidents of predation and attributing the taking to a particular sea lion may be difficult, the Commission thought that some of the criteria proposed by the task force needed to be better justified and explained. For example, the Commission questioned whether a single observation of a particular sea lion eating a salmon was sufficient to establish that animal as a significant contributor to the predation problem. Similarly, the Commission expressed concern that

some of the sea lions on the list of individuals that would be targeted for removal had little or no documented history of preying on salmonids in the area below Bonneville Dam. As such, the Commission recommended that the Service consider a phased approach with additional selection criteria that, at least initially, would target the sea lions that are the greatest contributors to the predation problem.

The Commission also commented on the task force proposal to establish alternative removal criteria if the predicted run size of upriver spring chinook salmon drops to 82,000 or fewer fish. The Commission noted that the task force had not explained its selection of this level and recommended that, if the Service adopts this proposal or establishes a similar threshold based on run size, it explain why any predation at that point would be considered significant.

In addition to making recommendations about whether to approve a state's application for lethal removal authority, a task force established under section 120 of the Marine Mammal Protection Act is to consider non-lethal alternatives if they are available and practicable. In this case, the task force noted that non-lethal alternatives had been tried extensively without much success but recommended that they be continued in an effort to prevent new animals from becoming established. The Commission concurred that any lethal taking program approved by the Service should include an aggressive non-lethal deterrence component. The Commission also agreed with the task force that the Service and others should continue to pursue emerging technologies that may provide effective non-lethal alternatives. In particular, the Commission encouraged the Service to facilitate research on an electrical field barrier currently under development that could prove to be an effective deterrent if it prevents sea lions from moving upstream.

The Commission observed that, by choosing to seek authority to address sea lion predation of salmonids in the Columbia River under section 120, the states had accepted certain limits on what taking could be authorized and under what conditions. Although the Commission appreciated the perspective of those task force members that seemed driven more by the pragmatic goal of protecting fish stocks than the specific requirements of section 120, the Commission cautioned that any lethal taking authorization issued by the Service needed to comply fully with the applicable requirements. The Commission noted that seeking authority under other provisions of the Act, such as a waiver under sections 101(a)(3)(A) and 103, should be possible and would provide greater flexibility. For example, under those provisions, the Service could consider whether it is appropriate to take steps to exclude all sea lions from a certain area, irrespective of a showing of a documented impact on salmonid stocks.

Draft Environmental Assessment

On 18 January 2008 the National Marine Fisheries Service published a notice of availability of a draft environmental assessment proposing to issue the requested lethal taking authority to the states (73 Fed. Reg. 3453). The Marine Mammal Commission submitted comments on the draft on 19 February 2008. The Commission reiterated several points that it had raised in its comments on the application and the task force report. The Commission again cited the primary directive of the Marine Mammal Protection Act to maintain the health and stability of the marine ecosystem and recognized that the removal of some pinnipeds in the Columbia River might be necessary to achieve this goal. Nevertheless, predation by pinnipeds is but one factor affecting the runs of salmon in the Columbia River. The Commission noted that these other risks, such as at-sea mortality in fisheries, also needed to be addressed. Also, recognizing the controversy surrounding the proposed authorization, the Commission thought it essential that the Service provide a clear and comprehensive rationale for the management alternatives considered in the environmental assessment and the alternative ultimately adopted.

As the Commission had recommended, the Service proposed a two-part test for making a finding that individually identifiable pinnipeds are having a significant negative impact on salmonid stocks. However, the Commission remained concerned about the Service's application of that test and recommended that a robust quantitative assessment of the term "significance" be provided that relates the finding of significance to the observed or estimated predation rates and their impact on the decline or impairment of recovery of the affected salmonid stocks. Toward

that end, the Commission again suggested that the Service draw parallels between the significance standard under section 120 of the Marine Mammal Protection Act and the jeopardy standard under section 7 of the Endangered Species Act and/or look to delay in recovery time as a measure of significance.

The preferred alternative identified by the Service in the draft environmental assessment would suspend the proposed lethal removal authority if the observed rate of predation drops to 1 percent over any three consecutive years. Presumably, the Service believed that predation at this level would no longer be significant. The Commission thought that this was a good first step towards quantifying significance but indicated that the Service needed to provide a justification for selecting this level.

The Commission also thought that further explanation of and justification for the criteria that would be used to identify sea lions subject to removal needed to be provided. For example, it remained unclear whether an animal being observed eating a single salmonid or remaining in the area near the dam after being subject to non-lethal deterrence efforts should, in itself, be a sufficient basis for lethal removal.

The Commission believed that the environmental assessment also should be expanded to describe how any pinnipeds removed by the states might be used to gather information that would lead to a better understanding of predation rates and patterns. The collection and examination of stomach contents from animals that are lethally removed or captured for placement in display facilities would provide a useful snapshot of what the animals have been consuming in the area near Bonneville Dam and could prove valuable in assessing the accuracy of predation rate estimates based on observations of the animals in the wild.

Under section 120 of the Marine Mammal Protection Act, the effectiveness of any authorized lethal removal is to be reviewed periodically. The draft environmental assessment merely indicated that such a review would be conducted every five years. The Commission thought that it would be useful if that discussion were expanded to describe the criteria that would be used to assess effectiveness and to identify the types of information to be collected to facilitate such reviews.

The Commission sent a follow-up letter to the Service on 25 February 2008 to provide a larger context for considering the Commission's 19 February comments, which had focused on the specific alternatives under consideration. The Commission noted that a decision on how best to conserve endangered and threatened salmonid stocks likely would be based on imperfect information and that the Service should interpret the available information in a precautionary manner. That is, top priority should be given to the conservation and recovery of those fish stocks, and the Service should not wait to take action until it has complete information. The Commission drew a parallel with another situation in which it has been necessary to remove predators to protect an imperiled species—the taking of sharks to protect juvenile monk seals in the Northwestern Hawaiian Islands—and indicated that the lethal removal of pinnipeds to protect salmonids might also be necessary.

The follow-up letter also recognized the efforts that have been taken to reduce salmonid mortality from other sources and noted that any removals of sea lions to reduce predation should be viewed as part of a larger management effort. However, the Commission again cautioned that the Service needed to provide a clear description and rationale in the determination it ultimately adopts for (1) the extent to which predation must be reduced to promote the conservation and recovery of the salmonid stocks and (2) the manner in which salmonid mortality is allotted among different sources, including that caused by pinnipeds.

Issuance of the Authorization

The National Marine Fisheries Service issued a pinniped removal authorization to Oregon and Washington on 17 March 2008. The authorization is valid until 30 June 2012, at which time the Service may extend it for an additional five years.

The authorization allows the lethal removal of individually identifiable California sea lions that are having a significant negative impact on endangered and threatened salmonids, subject to certain terms and conditions. Sea lions subject to removal must be individually distinguishable either by unique natural markings or applied features such as brands. Those sea lions that meet one of the following cri-

teria are to be placed on a list of animals eligible for removal— (1) the sea lion was observed eating salmonids in the area below Bonneville Dam at any time between 1 January and 31 May, (2) the sea lion was observed in the area below Bonneville Dam on a total of any five days (whether in a single year or over multiple years), or (3) the sea lion was sighted in the area below Bonneville Dam after having been subject to active non-lethal deterrence efforts. At the time the authorization was issued, 61 sea lions had been identified as meeting these criteria.

The authorization sets an annual limit on the number of lethal removals allowed at 1 percent of the potential biological removal level calculated in the stock assessment report for California sea lions. In 2008 the potential biological removal level was 8,511, and therefore the number of lethal removals was capped at 85 sea lions. This number may fluctuate in subsequent years as population estimates and the potential biological removal level change.

The Service also conditioned the authorization to require the states to establish an animal care committee composed of qualified veterinarians and biologists to provide advice on protocols for capturing, holding, and euthanizing predatory sea lions. Sea lions identified for lethal removal that are captured in traps must be held for at least 48 hours before being euthanized while the states determine whether a facility approved by the Service for permanently maintaining the animals in captivity is available. Free-ranging sea lions included on the list of animals approved for lethal removal may be shot by a qualified marksman if they are hauled out at certain locations or when they are in the water within 50 feet of the dam's power houses or a concrete apron below the dam. As practicable, the states are required to retrieve the carcasses of all sea lions that are shot. The carcasses or tissues from them are to be made available for use in scientific research or for educational purposes. However, the Service did not specifically require that the stomach contents of shot or euthanized sea lions be examined, as the Commission had suggested.

The states are required to develop and implement a monitoring plan and to submit an annual monitoring report to the Service by 1 November of each year. After the third year of sea lion removals (i.e., in June 2011), the Service and the states will conduct a review to determine whether the predation rate on salmonids has decreased to below 1 percent of the observed fish passage at the dam. If so, no lethal removals will be authorized in the following year.

As discussed below in the litigation section, because of a pending lawsuit, no intentional lethal removals were carried out during 2008. Seven sea lions listed as eligible for removal were captured for placement at public display facilities. However, one of these died while under anesthesia during health screening prior to transfer to a facility. In addition, six other animals (four California sea lions and two Steller sea lions) died after having been trapped unintentionally, likely related to organ failure associated with stress and heat prostration. These included one sea lion identified as eligible for lethal removal. Following that trapping incident, the states consulted with their animal care committee and revised the trapping and monitoring protocols to avoid similar problems in the future.

Fish and wildlife officials from Oregon and Washington submitted their first annual report under the authorization to the Service on 1 November 2008. In addition to reporting on the states' activities during 2008, they sought clarification from the Service concerning the terms and conditions of the authorization. The states asked the Service to confirm that the lethal taking authorization did not include any seasonal restriction, such that sea lions eligible for removal could be captured throughout the year. The states also asked the Service to confirm that removals could be carried out at locations other than Bonneville Dam (e.g., in the lower part of the Columbia River or elsewhere) as long as animals are not captured at rookeries.

Oregon and Washington indicated their intent to resume boat-based hazing activities below Bonneville Dam in February 2009. Pending approval from the courts, the states also indicated their intent to proceed with trapping and removing sea lions beginning on 1 March 2009.

The Service responded to the states on 4 December 2008, confirming the states' interpretations as to when and where identified sea lions could be taken. The Service also provided an updated list of the sea lions that had met the specified criteria and that were eligible for removal. The revised list in-

cluded 75 animals, but of these 8 had either been transferred to permanent maintenance at display facilities or had died.

Litigation

On 24 March 2008, the same day that the Service published notice of the authorization in the *Federal Register* (73 Fed. Reg.15483), the Humane Society of the United States and other organizations filed a lawsuit challenging that action. The plaintiffs alleged violations of the Marine Mammal Protection Act, the National Environmental Policy Act, and the Administrative Procedure Act. Under the authorization, lethal removal could have begun on 4 April 2008. This prompted the plaintiffs to file a motion for a preliminary injunction seeking to prevent any removals while the court considered the merits of their claims. To avoid the need for emergency review by the court, the parties entered into an agreement delaying any lethal removals until 18 April so the court would have time to consider the preliminary injunction motion on an expedited schedule. In the meantime, the states could engage in trapping and marking sea lions and in non-lethal relocation of some individuals.

The U.S. District Court for the District of Oregon denied the request for a preliminary injunction on 16 April 2008, prompting the plaintiffs to seek an emergency stay of the ruling pending appeal. The Ninth Circuit Court of Appeals issued a stay on 23 April. The appellate court agreed with the lower court that the likelihood of success on the merits of the case tipped somewhat in favor of the plaintiffs but, in contrast to the district court, found that the balance of likely harm if the stay were not issued also weighed in the plaintiff's favor. The appellate court noted that, by definition, any lethal taking of sea lions would be irreparable. In addition, approval of a stay would affect only the 2008 salmon runs, which all parties to the litigation had agreed were expected to be unusually large. As had the lower court, the appellate court allowed non-lethal removals to go forward so that the states could trap problem sea lions and transfer them to zoos and aquaria that had offered to house them.

Meanwhile, the district court continued to consider the merits of the case. The court issued its opinion on 25 November 2008, finding in favor of the federal and state agencies named as defendants. Unless reversed on appeal, that ruling cleared the way for lethal removals to go forward in 2009.

The plaintiffs had contended that the Service's criteria for determining the significance of predation by sea lions under the Marine Mammal Protection Act was deficient because it failed to link the predation to an impact on the decline or recovery of salmonid stocks. The court found the definition of significance used by the Service, which used impacts on the productivity of salmonids as a proxy for the decline or recovery of the stocks, not to be contrary to the language of the Act. Although there is legislative history to support the view put forward by the plaintiffs, the court thought that the statutory provision was clear on its face and, hence, there was no need to consider that history to resolve any ambiguities. Because Congress had not defined more precisely what would constitute a significant negative impact on the salmonid stocks, the court believed that it was compelled to defer to the Service's interpretation as long as it was a reasonable one. The court also deferred to the agency's construction of the statute in formulating the criteria to be used to identify the individual sea lions contributing the most to predation at the dam.

The court determined that section 120 of the Marine Mammal Protection Act did not require the Service to use a quantitative standard to assess the significance of predation by sea lions. Rather, the court believed that the qualitative approach adopted by the Service was not an arbitrary or capricious application of the statute.

The plaintiffs also noted that the take of salmonids by pinnipeds near Bonneville Dam is much smaller than takes from other sources that the Service has determined not to be significant under the National Environmental Policy Act and the Endangered Species Act and argued that these takes likewise should be considered insignificant. The court, however, saw no incongruity in using different standards of significance under the different statutes. It therefore ruled that the Service was not obligated to discuss and explain how previous decisions about the impacts to salmonids from fishing activities or operation of the dam reached under these other statutes are consistent with its decision under section 120 of the Marine Mammal Protection Act.

The court also rejected the plaintiffs' contention that the Service should have prepared an environmental impact statement rather than an environmental assessment. The plaintiffs argued that, if sea lion predation is considered to be significant for purposes of the Marine Mammal Protection Act, it should also be considered significant when assessing impacts under the National Environmental Policy Act. The court ruled, however, that the two statutes have entirely different foci and found it rational for the Service to conclude that the impact of sea lion predation meets the significance criteria of one Act, but not the other. In the court's view, the environmental assessment prepared by the Service adequately demonstrated that the sea lion population would not be adversely affected by the authorized removals while the salmonid stocks would likely benefit.

It is likely that the plaintiffs will appeal the district court ruling; however, as of the end of 2008 a notice of appeal had yet to be filed.

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Chapter IX

MARINE MAMMALS AND ACOUSTICS

The risk to marine mammals posed by human-generated sound in the oceans is highly controversial. The controversy is exacerbated by varying degrees of uncertainty regarding topics such as the physics of sound and conventions for measuring its properties, the biology and sensitivity of marine mammal hearing, and the importance of that hearing to their natural history functions. To address these and related topics, in 2007 the Marine Mammal Commission completed "Marine Mammals and Noise: A Sound Approach to Research and Management." To promote a more informed discussion about sound effects and the means for mitigating them, in 2008 the Commission published a primer entitled "Underwater Sound and the Marine Mammal Acoustic Environment: A Guide to Fundamental Principles" by Bradley and Stern (2008). Both documents are available in print or on the Commission's Web site (http://mmc.gov/reports/workshop).

A variety of human activities introduce sound into the marine environment, including commercial shipping, seismic testing for oil and gas development and geophysical research, military activities involving the use of various types of sonar and explosives, onshore and offshore construction (e.g., pile-driving, dredging), recreational and small-boat use, fish-finding and navigational sonar, and pingers and acoustic harassment devices used to dissuade marine mammals from interacting with fishing gear. Most of these activities can reasonably be expected to increase in the near future with increases in population growth, increased commercial shipping and widening of ports to accommodate that increase, construction of offshore liquid natural gas ports, development of oil and gas and alternative energy (wind, wave, and tidal) and mineral sources, and increasing harbor security measures.

To date, much of the concern about human-generated sound in the marine environment has focused on the Navy's use of mid- and low-frequency active sonar for detecting submarines and, to a lesser degree, on the use of seismic airguns for geophysical research and oil and gas development. Commercial shipping has only recently begun to receive attention despite the fact that it is a major source of low-frequency sound in the oceans. That attention has focused on the mechanisms by which ships generate noise and potential noise-reduction measures.

In response to the growing awareness of and concerns about increasing sound in the oceans, federal agencies and others have increased their investment in research and risk assessment, a trend that may well continue until scientists can explain and predict the actual effects of noise and managers can develop corresponding regulations and guidelines to ensure that those effects are reduced to acceptable levels. To that end, in 2008 an Interagency Task Force on Anthropogenic Sound and the Marine Environment completed a review of ongoing and planned agency efforts and a prioritized list of anticipated information needs and gaps. The Interagency Committee on Ocean Science and Resource Management Integration reviewed the plan, which is entitled "Addressing the Effects of Human-Gen-

erated Sound on Marine Life: An Integrated Research Plan for U.S. Federal Agencies." The White House Council on Environmental Quality and Office of Management and Budget were expected to give it final approval at the end of 2008. In early 2009 the Council on Environmental Quality likely will make the report available at http://ocean.ceq.gov/about/docs/iatf_finalreport_09.pdf.

The following sections highlight sound-related research and regulatory activities in 2008.

Research Activities

Research investment by the Navy, National Science Foundation, Minerals Management Service, and National Oceanic and Atmospheric Administration increased in 2008. The increase reflects an effort by these agencies to understand and minimize the effects of sound generated by activities they conduct or regulate.

U.S. Navy

Between 2004 and 2008 the Navy funded in excess of $100 million for environmental research, much of which was focused on potential effects of human-generated sound in the oceans and the means to monitor and mitigate such effects. In 2008 the Office of Naval Research supported basic and early-stage applied research including approximately $14 million for studies of marine mammal hearing, physiological and behavioral responses to sound, computer models of acoustic effects on marine life, and novel technologies for monitoring marine mammal behavior, movements, and habitat use. The Navy's Environmental Readiness Division also provided support for marine mammal surveys in or near naval testing and training areas, development and maintenance of databases and models of marine mammal distribution, assessments of behavioral and physiological responses to sonar and explosives, and related topics (see Figure 8 in Chapter II for a graph of research expenses by topic). The Navy also may increase its investment in marine mammal research and management activities in the future as it develops and implements an integrated comprehensive monitoring plan for testing and training exercises on all major Navy ranges.

Minerals Management Service

The Minerals Management Service contributes more than $4 million annually to fund research related to marine mammals and sound. From 2002 to 2008 the Service directed extensive resources toward its Sperm Whale Seismic Study (also referred to as the SWSS study) in the Gulf of Mexico (Jochens et al. 2008). As noted in Chapter II, this study was led by the Service in collaboration with the National Fish and Wildlife Foundation, Industry Research Funders Coalition, National Science Foundation, and Office of Naval Research. The study was conducted by researchers from Texas A&M University, Woods Hole Oceanographic Institution, Oregon State University, Scripps Institution of Oceanography, University of Colorado, University of South Florida, University of St. Andrews (United Kingdom), and University of Durham (United Kingdom). The objectives were to (1) establish baseline information on the biology and behavior of sperm whales in the northern Gulf, (2) characterize the species' habitat use in that area, and (3) determine possible behavioral responses of sperm whales to human-made noise, particularly from seismic studies. The study provided useful information about the population structure, distribution, and life history of sperm whales in the northern Gulf. It also found that sperm whales do not appear to move horizontally to avoid noise from seismic airguns greater than 1 km away, but they may alter their foraging patterns. Whether those changes are significant at the population level is not yet clear. The study resulted in a number of recommendations for additional research. It also established an excellent model for cooperative investigations of the life history of a marine mammal species and factors that may influence its response to noise.

In 2008 the Service held a workshop on seismic survey mitigation measures and marine mammal observer reports. The intent of the workshop was to review observer reports from seismic surveys dating back to 2003 to evaluate mitigation measures and suggest ways that they could be improved. The results would be used to update a Notice to Lessees, originally published in 2002 (NTL 2002-G07), regarding the best available mitigation measures.

In 2008 the Service also increased its emphasis on research and risk mitigation in the Arctic (including the Bering Sea region), where the search for oil and gas has increased markedly in response to fluctuating but generally increasing energy demands and prices. Exploration activities consisted primarily of seismic surveys in the Beaufort and Chukchi Seas. With regard to marine mammals, the primary concerns in these areas pertain to possible effects on conservation and subsistence use of bowhead whales, beluga whales, polar bears, walruses, ringed seals, and bearded seals

In 2008 the Service allocated $528,400 for a multi-year study on polar bear population and recruitment. The objective of this study is to evaluate the importance of natal dispersal in polar bears and, specifically, on the extent to which bears born in or near Canada make use of U.S. land, nearshore, or outer continental shelf habitats at various life stages.

In 2008 the Service also allocated $771,275 for a multi-year study of the distribution of Arctic whales. The Service has conducted aerial surveys of the fall migration of bowhead whales each year since 1987. The survey methods are comparable to those used for monitoring since 1979. This long-term dataset provides the basis for evaluating potential cumulative effects of oil and gas exploration activities along the bowhead migration corridor across Alaska's Beaufort Sea. The objectives of the study are to (1) define the annual bowhead fall migration, significant inter-year differences, and long-term trends in distance from shore and water depths at which whales migrate; (2) monitor temporal and spatial trends in the distribution, relative abundance, habitat, and behaviors (especially feeding) of endangered whales in Arctic waters; (3) provide real-time data on the status of the fall migration of bowhead whales across the Beaufort Sea for use in protecting this endangered species; and (4) provide an objective, geographically based overview of bowhead migration.

In 2008 the Service also allocated $1.2 million for a multi-year study of the distribution, abundance, and habitat use of North Pacific right whales in the southeastern Bering Sea. Historical data as well as recent observations confirm that the North Aleutian Basin lease sale area is used by right whales for at least the period from May to September. The animals probably migrate out of the area during winter, but this assumption is based on very little information and has never been confirmed. It is assumed also that right whales occupy the North Aleutian Basin area to feed on copepods, but scientists have not conducted the necessary oceanographic and foraging ecology studies to confirm this hypothesis. The objectives of the new study are to estimate the seasonal distribution, abundance, and movement patterns of right whales in and adjacent to the lease sale area and to characterize their habitat, foraging behavior, health, and prey distribution.

Plans for oil and gas development in the North Aleutians Basin region are under consideration and likely will be highly controversial because of potential interactions with the North Pacific right whale, other endangered and threatened species, the fishing industry, and Alaska Native communities that depend on wildlife in this area for subsistence

National Science Foundation

In 2008 the National Science Foundation directed about $2 million to the study of potential sound effects from geophysical research sponsored by the Foundation. Marine geophysical research is used for a variety of purposes, including studies of the factors that lead to earthquakes, undersea landslides, and tsunamis. The agency recently acquired the research vessel R/V *Langseth*, operated by the Lamont-Doherty Earth Observatory of Columbia University. The *Langseth* is the foundation's first seismic survey vessel and is being used to characterize the sound fields produced by airgun arrays and to test the use of passive acoustic monitoring and other marine mammal detection technologies. The following section of this chapter on regulatory activities provides additional information related to environmental compliance by the Foundation and the R/V *Langseth*.

National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration supports a very modest program of research on human-generated sound and its environmental effects. In 2007 an expert panel convened by the agency reviewed physiological thresholds of risk from underwater sound and published its con-

clusions in the journal *Aquatic Mammals* (Southall et al. 2007). In 2008 the agency directed about $200,000 toward (1) a panel discussion of sound levels that may cause significant behavioral responses by marine mammals, (2) investigation of vessel noise and its effects, (3) use of passive acoustic monitoring technologies to improve marine mammal surveys, and (4) deployment of archival acoustic tags to monitor marine mammal behavior.

Multi-agency Efforts

The National Oceanographic Partnership Program enables agencies and non-government entities to pool resources on research projects of shared interest. Since 2000 the Navy, National Science Foundation, Minerals Management Service, National Oceanic and Atmospheric Administration, Sloan Foundation, and the Joint Industry Program have supported an annual research budget of about $2.5 million through this program. The research has been directed toward projects such as development of prototype marine mammal databases, large-scale marine animal tagging, models of beaked whale hearing, and a library of marine animal sounds. The Navy, National Oceanic and Atmospheric Administration, and oil industry also co-sponsored a multi-investigator effort to experimentally expose marine mammals to controlled sound sources to assess behavioral responses under systematically varied signal characteristics. This project, known as the behavioral response study, was initiated at the Navy's Atlantic Undersea Test and Evaluation Center in the Bahamas in August-September of 2007 and was continued in 2008. Blainville's beaked whales, pilot whales, sperm whales and several species of dolphins regularly occur within the test range. The Commission believes this kind of carefully controlled study is essential to understanding possible sound effects on marine mammal behavior, has supported such testing in the past, and encourages additional testing at this and other sites in the future (Cox et al. 2006).

Other Research

Private industry and foreign governments also have sponsored research on the effects of underwater sound on marine mammals. Such sponsors include the oil industry, foreign navies, and national or international environmental agencies (e.g., International Council for the Exploration of the Seas, European Science Commission, and the United Kingdom's Joint Nature Conservation Council). The Joint Industry Program, a consortium of oil and gas companies, has supported studies to investigate the potential effects of airguns used in geophysical exploration, as well as other industry activities that produce sound, and to develop technologies to reduce noise and to monitor and mitigate potential effects. The program has an annual budget of about $10 million and sponsored a review of its initial research investments in October 2008. (More information can be obtained from the program's Web site, http://www.soundandmarinelife.org.) In addition, individual oil and gas companies have invested in research and monitoring of potential effects, including the monitoring of gray whales in the nearshore waters off Sakhalin Island, Russia (http://www.sakhalinenergy.com/en/), where oil development is underway and expected to continue, and the monitoring of the potential effects caused by offshore drilling by the Northstar drilling installation in the Beaufort Sea. Finally, in 2007 in Nyborg, Denmark, the International Bioacoustics Council sponsored an international review of current research on the effects of underwater sound. Proceedings from that meeting were published in a special issue of the journal *Bioacoustics* in 2008.

Regulatory Activities

In 2007 the Commission reviewed 30 analyses pertaining to the effects of human-generated sound on the marine environment. In 2008 it reviewed 94. The increase was a function of increasing Navy activities and efforts to comply with related environmental statutes (e.g., Table 20) and increasing oil and gas prices that have spurred exploration for oil and gas resources and development of alternative energy sources.

U.S. Navy

Regulatory and oversight efforts related to the Navy focused primarily on its use of low- and mid-frequency sonar and ship-shock testing.

Low-Frequency Active Sonar: The Navy's Surveillance Towed Array Sensor System Low-

Table 20. List of major Navy range complexes, along with the dates of corresponding applications for a letter of authorization to take marine mammals, the release dates of the associated draft environmental impact statements, and Web sites where related environmental documentation is posted

Range complex	Request for letter of authorization	Draft environmental impact statement	Web site
Atlantic Fleet Active Sonar Training	February 08	February 08	http://afasteis.gcsaic.com
Hawaii Range Complex	July 07	July 07	http://www.govsupport.us/hrc
Southern California	April 08	April 08	http://www.socalrangecomplexeis.com
Cherry Point, North Carolina	June 08	September 08	http://www.navycherrypointrangecomplexeis.com/
Gulf of Alaska			http://www.GulfofAlaskaNavyEIS.com
Gulf of Mexico	October 08	November 08	http://www.GOMEXRangeComplexEIS.com
Jacksonville, Florida	April 08	June 08	http://www.jacksonvillerangecomplexeis.com/
Keyport, Washington	April 08	September 08	http://www-keyport.kpt.nuwc.navy.mil
Mariana Islands	August 08		http://www.MarianasRangeComplexEIS.com
Northwest	September 08	December 08	http://www.nwtrangecomplexeis.com
Panama City, Florida	March 08	April 08	http://nswcpc.navsea.navy.mil/Environment.htm
Undersea Warfare Training Range	May 08	September 08	http://projects.earthtech.com/USWTR/
Virginia Capes	April 08	June 08	http://www.vacapesrangecomplexeis.com/EIS.aspx

Frequency Active (SURTASS LFA) sonar was developed in the late 1980s through 1990s to detect diesel-electric submarines at long range. These submarines are quieter and therefore more difficult to detect using passive acoustic systems (systems that simply listen to detect unusual sound) or other non-acoustic means. They also carry more advanced weapons with increasing range. Low-frequency sound travels great distances in water, and SURTASS LFA sonar, which operates at frequencies between 100 and 500 Hz, has become an important Navy tool for detecting these submarines. Unfortunately, the low-frequency emissions of SURTASS LFA overlap with sounds used by large whales and may affect their hearing, physiology, or behavior. A review of potential *in vivo* tissue damage by exposure to underwater sound is available in the Navy's environmental impact statement at http://www.surtass-lfa-eis.com/. The effects of low-frequency sound were investigated in depth prior to its use

(Cudahy and Ellison 2002), but considerable uncertainty remains and further study is required.

The Navy initially used one vessel to deploy its SURTASS LFA and that vessel operated in the Mariana Islands and Guam area. It added a second vessel in 2006–2007 and both vessels confined their operations to the central western Pacific. Since 2002 the Natural Resources Defense Council and co-plaintiffs have challenged the Navy and the National Marine Fisheries Service regarding use of SURTASS LFA. A settlement agreement filed on 12 August 2008 provided an informative summary of this case (Case 3:07-cv-04771-EDL, United States District Court, Northern District of California, San Francisco Division), paraphrased as follows:

- In 2002 plaintiffs filed suit against the Navy and National Marine Fisheries Service regarding the Service's issuance of a letter of authorization to the Navy and the Navy's use of SURTASS LFA.
- In August 2002 the court granted in part and denied in part the plaintiff's motion for a preliminary injunction on the use of SURTASS LFA and ordered the parties to meet and confer on the terms of the injunction.
- In October 2003 the parties filed and the court approved a joint stipulation that allowed the use of SURTASS LFA in certain areas of the western Pacific.
- In April 2007 the Navy published a final supplemental environmental impact statement in anticipation of the expiration of both the Service's 2002 letter of authorization and the preliminary injunction in August 2007.
- On 15 August 2007 (1) the joint stipulation expired, (2) the Navy signed its record of decision regarding its future use of SURTASS LFA, (3) the National Marine Fisheries Service issued a new letter of authorization to the Navy for use of SURTASS LFA and biological opinions under the Endangered Species Act finding that the Navy's use of SURTASS was not likely to jeopardize the continued existence of any endangered or threatened species and was not likely to destroy or adversely affect any designated critical habitat, and (4) the plaintiffs filed for leave to submit a supplemental complaint alleging that the Navy and National Marine Fisheries Service had failed to meet their obligations under the National Environmental Policy Act and the permanent injunction.
- On 17 September 2007 the plaintiffs filed suit challenging the defendants' actions.
- On 5 October and 19 December 2007 the parties agreed to extend the previous preliminary injunction, with several exceptions allowing the Navy's use of SURTASS LFA in exclusion zones under certain conditions.
- On 6 February 2008 the court granted in part and denied in part the plaintiffs' new motion and ordered the parties to confer on the new injunction.
- On 26 March and 27 May 2008 the parties attended settlement conferences, reached agreement, and stipulated, among other things, the new areas in which the Navy may operate SURTASS LFA (including exceptions), and mechanisms for conferring if either party sought changes to those areas.

Mid-Frequency Active Sonar: The Navy has used mid-frequency active sonar since the 1960s. Potential effects of this type of sonar were not recognized until the 1990s and early 2000s when Navy activities at a number of sites around the world were associated with the stranding and deaths of various types of marine mammals, particularly beaked whales (see the Marine Mammal Commission's 2003 Annual Report to Congress, available at http://www.mmc.gov/reports/annual/).

Beaked whales are the species most often involved in strandings associated with mid-frequency sonar. The reason or reasons for their vulnerability are not known. The leading hypothesis is that they respond to the sonar by changing their diving behavior in ways that lead to physiological dysfunction similar to development of "the bends" in human scuba divers. However, that hypothesis has not been confirmed, and the reasons for beaked whale vulnerability remain unclear. A mass stranding in the Bahamas in March 2000 highlighted these concerns, which have been reinforced by strandings in other parts of the world where mid-frequency sonar has been used. Previous Commission annual reports (particularly 2006 and 2007) describe chal-

lenges led by the Natural Resources Defense Council to the Navy's use of mid-frequency, primarily off southern California and Hawaii.

In February 2007 the Navy completed an environmental assessment evaluating planned exercises in its Southern California Range Complex. Plaintiffs sued the Navy under the National Environmental Policy Act, Endangered Species Act, and Coastal Zone Management Act, asserting that the Navy's analysis was insufficient and that its training exercises posed significant threats to marine mammals. The district court agreed and enjoined the Navy from using mid-frequency sonar for the remainder of its planned exercises. The Navy appealed to the Ninth Circuit Court of Appeals, which upheld the district court's finding but remanded the ruling back to the district court because the remedy was deemed too broad. The district court allowed the Navy to proceed with its use of mid-frequency sonar as long as it added six mitigation measures to its operations: (1) imposing a 12-mi exclusion zone from the coastline, (2) using lookouts to conduct additional monitoring for marine mammals, (3) restricting the use of helicopter-dipping sonar, (4) limiting the use of mid-frequency active sonar in geographic choke points, (5) shutting down mid-frequency active sonar when a marine mammal is spotted within 2,200 yd of a vessel, and (6) powering down the sonar source level by 6 dB during significant surface ducting conditions.

The Navy filed a notice of appeal and then turned to the Council on Environmental Quality for exemptions from the last two mitigation measures. The Council cited emergency conditions and granted the exemptions, although it also imposed additional requirements on the Navy. The Navy then returned to the district court, where it tried unsuccessfully to have the last two mitigation measures removed. The district court declined to do so, and its decision was upheld by the appellate court, which questioned whether emergency conditions prevailed. The Navy appealed to the U.S. Supreme Court, which heard oral arguments on 8 October 2008 and arrived at a decision on 12 November 2008. The court accepted the Navy's arguments that the exemptions were necessary for training to ensure national security readiness. It also stipulated that (1) the Navy complete in a timely manner the required analyses under the National Environmental Policy Act, Endangered Species Act, Marine Mammal Protection Act, and Coastal Zone Management Act and (2) its ruling should not be precedent-setting.

The Navy's efforts to bring its testing and training activities into compliance with relevant laws and directives have been incorporated into its Tactical Training Theater Assessment and Planning Program. The Navy intends this program to bring most major fleet training activities, including use of mid-frequency sonar and explosives, into 13 major testing and training ranges by 2010. Rather than develop environmental compliance documents for each individual exercise or vessel, sonar use for testing and training exercises (together with other sound sources such as explosives, aircraft, missiles and vessel noise) would be addressed in programmatic environmental analyses for each of the 13 ranges (Table 20).

The Commission has provided comments on one or more stages of the compliance process for all 13 ranges (see http://mmc.gov/letters/). Although the specific details vary by range, the Commission has emphasized the following points in its letters and meetings with the Navy.

- The Commission believes that the Navy has repeatedly misused the "No Action" alternative to indicate a continued level of activity consistent with the previous practices. Although this approach is acceptable when past levels of activity have been analyzed, that is not the case for many of the Navy's ranges. Further, in some cases, the alternatives described in environmental analyses have not included reductions of activity levels, in essence limiting the alternatives available to decision makers by pre-empting consideration of such reductions.
- The Navy has prepared and cites important documents regarding estimated marine mammal distribution and abundance on various ranges, but the Navy has not subjected those documents to peer review, which is an important element of any science-based approach to risk analysis.
- The Navy relies on monitoring and mitigation measures of unproven utility and, to date, has

not conducted the verification and validation tests required to assess the efficacy of those measures. Such tests are conceptually straightforward, the Navy has the resources and capability to conduct them, and they are standard practice in other types of Navy operations. The Navy has indicated it will conduct such tests as part of its integrated comprehensive monitoring plan, which is under development. The Commission supports the development of the integrated monitoring plan but also believes it warrants greater emphasis and priority than it has been given to date.

- The analyses used to compute risks to marine mammals are inconsistent across Navy documents and inconsistent with analyses used by the National Marine Fisheries Service. Further work is needed to compare, contrast, and verify these models to assure they are realistic in their projections of marine mammal takes from Navy exercises.
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Ship-shock Trials and Other Use of Explosives: Ship-shock trials and other use of explosives also require analyses of environmental risk and, as necessary, mitigation. The Navy, in cooperation with the National Marine Fisheries Service, has developed standardized safety, monitoring, and mitigation guidelines for gunnery and bombing exercises, mine neutralization, missile tests, and other uses of relatively small amounts of explosives. The guidelines follow risk thresholds set forth in Southall et al. (2007) and include a more or less standard set of monitoring and mitigation measures described in all current Navy environmental impact statements and letters of authorization issued by the National Marine Fisheries Service. The guidelines are based on received energy levels that might result in injury or disturbance of marine mammal behavior. Mitigation measures include pre-detonation surveys with buffer zones varying by charge size, specific criteria for selecting blast areas, and post-detonation monitoring. Similar guidelines were developed in 2008 for the Minerals Management Service, which issues and oversees permits for explosive removal of decommissioned oil and gas structures in the Gulf of Mexico.

Ship-shock trials are infrequent events conducted only during the introduction of a new class of ship. In 2006 the Navy began production of the LPD-series or San Antonio class of amphibious docking vessel. As required by law, a representative vessel of this class must be subjected to nearby explosions to assess the vessel's performance under conditions similar to those that would be experienced in combat. The most recent trial tested the USS Mesa Verde in August-September 2008 off the coast of northern Florida. Because these tests involve relatively large amounts of explosives, they require more elaborate monitoring and mitigation measures. The test plan and mitigation measures for testing the USS Mesa Verde closely followed those that were used for the destroyer USS Winston Churchill in 2001. Site selection was based on operational requirements as well as results from various types of marine mammal surveys (aerial, satellite) with preference given to areas of low marine mammal density. Pre-detonation monitoring consisted of aerial and shipboard monitoring, passive acoustic monitoring, and establishment of a 3.5-nmi safety range and a buffer zone from 2 to 3 nmi from the detonation point. After detonation, the area was surveyed by vessel and aircraft to detect any injured or killed marine mammals. In addition, the Navy maintained contact with stranding network personnel to detect any animals that might have stranded because of the trial. Test results are available at http://www.mesaverdeeis.com/. The surveys and stranding records did not reveal any injured, killed, or stranded marine mammals.

Minerals Management Service

The Minerals Management Service, acting for the Secretary of the Interior under the Outer Continental Shelf Lands Act, plays a key role in meeting America's energy demands by managing 1.7 billion acres of the outer continental shelf lands and the regulation of energy (e.g., oil, gas, and renewables) and mineral resources in these federal waters.

Oil and gas production has been a matter of great concern over the past decade because of the increasing cost of fuel for consumers and the increasing costs to the environment via emissions of greenhouse gases. The price of a gallon of gasoline

(all grades combined) rose from a monthly average of about $1.00 in 1999 to $4.11 in July of 2008 and then dropped precipitously to $1.75 by December 2008 (http://tonto.eia.doe.gov/dnav/pet/hist/mg_tt_usw. htm). Although the steep decline in the latter half of 2008 created a highly variable environment for energy planning, the overall trend in oil and gas prices has driven a wave of new energy-related initiatives, including exploration for new oil and gas reserves and greater consideration of renewable energy sources. The cost of oil and gas and the ever-growing demand for energy was a topic of considerable debate in the 2008 presidential campaign. The debate had—and continues to have—implications for a number of topics relevant to the protection of marine mammals and marine ecosystems, including (1) the advisability of extending offshore development of oil and gas resources into new areas within U.S. waters (various congressional moratoria have prohibited oil and gas development on about 85 percent of outer continental shelf area adjacent to the lower 48 states), (2) the recent marked increase in seismic surveys to search for new reservoirs, (3) the development of offshore ports for transport of liquid natural gas (regulated by the U.S. Coast Guard and U.S. Maritime Administration), and (4) the need for renewable energy sources, including those in the marine environment (e.g., wind, wave, current, and tidal energy).

Offshore production accounts for about 21 percent of all U.S. production of natural gas and 30 percent of crude oil (http://tonto.eia.doe.gov/dnav/pet/ pet_crd_crpdn_adc_mbbl_m.htm). In 2008 the Gulf of Mexico region accounted for 78 percent of offshore production, the Pacific region (California) about 7 percent, and Alaska 15 percent (Figure 34). Although exploration has occurred in the Atlantic region previously, oil and gas are not currently produced in federal waters off the Atlantic coast (http://tonto.eia.doe.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm).

The Minerals Management Service plans its oil and gas leasing in five-year cycles based on specific areas being considered for leasing. The current five-year period of lease sales extends from July 2007 to June 2012 (Table 21), and more information on lease sale activities can be found at the Service's Web site (http://www.mms.gov/ld/leasing.htm). In 2008 the Service planned one sale in the Alaska region (sale 193 in the Chukchi Sea) and three in the Gulf of Mexico. In Alaska waters, sale 193 was expected to lead to survey efforts in the Chukchi region through 2010 with exploratory drilling to commence in 2011 or later. Energy development in the offshore Chukchi Sea would reflect an expansion for the oil industry as, to date, the limited drilling in the Alaska region has been confined to state waters (within 3 nmi) in Cook Inlet and along the North Slope. In both areas, oil and gas development have been considered major environmental concerns because of the risk of oil leaks and spills and also because of the noise associated with

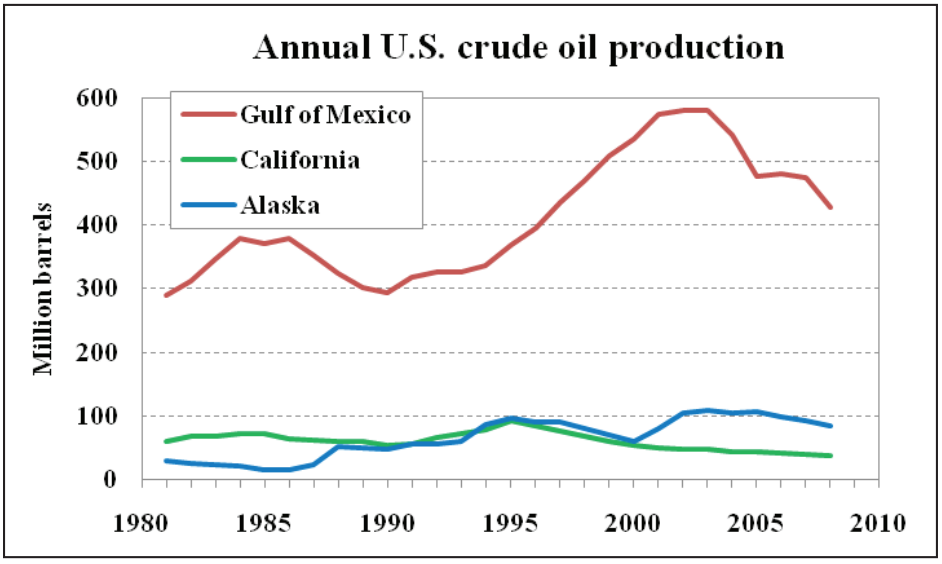

Figure 34. Annual crude oil production in the United States

Source: Energy Information Administration (http://tonto.eia.doe.gov/dnav/pet/pet_crd_crpdn_adc_mbbl_m.htm)

Table 21. Lease sales offered and planned by the Minerals Management Service for the five-year period, July 2007–June 2012

Sale	Area	Year
204	Western Gulf of Mexico	2007
205	Central Gulf of Mexico	2007
193	Chukchi Sea	2008
206	Central Gulf of Mexico	2008
224	Eastern Gulf of Mexico	2008
207	Western Gulf of Mexico	2008
208	Central Gulf of Mexico	2009
210	Western Gulf of Mexico	2009
209	Beaufort Sea	2010
211[1]	Cook Inlet	2010
212	Chukchi Sea	2010
213	Central Gulf of Mexico	2010
215	Western Gulf of Mexico	2010
216	Central Gulf of Mexico	2011
217	Beaufort Sea	2011
214	North Aleutian Basin	2011
218	Western Gulf of Mexico	2011
219	Cook Inlet	2011
220	Mid-Atlantic	2011
221	Chukchi Sea	2012
222	Central Gulf of Mexico	2012

[1] Sale 211 will not be held because of insufficient response to the Service's 2008 call for interest.

Source: Minerals Management Service (http://www.mms.gov/5-year/2007-2012LeaseSaleSchedule.htm)

construction and seismic surveys required to find energy reserves and guide their exploitation. In Cook Inlet, the primary concern has been possible effects on the endangered beluga whale population, whereas along the North Slope the primary concern has been the effects on species taken for subsistence purposes by Alaska Natives, including bowhead and beluga whales and several ice seal species (i.e., bearded seal and ringed seals).

In 2008 the Minerals Management Service held three lease sales in the Gulf of Mexico: 224 in the eastern Gulf, 206 in the central Gulf, and 207 in the western Gulf. In October 2008 the Service also issued a preliminary notice of lease sale 208 (73 Fed. Reg. 57649) planned for March 2009. That sale will include the Mississippi River mouth and DeSoto Canyon, both sites of high concentrations of endangered sperm whales. In October 2008 the Service published a notice of intent to prepare an environmental assessment for lease sale #213 in 2010, but as of the end of 2008 no further action had been taken on this sale.

In June and July 2008 the Marine Mammal Commission wrote four letters to the National Marine Fisheries Service regarding incidental harassment authorizations for oil exploration and development projects. Although those letters pertained to oil and gas development off Alaska's North Slope, the incorporated recommendations addressed matters pertinent to all oil and gas operations. The recommendations included implementing more robust monitoring and mitigation measures, evaluating the effectiveness of those measures, halting activities if a marine mammal is seriously injured or killed and the injury or death could be attributed to development activities, and assessing the cumulative effects of all these activities. With regard to the last point, the Commission has on numerous occasions recommended to the National Marine Fisheries Service, Fish and Wildlife Service, and Minerals Management Service that those agencies work with the oil and gas industry to develop comprehensive assessment and monitoring programs that will provide a better basis for detecting long-term, cumulative effects from increasing oil and gas activity.

Both the Services and industry have made significant efforts to improve their monitoring efforts. In 2006 the Minerals Management Service completed a review of the effects of seismic activities on marine mammals. That review led to a permitting process and a marine mammal observing and reporting program that is jointly overseen by the Minerals Management Service and the National Marine Fisheries Service. In addition, on 7 February 2007 the Minerals Management Service issued a Notice to Lessors and Operators (NTL 2207-G02; www.gomr.mms.gov/homepg/regulate/regs/ntls/2007NTLs/07g02.pdf) stipulating monitoring and mitigation requirements for seismic survey (airgun) operations. Those requirements include measures such as posting visual observers to spot marine mammals, ramping up sound sources at the onset of a survey and

following shutdown, and shutdown criteria when in the proximity of marine mammals. The oil and gas industry also has made important efforts to monitor their impacts; for example, at the Northstar production site off the North Slope of Alaska. However, the efficacy of these measures is questionable, and the Commission has repeatedly called for performance studies to determine how well they work. In addition, most of the monitoring and mitigation efforts to date are largely aimed at detecting and controlling direct, short-term interactions with wildlife (including marine mammals) and further efforts are needed to address indirect, long-term effects.

The 2007–2012 schedule for lease sales includes sale 214 in the North Aleutians Basin in 2010. In 1998 President Clinton excluded this region from consideration, but in 2007 President Bush withdrew that exclusion, opening the way for oil and gas exploration. On 8 April 2008 the Minerals Management Service published a notice of intent to prepare an environmental impact statement for this sale and sought public comment (73 Fed. Reg. 19095). The Commission normally does not respond to notices of intent but did so in this case because of the area's biological richness (including marine mammals, fishes, and seabirds), the large-scale fishing operations that occur in or adjacent to the area, and the extensive use of marine resources in the surrounding area for subsistence purposes. In a 7 July 2008 letter to the Minerals Management Service, the Commission emphasized that the environmental impact statement under consideration would need to include a description of (1) the biological and ecological richness and potential vulnerability of the southeastern Bering Sea ecosystem; (2) the harsh physical conditions, which would pose significant challenges to the construction and maintenance of oil platforms, vessels, and pipelines, (3) the expected increase in other human activity in that region (e.g., commercial shipping with the opening of Arctic sea lanes); (4) the risk factors associated with oil and gas development in the marine environment; (5) the compounding effects of climate change in this region; and (6) the cumulative effects of all these factors. Finally, the Commission asked the Service to meet and discuss how the two agencies might consult during the development of the environmental impact statement to ensure that all pertinent topics are given the best possible consideration. On 7 August 2008 the chief of the Environmental Studies Division, Alaska Region, met with Commission staff for a preliminary discussion regarding such consultation.

On 1 August 2008 the Minerals Management Service responded to the growing energy crisis by issuing a notice of intent to prepare a new five-year lease plan spanning the period from 2010 to 2015 and covering the entire U.S. outer continental shelf (73 Fed. Reg. 45065). The Service suggested that the new plan would be part of the federal government's actions to address the current domestic energy situation. In support of this new plan, the Service noted that —

> [c]urrently, each American uses an average of 3 gallons of oil per day. About two-thirds of that oil is used in transportation. In fact, oil is expected to remain, by far, the primary fuel for transportation for decades to come, even with aggressive efforts and government policies to encourage the development of alternative fuels, more efficient engines, and increasingly effective conservation measures.

The Service therefore sought comments on the development of a new five-year leasing program.

On 15 September 2008 the Commission responded, recommending that the Service work with the Department of Energy to—

- initiate a new 5-year oil and gas leasing program to supersede the current program, and
- conduct the environmental analyses needed to guide the public and decision-makers regarding the new program, including (a) a projection of the country's long-term energy needs based on expected population growth and economic expansion, (b) a description of all existing and potential sources of energy and trends in the development of those sources, (c) alternative approaches for meeting projected needs, including conservation, and the potential environmental impacts associated with those alternatives, and (d) a significant large-scale program aimed at reducing per capita energy demand, achieving greater efficiency in ongoing energy use, developing alternative energy sources, and reducing greenhouse gas production.

To support its recommendations, the Commission noted that the United States has faced an impending energy crisis for decades but has neither responded with adequate foresight and commitment to address the crisis in its earlier stages nor shown the foresight to reduce our national dependence on hydrocarbons and minimize the production of greenhouse gases. The Commission pointed out that records of the production and use of oil and gas since the enactment of the Outer Continental Shelf Lands Act in 1953 illustrate historical patterns in oil and gas production and use, as do similar records for other energy sources. Those historical records, combined with anticipated population and economic growth, should be sufficient to project future patterns and potential consequences of continuing with a "business as usual" approach. In the Commission's opinion, a thoughtful and farsighted plan is needed to move the nation beyond efforts simply to find the next oil field. If left unchanged, the present course would have a number of undesirable consequences, including the acceleration of climate change and its multitude of adverse effects.

Further information on the environmental assessment and lease sale process can be found at the Minerals Management Service's offshore energy Web site (http://www.mms.gov/offshore).

In 2005 the Energy Policy Act expanded the Minerals Management Service's authority to manage energy production from sources other than oil and gas (e.g., wind, wave, current, and tidal energy). In 2008 the Service prepared a draft environmental impact statement for leasing sites on the outer continental shelf for development of alternative sources of energy. The final version is expected in early 2009.

In U.S. waters, developers have proposed several wind farm projects in federal and state waters to date. The Cape Wind project was proposed for the Cape Cod–Nantucket Sound area. In January 2008 the Minerals Management Service released a draft environmental impact statement for that project. Despite the promise of this technology, it raises concerns ranging from aesthetics for coastal communities to seabird mortality, the latter being a particular concern for land-based wind farms as well. The effects on marine mammals are not clear, as only a small number of wind farms have been operating in northern Europe for short periods of time, and data on effects are just starting to emerge. The environmental impact statement received considerable public comment reflecting such concerns. The Commission also commented, recommending a thorough examination of risks from operating noise and spills of lubricants, generator fuel and other toxic compounds used on the platforms. In August 2008 the Federal Register posted a notice of another project to be located off the Pacific coast of Baja California. No further activity on this proposed project has been recorded since that time. At the end of 2008 the Minerals Management Service was finalizing its program for leasing and regulating renewable energy projects in federal waters (see http://www.mms.gov/offshore/RenewableEnergy/index.htm).

National Science Foundation

The National Science Foundation supports a wide range of marine studies, including geophysical research of the ocean bottom. These studies use seismic airguns, which introduce large amounts of sound energy into the marine environment and pose some risk to marine mammals and marine life. The Foundation did not conduct environmental analyses for such studies until recently when it was forced to cancel two geophysical projects because it had not completed the required analyses. The Foundation is now preparing a programmatic analysis under the National Environmental Policy Act for all of its marine geophysical research efforts involving underwater sound. The analysis was still underway at the end of 2008.

As noted previously in this chapter, the National Science Foundation purchased the R/V *Langseth* to support geophysical research. The vessel is operated by the Lamont-Doherty Earth Observatory. It went into operation in 2007 and in January 2008 began a series of studies in the Gulf of Mexico. The tests were carried out to assess the potential effects of vessel operations and the efficacy of various monitoring and mitigation measures for avoiding effects on marine mammals (e.g., measurements of the acoustic sound field of an operating airgun array, tests of automated passive acoustic monitoring systems, and use of visual observers on the vessel). Since then, the Lamont-Doherty Earth Observatory has prepared environmental assessments under the National Environmental Policy Act and

applied for and been granted incidental harassment authorizations from the National Marine Fisheries Service for seismic surveys in the eastern tropical Pacific off the coast of Central America and in the Gulf of Alaska. Applications for similar research in the southwest Pacific–Philippine Islands region and southeast Asia/Taiwan region were filed in November and December of 2008 but had not yet been authorized at the end of 2008. The proposed project near Taiwan generated considerable concern because the study overlapped the habitat of a small, isolated population of Indo-Pacific humpback dolphins (*Sousa* spp.). Similar objections are expected for the Gulf of Alaska studies planned for the summer of 2009 off Vancouver Island, where a 2006 study was cancelled by the Canadian government because of concerns about possible effects of seismic airguns on fish and mammals.

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Chapter X

REAUTHORIZATION OF THE MARINE MAMMAL PROTECTION ACT

The Marine Mammal Protection Act was enacted in 1972 and has since been reauthorized and amended several times. The most recent reauthorization of appropriations to carry out the directives of the Act was signed into law in 1994 and expired at the end of fiscal year 1999. Nevertheless, the provisions of the Act remain in force and continue to be funded by Congress through annual appropriations legislation.

Congress began the process to reauthorize the Marine Mammal Protection Act in 1999. The Subcommittee on Fisheries Conservation, Wildlife, and Oceans of the House Resources Committee held hearings on reauthorization issues in June 1999, April 2000, October 2001, June 2002, and July and August 2003. The Senate Committee on Commerce, Science, and Transportation held a hearing on the reauthorization of the Marine Mammal Protection Act in July 2003. The Commission participated in all of the hearings except the one in August 2003, which was a field hearing convened in San Diego, California, to consider the impacts of increasing pinniped populations on fisheries and recreational activities. Commission testimony presented at the other hearings can be found in the appendices of previous annual reports and on the Commission's Web site (www.mmc.gov).

The Administration Bill

The Marine Mammal Commission and the other federal agencies with responsibilities under the Marine Mammal Protection Act entered into interagency discussions beginning in 1999 to identify issues that they believed merited attention during the reauthorization of the Act and to begin to formulate a recommended Administration bill that could be transmitted to Congress for its consideration. Recommended bills were transmitted to Congress in 2000, 2002, 2003, and 2005. Detailed summaries of those proposed bills can be found in previous annual reports. The Administration considered whether to submit a new reauthorization bill for consideration by legislators during the 2007 and 2008 sessions of Congress. After discussing possible updates and other changes to the earlier Administration proposals, the involved agencies decided not to transmit a new recommended bill to the 110th Congress.

Presumably, the new Administration will revisit the issue of reauthorizing the Marine Mammal Protection Act and decide whether to prepare a new recommended bill to send to Congress once key appointments have been made and congressional priorities have been established. Because the bills transmitted by the outgoing Administration drew heavily on the bill put forth by the previous Democratic Administration, the interested agencies might use the previously recommended bills as a starting point for a new review. Among the issues that might be considered for inclusion in such a bill are—

- providing authority for federal wildlife agencies and Alaska Native organizations to enter into enforceable harvest management agreements;
- expanding the incidental take regime for commercial fisheries to include other fisheries using similar gear or having similar impacts;
- clarifying when exports of marine mammals and marine mammal products are allowed;
- increasing the maximum fines and penalties available for violations of the Act;

- allowing states to impose measures more protective that those in the Act; and
- building capacity for co-management in Alaska.

Action in the 110th Congress

During its 2007 and 2008 sessions, Congress did not consider any comprehensive bills to reauthorize the Marine Mammal Protection Act. Rather legislators opted to introduce bills targeted at specific issues. Bills introduced in 2007 were summarized in the previous annual report. Bills introduced in 2008 included—

- H.R. 5106, which would have established a National Marine Mammal Research Program to be administered by the Marine Mammal Commission;
- H.R. 5429, which would have expanded the authority under section 119 of the Act to allow the National Marine Fisheries Service and the Fish and Wildlife Service to enter into cooperative agreements with Alaska Native organizations to manage the taking of marine mammals for subsistence purposes;
- S. 2907, which would have established uniform enforcement procedures and penalties under the High Seas Driftnet Fishing Moratorium Protection Act (16 U.S.C. § 1826d *et seq*.) and other statutes, including the tuna-dolphin provisions of the Marine Mammal Protection Act;
- H.R. 6936, which would have allowed the importation of polar bears taken in sport hunts in Canada before the date on which the polar bear was listed as a threatened species under the Endangered Species Act (see additional discussion of this bill, H.R. 7171, and other bills related to polar bear imports in the polar bear section of Chapter IV); and
- H.R. 7171, which would have allowed for continued importation of polar bears taken in sport hunts in Canada despite the species being depleted under the Marine Mammal Protection Act by virtue of its listing under the Endangered Species Act.

Despite the introduction and consideration of these bills and others introduced in 2007, no amendments to the Marine Mammal Protection Act were enacted during either session of the 110th Congress.

Chapter XI

PERMITS AND AUTHORIZATIONS TO TAKE MARINE MAMMALS

The Marine Mammal Protection Act places a general moratorium 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 to attempt to harass, hunt, capture, or kill any marine mammal. The Act also allows certain exceptions, one providing for the issuance of permits by either the National Marine Fisheries Service or the Fish and Wildlife Service (depending on the species of marine mammal involved) to authorize 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. Permits also are available for the taking of marine mammals in the course of educational or commercial photography.

The Marine Mammal Commission is to review all permit applications except those issued for the importation of polar bear trophies from certain populations in Canada. However, such permits are no longer available following the listing of the polar bear as a threatened species under the Endangered Species Act. The Act also allows the National Marine Fisheries Service and the Fish and Wildlife Service to grant authorizations for the taking of small numbers of marine mammals incidental to activities other than commercial fishing, provided that the taking will have only a negligible impact on the affected stocks. The taking of marine mammals incidental to commercial fishing operations is authorized under separate provisions of the Marine Mammal Protection Act and is discussed in Chapter VIII.

Permit Applications

Permits for scientific research, public display, species enhancement, and photography all involve the same four-step review process: (1) individuals or organizations submit permit applications to either the National Marine Fisheries Service or the Fish and Wildlife Service; (2) the Service conducts an initial review, publishes a notice of receipt of the application in the Federal Register inviting public review and comment, and transmits the application to the Marine Mammal Commission; (3) the Commission, in consultation with its Committee of Scientific Advisors on Marine Mammals, reviews and transmits its comments and recommendations to the Service; and (4) the Service takes final action after consideration of comments and recommendations from the Commission and the public. If captive maintenance of animals is involved, the Service seeks the views of the Department of Agriculture's Animal and Plant Health Inspection Service on the adequacy of facilities, animal husbandry and care programs, and transportation arrangements.

Once a permit is issued, the responsible agency can amend it, provided the proposed change meets the applicable statutory and regulatory requirements. Depending on the extent of the proposed change, an amendment may be subject to the same notice, review, and comment procedures as the original permit application. The Commission reviews proposed amendments to permits, except those considered under the National Marine Fisheries Service's permit regulations to be of a minor nature (i.e., those that do not extend the duration of the research beyond 12 months, result in the taking of additional numbers or species of animals, increase the level of take or risk of adverse impact, or change or expand the location of the research).

During 2008 the Commission reviewed and provided recommendations on 17 permit applica-

tions submitted to the National Marine Fisheries Service and 19 permit applications submitted to the Fish and Wildlife Service. Twelve of the applications to the National Marine Fisheries Service involved scientific research, one was for commercial/educational photography, and four were for public display. Nine of the applications submitted to the Fish and Wildlife Service involved scientific research, seven were for enhancement, and three were for public display. In addition, the Commission reviewed and provided comments on 13 permit amendment requests submitted to the Services (nine to the National Marine Fisheries Service and four to the Fish and Wildlife Service). In general, the Services adopted the Commission's recommendations concerning these permit actions. The proposed activities, Commission recommendations, and agency responses to the Commission recommendations are summarized in Appendix A.

General Authorization of Scientific Research

Amendments to the Marine Mammal Protection Act enacted in 1994 enable the National Marine Fisheries Service and the Fish and Wildlife Service to streamline authorization of research involving taking by Level B harassment only (i.e., any act of pursuit, torment, or annoyance that has the potential to disturb but not injure a marine mammal or marine mammal stock). The Services have granted such authorizations to between 6 and 19 researchers each year. During 2008 the National Marine Fisheries Service issued nine letters of confirmation under this general authorization and thereby reduced delays associated with issuing permits. However, the general authorization does not apply to activities that may take endangered or threatened marine mammals, which remain subject to additional permitting requirements of the Endangered Species Act. In its testimony before the House Natural Resources Committee's Subcommittee on Fisheries Conservation, Wildlife, and Oceans in June 1999, the Commission recommended that the general authorization be expanded to apply to all marine mammals. Such a proposal has yet to be included in the Marine Mammal Protection Act reauthorization bills submitted to Congress by the Secretary of Commerce and the Secretary of the Interior because the responsible agencies believe that amending the Endangered Species Act would be a more appropriate way to implement such a change.

Polar Bear Trophy Imports

The 1994 amendments to the Marine Mammal Protection Act allowed the Secretary of the Interior to issue permits authorizing the importation of polar bear trophies from sport hunts conducted in Canada, provided that certain findings were made (e.g., that Canada has a monitored and enforced sport-hunting program that is consistent with the purposes of the Agreement on the Conservation of Polar Bears and the Marine Mammal Protection Act and is based on scientifically sound quotas that will ensure the maintenance of the affected population stock at a sustainable level). The Commission has provided comments to the Service as to which of Canada's polar bear management units meet the criteria to qualify for importation. Since regulations authorizing the importation of polar bear trophies from Canada were published in 1997, 969 import permits have been issued. Of these, the annual numbers of permits issued for 1997 through 2007 were 132, 60, 142, 76, 70, 52, 68, 108, 61, 71, and 113. A total of 16 permits were issued through 15 May 2008. As discussed in Chapter IV, the Fish and Wildlife Service published a final rule on 15 May 2008 listing the polar bear range-wide as threatened under the Endangered Species Act. As a result of this listing, polar bears are considered depleted under the Marine Mammal Protection Act, and the importation of polar bear trophies from Canada is no longer allowed.

Small-Take Authorizations

Section 101(a)(5) of the Marine Mammal Protection Act allows U.S. citizens to obtain authorization for the unintentional taking of small numbers of marine mammals incidental to activities other than commercial fishing when they meet certain conditions. Applicants can utilize this provision when the number of animals likely to be affected is considered to be small and the impact on the size and productivity of the affected species or populations is likely to be negligible. This provision applies to the incidental taking of both depleted and non-depleted species and populations. All forms of incidental taking, including

lethal taking, may be authorized by regulation under section 101(a)(5)(A). Section 101(a)(5)(D), added to the Act in 1994, provides a streamlined alternative to rulemaking for obtaining a small-take authorization when the taking will be by harassment only.

Authorizations under section 101(a)(5)(A) require that regulations be promulgated that set forth permissible methods of taking and requirements for monitoring and reporting and include a finding that the incidental taking will have a negligible effect on the size and productivity of the affected species or stocks. Authorization for incidental taking by harassment under section 101(a)(5)(D) does not require promulgation of regulations. Rather, within 45 days of receiving an application that makes the required showings, the Secretary of the responsible agency is to publish a proposed authorization and notice of availability of the application for public review and comment in the Federal Register, in newspapers, and by appropriate electronic media in communities in the area where the taking would occur. Following a 30-day comment period, the Secretary has 45 days to make a final determination on the application. The Secretary may issue authorizations under section 101(a)(5)(A) for periods of up to five years and under section 101(a)(5)(D) for periods of up to one year. Both types of authorizations may be renewed. Under amendments enacted in 2003, somewhat different requirements apply to incidental-take authorizations for military readiness activities.

During 2008 the Commission reviewed 34 requests for small-take authorizations submitted to the National Marine Fisheries Service, 10 requests under section 101(a)(5)(A) and 24 requests under section 101(a)(5)(D). The Commission also reviewed one small-take request submitted to the Fish and Wildlife Service under section 101(a)(5)(D). The proposed activities, Commission recommendations, and agency responses to the Commission recommendations are summarized in Appendix A.

Appendix A

2008 MARINE MAMMAL COMMISSION RECOMMENDATIONS AND AGENCY RESPONSES

2 January

To: National Marine Fisheries Service

Issue: Application from Sea World, Inc., to import one female beluga whale from Marineland of Canada for public display

Recommendation: The Commission recommended approval, provided that the Service, in consultation with the Animal and Plant Health Inspection Service, is satisfied that the applicant's plans and facilities for transport and maintenance of the requested animal are adequate to provide for its health and well-being, the applicant's education program is in place as a component of the proposed public display, the basic message of the program is accurate and consistent with the policies of the Marine Mammal Protection Act, and the program includes accurate information about the life history and other aspects of the species.

Agency Response: The Service issued the permit on 5 September 2008, consistent with the Commission's recommendations.

2 January

To: U.S. Fish and Wildlife Service

Issue: Application from the Detroit Zoological Society to permanently maintain one non-releasable male polar bear for public display

Recommendation: The Commission recommended approval, provided that the Service, in consultation with the Animal and Plant Health Inspection Service, is satisfied that the applicant's plans and facilities for maintenance of the requested animal are adequate to provide for its health and well-being, the applicant's education program is in place as a component of the proposed public display, the basic message of the program is accurate and consistent with the policies of the Marine Mammal Protection Act, and the program includes accurate information about the life history and other aspects of the species.

Agency Response: The Service issued the permit on 29 February 2008, consistent with the Commission's recommendations.

7 January

To: U.S. Department of Transportation

Issue: Application from the U.S. Coast Guard for comments on proposed preparation of a port access route study for waters east and south of Cape Cod, Massachusetts.

Recommendation: The Commission recommended that the proposed study evaluate (1) the utility of all the management options identified in the National Marine Fisheries Service's July 2006 Draft Environmental Impact Statement to Implement the Operational Management Measures of the North

Atlantic Right Whale Ship Strike Reduction Strategy; (2) the development of a real-time passive acoustic network along the entire Boston traffic separation lanes east of Cape Cod and Nantucket Shoals that could be used to trigger speed restrictions whenever and wherever right whale calls are detected; and (3) designation of the Boston traffic separation system as a mandatory vessel traffic route for all vessels greater than a certain size traveling along the U.S. East Coast between the Gulf of Maine and waters south of New England, with a "roundabout" added to traffic lanes in the Off Race Point Management Area to separate those vessels using ports in Massachusetts Bay and those using ports to the north of the bay.

Agency Response: At the end of 2008 the Department of Transportation had not responded to the Commission's letter.

10 January **To**: National Marine Fisheries Service

Issue: Application from Glenn R. VanBlaricom, Ph.D., to take by harassment small numbers of California sea lions, Pacific harbor seals, and northern elephant seals incidental to research activities on black abalone populations at San Nicolas Island, California

Recommendation: The Commission recommended approval of the application.

Agency Response: The Service issued the incidental harassment authorization effective 18 January 2008**.**

17 January **To**: National Marine Fisheries Service

Issue: Application from the Lamont-Doherty Earth Observatory to take small numbers of marine mammals by harassment incidental to conducting a seismic survey in the Pacific Ocean and Caribbean Sea off Central America from February through April 2008

Recommendation: The Commission recommended that, before issuing the requested authorization, the Service take steps to ensure that the planned monitoring program would be sufficient to detect, with reasonable certainty, all marine mammals within or entering the identified safety zones. The Commission further recommended that, if issued, the authorization require monitoring be conducted for one hour prior to the start of seismic activities and one hour prior to resuming airgun activities after a power-down and that observations be made during all ramp-up procedures to gather data regarding the effectiveness of ramp-up as a mitigation tool.

Agency Response: The Service issued the incidental harassment authorization on 14 February 2008. The Service responded, among other things, that it considers 30 minutes to be an adequate monitoring period prior to the start-up of airguns because (1) the source vessel is required to ramp-up and, thus, the time of monitoring prior to start-up of any but the smallest array is effectively longer than 30 minutes; (2) in many cases, monitoring for marine mammals will be conducted during times when sonar is not being operated (i.e., prior to the 30-minute observation period); (3), many of the species that may be exposed do not stay underwater more than 30 minutes; and (4) if a deep-diving marine mammal was in the area in the short time immediately prior to the pre-start-up monitoring, and its maximum underwater time is 45 minutes, there is only a 1 in 3 chance that its last random surfacing would be prior to the beginning of the required 30-minute monitoring period.

22 January **To**: National Marine Fisheries Service

Issue: Application from the North Carolina Zoo to import two captive-born juvenile harbor seals from the New Brunswick Aquarium and Marine Center, Shippagan, New Brunswick, Canada, for public display

Recommendation: The Commission recommended approval, provided that the Service, in consultation with the Animal and Plant Health Inspection Service, is satisfied that the applicant's plans and facilities for transport and maintenance of the requested animals are adequate to provide for their health and well-being, the applicant's education program is in place as a component of the proposed public display, the basic message of the program is accurate and consistent with the policies of the Marine Mammal Protection Act, and the program includes accurate information about the life history and other aspects of the species.

Agency Response: The Service issued the permit on 31 March 2008, consistent with the Commission's recommendations.

24 January **To**: U.S. Fish and Wildlife Service

Issue: Application from Beyond Bears, Inc., to import an adult female polar bear from Canada for public display

Recommendation: The Commission recommended that the Service either deny the permit outright or obtain additional information from the applicant about why the animal was exported from Sweden to Canada at two months of age and consider whether paragraph (4) of section 101(b) of the Marine Mammal Protection Act concerning humaneness establishes a separate impediment to authorizing the bear's importation. The Commission further recommended that the Service obtain a specific description of the applicant's plans for moving the bear among various locations and all activities that he intends to pursue, and that it make a finding that filmmaking and similar activities, except those incidental to conducting and publicizing authorized public display activities, do not constitute public display and cannot be authorized under such permits.

Agency Response: The Service denied the permit request on 19 February 2008.

30 January **To**: National Marine Fisheries Service

Issue: Application from Janice Straley to amend a permit to authorize an additional 25 takings of sperm whales annually to attach suction-cup tags, the satellite-tagging of up to 20 sperm whales and 20 killer whales, and the harassment of up to 40 sperm whales annually during experiments involving fishing operations and methods

Recommendation: The Commission noted that, because the original permit, its subsequent amendment, and the current amendment request refer to the number of "takes" authorized to be conducted on animals rather than the number of animals that are authorized to be taken, it is not possible to determine the number of animals that would be subject to such takes, as is required by section 104(b)(2)(A) of the Marine Mammal Protection Act, or the number of times individual animals might be taken. The Commission recommended that the Service clarify in the permit and subsequent amendments the number of animals that are and would be authorized under the permit, after which the request be approved, provided that the conditions contained in the current permit remain in effect.

Agency Response: The Service had not issued the amendment at the end of 2008.

30 January **To**: U.S. Fish and Wildlife Service

Issue: Application from Gordon B. Bauer, New College of Florida, to renew and amend a permit authorizing the permit holder to conduct perception and behavior studies on two captive manatees maintained at Mote Marine Laboratory

Recommendation: The Commission recommended approval, provided that the conditions contained in the original permit, as amended on 24 January 2005, remain in effect.

Agency Response: The Service issued the amendment on 24 March 2008, consistent with the Commission's recommendation.

30 January **To**: U.S. Fish and Wildlife Service

Issue: Application from Henry Vilas Zoo, Madison, WI, to maintain permanently one non-releasable male polar bear for public display

Recommendation: The Commission recommended approval of the requested permit, provided that the Service, in consultation with the Animal and Plant Health Inspection Service, is satisfied that the applicant's plans and facilities for maintaining the animal are adequate to provide for its health and well-being, the applicant's education program is in place as a component of the proposed public display, the basic message of the program is accurate and consistent with the policies of the Marine Mammal Protection Act, and the program includes accurate information about the life history and other aspects of the species.

Agency Response: The Service issued the permit on 29 February 2008, consistent with the Commission's recommendations.

12 February **To**: National Marine Fisheries Service

Issue: Application from the Alaska Department of Fish and Game to collect and to import and export to various laboratories and museums worldwide for research and curatorial purposes an unspecified number of samples from pinnipeds and cetaceans found dead or killed legally by Alaska Natives for subsistence purposes, taken by researchers under other permits, or taken in legal fisheries to obtain information that can be used to monitor the health and population status of marine mammal species in Alaska

Recommendation: The Commission recommended approval, provided that the applicant be required to obtain all necessary permits under the Convention on International Trade in Endangered Species of Wild Fauna and Flora before importing or exporting any marine mammal parts; maintain detailed records indicating the source of each specimen and the circumstances under which it was collected; and periodically provide reports to the Service sufficient to demonstrate that each specimen was taken in accordance with the laws of the country of origin, was not taken in violation of the Marine Mammal Protection Act or other applicable U.S. laws, and is being used only for bona fide scientific purposes.

Agency Response: The Service issued the permit on 9 April 2008, consistent with the Commission's recommendations.

19 February **To**: Knik Arm Bridge and Toll Authority

Issue: Draft and final environmental impact statements as they pertain to marine mammals in Alaska that might be affected, directly or indirectly, by the construction and use of the proposed Knik Arm Bridge

Recommendation: The Commission recommended that the Knik Arm Bridge and Toll Authority and the Federal Highway Administration refrain from making any irreversible or irretrievable commitment of resources related to bridge construction until the uncertain but potentially significant impact of bridge construction and use can be evaluated and the Administration can make an affirmative finding that such activities, once mitigated, will not have a more than negligible impact on the Cook Inlet beluga whale stock. The Commission further recommended that, in view of the pending proposed rule to list the Cook Inlet beluga whale stock under the Endangered Species Act, the Knik Arm Bridge and Toll Authority, in collaboration with the Federal Highway Administration, initiate a conference with the National Marine Fisheries Service to evaluate the potential effects of bridge construction and use on this stock.

Agency Response: Plans for construction of the bridge were proceeding at the end of 2008.

19 February **To**: National Marine Fisheries Service

Issue: The Service's draft environmental assessment on Reducing the Impact on At-risk Salmon and Steelhead by California Sea Lions in the Area Downstream of Bonneville Dam on the Columbia River, Oregon and Washington

Recommendation: The Commission generally concurred with the approach put forth in the environmental assessment but recommended that the Service develop and include in its decision documents a more detailed explanation of the term "significance" (i.e., a clear , quantitative standard for determining when pinnipeds are having a significant negative impact on salmonid stocks) than is currently provided in the draft.

Agency Response: On 17 March 2008 the Service granted partial approval of an application from the states of Oregon, Washington, and Idaho to intentionally take, by lethal methods, individually identifiable California sea lions that prey on Pacific salmon and steelhead listed as threatened or endangered under the Endangered Species Act in the Columbia River in Washington and Oregon.

24 February **To**: National Marine Fisheries Service

Issue: Alternative actions being considered under the Service's draft environmental assessment on Reducing the Impact on At-risk Salmon and Steelhead by California Sea Lions in the Area Downstream of Bonneville Dam on the Columbia River, Oregon and Washington

Recommendation: The Commission commented on whether, and under what conditions, the Service should authorize the lethal removal of California sea lions under section 120 of the Marine Mammal Protection Act. The Commission noted that, consistent with the primary objective of the Marine Mammal Protection Act (i.e., to maintain the health and stability of the marine ecosystem), the Service should give precedence to the conservation of the endangered and threatened salmonid stocks at Bonneville Dam. The Commission further noted that the Service should be particularly clear regarding (1) its rationale for determining the extent to which predation must be reduced to promote conservation and recovery of the salmonid stocks and (2) the manner and rationale by which it is, in effect, allocating allowable salmonid mortality among different sources of mortality.

Agency Response: The Service responded by letter of 28 May 2008, stating that it had announced its partial approval of the states' request on 17 March 2008, which requires that after the third year of sea lion removals (June 2010), the states and the Service review whether the average observed salmonid predation rate has fallen below 1 percent of the observed fish passage at the dam. If the Regional Administrator of the Service's Northwest Region determines that the predation rate has fallen below 1 percent, no lethal removal would be authorized for the following year.

25 February **To:** National Marine Fisheries Service

Issue: Application from Michael Etnier, Ph.D., to both the National Marine Fisheries Service and the Fish and Wildlife Service to obtain, possess, import, and export, on an opportunistic basis, teeth, bone, and whisker samples from pinnipeds, cetaceans, and mustelids (northern sea otters) for scientific research

Recommendation: The Commission recommended that the two Services approve the permit request, provided that the applicant be required to obtain all necessary permits under the Convention on International Trade in Endangered Species of Wild Fauna and Flora before importing or exporting any marine mammal parts; maintain detailed records indicating the source of each specimen and the circumstances under which it was collected; and periodically provide reports to the Services sufficient to demonstrate that each specimen was taken in accordance with the laws of the country of origin, was not taken in violation of the Marine Mammal Protection Act or other applicable U.S. laws, and is being used only for bona fide scientific purposes.

Agency Response: The Service issued the permit on 18 June 2008, consistent with the Commission's recommendations.

25 February **To**: Fish and Wildlife Service

Issue: Application from the Florida Fish and Wildlife Conservation Commission to renew and amend a permit to increase the number of manatees to be marked, tagged, and harassed during research studies

Recommendation: The Commission recommended approval of the requested renewal and amendment, provided that the conditions contained in the original permit remain in effect.

Agency Response: The Service issued the renewed and amended permit on 22 April 2008, consistent with the Commission's recommendation.

29 February **To**: Crystal River National Wildlife Refuge

Issue: The Fish and Wildlife Service's intent to prepare a comprehensive conservation plan and associated environmental assessment for the Crystal River National Wildlife Refuge

Recommendation: The Commission recommended that the proposed plan include provisions for establishing a management objective that calls for enhancing and implementing measures to protect and conserve manatees in Kings Bay and adjacent waterways; developing and implementing regulations that prohibit swimmers and divers from approaching manatees closer than a specified distance (e.g., 10 ft) or touching manatees; evaluating and, if warranted, implementing a permit system for divers and dive tour operators in Kings Bay to assure an equitable way of limiting and distributing the number of boats and people allowed at any one time in popular dive locations during peak viewing periods; developing and implementing an ongoing monitoring program that includes underwater

videotaping to document interactions between swimmers and divers and manatees and assess the extent to which people comply with regulations and guidance; assisting with and supporting research to assess the quality of habitat vital to the survival of manatees and to monitor the abundance, distribution, and habitat-use patterns of manatees in Kings Bay and surrounding areas; and evaluating and, as possible, purchasing land areas that could be added to the refuge to improve the protection and conservation of manatees in Kings Bay.

Agency Response: At the end of 2008 the Service had not yet circulated a draft conservation plan for review.

3 March

To: National Marine Fisheries Service

Issue: Application from Kathryn Ono, Ph.D., to amend a permit to increase the number of grey seals authorized to be harassed from 1,000 to 2,000 animals annually

Recommendation: The Commission recommended that the Service approve the requested permit amendment, provided that the conditions contained in the original permit remain in effect.

Agency Response: The Service issued the amended permit on 17 December 2008, consistent with the Commission's recommendation.

4 March

To: National Marine Fisheries Service

Issue: The Service's draft supplemental environmental impact statement on the Cook Inlet beluga whale harvest

Recommendation: The Commission recommended that the Service revise the draft statement to indicate that it intends to maintain its current survey effort to monitor the status of the Cook Inlet beluga whale population and not diminish the current survey effort without first conducting an analysis to assess the possible impacts on beluga whales and subsistence hunters that might result from decisions based on population data that are less reliable. The Commission noted that the Service proposes to use data obtained since 1999 to establish the baseline for determining what level of mortality is normal, but that the years 1999–2007 generally had the highest number of observed deaths. The Commission recommended that the Service analyze the possible effects of its selection of an expected mortality limit based on data obtained from that time frame on the potential for recovery of the stock and consider alternatives to the one proposed and give high priority to investigating possible causes of the stock's failure to recover.

Agency Response: The Service released its final supplemental environmental impact statement on 20 June 2008. The Service disagreed that the period from 1999 to 2007 represents a period of higher-than-usual mortality, noting that differences between the observed deaths during 1988–1995 and 1999–2007 are more likely related to differences in likelihood of discovery and reporting of stranded beluga carcasses. The Service further noted that the unusual mortality event determination depends on volunteer reporting and, consequently, the most appropriate data to use are the most recent so that improved reporting does not impact the harvest determination. The Service agreed that additional research and coordination with industry is a high priority to determine possible causes for the stock's failure to recover.

7 March **To**: Fish and Wildlife Service

Issue: Application from Graham Worthy, Ph.D., to renew a permit for an additional five years and to amend it to increase from 10 to 20 animals the number of captive manatees that can be sampled annually, to authorize the permit holder to obtain samples collected by other permitted researchers or the state of Florida from up to 100 dead manatees annually, and to rescind the previous authorization for sampling 40 free-ranging manatees

Recommendation: The Commission recommended that the Service approve the requested permit renewal and amendment, provided that the conditions contained in the current permit remain in effect.

Agency Response: The Service issued the permit on 9 May 2008, consistent with the Commission's recommendation.

7 March **To**: Fish and Wildlife Service

Issue: Application from the Monterey Bay Aquarium to renew and amend a permit to increase from 50 to 100 the maximum number of southern sea otters that may be taken annually; authorize the conduct of rehabilitation and related activities under an enhancement permit, and authorize scientific research on live-stranded, captive-held, or released southern sea otters

Recommendation: Consistent with its view concerning the scope of the enhancement permit provision of the Marine Mammal Protection Act, the Commission recommended that the Service authorize the rescue and rehabilitation activities proposed by the applicant under sections 109(h) and 112(c) of the Act and under a permit issued under section 10 of the Endangered Species Act; encourage the applicant to amend its application to seek authority for all research activities under a scientific research permit; and defer consideration of the proposed captive breeding program pending the submission of additional information that addresses the questions identified by the Commission and that fully satisfies the requirements of section 104(c)(4) of the Marine Mammal Protection Act. With respect to scientific research, the Commission recommended that the Service defer approval of the requested research activities until the proposed projects are described in sufficient detail for the Service and others to make the determinations required under the Act and, if the Service determines that a staged approval process for the proposed research activities is appropriate, that the process be structured to accommodate participation and input from the Commission and the public. The Commission also recommended that, consistent with the Service's guidelines for the release of rehabilitated sea otters, decisions concerning the releasibility of stranded animals and their placement at a facility be made by the Service based on information provided by, and in consultation with, the facility holding the animals.

Agency Response: The Service adopted the Commission's recommendations and issued two separate permits on 25 July 2008, one authorizing the rescue, rehabilitation, and release of stranded southern sea otters and the other authorizing scientific research on the subject animals.

11 March **To**: Fish and Wildlife Service

Issue: Application from Niladri Basu, Ph.D., to import from Canada brain samples taken from 110 subsistence-harvested polar bears for scientific research on the effects of chemical pollution on the health of Arctic polar bear populations

Recommendation: The Commission recommended that the Service approve the permit request, provided that the applicant obtains all necessary permits under the Convention on International Trade

in Endangered Species of Wild Fauna and Flora before importing or exporting any marine mammal parts.

Agency Response: The Service issued the permit on 21 April 2008, consistent with the Commission's recommendation.

14 March **To**: Minerals Management Service

Issue: The Service's draft environmental impact statement on plans to lease submerged Outer Continental Shelf lands in Nantucket Sound, Massachusetts, for the Cape Wind Energy Project

Recommendation: The Commission recommended that the Service revise discussions throughout the draft statement to clarify reference units and analyses regarding sound levels, the frequencies or frequency bands involved, and their potential impact on marine species; immediately consult with the applicant and require that, prior to construction activity, it initiate a series of studies to develop baseline information on the numbers, distribution, and habitat-use patterns of marine mammals, particularly harbor seals, gray seals, harbor porpoises, and large whales, in Nantucket Sound; expand the draft statement to provide information appropriate to impulse sound sources like pile-driving, including time/amplitude waveforms, the maximum source levels, and maximum received levels; and require, rather than recommend, that the applicant contact the National Marine Fisheries Service to determine the need for an incidental harassment authorization pursuant to the Marine Mammal Protection Act.

The Commission further recommended that, if an incidental harassment authorization is needed, the Minerals Management Service require that any authorization it may issue to proceed with offshore construction is contingent upon full compliance by the applicant with all provisions of any incidental harassment authorization issued; require the implementation of an environmental management system and the approval of its provisions before any project construction activities are initiated; assure that any approved environmental management system for the project requires that underwater sound levels and their attenuation rates throughout the pile-driving phase and during at least the first two years of wind turbine operation be subject to monitoring studies approved in consultation with the National Marine Fisheries Service; require that dedicated wildlife observers are posted at pile-driving sites in a location suitable for detecting whales, seals, turtles, and other protected marine species within the 500-meter safety zone whenever pile-driving operations are being undertaken; require that, when visibility is limited by night, fog, or other circumstances, pile-driving work is either suspended or alternative means of effective wildlife detection, such as acoustic monitoring or other alternative sensing methods, is employed; and expand the draft statement to identify alternative methods for mitigating sound levels produced by pile-driving and add a mitigation measure to require that the applicant use the best available technology for minimizing the size of the zone around pile-driving sites within which marine mammals and other marine species could be injured or otherwise affected by underwater sound.

Agency Response: The Service had not issued a final environmental impact statement at the end of 2008.

20 March **To**: National Marine Fisheries Service

Issue: Application from Neptune LNG, LLC, for an incidental harassment authorization to harass small numbers of various species of seals, toothed whales, and baleen whales, including North Atlantic right whales, incidental to the construction and operation of an offshore liquefied natural gas facility in Massachusetts Bay

Recommendation: The Commission recommended that the Service issue the requested incidental harassment authorization, provided that all mitigation, monitoring, and reporting measures identified in the *Federal Register* notice are included in the authorization; that the Service condition the authorization to postpone the onset of construction in Massachusetts Bay in 2009 until June 1 and require passive acoustic monitoring at all times; and that it reevaluate the numbers of animals likely to be taken incidentally to the covered activities, as proposed in the Service's notice.

Agency Response: The Service issued the incidental harassment authorization on 6 June 2008. The Service stated that it had recalculated the cetacean density data and estimated take number based on the compilation of a large number of databases published by the National Centers for Coastal Ocean Science and multiplied the recalculated density numbers by the area to be ensonified to 120 dB, which was used as the threshold for estimating the onset of Level B (behavioral) harassment for continuous sounds (the number of days that construction activities will occur were also included). The Service included a detailed description of how the new take numbers were calculated.

21 March **To**: National Marine Fisheries Service

Issue: Applications from 13 power-generating stations located on the coast of central and southern California to take by Level A harassment and killing small numbers of harbor seals and California sea lions as a result of entrapment in intake structures incidental to routine power plant operations over a five-year period

Recommendation: The Commission recommended that, if the Service proceeds with a proposed rule to authorize the taking of small numbers of seals incidental to operation of the power plants, the applicants should be required to take steps to eliminate, to the extent possible, the taking of seals and sea lions in intake structures.

Agency Response: The Service had not issued the proposed rule at the end of 2008.

25 March **To**: Department of Commerce

Issue: Efforts to conserve the vaquita

Recommendation: The Commission noted that Mexico's Ministry of the Environment and Natural Resources and the Ministry of Fisheries had jointly announced that they would be working together to conserve the vaquita. The Commission urged the National Oceanic and Atmospheric Administration to support the Southwest Fisheries Science Center's upcoming cruise in the Gulf of California to study the species. The Commission stated its belief that the scientific information from the cruise will inform Mexican government officials, strengthen the basis for their decisions, and provide valuable insights into thoughtful and creative recovery measures.

Agency Response: The National Marine Fisheries Service responded by letter of 8 May 2008, stating that it plans to conduct shipboard research in the northern Gulf of California in the autumn of 2008. The Service noted that it had requested funding from the Commission to support this effort.

31 March **To**: Naval Facilities Engineering Command, Atlantic

Issue: The Draft Environmental Impact Statement/Overseas Environmental Impact Statement provided by the Department of the Navy to evaluate its Atlantic Fleet Active Sonar Training activities

Recommendation: The Commission expressed its belief that the draft statement requires major revision with regard to the evaluation of action alternatives, estimation of risk, and mitigation of that risk, and recommended that the Navy rename the "no action" alternative to something more reflective of the actual level of activity and associated unmitigated risk from that activity; provide a more complete and detailed explanation of how the action alternatives were compared; alter or augment its risk analysis in Appendix D and the remainder of the draft statement to provide the information the reader would need to evaluate the analyses of costs and risks of the alternatives; include more background in the statement and appendices on the methods used to generate the sound exposure numbers and derive the risk plots; and provide a comprehensive description of the various monitoring and mitigation measures that might be used, evaluate the performance of those measures, taking into account existing marine mammal monitoring and mitigation data, and instigate planning to evaluate and address the shortcomings of the proposed measures.

Agency Response: The Final Environmental Impact Statement/Overseas Environmental Impact Statement was signed on 10 December 2008, and the Record of Decision was to be signed early in January 2009.

4 April **To**: National Marine Fisheries Service

Issue: The proposed rule to amend regulations concerning experimental fishing permits, exempted fishing permits, and scientific research activities under the Magnuson-Stevens Fishery Conservation and Management Act

Recommendation: The Commission recommended that the Service revise the proposed regulations to clarify that exempted fishing permits will not be issued to authorize fishing activities that are inconsistent with the requirements of take reduction plans adopted under the Marine Mammal Protection Act and, with regard to proposed changes to section 600.745(b)(3)(i) of its regulations, not delete reference to its intent to issue an experimental fishing permit but rather indicate that the Service will include a preliminary or proposed finding in its notice.

Agency Response: The Service had not issued a final rule at the end of 2008.

4 April **To**: National Marine Fisheries Service

Issue: Application from the Lamont-Doherty Earth Observatory for authorization to take small numbers of marine mammals by harassment incidental to conducting two marine seismic surveys in the eastern tropical Pacific Ocean during 2008

Recommendation: The Commission recommended that, prior to issuing the requested authorization, the Service take steps to ensure that the planned monitoring program will be sufficient to detect, with reasonable certainty, all marine mammals within or entering the identified safety zones; extend to one hour the monitoring period imposed prior to the initiation of seismic activities and resumption of airgun activities after a power-down; and require that observations be made during all ramp-up procedures to gather data regarding the effectiveness of ramp-up as a mitigation tool.

Agency Response: The Service issued the incidental harassment authorization on 23 May 2008. The Service acknowledged that several species of deep-diving cetaceans are capable of remaining underwater for more than 30 minutes. However, the Service considered 30 minutes to be an adequate duration for the monitoring period prior to the start-up of airguns because (1) the time of monitoring prior to start-up of any but the smallest array would effectively be longer than 30 minutes; (2) the institution conducts marine mammal monitoring during transit even though the airguns are not in

operation, so that all safety radii will be continuously monitored; and (3) the majority of the species that may be exposed do not stay underwater more than 30 minutes.

4 April **To**: National Marine Fisheries Service

Issue: Application from the U.S. Navy for authorization to take by Level A and Level B harassment and killing small numbers of several species of marine mammals incidental to Atlantic Fleet Active Sonar Training activities conducted off the U.S. Atlantic coast and in the Gulf of Mexico over a five-year period

Recommendation: The Commission recommended that issuance of a proposed rule authorizing the requested incidental taking be contingent upon the revision of the Navy's draft environmental impact statement as recommended by the Commission in its 31 March 2008 letter to the Navy. The Commission also recommended that the regulations, if issued, require the Navy to implement a plan to validate and verify its proposed monitoring and mitigation measures; contain a clear discussion of why the Service believes that the Navy's proposed activities will have only a negligible impact on marine mammals, particularly on the North Atlantic right whale and particularly in areas designated as critical habitat for this species; and require that a 60-minute observation period be adopted for detecting whether a deep-diving marine mammal (e.g., sperm whale or beaked whale) is within or has left a safety zone before operations are initiated or resumed unless the animal is resighted at a safe range before that time. The Commission also recommended that issuance of the regulations be contingent on the development of a more thorough discussion of potential cumulative effects of Navy and other activities in the area of the proposed operations, the measures that will be taken to avoid or minimize them, and the basis for concluding that those effects are negligible.

Agency Response: The Service published the proposed rule on 14 October 2008. In response to the Commission's recommendations, the Service noted, among other things, that it participated as a cooperating agency in developing the Navy's draft environmental impact statement and that it believes that adoption of the draft statement will allow the Service to meet its responsibilities under the National Environmental Policy Act for the issuance of a letter of authorization for the proposed activities. It noted that, if the final environmental impact statement is deemed inadequate, the Service would supplement the existing analysis and document to ensure that it complies with the National Environmental Policy Act before issuing the final rule.

6 April **To**: U.S. Fish and Wildlife Service

Issue: Application from Terrie M. Williams, Ph.D., for authorization to conduct annually non-invasive physiological research on up to 24 southern sea otters being maintained in captivity for rehabilitation, to examine the energy-based physiological limits of sea otters, and to investigate the effects of food and energetic limitations on the diving ability of male and female sea otters of different age classes

Recommendation: The Commission recommended that the Service approve the permit request.

Agency Response: The Service issued the permit on 23 September 2008, consistent with the Commission's recommendation.

7 April

To: Navy Pacific Missile Range Facility

Issue: Supplement to the Navy's Draft Environmental Impact Statement/ Overseas Environmental Impact Statement to evaluate its planned Navy Pacific Fleet training and defense-related research on the Hawaii Range Complex

Recommendation: The Commission identified three elements of the statement in need of further consideration and revision: estimation of risk, mitigation of risk, and evaluation of action alternatives. The Commission recommended that the Navy rename its "no-action" alternative corresponding to the current level of action and incorporate a true "no-action" alternative in which active sonar would not be used; explain how the original analysis led to such a large error in estimated sonar use and provide some means of verifying and validating the numbers derived from the SPORTS database; and more fully explain the analytical procedures used with the new risk function and correct existing errors or sources of confusion to enable the reader to readily follow the process of risk estimation to its conclusion.

Agency Response: The Navy issued its Record of Decision on the proposed action on 26 June 2008. In response to the Commission's recommendations, the Navy stated, among other things, that the risk function reflects the recommendations of the National Marine Fisheries Service and the scientific review panel charged with revision of the analytical methodology; the document has been updated and includes the measures that would be taken to protect marine mammals during training events, and that current mitigation measures reflect the use of the best available science balanced with the National Marine Fisheries Service's approach and the Navy's training requirements; and the no-action alternative consists of the current baseline of operations at the Hawaii Range Complex, and appropriately uses current activities as the no-action status quo.

8 April

To: Fish and Wildlife Service

Issue: Application from Matson's Laboratory, Milltown, MT, for authorization to import from Canada teeth obtained from polar bears taken in the Nunavut harvest management program

Recommendation: The Commission recommended that the Service approve the permit request, provided that the applicant is required to obtain all necessary permits under the Convention on International Trade in Endangered Species of Wild Fauna and Flora before importing any marine mammal parts.

Agency Response: The Service issued the permit on 21 April 2008, consistent with the Commission's recommendation.

11 April

To: National Ocean Service

Issue: Revised Draft Framework for Developing the National System of Marine Protected Areas

Recommendation: The Commission recommended that the Marine Protected Area Center proceed with steps to adopt and implement a final framework; modify its system of classifying sites listed in the national system by using multi-tiered criteria that reflect the extent to which individual units contribute to the overall effectiveness of the system; convene an interagency working group to recommend a set of criteria for classifying marine protected areas; and include the text of Executive Order 13158 as an appendix to revised draft framework.

Agency Response: The Service completed the final framework on 7 November 2008. The Service did not specifically address the Commission's comments and recommendations.

15 April **To**: National Marine Fisheries Service

Issue: Advance notice of proposed rulemaking on possible changes to the Service's regulations governing the taking of stranded marine mammals under section 109(h), section 112(c), and Title IV of the Marine Mammal Protection Act

Recommendation: The Commission noted the scope and complexity of the issues identified and the limited background discussion or rationale provided for some of the changes being considered. Rather than submitting comprehensive comments on the proposed rulemaking, the Commission suggested that a working group be established involving the National Marine Fisheries Service, the Fish and Wildlife Service, and the Commission to discuss the various issues that need to be resolved to develop a proposed rule. The Commission also suggested that, regardless of how the Service chooses to proceed, it should (1) consider compartmentalizing its envisioned rulemaking so that specific topics can be addressed separately rather than being folded into a single rule; (2) continue to rely on current agency statements and guidelines in making fact-specific determinations (e.g., on whether to release a rehabilitated marine mammal, allow an animal undergoing rehabilitation to be placed on public display, or euthanize a stranded animal), rather than attempting to incorporate the same level of detail into the regulations; and (3) recognize the differences in the underlying statutory authorities when contemplating regulatory changes to consolidate the regulations applicable to federal, state, and local government officials responding to strandings under the authority of section 109(h) of the Marine Mammal Protection Act with those applicable to individuals who participate in the stranding network under a section 112(c) agreement.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

17 April **To**: National Marine Fisheries Service

Issue: Application from the Pacific Islands Fisheries Science Center for authorization to conduct research and enhancement activities involving Hawaiian monk seals over five years

Recommendation: The Commission recommended, among other things, that the Service approve the requested permit, provided that the applicant take steps to minimize disturbance of the subject animals by exercising caution when approaching them, particularly mother-pup pairs, and stopping an approach or research activity if there is evidence that the activity may be interfering with mother-pup behavior, feeding, or other vital functions; that activities be suspended, pending review and authorization to proceed, if the authorized number of deaths or injuries is reached; that in the event that a lactating female is killed or seriously injured as a result of permitted activities, the permit holder be required to salvage and care for the female's orphaned pup or, if salvage is not possible, to euthanize the pup; that the applicant ensure that on-site veterinary care is available for animals that are to be translocated between subpopulations or between the main Hawaiian Islands and the Northwestern Hawaiian Islands; and that the applicant develop and incorporate adequate disease screening as part of the evaluation of seals that may be translocated.

Agency Response: The Service had not issued the permit at the end of 2008.

17 April **To**: National Marine Fisheries Service

Issue: Application from the Port of Anchorage seeking authorization to take by harassment small numbers of beluga whales, harbor seals, harbor porpoises, and killer whales incidental to Phase II of a five-year marine terminal redevelopment project

Recommendation: The Commission recommended that the Service defer issuing the requested authorization until the uncertain but potentially significant impact of the planned activities can be evaluated and the Service can make an affirmative finding that such activities, once mitigated, will not have a more than negligible impact on the Cook Inlet beluga whale stock; and, in view of the pending proposed rule to list the Cook Inlet beluga whale stock under the Endangered Species Act, initiate a conference to evaluate the potential effects of the proposed project on this stock.

Agency Response: The Service responded that it had carefully considered available information and assessed the cumulative impacts from past, present, and reasonably foreseeable actions in upper Cook Inlet and the effects of climate change in the context of the specified activity and impact on marine mammals. The Service acknowledged some uncertainty in the specific factors that have inhibited the Cook Inlet beluga whale population recovery but expressed its belief that issuance of an incidental harassment authorization would result in a negligible impact to marine mammals, given (1) the animals' natural reactions to avoidance of and habituation to loud sounds, (2) the maintenance of a harassment-free migration route to prime feeding grounds, and (3) comprehensive mitigation measures set in place for the project. The Service stated that it would analyze any future coastal development projects, oil, gas, and alternative energy exploration or extraction activities in Arctic waters, and permit reviews to determine how they may, individually and cumulatively, affect marine mammals. The Service also stated that, because the impacts associated with the incidental harassment authorization are part of those already considered by the U.S. Army Corps of Engineers (and the Service has required additional mitigation in the authorization issued to the Corps to carry out port construction activities), it has determined that issuance of an incidental harassment authorization to the Port of Anchorage is also not likely to jeopardize the continued existence of the Cook Inlet beluga whale. It noted, however, that section 7 consultation may be required for this action and future rulemaking if the beluga whale is listed as threatened under the Endangered Species Act.

18 April **To**: National Marine Fisheries Service

Issue: Development of a supplemental environmental impact statement on potential revision of Steller sea lion protection measures applicable to the groundfish fisheries of the Bering Sea/Aleutian Islands and the Gulf of Alaska

Recommendation: The Commission recommended that the Service's Alaska Region provide in the impact statement a detailed description of the new socioeconomic information that prompts a potential change in protection measures for Steller sea lions; consult under section 7 of the Endangered Species Act with the headquarters office of the Service's Office of Protected Resources to obtain independent review of any alternative protection measures developed; provide sufficient evidence to support a determination that the final measures are adequate to protect sea lions and promote their recovery; and work with the Protected Resources Division of the Alaska Region and the Steller Sea Lion Recovery Team to ensure that any proposed alternative measures provide adequate protection to sea lions and will lead to their recovery.

Agency Response: The Service had not issued the final impact statement at the end of 2008.

21 April **To**: Governor of Florida

Issue: Development, testing, and implementation of alternative warm-water sources essential for the winter survival of Florida manatees

Recommendation: The Commission urged the governor of Florida to support needed management actions to avoid adverse effects on manatees resulting from the closure of power plants that have

provided warm-water refuges to manatees. The Commission stated that it had recommended to the Florida Fish and Wildlife Conservation Commission and the U.S. Fish and Wildlife Service that they establish a revolving fund to make resources available for development of a prototype warm-water refuge. The Commission requested that the Governor's Office provide assistance in establishing such a fund.

Agency Response: The Governor's Office responded by means of a form letter on 16 May 2008, thanking the Commission for sharing its concerns about the Florida manatee.

21 April

To: U.S. Fish and Wildlife Service, Southeast Regional Office, and Florida Fish and Wildlife Conservation Commission

Issue: The feasibility of creating temporary warm-water refuges for manatees to replace outfalls that are eliminated when power plants are closed

Recommendation: The Commission noted that the Florida Solar Energy Center, Reliant Energy, and the Marine Mammal Commission have developed a conceptual design and cost estimate for a temporary warm-water refuge for manatees at the Reliant Energy power plant in Brevard County, Florida. The Commission recommended that the Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission work with the Florida electric utility industry to establish a fund to support such a refuge. The Commission further recommended that the Fish and Wildlife Service and the Florida Fish and Wildlife Conservation Commission consult with representatives of Reliant Energy to address and resolve issues so that construction and testing of a refuge facility can occur at the earliest possible date. The Commission expressed its belief that testing of such a facility is a matter of urgency.

Agency Response: The Florida Fish and Wildlife Conservation Commission responded by letter of 19 May 2009, agreeing that a well-thought-out and thorough plan is necessary to properly address the future loss of manatee warm-water habitat. It stated that, before moving forward, it needed to learn more about the proposal to repower the Cape Canaveral and Riviera Beach power plants and determine how this may affect manatees and potentially alter plans and tasks described in the Florida Manatee Management Plan.

22 April

To: Naval Facilities Engineering Command Northwest

Issue: Request for comments on the Navy's proposed Gulf of Alaska Environmental Impact Statement/ Overseas Environmental Impact Statement to examine the individual and cumulative effects of naval training and exercises in the Gulf of Alaska

Recommendation: The Commission recommended that the Navy include a true "no-action" alternative in its analysis to ensure that decision-makers are fully informed regarding the likely consequences for national defense readiness as well as the full environmental risks associated with existing and proposed actions; refrain from using the term "no-action" to refer to an alternative of continuing activities at current levels; incorporate in the document a full description of the operational benefits and indirect environmental effects resulting from the Navy's support activities in the Gulf of Alaska; provide a comprehensive description of the various monitoring and mitigation measures that might be used; evaluate the performance of those measures; instigate planning to evaluate and address the strengths and shortcomings of the proposed measures; and describe the measures that will be taken to ensure the protection of endangered, threatened, and depleted marine mammal stocks and provide evidence confirming that those measures will be effective.

Agency Response: The Navy had not published the final impact statement at the end of 2008.

25 April **To**: National Marine Fisheries Service

Issue: Application from Service's Marine Mammal Health and Stranding Response Program for a permit to take an unspecified number of all species of endangered and threatened marine mammals under the jurisdiction of the Service while conducting activities pursuant to section 109(h), section 112 (c), and Title IV of the Marine Mammal Protection Act

Recommendation: The Commission recommended that the Service issue the permit, contingent on (1) the completion and publication of a programmatic environmental impact statement incorporating the revisions recommended by the Commission in its 30 May 2007 letter to the Service; (2) the permit application and the resulting permit specifying the appropriate statutory provisions under which the proposed activities are authorized; and (3) adoption of a staged approach that approves those research activities that fit within the authority of Title IV of the Act and defers approval of the remaining activities until the proposed projects are described in sufficient detail to allow the Commission and other reviewers to comment on, and the Service to determine, whether such studies meet the Act's requirements for bona fide research. The Commission further recommended that each step of this approach be structured to accommodate participation and input from the Commission and the public and the submission by the applicant of information needed to allow the Commission and other reviewers to determine whether the procedures to be undertaken under this permit are appropriate and humane, including written approval from the applicant's Institutional Animal Care and Use Committee.

Agency Response: The Service had not issued the permit at the end of 2008.

28 April **To**: National Marine Fisheries Service

Issue: Application from the U.S. Air Force seeking authorization to take Atlantic bottlenose dolphins and Atlantic spotted dolphins by harassment incidental to surf zone testing and training and amphibious vehicle training and weapons testing off Eglin Air Force Base's Santa Rosa Island property in the Gulf of Mexico and the Service's request for comments on its intent to promulgate regulations to authorize the take of marine mammals incidental to these activities

Recommendation: The Commission concurred with the Service's initial finding that, provided that the population measures are carried out as described, the proposed testing and training exercises are unlikely to have more than a negligible, short-term impact on the potentially affected marine mammal species and stocks. The Commission recommended that the Service issue the requested authorization, provided that it requires that operations be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to the proposed activities.

Agency Response: The Service issued the incidental harassment authorization on 24 July, consistent with the Commission's recommendation.

28 April **To**: National Marine Fisheries Service

Issue: Application from Northeast Gateway Energy Bridge, LLC, and Algonquin Gas Transmission, LLC, seeking authorization to take by Level B harassment small numbers of various species of seals, toothed whales, and baleen whales, including North Atlantic right whales, incidental to the operation of a deepwater port and the associated pipeline, and the Service's request for public comments on

the structure and content of future regulations to govern incidental taking after the one-year incidental harassment authorization expires

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that all marine mammal mitigation, monitoring, and reporting measures identified in the *Federal Register* notice are included in the authorization and retained in any proposed regulations issued by the Service to govern the activities over a five-year period; that operations be suspended immediately if a dead or seriously injured right whale or other marine mammal is found in the vicinity of the operations and the death or injury could be attributable to the applicant's activities; and that any suspension remain in place until the Service (1) has reviewed the situation and determined that further deaths or serious injuries are unlikely or (2) has issued regulations authorizing such takes under section 101(a)(5)(A) of the Marine Mammal Protection Act.

Agency Response: The Service issued the incidental harassment authorization on 15 May 2008, consistent with the Commission's recommendations.

28 April **To**: National Marine Fisheries Service

Issue: Application from Zvi Livant, For the Sea Productions, for authorization to take by Level B harassment up to 2,710 Hawaiian spinner dolphins annually by close approach during filming on land and underwater and to acquire film footage for an educational video on the impact of closely approaching and swimming with wild dolphins and to illustrate appropriate dolphin-watching techniques

Recommendation: The Commission recommended that the Service approve the requested permit, provided that the permit, if issued, also authorizes the potential harassment of an unspecified number of spotted and bottlenose dolphins, as requested in the application.

Agency Response: The Service issued the permit on 16 July 2008, consistent with the Commission's recommendation.

1 May **To**: U.S. Department of Commerce

Issue: A 22 April 2008 *Federal Register* notice announcing a six-month delay in determining whether to list the Cook Inlet beluga whale distinct population segment as endangered under the Endangered Species Act

Recommendation: The Commission recommended that the Department of Commerce withdraw the request for a six-month extension for determining whether to list the Cook Inlet beluga whale population as endangered, proceed immediately with an affirmative listing decision, and initiate all actions that flow from such a listing to conserve the population and promote its recovery.

Agency Response: The Service responded by letter of 16 May 2008, stating that it continued to believe that substantial disagreement exists regarding the population trend of beluga whales in Cook Inlet and that the Endangered Species Act provides for a six-month extension in such cases. It stated that it would make a final determination by 20 October 2008.

6 May **To**: National Marine Fisheries Service

Issue: Application from the New Jersey Department of Environmental Protection to amend a permit authorizing the harassment of up to 30 species of cetaceans and up to 4 species of pinnipeds in waters

off southern New Jersey during shipboard and aircraft transect surveys carried out to obtain information on the species' distribution and abundance

Recommendation: The Commission recommended that Service approve the amendment, provided that the conditions contained in the current permit remain in effect.

Agency Response: The Service issued the amended permit on 30 May 2008, consistent with the Commission's recommendation.

6 May **To**: U.S. Fish and Wildlife Service

Issue: The Service's draft 2008 stock assessment reports for the three stocks of northern sea otters in Alaska

Recommendation: The Commission recommended that the Service update the stock assessment reports for northern sea otter stocks in Alaska on the schedule specified in section 117(c) of the Marine Mammal Protection Act; review available information on stock structure of northern sea otters, including the strongly diverging demographic trends, to determine if there are more than three stocks in Alaska; describe more thoroughly the methods and analyses used to assess northern sea otter stocks, particularly with regard to estimates of population size and fishery interactions; and evaluate more thoroughly other factors that may be affecting the status of northern sea otter stocks, including the ongoing unusual mortality event and elevated contaminant levels in sea otters from certain regions.

Agency Response: The Service issued the final 2008 stock assessment reports on 29 July 2008. In response to the Commission's recommendations, the Service stated, among other things, that it would continue to review available information on an annual basis and revise stock assessment reports for the northern sea otter in Alaska as appropriate. Concerning stock structure, the Service noted the most recent genetic study of northern sea otter stocks in Alaska was conducted in 2002, and since then, more sample material has been collected during live-capture studies in the Kodiak Archipelago (southwest Alaska stock) and Kamishak Bay (south-central Alaska stock). The Service noted that additional tissue samples from other areas are required before sea otter stock structure in Alaska can be analyzed. Concerning fisheries interactions, the Service noted that the predominant type of fishing gear known to interact with sea otters are salmon set and drift gillnets. The Service further noted that, although gillnet fisheries occur throughout the range of sea otters in Alaska, their potential for interaction depends on several factors including sea otter distribution and abundance relative to the distribution and effort expended in these fisheries. The Service expressed the belief that application of entanglement rates derived from small sample sizes in observed fisheries to unobserved fisheries in other areas would produce questionable results.

9 May **To**: National Marine Fisheries Service

Issue: Application from the Service's Office of Science and Technology to amend a permit authorizing the taking by harassment of beaked whales and various other species of cetaceans by conducting playback experiments to determine what characteristics of exposure to specific sounds (including mid-frequency sonar) evoke behavioral responses in beaked whales and other deep-diving cetaceans and to characterize the nature of the responses. The permit holder requested that the permit be extended until 1 January 2011 to allow for three additional field seasons with additional time for importing and exporting tissue samples for analysis, an increase in the number of marine mammals that may be harassed annually, and permission to direct additional playbacks toward animals that have not been tagged but that can be visually or acoustically monitored for responses.

Recommendation: The Commission recommended that the Service approve the amendment as proposed, provided that the Service's supplemental environmental assessment reflects the correct numbers of animals requested to be taken by harassment and that the conditions contained in the current permit remain in effect.

A**gency Response**: The Service had not issued the amendment at the end of 2008.

12 May **To**: National Marine Fisheries Service

Issue: Application from the Navy for authorization to take by Level A and B harassment and by killing marine mammals incidental to shock-testing the *Mesa Verde* off Mayport, Florida, and the Service's request for comments on its proposal to issue regulations to authorize and govern the requested taking

Recommendation: The Commission concurred with the Service's finding that the planned shock-testing is unlikely to have more than a negligible, short-term impact on the potentially affected marine mammal species and stocks, provided that the planned mitigation measures are imposed. Accordingly, the Commission recommended that the Service issue the requested authorization, subject to a requirement that operations be suspended immediately if more than the anticipated number of marine mammals are killed or injured incidental to the operations or if a dead or seriously injured North Atlantic right whale is found in the vicinity of the operations and the death or injury could have occurred incidental to the proposed activities. The Commission further recommended that if, for some reason, the proposed shock trial cannot be completed before the end of summer 2008, it be postponed until the spring or summer of 2009 to avoid the seasons when North Atlantic right whales are most likely to be present.

Agency Response: The Service issued the final rule on 18 July 2008, consistent with the Commission's recommendations.

14 May **To**: Fish and Wildlife Service

Issue: Application from the Western Ecological Research Center, U.S. Geological Survey, to renew and amend a permit authorizing the permit holder to conduct tagging studies and aerial surveys of California sea otters. The permit holder requested that the permit be renewed for an additional five years and amended to authorize an increased number of recaptures of animals implanted with recorders and several changes to the research plans and protocols.

Recommendation: The Commission recommended that the Service approve the requested amendment, provided that the conditions contained in the existing permit remain in effect and that the proposed revisions to the research have been reviewed by the applicant's Institutional Animal Care and Use Committee. The Commission further recommended that the Service consult with the applicant to ensure that a power analysis had been or would be prepared to ensure that authorized takes are limited to the minimal number of animals necessary to produce statistically meaningful results, and the permit, if renewed, require that post-release monitoring be conducted to verify that the research is not having unanticipated adverse impacts on the population.

Agency Response: The Service issued the amended permit on 31 October 2008, consistent with the Commission's recommendations.

23 May **To**: U.S. Fish and Wildlife Service

Issue: The Leeward Yacht Club, LLC, marina project along the Orange River near the Fort Myers power plant in Lee County, Florida

Recommendation: The Commission recommended that the Fish and Wildlife Service reinitiate section 7 consultations on the proposed project with the Army Corps of Engineers and more thoroughly assess the available information on manatee habitat use, vessel traffic, and the project's potential impact on manatees and their habitat. The Commission expressed concern that the area in question is one of the most heavily used warm-water refuges for manatees in Florida and that such refuges are essential for the species' survival in winter. The Commission noted that the Service's current biological opinion did not consider all available information on manatee use of the area that would be affected or the area's importance as winter manatee habitat; nor did it adequately assess the potential effects of the project on vessel traffic and manatees. Because the analysis is incomplete, the Commission believed that approval of this project would be inappropriate.

Agency Response: The Service responded by letter of 15 July 2008, stating that, in developing the biological opinion, it had reviewed numerous publications, reports, and studies on manatees, vessels, speed zones, etc., from numerous sources, including the Florida Manatee Recovery Plan, the Service's 5-year status review of the Florida manatee, the state's Florida Manatee Management Plan, and Lee County's Manatee Protection Plan. The Service stated that the Commission's letter offered no new information that would support reinitiating formal section 7 consultation.

23 May **To**: Naval Facilities Engineering Command

Issue: The Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS) to evaluate its Southern California Range Complex activities

Recommendation: The Commission recommended that the Navy replace the "no-action" alternative in the draft statement with a term that is reflective of the actual level of activity and associated risks; augment its risk analysis in Appendix F to provide all the information needed to evaluate and understand the analyses of those risks; develop and implement a plan to validate monitoring performance before beginning operations under the approved final documents, modify its criteria for resuming full use of operational sonar following a power-down or shutdown because of a marine mammal sighting, and provide follow-up data on the cost-effectiveness of such mitigation efforts; remove the mine-countermeasures range on Tanner Bank from the draft statement and address it as a separate action when adequate detailed supporting information can be provided; and elaborate on the details of the marine species monitoring plan, including when it will be initiated, anticipated levels of effort, external review procedures, reporting milestones, and the manner in which those reports will be used to inform and update risk assessment and mitigation efforts.

Agency Response: The Navy had not published the final document at the end of 2008.

23 May **To**: National Marine Fisheries Service

Issue: Application from the U.S. Navy for authorization to take by harassment, serious injury, or death marine mammals incidental to military readiness training in the Navy's Southern California Range Complex from January 2009 to January 2014 and the National Marine Fisheries Service's request for public comments on its proposal to develop and implement regulations to govern the requested taking

Recommendation: The Commission recommended that, if the Service proceeds with publication of a proposed rule, the Navy be required to develop and implement a plan to calibrate and verify the performance of the visual monitoring and passive acoustic monitoring programs being proposed to enable the Navy, the Service, and other interested parties to evaluate their effectiveness; provide a specific date for initiating the proposed marine species monitoring plan; provide a detailed explanation and all necessary data regarding the derivation of exposure numbers to reconcile the Levels A and B take estimates with the sound patterns produced during the proposed operations and the spatial and temporal complexity in animal distribution and density; modify its criteria for resuming full operational sonar use following a power-down or shutdown to require monitoring periods of 30 minutes for most marine mammals and 60 minutes for deep-diving species unless the animal is resighted at a safe range before that time and provide follow-up data on the effectiveness and cost of such mitigation and monitoring efforts; suspend an activity if a beaked whale or other marine mammal is killed or seriously injured and the death or injury appears to be associated with the Navy's activities; submit annual reports providing full documentation of methods, results, and interpretation pertaining to all monitoring tasks, and the dates and locations of operations, marine mammal sightings, and estimates of the amount and nature of potential takes of marine mammals by harassment or in other ways. The Commission further recommended that, if the death or serious injury of an individual of any species other than a beaked whale occurs, the Service amend the regulations to provide for such taking of a certain number of individuals of such species during future operations, and that the Service withhold authorization for the taking of marine mammals as a result of the Navy's proposed development of a shallow water minefield on Tanner Bank, pending its receipt from the Navy of a separate, independent analysis of the costs and benefits of such an expansion.

Agency Response: The Service published a proposed rule on 14 October 2008. With the exception of requiring action to be taken in the event of the death or injury of a marine mammal, the Service did not adopt the Commission's recommendations.

27 May **To**: National Marine Fisheries Service

Issue: Application from Arctic Slope Regional Corporation Energy Services to take by Level B harassment bowhead, gray, humpback, minke, beluga, and killer whales, harbor porpoises, and bearded, ringed, spotted, and ribbon seals incidental to shallow hazard and site clearance surveys in the Chukchi Sea between July and November 2008

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that the proposed mitigation and monitoring activities are carried out as described in the Service's 28 April 2008 *Federal Register* notice and that operations be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to those operations**.**

Agency Response: The Service issued the incidental harassment authorization on 30 July 2008, consistent with the Commission's recommendations.

29 May **To**: Fish and Wildlife Service

Issue: Application from Catherine Foy for authorization to take by harassment up to 200 northern sea otters from the threatened population in Chiniak Bay near Kodiak Island, Alaska, to obtain data on seasonal distribution and abundance in order to complete an environmental impact statement being prepared by the Federal Aviation Administration on proposed actions to improve runway safety at the Kodiak airport

Recommendation: The Commission recommended that the Service approve the permit request.

Agency Response: The Service issued the permit on 22 August 2008.

2 June **To**: National Marine Fisheries Service

Issue: Application from BP Exploration (Alaska), Inc., for authorization to take by harassment bowhead, gray, and beluga whales and ringed, spotted, and bearded seals incidental to a 3-D, ocean-bottom seismic survey in the Liberty Prospect area of the Beaufort Sea in July and August 2008

Recommendation: The Commission recommended that the Service issue the incidental harassment authorization, provided that the Service require the applicant to implement all practicable monitoring and mitigation measures to protect bowhead whales and other marine mammal species from disturbance and that ramp-up be allowed only when the entire area encompassed by the safety zone is clearly visible for a sufficiently long period to ensure that marine mammals are not present; and require operations to be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and that death or injury could be attributable to the applicant's activities. The Commission further recommended that the Service, together with the applicant and other appropriate agencies and organizations, develop a broad-based population monitoring and impact assessment program to ensure that these activities, in combination with other risk factors, are not individually or cumulatively having any significant adverse population-level effects on marine mammals or having an unmitigable adverse effect on the availability of marine mammals for subsistence uses by Alaska Natives. The Commission recommended that such a monitoring program focus initially on the need to collect adequate baseline information to allow for future analyses of effects.

Agency Response: The Service issued the incidental harassment authorization on 8 July 2008, consistent with the Commission's recommendations.

11 June **To**: U.S. Fish and Wildlife Service

Issue: The Service's draft revised marine mammal stock assessment report for the northern sea otter stock in Washington State

Recommendation: The Commission recommended that the Service adopt the revised marine mammal stock assessment report, subject to modifications that (a) clarify that the next revision of this assessment will be prepared within three years and (b) revise estimates of the minimum population size and the potential biological removal level to reflect results of the 2007 survey of sea otters in Washington, and that it consult with the National Marine Fisheries Service, tribal authorities, and other relevant groups to arrange for placement of observers aboard trap and gillnet fishing vessels that may pose a significant risk of incidentally taking sea otters within their range in Washington State.

Agency Response: The Service issued its final stock assessment report for the northern sea otter stock in Washington State on 2 October 2008, consistent with the Commission's recommendations. The Service agreed that a useful estimate of fishing mortality will require instituting observer coverage to obtain data on fishery efforts and has so advised the National Marine Fisheries Service.

18 June **To**: National Marine Fisheries Service

Issue: The Service's proposed rule to prohibit krill harvesting in the U.S. Exclusive Economic Zone along the U.S. West Coast

Recommendation: The Commission recommended that the Service implement amendment 12 of the Coastal Pelagic Species Fishery Management Plan to prohibit commercial harvesting of all species of krill in the Exclusive Economic Zone off the West Coast.

Agency Response: The Service had not issued a final rule at the end of 2008.

18 June **To**: National Marine Fisheries Service

Issue: Application from John Calambokidis to amend a permit authorizing the taking by harassment of 26 species of cetaceans and 5 species of pinnipeds during studies of the distribution, abundance, habitat use, and feeding behavior of marine mammal populations in the eastern North Pacific. The permit holder requested that the permit be amended to allow (1) an increase in the number of cetaceans that can be biopsy-sampled and suction-cup tagged annually and (2) satellite tagging of beaked whales, Cuvier's beaked whales, Baird's beaked whales, blue, fin, sei, minke, Bryde's, humpback, gray, and sperm whales and Risso's and bottlenose dolphins (up to 5 takes of sei whales and up to 20 takes of each of the other species annually). The applicant stated that the purpose of the proposed amendment is to enhance investigation of the species' movements for stock structure assessment and habitat use.

Recommendation: The Commission recommended that, upon clarification of the authorized number of animals to be taken under the current permit and the number that could be taken under the proposed amendment, the Service approve the requested amendment, provided that the conditions contained in the current permit remain in effect. The Commission noted that the application for amendment and the permit itself make reference to the number of "takes" allowed rather than the authorized number of animals that can be taken, therefore making it impossible to determine the number of animals subject to such takes, as is required by section 104(b)(2)(A) of the Marine Mammal Protection Act. The Commission stated that, for purposes of its review, it had interpreted the requested increase in numbers to apply to the number of animals that could be taken and not to the number of takings.

Agency Response: The Service had not issued the permit at the end of 2008.

23 June **To**: National Marine Fisheries Service

Issue: Application from ConocoPhillips Alaska, Inc., to take by Level B harassment bowhead, gray, humpback, minke, beluga, and killer whales; harbor porpoises; and bearded, ringed, spotted, and ribbon seals incidental to shallow-water hazard and site clearance surveys in the Chukchi Sea

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that the proposed mitigation and monitoring activities are carried out as described in the Service's 23 May 2008 *Federal Register* notice; that operations be suspended immediately pending review and authorization to proceed if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to those operations; and that the list of species authorized to be taken be expanded to include fin whales.

Agency Response: The Service issued the incidental harassment authorization on 15August 2008, consistent with the Commission's recommendations.

23 June **To**: National Marine Fisheries Service

Issue: Application from the University of Texas, Institute of Geophysics, to take marine mammals by harassment incidental to a seismic survey to be conducted off the coast of Oregon from 30 June to 19 July 2008

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that the applicant be required to implement all practicable monitoring and mitigation measures that reasonably can be expected to protect the potentially affected marine mammal species from serious injury and that activities be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to the seismic survey.

Agency Response: The Service issued the incidental harassment authorization on 30 June 2008, consistent with the Commission's recommendations.

24 June **To**: National Marine Fisheries Service

Issue: Application from SeaWorld, Inc., for authorization to import one adult male beluga whale from the Vancouver Aquarium, Canada, to SeaWorld of Texas, San Antonio, for public display

Recommendation: The Commission recommended that the Service approve the permit request, provided that the Service, in consultation with the Animal and Plant Health Inspection Service, determines that the applicant's plans and facilities for transport and maintenance of the requested animal are adequate to provide for its health and well-being; that the Service determines that the applicant's education program is acceptable; and that the applicant obtains the necessary permits under the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Agency Response: The Service issued the permit on 8 September 2008, consistent with the Commission's recommendations.

26 June **To**: Fish and Wildlife Service

Issue: Application from the U.S. Geological Survey, Alaska Science Center, to amend a permit authorizing the various research activities involving polar bears. The permit holder requested that the permit be amended to authorize additional procedures on up to 70 of the 200 animals authorized to be captured, sampled, etc., annually under the existing permit.

Recommendation: The Commission recommended that the Service approve the permit amendment request, provided that the conditions contained in the existing permit remain in effect and that the applicant obtains the necessary permits under the Convention on International Trade in Endangered Species of Wild Fauna and Flora.

Agency Response: The Service issued the amended permit on 31 July 2008, consistent with the Commission's recommendations.

27 June **To**: National Marine Fisheries Service

Issue: Application from Fred Sharpe, Ph.D., for an amendment of a permit authorizing the taking annually by harassment of up to 350 humpback whales in the North Pacific Ocean. The permit

holder requested that the permit be amended to authorize the use of a mini-helicopter to film lunge-feeding humpback whales in Alaska for approximately 15 days during July and August 2008.

Recommendation: The Commission recommended that the Service approve the requested amendment, provided that the conditions currently contained in the permit remain in effect and that the amendment, if issued, require the investigator to conduct systematic behavioral observations and to document and report whale responses (or lack of response) to the mini-helicopter for review by the Service, the Commission, and other interested parties.

Agency Response: The Service had not issued the permit at the end of 2008.

1 July **To**: National Marine Fisheries Service

Issue: Proposed regulations to amend the Atlantic Large Whale Take Reduction Plan to delete references to the term "neutrally buoyant line" and to delay implementation of a requirement for trap and pot fisheries to use sinking groundlines

Recommendation: The Commission recommended that the Service adopt the proposed revisions to delete references to and the definition of "neutrally buoyant line" in lieu of the term "sinking line," and that it withdraw the proposal to defer until 5 April 2009 the effective date requiring the use of sinking groundlines and retain the current implementation date of 5 October 2008.

Agency Response: The Service issued the final rule on 25 August 2008, providing an additional six months (through 5 April 2009) for trap/pot fishermen along the Atlantic coast to comply with the Atlantic Large Whale Take Reduction Plan's sinking groundlines requirement.

3 July **To**: National Marine Fisheries Service

Issue: Application from Thomas A. Jefferson, Ph.D., requesting authorization to take by harassment up to 500 dolphins to examine the levels and impact of persistent organic pollutants on the California coastal stock

Recommendation: The Commission recommended that the Service defer further consideration of applications for research permits, including the requested permit, until the applicant has demonstrated that it is in compliance with section 2.31 of the Animal and Plant Health Inspection Service's Animal Welfare Act regulations requiring review and approval of the proposed research by an Institutional Animal Care and Use Committee. The Commission also recommended that, if and when a permit is issued, it clearly specify not just the number of takes, but (1) the number of individual bottlenose dolphins authorized to be taken and the manner in which they may be taken (i.e., biopsy-sampled, approached for photo-identification), including the authorized number of biopsy attempts per dolphin; (2) the authorized number of approaches to bottlenose dolphins for photo-identification purposes; and (3) the number of killer whales and harbor porpoises authorized to be harassed incidental to conducting research on bottlenose dolphins.

Agency Response: The Service had not issued the permit at the end of 2008.

7 July **To**: National Marine Fisheries Service

Issue: Application from Shell Offshore, Inc., seeking authorization to take bowhead, gray, and beluga whales and ringed, spotted, and bearded seals by harassment incidental to offshore exploratory drilling and geotechnical activities on the Outer Continental Shelf in the Beaufort Sea off Alaska

Recommendation: The Commission recommended that issuance of the requested authorization be contingent on the applicant and the Service agreeing upon specific mitigation measures for bowhead and beluga whales that will ensure that the proposed activities do not affect these species in ways that will make them less available to subsistence hunters. The Commission also recommended that, if the Service issues an incidental harassment authorization for this activity, it require that operations be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to the drilling or associated activities.

Agency Response: The Service had not issued the authorization at the end of 2008.

7 July **To**: National Marine Fisheries Service

Issue: Application from the Service's Southwest Fisheries Science Center to amend a permit authorizing the Center to take by Level A and B harassment up to 710 Antarctic fur seals and up to 20 leopard seals annually to study the life history, abundance, and distribution of pinnipeds that haul out on the South Shetland Islands.The permit also authorizes the accidental death of up to three adult or juvenile Antarctic fur seals, five Antarctic fur seal pups, and two adult or juvenile leopard seals annually in carrying out these activities. The Center requested that the permit be amended to authorize it to conduct additional research.

Recommendation: The Commission recommended that the Service defer issuance of the requested permit amendment until the permit holder demonstrates (1) that it is in compliance with section 2.37 of the Animal and Plant Health Inspection Service's Animal Welfare Act regulations requiring the establishment of Institutional Animal Care and Use Committees and (2) that the proposed research has been reviewed and approved by such a committee.

Agency Response: The Service had not issued the amended permit at the end of 2008.

7 July **To**: Minerals Management Service

Issue: A request for comments on the Service's intent to prepare an environmental impact statement for Lease Sale 214 in the North Aleutian Basin

Recommendation: The Commission recommended that analyses of cumulative effects take into account other human activities in the area, including fishing, commercial shipping, and military operations. The Commission noted that the North Aleutian Basin encompasses a good portion of the southeastern Bering Sea, which is one of the most productive areas of the world's oceans and prime habitat for a diverse assemblage of marine mammals and birds, as well as a number of Alaska Native communities that depend on hunting and fishing for subsistence. The Commission noted that, if oil and gas resources in the area are to be exploited, then exploration and development will require extraordinary care to protect the health and stability of the affected marine ecosystem. In light of the area's importance, the Commission requested that the Service meet with the Commission to discuss how the two agencies might consult during the development of the environmental impact statement.

Agency Response: On 3 July 2008 the Service extended the comment period until 17 October 2008 to allow for the submission of comments on the environmental impact statement.

14 July **To**: Department of the Interior

Issue: The Fish and Wildlife Service's interim final rule establishing protective regulations for the polar bears

Recommendation: The Commission recommended that the Service publish a new proposed rule that includes provisions tailored to the specific conservation needs of polar bears and the threats they face, including ongoing and projected loss of sea ice habitat; that any final rule adopted by the Service specifically prohibit any elements of taking included under the Endangered Species Act definition that are not covered under the Marine Mammal Protection Act definition; that the Service revise the interim rule to require that a polar bear used to create authentic Native articles of handicrafts and clothing for sale be taken primarily for subsistence purposes; that authorizations for scientific research and enhancement permits involving polar bears be treated like similar authorizations for other endangered and threatened marine mammals and be subject to concurrent review under both Acts; that the Service either provide additional explanation concerning the perceived need for incidental taking authorization under both Acts and provide the Commission and the public an additional opportunity to comment before a final rule is issued or delete the pertinent paragraph of the interim rule; and if said paragraph is retained, that it be revised to clarify that the exception does not apply in Alaska, in other waters subject to U.S. jurisdiction contiguous with Alaska, and in other areas of the high seas where polar bears occur.

Agency Response: The Service issued the final rule on 10 December 2008, responding, among other things, that, based on its more than 30-year history of implementing the Marine Mammal Protection Act and its analysis in the Endangered Species Act final listing rule, it believes that none of the activities currently regulated under those statutes threaten the polar bear throughout all or a significant portion of its range and that those laws provide appropriate regulatory protection to polar bears. The Service noted that the threat identified in the final listing rule (i.e., loss of habitat and related effects) would not be alleviated by the additional overlay of provisions. The Service stated that nothing within its authority under section 4(d) of the Endangered Species Act, above and beyond what is required in the final special rule, would provide the means to resolve that threat.

14 July **To**: National Marine Fisheries Service

Issue: Application from Niladri Basu, Ph.D., for authorization to obtain and import for scientific research 40 samples of brain tissue taken from Baikal seals to determine the types and amounts of heavy metals that accumulate in specific brain regions of Baikal seals and whether these exposures are of neuro-toxicological concern

Recommendation: The Commission recommended that the Service approve the permit request, provided that the applicant is required to obtain all necessary permits under the Convention on International Trade in Endangered Species of Wild Fauna and Flora before importing the samples.

Agency Response: The Service issued the permit on 8 September 2008, consistent with the Commission's recommendations.

15 July **To**: U.S. Fish and Wildlife Service

Issue: The draft management plan for the Papah□naumoku□kea Marine National Monument to identify proposed policies and activities that the Fish and Wildlife Service, National Oceanic and Atmospheric Administration, and Hawaii Department of Land and Natural Resources would pursue jointly as co-trustees to manage the Monument

Recommendation: The Commission commended the authors for preparing an exceptionally good draft plan and recommended that the draft plan be adopted subject to certain modifications, including highlighting the most urgent recovery needs for Hawaiian monk seals in the Northwestern Hawaiian Islands; appointing a representative of the Marine Mammal Commission to the Monument Interagency Coordinating Committee; establishing a Monument Advisory Council to provide advice and recommendations on research and management activities; and reviewing and, as appropriate, revising the Memorandum of Agreement for managing the Monument to, among other things, identify provisions and a schedule for periodically updating the management plan; modify the mission statement to reflect the aspiration for restoring significant natural and cultural resources; and add the recommended guiding principle to the list of guiding principles.

Agency Response: On 21 November 2008, the State of Hawaii's Department of Land and Natural Resources responded to the Commission's letter on behalf of the co-trustee agencies of the Monument. The majority of the Commission's recommendations were accepted and incorporated into the final management plan.

17 July **To**: National Marine Fisheries Service

Issue: Application from PGS Onshore, Inc., for authorization to take by harassment bowhead, gray, and beluga whales and ringed, spotted, and bearded seals incidental to a 3-D, ocean-bottom cable seismic survey in the Beaufort Sea

Recommendation: The Commission recommended that the Service approve the incidental harassment authorization request, provided that the Service require the applicant to implement all described monitoring and mitigation measures to protect bowhead whales and other marine mammals from disturbance associated with the proposed survey and require that operations to be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could be attributable to the applicant's activities. The Commission further recommended that authorization be contingent on a requirement that the applicant implement all practicable monitoring and mitigation measures that will ensure that the proposed activities do not adversely affect the availability of bowhead whales and other marine mammals to subsistence hunters, and the Service, in consultation with appropriate parties, develop and implement a broad-based population monitoring and impact assessment program to collect baseline population information sufficient to detect changes and identify their possible causes and to verify that planned oil and gas-related activities, in combination with other risk factors, are not individually or cumulatively having any significant adverse population-level effects on marine mammals or having an unmitigable adverse effect on the availability of marine mammals for subsistence uses by Alaska Natives.

Agency Response: The Service issued the incidental harassment authorization on 30 July 2008, consistent with the Commission's recommendations.

18 July **To:** National Marine Fisheries Service

Issue: Application from the U.S. Fish and Wildlife Service for authorization to harass Steller sea lions and Pacific harbor seals incidental to a rat eradication program at Rat Island, Alaska, and the National Marine Fisheries Service's intent to promulgate regulations to authorize the take of marine mammals incidental to the specified activities for a five-year period

Recommendation: The Commission recommended that the Service issue the requested incidental harassment authorization, provided that before issuing the authorization, the Service require the applicant to expand its monitoring plan to detect the effects of disturbance and short-term and long-

term exposure to the rodenticide; that, should a sea lion or harbor seal injury or death occur, activities be suspended until the Service has reviewed the situation and determined that further deaths or serious injuries are unlikely to occur or has issued regulations authorizing such takes; and that all mitigation, monitoring, and reporting measures identified in the *Federal Register* notice are included in the authorization and the approach be supplemented by the measures designed to avoid disturbance and detect problems that may arise after the rodenticide has been dispersed over the island.

Agency Response: The Service issued the incidental harassment authorization on 26 August 2008. The Service disagreed with the Commission's assessment that rodenticide poses any short-term or long-term exposure pathway for harassment, injury, or death, noting that pinnipeds are not expected to be affected by the use of rodenticide during the rat eradication operations; that most vertebrates are less susceptible to the rodenticide than are the rats and would have to consume a higher dose, relative to body mass, before reaching a toxicity threshold; that pinnipeds would have to directly consume tens, if not hundreds of bait pellets, to be affected; that the pellets, which are primarily composed of grain, are not part of the natural diet of carnivorous (almost exclusively piscivorous) pinnipeds and therefore are not expected to be consumed; that pinnipeds are not expected to prey or scavenge on other animals that have consumed and succumbed to the effects of the rodenticide as they do not feed while hauled out on land; that the bait will not be broadcast into the marine environment, and if it were to enter the water, it would disperse and disintegrate within hours; that there are no steep or precipitous areas that animals would be flushed from during the rat eradication operations; and that monitoring and mitigation measures will be implemented to avoid any potential harassment and to report and document disturbances during the field crew activities.

25 July **To**: **National Marine Fisheries Service**

Issue: Application from Shell Offshore, Inc., and WesternGeco, Inc., for authorization to take by harassment marine mammals incidental to conducting seismic surveys in the Chukchi and Beaufort Seas during the open-water season

Recommendation: The Commission recommended that, before approving the request, the Service conduct a more extensive analysis of the potential effects of the proposed operations that considers (1) the direct effects of the proposed operations; (2) the potential or likely effects of other currently authorized and proposed oil and gas activities, climate change, and additional anthropogenic risk factors (e.g., industrial operations); and (3) the possible cumulative effects of all of these activities over time. The Commission further recommended that the Service, together with the applicant and other appropriate agencies and organizations, develop a broad-based population monitoring and impact assessment program to assess whether these activities, in combination with other risk factors, are (1) individually or cumulatively having any significant adverse population-level effects on marine mammals or (2) having an unmitigable adverse effect on the availability of marine mammals for subsistence use by Alaska Natives.

Agency Response: The Service disagreed with the Commission's recommendation that additional analysis be conducted of the potential effects of the applicant's proposed operations. The Service stated that there is no provision in the Marine Mammal Protection Act to delay issuance of an incidental harassment authorization in order to conduct additional analyses provided that the Service can make a reasonable determination that the proposed taking will result in no more than a small number of marine mammals being taken, have a negligible impact on affected marine mammal species or stocks, and will not have an unmitigable adverse impact on subsistence uses of marine mammals. The Service expressed its belief that the Minerals Management Service addressed the Commission's concerns in its 2006 Final Programmatic Environmental Assessment for Arctic Ocean Seismic Activities. The Service noted that it updated the analyses contained in that document in its 2008 Final

Supplemental Environmental Assessment for Arctic Seismic Surveys. The Service stated that those and other supporting documents provided the best information available for this analysis. The Service recognized that there is a lack of information on the potential impacts on marine mammal species and stocks from offshore oil exploration in Arctic waters and that the applicant and other offshore companies have developed and implemented a monitoring program to address data gaps.

28 July **To**: National Marine Fisheries Service

Issue: Application from the California Department of Transportation seeking authorization to take small numbers of marine mammals incidental to construction of a replacement for the east span of the San Francisco–Oakland Bay Bridge

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that the monitoring and mitigation activities proposed in the *Federal Register* notice are carried out as described.

Agency Response: The Service had not issued the authorization at the end of 2008.

4 August **To**: National Oceanic and Atmospheric Administration

Issue: The proposed rule and regulations published jointly by the National Oceanic and Atmospheric Administration and the U.S. Fish and Wildlife Service to establish a new mandatory ship reporting system and alter the configuration of the "Areas To Be Avoided" in the Papah□naumoku□kea Marine National Monument

Recommendation: The Commission supported adoption of the proposed rule and recommended that the National Oceanic and Atmospheric Administration and the Fish and Wildlife Service modify section 404.4 of the proposed regulations to (a) ensure that all vessels in the reporting area or Monument immediately report any emergencies, (b) clarify that emergencies include any accidents, pollution incidents, or losses of cargo that could pose a risk to natural and cultural resources, and (c) identify the types of information to be reported in cases of emergencies; adopt the proposed rule, as modified by the Commission's suggestion, and proceed to establish the new mandatory ship reporting system and the revised boundaries of the Areas To Be Avoided in the Monument.

Agency Response: The Service responded that the National Oceanic and Atmospheric Administration and the Fish and Wildlife Service are maintaining the regulations as proposed to implement the measures recommended by the International Maritime Organization but will consider a separate rule-making to address whether and how to require the reporting of emergencies in the Monument. The Service stated that the scope of such a rule could apply to a broader category of vessels than those simply passing through the Monument without interruption and could include vessels entering the Monument pursuant to permits and that such a rule would also be applied in accordance with international law.

4 August **To**: National Marine Fisheries Service

Issue: Application from the U.S. Navy for authorization to take marine mammals incidental to military readiness training operations in the Naval Undersea Warfare Center, Keyport Range Complex, in Washington State from September 2009 through April 2014, and the Service's request for comments on its proposal to develop and implement regulations to authorize and govern the requested taking over a five-year period

Recommendation: The Commission recommended that the Service and the Navy ensure that the contemplated rule and any Letter of Authorization issued under that rule provide authorization for the taking of all marine mammal species that may be exposed to Level A or Level B harassment as a result of the proposed activities. The Commission also recommended that the Navy be required to suspend an activity if a marine mammal is killed or seriously injured and the death or injury could be associated with the Navy's activities and that resumption of the activity should be contingent upon a review by the Service of the circumstances of the death or injury and the Navy's plans for avoiding additional deaths. Further, the Commission recommended that, if the Service proceeds with publication of a proposed rule, the Navy be required to explain its apparent ability to mitigate Level B harassment for some, but not other species; revise the general short-term exercise monitoring plan to enable the Navy to assess fully the effects of its activities on marine mammals, and provide the schedule for initiating that plan so as to obtain, on an on-going basis, biological data for documenting long-term trends in marine mammal abundance and distribution that can be used to inform subsequent exercise planning; develop and implement a plan to calibrate and verify the performance of the monitoring and mitigation measures being proposed to enable the Navy, the Service, and other interested parties to evaluate their effectiveness; provide additional details concerning the proposed mitigation and monitoring measures that would be implemented under the Navy's Range Operating Policies and Procedures Manual. In addition, the Commission recommended that the contemplated regulations, if issued, should require that the Navy (1) implement a plan to obtain monitoring performance validation data before beginning operations, (2) provide a more detailed and substantive explanation of the risk estimation protocols, and (3) modify its criteria for resuming full operational sonar use following a power-down or shutdown and provide follow-up data on the effectiveness and costs associated with such mitigation and monitoring efforts.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

4 August

To: National Marine Fisheries Service

Issue: Application from United Launch Alliance to renew a one-year incidental harassment authorization to take pinnipeds incidental to activities related to the Delta IV/Evolved Expendable Launch Vehicle at South Vandenberg Air Force Base, California

Recommendation: The Commission recommended that the Service approve the request, provided that all reasonable measures will be taken to ensure the least practicable impact on the subject species and the required mitigation and monitoring activities are carried out as described in the Service's 3 July 2008 *Federal Register* notice and the application.

Agency Response: The Service issued the incidental harassment on 18 August 2008, consistent with the Commission's recommendation.

7 August

To: National Marine Fisheries Service

Issue: Application from the U.S. Navy for authorization to take marine mammals incidental to military readiness training operations in the Cherry Point Range Complex off the coasts of North and South Carolina from 29 May 2009 through 28 May 2014 and the Service's request for public comments on its proposal to promulgate regulations to authorize and govern the requested taking

Recommendation: The Commission recommended that the Service and the Navy ensure that the contemplated rule and any Letter of Authorization issued under that rule cover all marine mammal species that may be taken by Level A or Level B harassment as a result of the proposed activities. Further, the Commission recommended that, if the Service proceeds with publication of a proposed

rule to authorize the taking of small numbers of marine mammals, the Navy be required to perform an external peer review of its marine mammal density estimates for the southeast operating area to ensure their accuracy; revise its explosive ordnance exposure analysis to provide a more realistic assessment of potential occurrences and outcomes; provide additional details concerning its integrated comprehensive monitoring program, including an estimated time frame for its implementation; develop and implement a plan to calibrate and verify the performance of monitoring and mitigation measures being proposed to enable the Navy, the Service, and other interested parties to evaluate their effectiveness; suspend an activity if a marine mammal is seriously injured or killed and the injury or death could be associated with the activity; and submit annual reports documenting the methods, results, and interpretation pertaining to all monitoring tasks and the dates and locations of operations, marine mammal sightings, and estimates of the amount and nature of potential takes of marine mammals by harassment or in other ways.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

11 August

To: Naval Facilities Engineering Command, Atlantic Division

Issue: The Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement (DEIS) to evaluate its planned training and defense-related research on the Jacksonville Range Complex Operating Area over a 10-year period

Recommendation: The Commission recommended that the Navy resubmit for public review a revised DEIS including (1) a true no-action alternative that consists solely of the current level of activity and fully analyzes the environmental effects of that level, (2) a new alternative based on a reduced level of activity, (3) a new alternative based on the current level of activity plus surge activities (described and analyzed in detail), and (4) any additional alternatives that the Navy wishes to consider and that are necessary to sharply define the issues and describe environmental effects. Further, the Commission recommended that the Navy submit its density estimate report to independent scientific review and make the report of that review available to the public before the Navy and Service complete the final environmental impact statement and consider any associated rulemaking for incidental taking or incidental harassment authorization.

Agency Response: The Navy had not published a revised draft or final environmental impact statement at the end of 2008.

11 August

To: National Marine Fisheries Service

Issue: The proposed rule to amend the regulations governing vessels authorized to fish for tuna in the eastern tropical Pacific Ocean

Recommendation: The Commission noted that, to a large extent, the proposed regulatory changes track resolutions adopted by the United States and other parties to the Inter-American Tropical Tuna Commission and the Agreement on the International Dolphin Conservation Program or constitute non-substantive changes to clarify and update the regulations. The Commission recommended, among other things, that the Service decline to adopt its proposed redefinition of the term "tuna product" in the final rule; revise its regulations to propose new criteria for distinguishing between vessels that are capable of catching tuna by setting purse seine nets to encircle dolphins and those that are not or explain what it is doing to carry out the directive in this regard from the fiscal 2005 Consolidated Appropriations Act; explain in the final rule that the lighting requirement and the suggestion that dolphin sets may be completed in darkness in no way alters the prohibition on making sundown sets (or initiating sets at night) as established in the Marine Mammal Protection Act and set forth elsewhere

in the Service's regulations; and delete section 300.22(b)(4)(i)(C) of the regulations and make corresponding changes to clause (D) of that provision to bring the regulations up to date.

Agency Response: The Service had not issued a final rule at the end of 2008.

12 August **To**: National Marine Fisheries Service

Issue: The proposed rule regarding an environmental review for fishery management actions

Recommendation: To enhance the Service's efforts to integrate requirements of the National Environmental Policy Act and the Magnuson-Stevens Fishery Conservation and Management Act, the Commission recommended that the Service establish a minimum comment period of 30 days for scoping notices and for review of a draft integrated fishery environmental management statement and provide longer comment periods when there is no compelling reason for such quick review; require as standard practice a three-meeting minimum for consideration of proposed actions requiring an environmental management statement to ensure public comments are analyzed and incorporated into the draft before decisions are made; require fishery management councils to submit written responses to the public's comments and questions when transmitting recommendations to the Service to ensure that the public record on their decision-making is complete; give full consideration to all public comments during Secretarial review and remove any restrictions on how the Service may act on or respond to those comments due to procedural constraints; eliminate the proposed restrictions on public comments on actions initiated by the Service; refrain from preemptively ruling out a no-action alternative that might involve no fishing or a reduction in fishing; use no-action alternatives to provide meaningful baselines for evaluating the effects of proposed actions in the context of the broader environmental effects of fishing; refrain from categorically exempting experimental fishing permits; and describe in its final rule the implications of existing case law for the various elements of the proposed rule and how the timeline of the proposed rule will be integrated with the timeline for section 7 consultation under the Endangered Species Act.

Agency Response: The Service had not issued a final rule at the end of 2008.

12 August **To**: National Marine Fisheries Service

Issue: The proposed rulemaking regarding the List of Fisheries for 2009

Recommendation: The Commission concurred with the Service's decision to describe and evaluate high-seas fisheries and include them in the List of Fisheries; split and reclassify the category I Hawaii-based longline fishery into category II shallow-set and category I deep-set fisheries; and reclassify the California halibut/white sea bass set net fishery from category I to category II. The Commission recommended that the Service develop and implement the research and monitoring programs needed to manage high-seas fisheries in a manner consistent with the requirements of the Marine Mammal Protection Act; reclassify all currently recognized West Coast trap and pot fisheries as category II until additional information is available to implicate a specific fishery as exceeding 50 percent of a stock's potential biological removal level (which would warrant a category I classification) or to exonerate a fishery that does not operate in areas where and when humpback whales are present. The Commission reiterated its previous recommendations that the Service expedite its investigation of bottlenose dolphin stock structure in the Gulf of Mexico; expand its efforts to collect reliable information on serious injury and mortality rates of marine mammals incidental to Gulf of Mexico fisheries; reevaluate the classification of Gulf of Mexico fisheries as information becomes available; and describe the level of observer coverage for each fishery as part of the List of Fisheries.

Agency Response: The Service issued the final rule on 24 November 2008, responding, among other things, that the development of a research and monitoring plan to manage high-seas fisheries consistent with the requirements of the Marine Mammal Protection Act will require novel stock assessment techniques and the development and/or continuation of international partnerships, and that it will consider such stock assessment techniques and components of a research and monitoring program while continuing to include high-seas fisheries on future Lists of Fisheries. Regarding the Commission's recommendation that the Service reclassify all currently recognized West Coast trap and pot fisheries as category II, the Service stated that it developed criteria to reclassify fisheries based upon the best available information and is working on ways to increase the amount of information available on interactions between marine mammals and pot and trap fisheries on the West Coast. The Service stated that it is focused on interactions with humpback whales and gray whales as these are the only species observed entangled in pot and trap gear on the West Coast, and that other pot and trap fisheries in the Pacific (including Hawaii and Alaska fisheries) have not been observed to interact with baleen whale species other than humpback whales.

12 August **To**: Office of Polar Programs, National Science Foundation

Issue: Application from Douglas P. Nowacek, Ph.D., for authorization under the Antarctic Conservation Act of 1978 to conduct research on cetaceans

Recommendation: The Commission noted its understanding that Dr. Nowacek is a co-investigator under a Marine Mammal Protection Act permit issued by the National Marine Fisheries Service to Andrew Read, Ph.D., and questioned why, if Dr. Nowacek's planned activities are covered under that permit, Dr. Read is not applying for the Antarctic Conservation Act permit. The Commission recommended that if Dr. Nowacek's activities in this instance are not covered by Dr. Read's permit, the National Science Foundation determine if his activities are covered by some other Marine Mammal Protection Act permit or if a Marine Mammal Protection Act permit issued specifically to Dr. Nowacek is needed. The Commission stated that it would provide its recommendation on the requested authorization upon clarification of this issue.

Agency Response: The National Science Foundation had not issued the permit at the end of 2008.

14 August **To**: National Marine Fisheries Service

Issue: Draft Environmental Impact Statement for Proposed Authorization of the Makah Whale Hunt

Recommendation: The Commission noted that the draft statement does a good job of analyzing the environmental consequences of the various issues that participants and decision-makers will need to consider in the course of a rulemaking under the Marine Mammal Protection Act to authorize a proposed hunt. The Commission stated that it saw no need to make recommendations concerning the selection of alternatives at this stage, but that the Service should address more directly the requirement under section 103(a) of the Marine Mammal Protection Act that regulations issued to waive the moratorium on taking or importing marine mammals ensure that the taking will not be to the disadvantage of the affected stock and will be consistent with the purposes and policies of the Act.

Agency Response: The Service had not issued a final environmental impact statement at the end of 2008.

14 August **To**: National Ocean Service

Issue: Draft management plan and draft environmental assessment for the Gerry E. Studds Stellwagen Bank National Marine Sanctuary

Recommendation: The Commission commended the Office of National Marine Sanctuaries for developing a thorough and well-documented assessment of sanctuary resources and threats and for identifying constructive actions to protect marine mammals and other resources in the Stellwagen Bank Sanctuary. The Commission recommended that, to ensure the management plan adequately addresses identified threats, the Office of National Marine Sanctuaries (a) amend the current designation document to add commercial fishing and whale-watching to the list of "Activities Subject to Regulation" or (b) clarify that, if warranted, commercial fishing and whale-watching activities will be subject to sanctuary regulation over the next five years; implement all of the research and management activities identified in the action plans for ecosystem alteration that pertain to whale-watching, commercial fishing, and vessel traffic; expand the draft plan to include new regulations, permit requirements, or other measures as may be necessary for managing commercial and recreational whale-watching vessels in the sanctuary; consult with the National Marine Fisheries Service regarding a ban on all fishing for sand lance within the sanctuary; expand the list of activities under the ecosystem alteration action plan to include a provision for implementing regulations, permit requirements, or other measures necessary to manage the impact of commercial fishing on natural and cultural resources within the sanctuary; identify and close one or more areas within the sanctuary to all commercial fishing to assess the potential for restoring habitats damaged by prior fishing activity and to provide a baseline for evaluating fishery impacts and potential fishery management actions in other areas; add a new action plan to the draft management plan section on capacity-building to include a comprehensive Stellwagen Bank Sanctuary science plan; and expand the administrative capacity and infrastructure action plan to include efforts to share information on management experience and practice and to develop consistent management strategies on issues of mutual concern, such as whale-watching, vessel traffic, and entanglement in fishing gear, and assign this activity a high priority.

Agency Response: On 29 July 2008 the Service announced that it was extending the public comment period through 3 October 2008. The Service had not finalized the plan and the environmental assessment at the end of 2008.

19 August **To**: National Marine Fisheries Service

Issue: Application from the 30th Space Wing, U.S. Air Force, for authorization to take small numbers of pinnipeds incidental to space vehicle launches and test-flight activities at Vandenberg Air Force Base, California, from February 2009 through February 2014 and the Service's request for public comments on its intent to propose new regulations to govern the requested taking

Recommendation: The Commission recommended that the Service publish the proposed small-take regulations for these activities, provided that all described research, mitigation, and monitoring activities are incorporated into the rule.

Agency Response: The Service issued the proposed rule on 15 December 2008, consistent with the Commission's recommendation.

20 August **To**: Fish and Wildlife Service

Issue: Application from ABR, Inc.–Environmental Research & Services for authorization to harass up to 15,100 northern sea otters over a five-year period during aerial, vessel, and onshore surveys to

determine the abundance and distribution of sea otters and other marine species in certain waters off Alaska.

Recommendation: The Commission recommended that the Service issue the permit for currently planned activities, with provisions; defer consideration of the request for authorization to harass animals during future surveys in other locations until the applicant can describe the proposed projects in sufficient detail (i.e., survey locations, number of surveys to be conducted in each location annually, and estimated number of sea otters, by location, that could be taken by harassment during those surveys); and upon receipt of such information, ensure that the review process (e.g., under a separate permit, an amendment, or other mechanism) be structured to accommodate participation and input from the Commission and the public.

Agency Response: The Service issued the permit on 4 November 2008, consistent with the Commission's recommendations.

25 August **To**: Department of Commerce

Issue: Video showing harassment of harbor seals at Children's Pool in La Jolla, California

Recommendation: The Commission noted that the activities documented in the video clearly constitute harassment of the seals, are in violation of the Marine Mammal Protection Act, and are placing members of the public, including children, at risk of being bitten or otherwise injured by the seals. The Commission stated that the lack of enforcement and control of this situation by the responsible authorities has devolved to an inexcusable state, and that it is only a matter of time before someone is seriously injured. The Commission recommended that the National Oceanic and Atmospheric Administration take prompt action to enforce the Act and establish control over the situation at Children's Pool. The Commission stated that, once control over the situation has been established, it would be pleased to work with the agency and other parties to seek a reasonable, long-term solution.

Agency Response: The National Marine Fisheries Service responded on 10 November 2008 by providing the Commission with a copy of the National Oceanic and Atmospheric Administration's Office for Law Enforcement's 2006 policy guidance memorandum regarding enforcement of human interactions with certain pinniped populations. The Service did not specifically address the Children's Pool issue.

25 August **To**: National Marine Fisheries Service

Issue: Application from the Lamont-Doherty Earth Observatory seeking authorization to take marine mammals by harassment incidental to conducting a marine seismic survey in the northeast Gulf of Alaska during 2008

Recommendation: The Commission recommended that, before issuing the requested authorization, the Service take steps to ensure that the planned monitoring program will be sufficient to detect, with reasonable confidence, all marine mammals within or entering the identified safety zones in order to determine whether animals are being taken in unanticipated ways and unexpected numbers; extend the monitoring period to one hour before initiation of seismic activities and one hour before the resumption of airgun activities after a power-down; and require that observations be made during all ramp-up procedures to gather data regarding the effectiveness of ramp-up as a mitigation tool.

Agency Response: The Service issued the incidental take authorization on 8 September 2008. Not all of the Commission's recommendations were adopted.

25 August **To**: U.S. Fish and Wildlife Service

Issue: Proposed rule to revise the format of the Lists of Endangered and Threatened Wildlife and Plants

Recommendation: The Commission recommended that the Fish and Wildlife Service adopt the proposed rule, provided that the Service modify section 17.11(b) to require that the acronyms ESU (evolutionarily significant unit) or DPS (distinct population segment) be inserted in the list immediately after any bracketed ESU or DPS common name to indicate the basis on which it is listed; clarify in the preamble to the final rule that any change in a species' name associated with the change to the Integrated Taxonomic Information System will not result in a change in listing status for that species or any part thereof, including the geographic area over which it is listed, unless that change is preceded by a formal listing or delisting process; and either (a) use the same description of geographic range provided in the current list of endangered or threatened wildlife when developing the new "where listed" column under the proposed rule or (b) ensure that any new descriptions of geographic range include, at a minimum, all areas currently encompassed by the existing list.

Agency Response: The Service had not issued a final rule at the end of 2008.

26 August **To**: U.S. Fish and Wildlife Service

Issue: Draft revised stock assessment report for the southern sea otter

Recommendation: The Commission recommended that the Service further revise the draft stock assessment report by replacing the current minimum population size estimate of 3,026 southern sea otters with an estimate based on the 20th percentile of the log-normal distribution of the average count for the 2006 to 2008 surveys, and recalculating the stock's potential biological removal level using the revised minimum population size estimate. The Commission also recommended that the Fish and Wildlife Service arrange for observer coverage of trap fisheries for lobster, crab, and fish in waters occupied by sea otters south of Point Conception.

Agency Response: The Service issued the final stock assessment report on 17 December 2008. The Service revised the minimum population estimate as recommended by the Commission. Concerning observer coverage of trap fisheries, the Service stated that the National Marine Fisheries Service conducts observer programs, and, because resources for these programs are fully utilized, no new programs may be initiated until other monitoring or conservation efforts are terminated. The Fish and Wildlife Service stated that it is evaluating options for obtaining additional information on interactions between sea otters and fisheries that have limited or no observer coverage.

10 September **To**: National Marine Fisheries Service

Issue: The proposed rule to amend the Bottlenose Dolphin Take Reduction Plan to extend for three years the current seasonal restriction on nighttime fishing off North Carolina with gillnets having a net mesh of 5 to 7 inches

Recommendation: The Commission recommended that the Service adopt the amendment as proposed.

Agency Response: The Service issued the final rule on 15 December 2008.

11 September **To**: National Marine Fisheries Service

Issue: Application from Eglin Air Force Base for authorization to take marine mammals incidental to training operations in the northern Gulf of Mexico and the Service's request for comments on its intent to promulgate regulations in 2009 to govern the incidental taking of marine mammals for a period of up to five years after the proposed one-year incidental harassment authorization expires

Recommendation: The Commission noted that the Service had issued incidental harassment authorizations for these activities in 2005, 2006, and 2007 and that the Commission had previously provided comments in which it had recommended that the Service provide a better explanation of, and justification for, using the dual criteria established for determining non-lethal injury; that defining Level B acoustic harassment from explosive detonation events in terms of temporary threshold shift (TTS) exclusively implies that behavioral changes not related to TTS would not constitute harassment as defined in the Marine Mammal Protection Act, which is inconsistent with that statute's definition of ''harassment''; and that the Service should provide a better explanation of and justification for using the 23 psi criterion for estimating the TTS pressure threshold.

Agency Response: The Service responded that it had provided a detailed explanation and justification for using the dual criteria for determining non-lethal injury in both the *Seawolf* and *Churchill* final environmental impact statements and had updated those documents in a 19 August 2005 *Federal Register* notice; it also provided a detailed justification for the way Level B harassment is defined as related to explosive detonations in that same *Federal Register* notice. The Service further noted that the use of the 23 psi criterion for estimating the TTS pressure threshold issue remains under review by the Service and the Navy for future rulemaking actions. The Service noted that it considers 23 psi to be conservative since it is below the level that induced TTS in bottlenose dolphins.

15 September **To**: Department of Commerce

Issue: A request for comments on the advisability of requiring written reports on scientific research, exempted fishing, and exempted activities

Recommendation: The Commission recommended that the Department of Commerce retract, revise, and republish the *Federal Register* notice to provide the information necessary for the public to comment meaningfully on the questions posed; require written reports for all activities for which it has issued a permit for scientific research, exempted fishing, or other exempted activities, and stipulate that the information to be included in such reports include, at a minimum, the activity conducted, the responsible party, the purpose of the activity, the means by which such activity was undertaken, the results of the activity, the value of that information, and the means by which it will be made available to other interested parties and the public.

Agency Response: The Service had not responded to the Commission's recommendations at the end of 2008.

15 September **To**: Minerals Management Service

Issue: A request for comments on whether the Service should initiate a new 5-year Outer Continental Shelf oil and gas leasing program

Recommendation: The Commission recommended that the Service work with the Department of Energy to initiate a new 5-year oil and gas leasing program to supersede the current program and conduct the environmental analyses needed to guide the public and decision-makers regarding the

new program, including (a) a projection of the country's long-term energy needs based on expected population growth and economic expansion, (b) a description of all existing and potential sources of energy and trends in the development of those sources, (c) alternative approaches for meeting projected needs, including conservation, and the potential environmental impacts associated with those alternatives, and (d) a significant, large-scale program aimed at reducing per capita energy demand, achieving greater efficiency in energy use, developing alternative energy sources, and reducing greenhouse gas production.

Agency Response: The Service had not published a follow-up regarding this issue at the end of 2008.

19 September **To**: National Science Foundation

Issue: Application from Robert Pitman, Southwest Fisheries Science Center, for authorization under the Antarctic Conservation Act of 1978 to conduct research on killer whales, minke whales, and humpback whales in the Antarctic

Recommendation: The Commission stated that it would provide a recommendation on the requested authorization upon clarification by the National Science Foundation of whether Mr. Pitman's proposed activities are covered under a Marine Mammal Protection Act permit or if he is relying on someone else's permit as his authorization under that statute. The Commission stated that the National Science Foundation and the National Marine Fisheries Service should determine whether allowing inconsistent permit holders under the Antarctic Conservation Act and the Marine Mammal Protection Act creates operational or legal problems that should be avoided.

Agency Response: The National Science Foundation had not issued the permit at the end of 2008.

22 September **To**: National Marine Fisheries Service

Issue: Proposed rule regarding the draft Atlantic Pelagic Longline Take Reduction Plan

Recommendation: The Commission recommended that the Service invest more resources in data collection activities to support implementation of the take reduction process for this fishery; place greater emphasis on identification of species and investigation of stock structure of pilot whales along the U.S. Atlantic coast, particularly within the Mid-Atlantic Bight; increase and optimize the allocation of observer coverage throughout the Atlantic pelagic longline fishery and thus improve the accuracy and precision of the estimates of marine mammal bycatch rates; work with federal and state fisheries management agencies and the fishing industry to develop a fair and sustainable funding strategy to support more effective observer programs; and revise the proposed regulations to require that the informational placard be displayed in the wheelhouse and on the working deck of all active pelagic longline vessels engaged in Atlantic highly migratory species fisheries.

Agency Response: The Service had not issued a final rule at the end of 2008.

22 September **To**: National Marine Fisheries Service

Issue: Proposed rule to revise the guidelines for National Standard 1 of the Magnuson-Stevens Fishery Conservation and Management Act

Recommendation: The Commission recommended that, to continue development of an ecologically safe fisheries management framework under the Magnuson-Stevens Act, the Service shift its

focus to the development, evaluation, and implementation of measures that take into account the uncertainty regarding ecological effects of fishing, not only on fish stocks but on all potentially affected ecosystem components; review the processes for setting catch limits and targets, identify all steps in those processes that involve discretion as to the level of precaution, and establish generally applicable standards for the level of precaution to be used in those cases; engage its quantitative experts in an investigation of the performance of using multi-year averages for managing highly variable fisheries with poor in-season data and use annual statistics for management of all fisheries, including those involving highly variable stocks or catch limits, until the unintended consequences of using multi-year averages have been identified and resolved; identify the various stock complexes that are taken in fisheries and eliminate the targeting of such complexes unless and until a suitably rigorous research program has been developed to affirm that all stocks taken within a complex are reasonably safe from being fished at an unsafe rate or reduced by fishing to an unsafe level; and demonstrate international leadership by establishing and adhering to annual catch limits and accountability measures for international fisheries.

Agency Response: The Service had not issued a final rule at the end of 2008.

26 September **To**: Fish and Wildlife Service

Issue: Application from the Alaska Department of Transportation and Public Facilities and the Aleutians East Borough to take small numbers of northern sea otters incidental to construction of a new airport, access road, and hovercraft landing area on Akun Island and a hovercraft landing and storage area on Akutan Island, Alaska, and testing and operation of a hovercraft between Akun and Akutan Islands

Recommendation: The Commission recommended that the Service authorize the incidental harassment of sea otters expected to occur during the proposed construction activities and hovercraft testing but defer authorization of taking incidental to operation of the hovercraft until the proposed research has been completed and other planned mitigation measures are in place; require, as part of the development of ramp-up and power-down procedures and the testing of the hovercraft, the collection of information to assess the responses of sea otters to these measures; and in consultation with the applicant, consider authorizing subsequent incidental taking for five-year intervals through regulations and letters of authorization issued under section 101(a)(5)(A) of the Marine Mammal Protection Act.

Agency Response: The Service issued both incidental harassment authorizations on 10 November 2008.

29 September **To**: National Marine Fisheries Service

Issue: The Service's Final Environmental Impact Statement to Implement Vessel Operational Measures to Reduce Ship Strikes to North Atlantic Right Whales

Recommendation: The Commission recommended that, to protect North Atlantic right whales from ship collisions, the Service adopt a final rule that is more in line with the proposed rule published in June 2006 rather than the provisions now identified as the preferred alternative in the final environmental impact statement. In particular, the Commission recommended that the Service establish permanent vessel speed restrictions without the five-year sunset clause contemplated under the preferred alternative in the final statement; extend the boundaries of seasonal management areas in the mid-Atlantic U.S. region from 20 to 30 nautical miles around major port entrances, as originally proposed; mandate a 10-knot speed restriction in dynamic management areas, as proposed in 2006,

rather than relying on voluntary compliance; and establish dynamic management areas in the southeast and mid-Atlantic regions based on the reliable sighting of a single right whale, as initially proposed in 2006, and shorten the effective period (e.g., to 5 to 10 days).

Agency Response: The Service issued the final rule on 6 October 2008. The Service did not respond specifically to the Commission's comments and recommendations.

29 September **To**: National Marine Fisheries Service

Issue: Application from Scripps Institution of Oceanography to take marine mammals by harassment incidental to conducting a marine seismic survey and piston coring activities in the Santa Barbara Channel

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that the applicant be required to conduct all practicable monitoring and mitigation measures that reasonably can be expected to protect the potentially affected marine mammal species from serious injury and that operations be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to the seismic survey.

Agency Response: The Service issued the incidental harassment authorization on 22 August 2008, consistent with the Commission's recommendations.

2 October **To**: National Marine Fisheries Service

Issue: Regarding amendment of a Southwest Fisheries Science Center's permit and the Commission's recommendation on the need to establish Institutional Animal Care and Use Committees (IACUCs) at the Southwest Fisheries Science Center and the Service's other science centers

Recommendation: The Commission noted that it has repeatedly expressed concern that the Service has been out of compliance with the Animal Welfare Act requirements pertaining to IACUCs for several years and is pleased that the task force reviewing the matter for the Service agrees that IACUCs are needed and that the Service has a plan to establish them. However, the Commission expressed concern as to why the Service requires more than a year to convene IACUCs and begin reviewing research proposals and grants. The Commission requested a meeting with the responsible Service officials to clarify the steps needed and being taken to establish IACUCs, the proposed schedule for implementation, whether anything can be done to expedite the process, and what alternative arrangements might be available to provide the required oversight and review on an interim basis.

Agency Response: The Service had not issued the amended permit at the end of 2008.

7 October **To**: National Marine Fisheries Service

Issue: Application from The Whale Center of New England for a permit amendment and a permit application from the Ocean Alliance

Recommendation: The Commission recommended that, prior to authorizing the requested activities, the Service first resolve its position on compliance with the National Environmental Policy Act (i.e., not to consider new requests for authorization of right whale research until it completes a programmatic environmental impact statement). The Commission further recommended that if the Service intends to abandon its previous position, it do so cautiously and with a record of decision providing

clear and adequate justification. With regard to the individual permit applications, the Commission recommended that the Service approve the requested amendment of the Whale Center of New England's permit, provided that the conditions contained in the original permit remain in effect. The Commission recommended, among other things, that the Service also approve the Ocean Alliance's application, provided that the researchers take steps to minimize disturbance by exercising caution when approaching animals, particularly mother/calf pairs, and halt an approach if there is evidence that the activity may be interfering with pair-bonding, nursing, reproduction, feeding, or other vital functions; the proposed studies have been reviewed and approved by the permit holder's Institutional Animal Care and Use Committee; absent additional justification, biopsy samples not be taken from North Atlantic right whale calves less than one year of age or from females accompanied by such calves; prior to authorizing biopsy-sampling of North Atlantic right whale calves and females accompanying such calves, the applicant provide clarification of what it expects to learn from sampling adult females and their calves; the Service obtain additional justification for the proposed sample sizes for biopsy-sampling of other cetacean species to establish baseline contaminant levels in various geographical regions; and the Service request clarification of whether the applicant is proposing to conduct research, including biopsy-sampling on southern right whales or North Pacific right whales in the event that these species are encountered.

Agency Response: The Service had not issued the amendment or the permit at the end of 2008.

9 October **To**: National Marine Fisheries Service

Issue: Applications from (1) the National Marine Mammal Laboratory for renewal of a permit authorizing the import and export of an unspecified number of cetacean and pinniped (except walrus) parts taken worldwide from animals captured and sampled under other research permits, maintained in captivity, taken directly or indirectly in legal fisheries, found dead at sea or beached, found dead by natural causes, or taken under a permit by biopsy; and (2) the National Ocean Service, Marine Forensic Lab, to receive, import, export, transfer, archive, and conduct forensic analyses of an unspecified number of cetacean and pinniped (except walrus) parts taken worldwide from animals found dead at sea or beached, sampled under other scientific research permits, taken directly or indirectly in legal fisheries, taken for subsistence purposes, or transferred from law enforcement agencies.

Recommendation: The Commission recommended that the Service issue the requested permits, provided that the permits be structured to require subsequent review and authorization whenever unanticipated studies or uses of the specimens are being contemplated, and any permit issued to authorize the importation of requested marine mammal parts include a mechanism that enables the Service to determine that specimens to be imported have not been acquired from marine mammals taken in high-seas driftnet fisheries, during whaling activities not approved by the International Whaling Commission, in violation of the laws of the country of origin, or in violation of the Marine Mammal Protection Act.

Agency Response: The Service issued the permits on 16 December 2008, consistent with the Commission's recommendation.

10 October **To**: National Marine Fisheries Service

Issue: The Service's intent to propose regulations to authorize the Naval Air Weapons Station to take by harassment small numbers of harbor seals, elephant seals, and California sea lions on San Nicolas Island incidental to target missile launch operations over five years

Recommendation: The Commission noted that the incidental taking of marine mammals during these activities is currently authorized under regulations that will expire this month and expressed support for the Service's intention to propose new small-take regulations for those activities, provided that appropriate and effective mitigation and monitoring activities are incorporated in the regulations.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

14 October **To**: Department of the Interior

Issue: The Service's notice proposing changes to the regulations governing consultation under section 7 of the Endangered Species Act of 1973

Recommendation: The Commission strongly disagreed with several of the proposed changes and the manner in which the Fish and Wildlife Service and National Marine Fisheries Service developed them. The Commission recommended that the Services withdraw the proposed rule, notify all interested agencies (action, consulting, and oversight agencies) of their intent to reexamine the existing regulations, and engage those agencies in an open process to discuss and refine the regulations; withhold the proposed regulations until the necessary environmental analyses under the National Environmental Policy Act and the Endangered Species Act have been completed and made available to the public and decision-makers; and consider alternative approaches for evaluating the effects of greenhouse gas emissions and associated climate change rather than excluding them from consideration during section 7 consultations.

Agency Response: The Service published a final rule on 16 December 2008. The Commission's recommendations were not adopted.

24 October **To**: National Marine Fisheries Service

Issue: The Service's draft 2008 stock assessment reports for marine mammals

Recommendation: To improve overall stock assessment efforts, the Commission recommended that the Service invest in the development of technologies and methods that will help address questions about population status and habitat use and thereby guide management strategies, particularly those aimed at avoiding adverse human effects; work with other agencies conducting research related to marine mammals to coordinate scientific efforts and share data and results; convene a comprehensive review of its stock assessment efforts to identify the obstacles to completing stock assessments, assign priorities, and identify needed resources; work with federal and state fisheries management agencies and industry to develop a funding strategy that will support more effective observer programs for collecting data on incidental fisheries-related mortality and serious injury of marine mammals; proceed with formal recognition of 12 stocks of harbor seals in Alaska and proceed with research and management of those stocks as set forth in the Marine Mammal Protection Act; convene a take reduction team to address pelagic longline fishery interactions with the Hawaii false killer whale stock; and develop and implement a systematic and comprehensive approach for incorporating and considering all risk factors into the stock assessment reports. The Commission suggested that the Service prioritize the first two recommendations for altering the basic underlying processes by which the Service obtains the data it needs to improve stock assessments and trends analyses. The Commission offered to meet with the Service to discuss how such priorities might be set in a fiscally restrained climate.

Agency Response: The Service had not issued the 2008 final stock assessment reports at the end of 2008.

24 October **To**: National Marine Fisheries Service

Issue: Application from the National Marine Mammal Laboratory for authorization to take harbor seals, California sea lions, and elephant seals in Washington and Oregon and adjacent waters over a five-year period to investigate the species' abundance and distribution, diseases, contaminant-loading, life history parameters, genetics, and foraging ecology

Recommendation: The Commission recognized the value of the research conducted by the National Marine Mammal Laboratory and expressed support for continuing the proposed research but concern that the Service's Science Centers have not established Institutional Animal Care and Use Committees, as previously recommended by the Commission. The Commission therefore reiterated its recommendation that, prior to issuing the requested permit, the Service provide the Commission with evidence that the applicant is in compliance with the Animal Welfare Act requirement that the proposed research has been reviewed by an Institutional Animal Care and Use Committee or provide a justification as to why compliance is not required. The Commission recommended that, upon resolution of this issue, the Service approve the requested permit, provided that the Service determines whether and, if so, under what mechanism the potential taking of Steller sea lions incidental to the proposed research will be authorized; the applicant provides (1) a science-based or data-based justification for why efforts to assess the impacts of such high levels of disturbance are not necessary, (2) science-based or data-based evidence that branding without anesthesia provides significant advantages that outweigh the benefits of anesthesia, and (3) scientific or data-based evidence that no elephant seal female/pup bonds are disrupted during research efforts; activities be suspended, pending review and authorization to proceed, if five California sea lions, five harbor seals, or two northern elephant seals are accidentally injured or killed in any one year as a result of conducting permitted activities; and researchers monitor the effects of activities that are either focused on or result in the disturbance of mother/pup pairs to determine if there are any lasting or significant effects on either the mother or the pup.

Agency Response: The Service had not issued the permit at the end of 2008.

27 October **To**: Gulf of Mexico Fisheries Management Council

Issue: The 3 September 2008 public hearing draft of the Fishery Management Plan for Regulating Offshore Marine Aquaculture in the Gulf of Mexico to establish a regional permitting process to manage the development of an environmentally sound and economically sustainable aquaculture industry in federal waters of the Gulf of Mexico

Recommendation: The Commission recommended that the Council and the National Marine Fisheries Service develop and implement protocols for collecting baseline data needed to assess aquaculture impacts on Gulf of Mexico ecosystems; ensure completion and implementation of the national aquatic animal health plan currently under development by the National Marine Fisheries Service, the Animal and Plant Health Inspection Service, and the Fish and Wildlife Service, as a necessary precursor to the implementation of aquaculture programs and the issuance of permits under this fishery management plan; review on a species-specific basis the consequences of unintentional releases and their ecological impact, including the likelihood of hybridization of escaped fish with local species as well as the potential for competition between released aquaculture stocks and wild stocks; revise the draft statement to include consideration of risks related to aquaculture interactions with protected species, including marine mammals, and establish a monitoring regime and

database to provide a basis for evaluating the level of interaction; and revise the draft statement to include an analysis of the potential effects of increased vessel traffic resulting from aquaculture operations.

Agency Response: No response had been received from the Council at the end of 2008.

27 October **To:** Naval Facilities Engineering Command, Atlantic

Issue: The Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement to evaluate its proposed Undersea Warfare Training Range activities

Recommendation: The Commission recommended that the Navy adopt and abide by the restrictions described in the National Marine Fisheries Service's Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with Northern Right Whales in all but emergency situations and include in its impact statement and observe similar seasonal speed restrictions as it moves to, from, over, and through the selected site; subject its marine assessment data and the analytical procedures used to estimate risks to marine mammals at the alternative sites to expert peer review; implement a plan to validate the effectiveness of monitoring and mitigation measures before beginning, or in conjunction with, operations under the final impact statement and anticipated issuance by the National Marine Fisheries Service of an incidental harassment authorization; and (1) modify the section on coordination and reporting to include immediate suspension of activities when a dead or injured marine mammal is detected and the cause could be related to Navy activities, and (2) consult immediately with the National Marine Fisheries Service to consider jointly the steps that should be taken to avoid similar occurrences.

Agency Response: The Navy had not finalized the environmental impact statement at the end of 2008.

29 October **To**: Navy Facilities Engineering Command, Northwest

Issue: The Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement on the potential environmental consequences of extending the operational areas of the Keyport Range Complex and increasing the average annual number of tests and testing days

Recommendation: The Commission recommended that the Navy provide a comprehensive description of the risk estimation process used for the Keyport Range Complex, subject that process to independent review, explain any differences between the processes used at Keyport versus those used at other sites, and assess and report the significance of those differences with respect to estimating risks to marine mammals; work with the National Marine Fisheries Service to plan and conduct an independent assessment of the Navy's proposed monitoring and mitigation methods; incorporate in the draft statement a requirement to submit to the Service annual reports providing full documentation of methods, results, and interpretation pertaining to all monitoring and mitigation efforts, including dates and locations of operations and marine mammal sightings, and estimates of the amount and nature of potential takes of marine mammals; and modify the draft to include the need to halt activities that result in the serious injury or death of a marine mammal, determine the cause of the injury or death, assess the number of animals involved, and determine how the activity should be modified to avoid future injuries or deaths.

Agency Response: The Navy had not finalized the environmental impact statement at the end of 2008.

29 October **To**: Navy Facilities Engineering Command, Atlantic Division

Issue: The Navy's Draft Environmental Impact Statement/Overseas Environmental Impact Statement on the potential environmental consequences arising from military readiness training operations in the Cherry Point Range Complex off the coasts of North and South Carolina from 29 May 2009 through 28 May 2014

Recommendation: The Commission recommended that the Navy, working with the National Marine Fisheries Service, take steps to ensure that the contemplated incidental take rule under section 101(a)(5) of the Marine Mammal Protection Act and any letter of authorization issued under that rule cover all marine mammal species that may be taken by Level A or Level B harassment as a result of the proposed activities; re-label its "no action" alternative to indicate that the least level of activity being proposed still exceeds that which has been conducted on the range historically and is therefore neither a true no-action alternative nor an alternative that offers any curtailment or reduction from historical levels of activity; as required by the National Environmental Policy Act, include and analyze a true no-action alternative; perform an external peer review of its marine mammal density estimates for the Cherry Point operating area; revise its analysis of exposure to explosive ordnance to provide a more realistic assessment of potential occurrences and outcomes; continue to develop its integrated comprehensive monitoring program and provide the Commission with additional details regarding the program, including an estimated time frame for its implementation; and develop and implement a plan to calibrate and verify the performance of monitoring and mitigation measures being proposed to enable the Navy, the National Marine Fisheries Service, and other interested parties to evaluate the reliability of proposed monitoring and mitigation measures; assess alternatives that would require it to suspend an activity if marine mammals are seriously injured or killed and the injuries or deaths could be associated with the activity, and include a requirement that any injury or death be investigated to determine the cause, assess the full impact of the activity (e.g., the total number of animals involved), and determine how the activity should be modified to avoid future injuries or deaths; and add a requirement for annual reports providing full documentation of methods, results, and interpretation pertaining to all monitoring tasks and the dates and locations of operations, marine mammal sightings, and estimates of the amount and nature of potential takes of marine mammals by harassment or in other ways.

Agency Response: The Navy had not finalized the environmental impact statement at the end of 2008.

29 October **To**: National Marine Fisheries Service

Issue: The Service's draft environmental assessment for managing the deep-set longline fishery for tuna in the eastern Pacific Ocean outside the U.S. Exclusive Economic Zone

Recommendation: The Commission recommended that the Service retain all existing management measures for this fishery, especially 100 percent observer coverage; add measures to limit entry to the fishery to ensure that bycatch levels remain below thresholds set by the Marine Mammal Protection Act; allow no more than one new vessel to enter the fishery per year, up to a total of five new vessels, with any such additions contingent upon fishery observer data confirming that take levels do not exceed the potential biological removal level for any marine mammal stocks; expand the draft assessment to include all relevant, available information on the California/Oregon/Washington stock of short-finned pilot whales and the fisheries that might take them; expand its preferred alternative to prohibit West Coast vessels from fishing west of 140ºW longitude to prevent any additional incidental take from the Hawaiian stocks of false killer whales; and expand the assessment to summarize available information on longline vessels that actually fish in the eastern Pacific Ocean, their numbers,

where they fish, their incidental catch rates, and the protected species taken, including marine mammals.

Agency Response: The Service had not finalized the environmental assessment at the end of 2008.

31 October **To**: National Marine Fisheries Service

Issue: Application from PRBO Conservation Science requesting authorization to take small numbers of California sea lions, Pacific harbor seals, northern elephant seals, and Steller sea lions by Level B harassment at the South Farallon Islands, Año Nuevo Island, and Point Reyes National Seashore, California, and to take by Level B harassment up to 16 Steller sea lions per year incidental to conducting research on northern elephant seals at the South Farallon Islands

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that any authorization issued require that, if a death or serious injury of a marine mammal occurs that appears to be related to the research, activities be suspended while the Service determines whether steps can be taken to avoid further injuries or deaths or until such taking has been authorized by regulations promulgated under section 101(a)(5)(A) of the Marine Mammal Protection Act.

Agency Response: The Service had not issued the incidental harassment authorization at the end of 2008.

3 November **To**: Office of National Marine Sanctuaries

Issue: The National Ocean Service's advance notice of proposed rulemaking concerning implementation of section 304(d) of the National Marine Sanctuaries Act

Recommendation: The Commission recommended that the National Ocean Service (1) proceed with the rulemaking under consideration and (2) review and draw on the regulations at 50 C.F.R. Part 402 that implement the consultation requirement under section 7 of the Endangered Species Act with respect to developing a proposed rule.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

4 November **To**: National Marine Fisheries Service

Issue: Application from Terrie Williams, Ph.D., Long Marine Laboratory, to continue to conduct research authorized under a previous permit on the energetic and diving physiology of odontocetes and pinnipeds

Recommendation: The Commission recommended that the Service approve the requested permit, provided that the proposed activities have been reviewed and approved by the permit holder's Institutional Animal Care and Use Committee and the Service require that activities be suspended, pending review and authorization to proceed, if two animals die or are seriously injured during the research activities.

Agency Response: The Service had not issued the permit at the end of 2008.

4 November **To**: Fish and Wildlife Service

Issue: Application from Wildlife Trust, Inc., to amend a permit authorizing the harassment of up to 210 manatees annually in the course of conducting research on the distribution, abundance, movement patterns, survival rates, site fidelity, and reproductive activities of free-ranging Florida manatees. The permit holder requested that the permit be amended to expand the geographic coverage to include holding facilities and waters of the southeastern United States, which would cover the natural range of the stock.

Recommendation: The Commission recommended that the Service approve the requested permit amendment, provided that conditions in the current permit remain in effect.

Agency Response: The Service had not issued the permit at the end of 2008.

7 November **To:** National Marine Fisheries Service

Issue: The announcement of a 90-day finding on a petition to list three ice seal species (ringed, bearded, and spotted seals) as threatened or endangered under the Endangered Species Act

Recommendation: The Commission noted that status reviews for the three ice seal species must consider a broad range of issues related to five listing factors set forth in the Endangered Species Act. The Commission recommended that the National Marine Fisheries Service analyze habitat changes relative to the unique life history characteristics and seasonal habitat requirements of each of the three species, evaluate the ability of each species to adapt in the face of changing conditions, and identify limits to behavioral adaptation to determine whether the present or threatened destruction, modification, or curtailment of its range places at risk the continued existence of any of the species now or in the foreseeable future; analyze in detail the potential for overutilization—primarily for subsistence purposes—and how it will ensure that such harvests do not increase the risk of extinction of any of these three species; consider how the three species might be affected by increasing exposure and susceptibility to disease, changing trophic food-web relationships, and changing ecological interactions as the Arctic climate warms; conduct a thorough review of regulatory mechanisms to address the effects of climate change; and characterize and evaluate the predicted increase in human activities in the ranges of the three species which may threaten ice seals now or in the foreseeable future.

Agency Response: The Service was conducting its status reviews at the end of 2008.

13 November **To**: National Marine Fisheries Service

Issue: The Service's intent to issue regulations to authorize the Navy to take up to 40 marine mammal species by Level B harassment and up to 10 beaked whales by serious injury or death over a five-year period incidental to Atlantic Fleet Active Sonar Training activities conducted off the U.S. Atlantic coast and in the Gulf of Mexico

Recommendation: The Commission noted that on 31 March 2008, it had provided comments to the Navy on its draft environmental impact statement for the proposed activities, many of which are pertinent to the proposed incidental take regulations. The Commission also noted that on 4 April 2008, it had provided comments and recommendations on the Service's notice of intent to develop regulations to govern the proposed activities. The Commission noted that some of the recommendations set forth in its 4 April 2008 letter were not adopted, and it recommended that the Service work with the Navy to provide in the final rule and final environmental impact statement a comparison of

the methods each agency used to generate the sound exposure estimates and use that information to assess the risks to marine mammal species and the adequacy of mitigation measures; validate the performance of Navy lookouts, to conduct similar testing to validate passive acoustic monitoring methods, and to complete such tests before the Navy proceeds with its training operations; analyze post-operational reports and use the results to resolve disparate views regarding the effectiveness of monitoring and mitigation measures and to improve those measures accordingly; modify the Navy's mitigation measures by requiring that the Navy delay resumption of full operational sonar use following a power-down or shutdown for 30 minutes if the sighted animal can be identified to the species level and the species is not deep-diving and 60 minutes if it cannot be identified or is known to be a member of a deep-diving species; modify the Navy's mitigation measures by allowing resumption of full operations before the end of the 30-minute or 60-minute period only when the Navy has good evidence that the marine mammal seen outside the safety zone is the same animal originally sighted within the zone; and prepare a more thorough analysis of potential cumulative effects, the measures that will be taken to avoid or minimize them, and the basis for concluding that those effects will be negligible.

Agency Response: The Service had not issued proposed regulations at the end of 2008.

13 November **To**: National Marine Fisheries Service

Issue: Proposed regulations to authorize the U.S. Navy to take marine mammals incidental to training activities in the Southern California Range Complex for the next five years

Recommendation: The Commission noted that the Service's proposed regulations do not incorporate all of the Commission's previous recommendations regarding activities on the Southern California range. The Commission recommended that, to address the Commission's concerns, the Service work with the Navy to modify the final rule by (1) clarifying which monitoring and mitigation measures will be required, (2) requiring performance testing and validation of those measures, (3) requiring new measures to address remaining monitoring and mitigation shortcomings, and (4) requiring continued preparation of post-activity reports for subsequent analysis; modify the Navy's mitigation measures by requiring that the Navy delay resumption of full operational sonar use following a power-down or shutdown for 30 minutes if the sighted animal can be identified to the species level and the species is not deep-diving and 60 minutes if it cannot be identified or is known to be a member of a deep-diving species such as sperm and beaked whales; modify the Navy's mitigation measures by allowing resumption of full operations before the end of the 30-minute or 60-minute period only when the Navy has good evidence that the marine mammal seen outside the safety zone is the same animal originally sighted within the zone; develop a database for storing original records of marine mammal interactions; and prepare an adequate analysis under the National Environmental Policy Act of proposed operations at Tanner Bank, but until such an analysis has been completed, the Service withhold authorization for the taking of marine mammals at that site.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

24 November **To**: National Marine Fisheries Service

Issue: Application from the Jacksonville Transportation Authority to take small numbers of marine mammals by harassment incidental to replacing support structures for the Beach Boulevard Bridge over the Atlantic Intracoastal Waterway in Duval County, Florida

Recommendation: The Commission recommended that the Service issue the requested authorization, provided that the Service consult with the Fish and Wildlife Service to ensure that it has reviewed

the applicant's recent information supplementing the 1999 biological assessment, revised blasting plan, and the current draft manatee, marine mammal, and sea turtle survey watch plan; the applicant be required to conduct all practicable monitoring and mitigation measures that reasonably can be expected to protect the potentially affected marine mammal species from serious injury; and operations be suspended immediately if a dead or seriously injured marine mammal is found in the vicinity of the operations and the death or injury could have occurred incidental to those operations.

Agency Response: The Service had not issued the authorization at the end of 2008.

26 November **To**: National Marine Fisheries Service

Issue: Application from Kathryn Ono, Ph.D., for amendment of a permit authorizing the permit holder to capture, examine, mark, tag, sample, and release annually 200 harbor seals and 500 gray seals to examine expanding populations of these species in the Gulf of Maine; to harass 400 harbor seals, 2,500 gray seals, 150 harp seals, and 150 hooded seals annually during the authorized capture and sampling activities; and to accidentally kill up to two harbor seals and up to four gray seals annually. The permit holder requested authorization to take by harassment over the duration of the permit an additional 900 gray seals (200 by marking and 700 incidental to the research activities) to facilitate behavioral research at the gray seal breeding colony on Muskeget Island. The permit holder also requested authorization for four additional lethal takes of maternally dependent pups resulting from mother/pup separation due to incidental disturbance.

Recommendation: The Commission recommended that the Service approve the requested amendment, provided that the conditions contained in the original permit remain in effect.

Agency Response: The Service had not issued the amended permit at the end of 2008.

2 December **To**: National Marine Fisheries Service

Issue: The Service's petition to expand critical habitat boundaries for Hawaiian monk seals in the Northwestern Hawaiian Islands (NWHI) and the main Hawaiian Islands

Recommendation: The Commission recommended that the Service propose regulations to expand critical habitat in the NWHI by adding (1) all beach areas on Sand Island at Midway Atoll and (2) all NWHI aquatic areas within the 500-m isobath; plan and conduct the studies needed to clarify current habitat-use patterns of monk seals in the MHI and conduct additional studies, both over time and as the population increases or expands its range, to ensure that critical habitat is identified and protected while minimizing the areas that are protected unnecessarily; and designate as critical habitat all MHI beach areas that are used regularly by more than one seal, all areas where births have occurred, and all waters out to the 200-m isobath in home range areas identified in the Littnan et al. (2007) study.

Agency Response: The Service had not issued a proposed rule at the end of 2008.

4 December **To**: National Marine Fisheries Service

Issue: Application from Daniel Costa, Ph.D., for amendment of a permit authorizing the permit holder to take by harassment various species of pinnipeds during two research projects to examine the foraging ecology and energetics of California sea lions in southern and central California, including the Channel Islands; Project II to determine the distribution and foraging behavior of adult Antarctic seals. The permit holder requested that the permit be amended to extend the area where Project II

can be carried out from the western Antarctic Peninsula to the Weddell Sea in order to explore the foraging behavior and habitat utilization of Weddell seals in a different ocean environment.

Recommendation: The Commission recommended that the Service approve the permit amendment request, provided that the conditions contained in the original permit remain in effect.

Agency Response: The Service had not issued the amended permit at the end of 2008.

15 December **To**: The National Marine Fisheries Service

Issue: Application from SeaWorld, Inc., for authorization to import one adult male long-finned pilot whale from the Lisbon Zoo, Lisbon, Portugal, to Sea World of California, San Diego, for public display

Recommendation: The Commission recommended that the Service defer further consideration of the application pending the receipt of additional information demonstrating that the proposed import is necessary for the animal's protection or welfare, and that, if a permit is issued, the applicant first be required to identify steps that it will take to prevent the animal in question and the short-finned pilot whales with which it is proposed to be maintained from producing hybrid offspring.

Agency Response: The Service had not issued the permit at the end of 2008.

16 December **To**: U.S. Fish and Wildlife Service

Issue: Applications from Conservation Force in support of requests from seven clients for authorization to import polar bear trophies from Canada for purposes of enhancement of the species

Recommendation: The Commission recommended that, consistent with the scope of the enhancement permit provision of the Marine Mammal Protection Act, the Service deny the requested authorizations to import polar bear trophies as being inconsistent with the statutory requirements for issuance of enhancement permits and adopt an interpretation that sport hunting does not constitute an enhancement activity under section 104(c)(4) of the Act and codify this interpretation by regulation.

Agency Response: The Service had not issued the permits at the end of 2008.

17 December **To**: National Marine Fisheries Service

Issue: The Service's request for comments regarding use of the best available science in carrying out the provisions of the Magnuson-Stevens Fishery Conservation and Management Act and, particularly, National Standard 2

Recommendation: The Commission recommended that the Service continue to base all of its management activities, including those related to fisheries, on the best available science; require that all aspects of fishery science used to manage fisheries be expressed or described with accompanying measures of confidence; expand its fishery science efforts to incorporate a more adaptive or experimental approach to better characterize the potentially significant but largely undescribed effects of commercial fishing on marine ecosystems; take all necessary measures to ensure a clear distinction between the processes of setting catch limits and allocating catch among fishery participants; define the best available science to include comprehensive descriptions of the possible positive and negative outcomes of management decisions, the probability that those results will occur, and the consequences if they do occur; develop and impose precautionary information standards for fishery man-

agement decisions to ensure that the best available science is adequate for its intended purpose; place on the industry the burden of supporting the research needed to manage a fishery in an appropriately conservative manner when the best available information is not sufficient to support management needs; establish explicit, detailed standards for stock assessment and fishery evaluation reports to ensure they describe all pertinent information required for management of the subject fishery and related ecosystem; and work with the fishery management councils to develop an independent process for appointing scientists to scientific and statistical committees to ensure that those committees are objective in their analysis and reporting of the best scientific information available.

Agency Response: The Service had taken no action at the end of 2008.

29 December **To**: National Marine Fisheries Service

Issue: Application from the Lamont-Doherty Earth Observatory for authorization to take marine mammals by harassment incidental to conducting a marine seismic survey in the southwestern Pacific Ocean off the coast of Tonga during January and February 2009

Recommendation: The Commission recommended that, before issuing the requested authorization, the Service provide additional justification for its preliminary determination that the planned monitoring program will be sufficient to detect, with a high level of confidence, all marine mammals within or entering the identified safety zones; extend the monitoring period to at least one hour before initiation of seismic activities and at least one hour before the resumption of airgun activities after a power-down because of a marine mammal sighting within the safety zone; and require that observations be made during all ramp-up procedures to gather the data needed to analyze and report its effectiveness as a mitigation measure.

Agency Response: The Service had not issued the incidental harassment authorization at the end of 2008.

Appendix B

SELECTED LITERATURE RECENTLY PUBLISHED ELSEWHERE RESULTING FROM COMMISSION-SPONSORED ACTIVIITIES

Note: Through 2002 the Commission's Annual Report to Congress included an appendix listing publicly available books and articles reporting on work that had been supported in full or in part by the Commission. With the introduction of the Commission's Web site (www.mmc.gov) in 2003, this appendix was made available on line and is no longer included in the printed report. Because the on-line document contains reports only through 2002, the Commission's 2007 annual report included a list of publications for the period 2003 through 2007. Here we list publications not previously included or those published after 2007.

Anonymous. 2008. A conversation with Vic Scheffer. *Aquatic Mammals* Historical Perspectives Series 34(2):229–254. (MMC contract E4047339)

Baird, R. W., A. M. Gorgone, D. J. McSweeney, D. L. Webster, D. R. Salden, M.H. Deakos, A. D. Ligon, G. S. Schorr, J. Barlow, and S. D. Mahaffy. 2008. False killer whales (*Pseudorca crassidens*) around the main Hawaiian Islands: long-term site fidelity, inter-island movements, and association patterns. *Marine Mammal Science* 24:591–612. (MMC contract EE0010033)

Bradley, D. L., and R. Stern. 2008. Underwater sound and the marine mammal acoustic environment: A guide to fundamental principles. (MMC contract T03325300)

Dalebout, M. L., C. S. Baker, D. Steel, K. M. Robertson, S. J. Chivers, W. F. Perrin, J. G. Mead, R. V. Grace and T. D. Schofield, Jr. 2007. A divergent ntDNA lineage among *Mesoplodon* beaked whales: Molecular evidence for a new species in the tropical Pacific? *Marine Mammal Science* 23(4):954–966. (MMC contract GP0012182)

Evans, W. E. 2008. A short history of the Navy's marine mammal program. *Aquatic Mammals* Historical Perspectives Series 34(3):367–380. (MMC contract E4047339)

Hofman, R. 2009. The continuing legacies of the Marine Mammal Commission and its Committee of Scientific Advisors on Marine Mammals. *Aquatic Mammals* Historical Perspectives Series 35(1):82–93. (MMC contract E4047339)

Huntington, H. P. 2009. A preliminary assessment of threats to arctic marine mammals and their conservation in the coming decades. *Marine Policy* 33(1):77–82. (MMC contract T03325177)

Mikhalev, Y. A. 2008. Whales of the Southern Hemisphere: Biology, whaling, and perspectives of population recovery. INVATS LLC, Odessa, Ukraine. 328 pp. (In Russian) (MMC contract E4041179)

Newsome, S. D., M. T. Tinker, D. H. Monson, O. T. Oftedal, K. Ralls, M. M. Staedler, M. L. Fogel and J. A. Estes. 2009. Using stable isotopes to investigate individual diet specialization in California sea otters (*Enhydra lutris nereis*). *Ecology* 90(4):961–974. (MMC contract EE0009713)

Ridgway, S. H. 2008. History of veterinary medicine and marine mammals: A personal perspective. *Aquatic Mammals* Historical Perspectives Series 34(4):471–513. (MMC contract E4047339)

Schultz, J. K., J. D. Baker, R. J. Toonen and B. W. Bowen. 2009. Extremely low genetic diversity in the endangered Hawaiian monk seal (*Monachus schauinslandi*). *Journal of Heredity* 100(1):25–33. (MMC contract GP0012185)

Schwarz, L. K. 2008. Methods and models to determine perinatal status of Florida manatee carcasses. *Marine Mammal Science* 24(4):881–898. (MMC contract EE0010133)

Zhao, X., J. Barlow, B. L. Taylor, R. L. Pitman, K. Wang, Z. Wei, B. S. Stewart, S. T. Turvey, T. Akamatsu, R. R. Reeves and D. Wang. 2008. Abundance and conservation status of the Yangtze finless porpoise in the Yangtze River, China. *Biological Conservation* 141(12):3006–3018. (MMC contract E4026195)

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