CHAPTER 20: PROTECTING MARINE MAMMALS AND ENDANGERED MARINE SPECIES

Protection for marine mammals and endangered or threatened species from direct impacts has increased since the enactment of the Marine Mammal Protection Act in 1972 and the Endangered Species Act in 1973. However, lack of scientific data, confusion about permitting requirements, and failure to adopt a more ecosystem-based management approach have created inconsistent and inefficient protection efforts, particularly from indirect and cumulative impacts. Consolidating and coordinating federal jurisdictional authorities, clarifying permitting and review requirements for potentially harmful activities, increasing scientific research and public education, and actively pursuing international measures to protect these species are all improvements that will promote better stewardship of marine mammals, endangered or threatened species, and the marine ecosystem.

ASSESSING THE THREATS TO MARINE POPULATIONS

Most endangered marine species fall into four main groups: marine mammals, sea turtles, seabirds, and salmon. Of the nineteen species listed as endangered by the National Oceanic and Atmospheric Administration (NOAA) under the Endangered Species Act, nine are marine mammals, five are sea turtles, and two are salmonids. Of the twelve species listed as threatened, two are marine mammals, three are sea turtles, and five are salmonids. Seabirds fall under the jurisdiction of the U.S. Fish and Wildlife Service and eleven species are listed as endangered or threatened under the Endangered Species Act. Different factors threaten the survival and recovery of each of these groups.

Marine Mammals

Because of their intelligence, visibility and frequent interactions with humans, marine mammals hold a special place in the minds of most people. Little wonder that, as a whole, marine mammals are afforded a higher level of protection than most other marine organisms. Nevertheless, they continue to be affected by a wide range of human activities.

The biggest threat to marine mammals worldwide is their accidental capture or entanglement in fishing gear (known as bycatch), which kills hundreds of thousands of them each year.[1] Dolphins, porpoises and small whales often drown when tangled in a net or a fishing line because they are not able to surface for air. Even large whales can become entangled, towing nets or other gear for long distances leading to injury, exhaustion, or death. Entanglement in fishing gear is a significant cause of mortality for one of the most endangered marine mammals, the North Atlantic right whale. (The issues of discarded gear and bycatch are also discussed in Chapters 18 and 19.)

Historically, commercial harvesting contributed to major declines in the populations of marine mammals but only a few nations still allow hunting for purposes other than subsistence. Nevertheless, hundreds of

thousands of seals, whales, and other marine mammals are killed by hunters each year, while subsistence catches account for thousands more deaths.

Just as pedestrians are vulnerable to traffic in the streets, marine mammals are vulnerable to ship traffic at sea, particularly in areas crowded with commercial and recreational vessels. Several hundred animals are wounded or killed by such interactions every year. Ship strikes are a leading cause of mortality for endangered North Atlantic right whales in busy East Coast corridors,[2] while manatees, another endangered species, are frequently struck by boats in shallow Florida waters.

Other possible causes of marine mammal mortality include the introduction of new diseases, ecosystem changes such as algal blooms, and indirect effects of climate change. These factors may cause several thousand additional deaths each year.

Although pollution rarely kills marine creatures directly, it can impair their health, harm their reproductive potential, and eventually lead to their death. Chemicals in fertilizers, pesticides, pharmaceuticals, and other materials can accumulate in the tissues of these animals, especially those with long life spans. As discussed in Chapter 18, ingestion of marine debris and entanglement in plastic trash can be significant additional sources of mortality.

Marine mammal populations may also be disturbed by noise from shipping, oil and gas exploration, ocean drilling, naval operations, oceanographic and geophysical research, and similar activities. In the last ten years, considerable publicity has surrounded the deaths of marine mammals in close proximity to naval operations and geophysical research vessels. Unfortunately, very little is known about marine mammal physiology, including baseline data on hearing, making it difficult to assess the potential biophysical impacts of noise on marine animals.

Another factor that is common to declines in many endangered species is the destruction or degradation of their natural habitat. Thus, the successful recovery of a species depends to a large degree on protection or restoration of its habitat.

Endangered Species

Sea Turtles

Sea turtles are integral components of the ocean environment and have been shown to have beneficial impacts on coral reefs, seagrass meadows, and coastal dune ecosystems. Sea turtles are particularly vulnerable to human impacts due to their long life spans, delayed onset of reproductive maturity, and other aspects of their life history. All sea turtle species found in U.S. waters are listed as threatened or endangered under the Endangered Species Act.

Sea turtles are threatened both on land and at sea. Nesting beaches and nearshore foraging habitat can be damaged or lost by beach armoring, coastal development, and vehicular access to nesting sites. Beach nourishment projects can enhance nesting beaches if conducted outside of nesting and hatching season, but can be harmful if improperly planned. Human predation on turtles and turtle nests, although no longer common in the United States, is a large source of mortality internationally and in some U.S. territories.

Overall, the largest source of mortality to sea turtles is bycatch during normal fishing operations.[3,4] Most of the turtles harmed in this way are juveniles or sub-adults that are critical to the stability and recovery of marine turtle populations.[5] Tens of thousands of leatherback and loggerhead turtles are captured by Pacific longline fishermen, with thousands subsequently dying. This is thought to be a major contributing factor in the twenty year decline of leatherback and loggerhead nests in the Pacific, by 95 percent and over 80 percent

respectively.[6] Given that the United States accounts for less than 2 percent of world longline effort, reversing this trend will require international action.[7]

Gear modifications, such as turtle excluder devices, used in the shrimp trawl fishery since the late 1980s, have saved tens of thousands of sea turtles in U.S. waters and other areas where the gear is required, such as Australia. Nevertheless, sea turtle bycatch in global shrimp fleets remains very high. Other gear types, notably gillnets, dredges, and other trawl nets, also cause significant turtle mortality. Mortality from bycatch threatens the ability of sea turtles to recover, and may threaten the long-term survival of particular populations, such as Pacific loggerhead and leatherback turtles and Atlantic olive ridleys.

Similar to marine mammals, other threats to sea turtles include: pollution; disease; loss of foraging areas in sensitive habitat; marine debris; and disturbance along ocean migration routes.

Salmonids

Over the past several decades, populations of wild salmon and steelhead throughout the West Coast have declined to dangerously low levels.[8] There is no single factor responsible for this decline, and it is even difficult to quantify the relative contributions of different factors. Salmon population declines are the result of numerous forces, such as habitat loss due to development, resource extraction, dam construction and other land uses, and commercial and recreational harvest. Human activities that diminish salmon populations also cause them to be more susceptible to natural environmental fluctuations, such as poor ocean conditions and drought.

Seabirds

Although many species of birds spend time on or near the ocean for at least part of their life cycle, seabirds are those that spend the majority of their life at sea, coming on land only to reproduce. Albatrosses and petrels are among the most well known seabirds, but murres, murrelets, auklets, kittiwakes, sea ducks and others also depend on the oceans. Disturbance of nesting habitats, non-native pests, marine debris, pollution, contaminants, and overfishing of prey species all threaten seabirds. However, because of the amount of time these birds spend at sea, mortality due to fishing operations is thought to be the greatest threat to the recovery of imperiled populations of seabirds.[9] The discussion on bycatch in Chapter 19 includes recommendations designed to minimize harm to seabirds and other threatened populations. Additional recommendations that will contribute to seabird protection can be found in Chapter 9 (on coastal management), Chapter 11 (on habitat conservation), Chapters 14 and 16 (on coastal and vessel pollution), and Chapter 18 (on marine debris).

REVIEWING AUTHORITIES AND RESPONSIBILITIES

The early 1970s witnessed the passage of several landmark environmental laws in the United States. Many of these statutes affected marine mammals and other protected species indirectly, but two were focused specifically on the conservation and protection of these animals.

The Marine Mammal Protection Act

The 1972 Marine Mammal Protection Act (MMPA) was passed by Congress in response to public concerns about the incidental deaths of hundreds of thousands of dolphins each year associated with tuna fisheries, the hunting of seals for fur, and the continuing commercial harvest of whales despite controls by the International Whaling Commission. The MMPA, with limited exceptions, prohibits the hunting, killing, or harassment of marine mammals.

The MMPA divides federal jurisdiction over marine mammals between two agencies. The National Oceanic and Atmospheric Administration's (NOAA's) National Marine Fisheries Service (NMFS) manages the vast majority of marine mammals, including whales, dolphins, porpoises, seals, and sea lions. The U.S. Department of the Interior's (DOI's) U.S. Fish and Wildlife Service (USFWS) manages five species: polar bears, walrus, sea otters, manatees, and dugongs.

The MMPA also established the independent Marine Mammal Commission (MMC). The MMC is charged with reviewing and making recommendations on domestic and international actions and policies of all federal agencies with respect to marine mammal protection and conservation. It also manages and funds a research program to support management activities. Although the Commission's independence has been essential to its functioning, establishment of the National Ocean Council will provide it with a venue to coordinate with other federal agencies involved in marine mammal research and management. According to the MMC, most marine mammal stocks in U.S. waters, and many others around the world, are in better condition now than before passage of the MMPA.[10]

The Endangered Species Act

In 1973, the Endangered Species Act (ESA) was enacted to conserve endangered and threatened species and the ecosystems upon which they depend. The new law vastly strengthened earlier measures directed at the same problem. The public was broadly supportive of the Act due to the well-publicized declines of well-known species such as the bald eagle. A 1999 public opinion survey indicated that public support for the protection of biodiversity continues.[11]

Under the ESA, the federal government is responsible for listing species as endangered or threatened based on population size and trends. This responsibility is divided between the USFWS, primarily responsible for terrestrial organisms, and NOAA, primarily responsible for marine and anadromous species. The law includes powerful prohibitions against any action that harms a listed animal. The law, with limited exceptions, prohibits federal agencies from authorizing, funding, or carrying out any action that would jeopardize a member of a listed species or destroy its critical habitat and requires them to undertake conservation programs. To promote state action, matching federal funds were authorized for states willing to enter into approved cooperative agreements.

Currently, there are 1,509 species listed as endangered and 345 species listed as threatened by USFWS while, as noted above, NOAA has listed 19 species as endangered and 12 as threatened. It is impossible to precisely quantify the overall biological impact of the ESA. However, a 1995 National Research Council (NRC) report concluded that the ESA has successfully prevented species from becoming extinct.[12] The rigorous provisions of the ESA work as a safety net to help species survive once they have declined to the level that listing is warranted. Because of this, the NRC did not recommend wholesale changes to ESA implementation. It did, however, point out that the ESA has been less effective in preventing species from declining to levels that require listing in the first place.

The NRC also observed that, although one purpose of the ESA is to conserve ecosystems, the Act itself includes little specific guidance in this area. To fix this, the NRC recommended a focus on broader rehabilitation of ecosystem functions, as part of a move toward ecosystem-based management. Maintaining healthy, functioning ecosystems can help prevent species from becoming threatened or endangered and avoid some of the economic disruption that results when drastic measures must be taken to protect an endangered species. The NRC report also concluded that the federal focus of the ESA should be broadened to include other layers of government and nongovernmental interests as well. Because humans are part of the ecosystem, comprehensive management plans will need to balance species conservation and human uses.

Recommendation 20–1. Congress should amend the Marine Mammal Protection Act to require the Marine Mammal Commission to coordinate with all the relevant federal agencies through the National Ocean Council (NOC), while remaining independent. The NOC should determine whether there is a need for similar oversight bodies for other marine animals whose populations are at risk, such as sea turtles.

IDENTIFYING AND OVERCOMING GAPS IN PROTECTION

Several changes are needed in federal law to enhance marine mammal and endangered species protection. The split of management jurisdiction between two federal agencies, confusion over the requirements of permit applications and approvals, and the lack of clarity in the definition of legal terms are all issues that should be addressed.

Clarifying Jurisdiction and Authority

As noted, the management of marine mammals and endangered species is currently divided between NOAA and USFWS. In the case of marine mammals, this split was intended to be temporary and makes little sense. In the case of endangered species, the split is more logical, but better coordination and clarity are still needed.

The original congressional committee reports that accompanied the MMPA in 1972 show that Congress did not intend marine mammal jurisdiction to be permanently divided between NOAA and USFWS.[13,14] Rather, House and Senate committees anticipated the creation of a new Department of Natural Resources that would combine NOAA and USFWS. The report stated that if the proposed new department did not become a reality, they would reexamine the question of jurisdiction and consider placing the entire marine mammal program within a single department. Nevertheless, the jurisdictional split remains today.

Recommendation 20–2. Congress should amend the Marine Mammal Protection Act to place the protection of all marine mammals within the jurisdiction of the National Oceanic and Atmospheric Administration.

The division of endangered species jurisdiction appears reasonable because of the expertise of each agency: NOAA has jurisdiction over marine and anadromous species and DOI has jurisdiction over terrestrial and freshwater species. But ecosystems do not recognize these distinctions. When some species of salmon were listed under the ESA in the 1980s and 1990s, most of the causes for their decline were land-based or freshwater in origin, requiring significant coordination between NOAA and USFWS, as well as other agencies. In addition, jurisdiction over listed sea turtles is split between NOAA and the USFWS according to location: NOAA has jurisdiction over sea turtles in the water and the USFWS has jurisdiction on land. Thus, addressing threats to sea turtles requires significant coordination. This coordination has not been entirely effective and improved oversight of the relationship between NOAA and USFWS is needed to clarify areas of responsibility and reduce conflicts.

Recommendation 20–3. The National Marine Fisheries Service and U.S. Fish and Wildlife Service, with guidance from the National Ocean Council, should significantly improve their coordination with respect to the implementation of the Endangered Species Act, particularly for anadromous species and sea turtles, and in circumstances where land-based activities have significant impacts on marine species.

Cooperation with States

Section 6 of the ESA provides authority to the Secretaries of Commerce and the Interior to enter into cooperative agreements with any state that "establishes and maintains an adequate and active program" for

the conservation of endangered and threatened species. Such joint programs are an effective way for the federal government to extend its limited resources and take advantage of state and local expertise and contacts. The states, working with the federal government, can better accomplish the purposes of the ESA than either could alone.

State natural resource agencies often have excellent knowledge about local species and their habitats, as well as local staff support and facilities. State residents may also be more familiar and more comfortable with state agencies than with federal ones. Cooperative programs may be particularly appropriate for protecting and rebuilding species such as sea turtles, that are affected by a range of human activities typically under the purview of states, such as coastal development and beach recreation. At the same time, the federal government can provide long-term monitoring, a broader ecosystem-based perspective, and potentially a more stable funding stream. It remains responsible for reviewing cooperative agreements regularly, to ensure that states are maintaining adequate protection for endangered species. However, despite its promise, the ESA Section 6 program has been chronically underfunded, limiting its effectiveness.

Recommendation 20–4. The U.S. Fish and Wildlife Service and National Oceanic and Atmospheric Administration should expand their cooperative agreements with states under Section 6 of the ESA, including enhanced research, management, monitoring, and public information.

Unclear Permitting and Review Standards

A *take* is a term used in the MMPA and ESA to define an activity that results in the death, injury, or harassment of a marine mammal or member of an endangered species. After much litigation and scrutiny, the interpretation of this term under the ESA appears fairly clear to both managers and the public. This is not the case for the MMPA.

The MMPA prohibits the taking or importation of marine mammals and marine mammal products unless that action falls under one of the law's exemptions, such as a taking for the purpose of public display, enhancement of the species, or scientific research. Exemptions are also allowed for Native Alaskans, who may take marine mammals for subsistence or for creating authentic native handicrafts and clothing.

Outside these narrow exemptions, the MMPA authorizes the issuance of letters of authorization for the unintentional and incidental taking of small numbers of marine mammals provided it has only a negligible impact on the species. This provision has been problematic because terms such as *small numbers* and *negligible impact* are not defined in the Act, resulting in a lack of clarity about when authorization is necessary and under what circumstances it should be granted.

Recommendation 20–5. Congress should amend the Marine Mammal Protection Act to require the National Oceanic and Atmospheric Administration to more clearly specify categories of activities that are allowed without authorization, those that require authorization, and those that are prohibited.

The Meaning of Harassment in the MMPA

Under the MMPA, the term *harassment,* defined as any act of pursuit, torment, or annoyance of a marine mammal, is an essential element in determining whether permits or authorizations are necessary for activities that fall under one of the law's exemptions. Amendments to the Act in 1994 split the definition of harassment into two categories:

- Level A harassment has the potential to injure a marine mammal or marine mammal stock in the wild.

- Level B harassment has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering.

The apparent intent of this definition was to distinguish activities likely to have significant effects from activities such as marine mammal research that, although perceptible to the animals, are not likely to result in, significant disturbance. However, NOAA and USFWS have had difficulties implementing the 1994 definition, which has led to public uncertainty with respect to its implications. The lack of clarity means that almost any commercial, recreational, or scientific activity that is noticed by a marine mammal might be defined as harassment. Both agencies assert that the confusion limits their ability to regulate even potentially harmful activities.

A 2000 National Research Council report concluded that the intent of the MMPA was not to regulate activities that result in minor changes in behavior.[15] The report recommended that Level B harassment be redefined to focus on "meaningful disruptions to biologically significant activities." Another National Research Council study currently underway is investigating what behaviors should be considered biologically significant and what research might be needed to implement the revised definition.

Recommendation 20–6. Congress should amend the Marine Mammal Protection Act to revise the definition of harassment to cover only activities that meaningfully disrupt behaviors that are significant to the survival and reproduction of marine mammals.

The Promise of Programmatic Permitting For Marine Mammals

In spite of the confusion about MMPA terminology, NOAA and USFWS have had to issue regulations and make case-by-case decisions on permit and authorization applications. Considerable deference has been given to the professional judgment of agency personnel regarding which activities are permissible. Both agencies have qualified and dedicated people reviewing applications, but the process is necessarily subjective and a personnel change can mean the difference between approval and denial of similar permits. This case-by-case decision making has led to inconsistencies, a lack of clear standards, and uncertain protection for marine mammals.

Most permit applications are processed according to the same procedures, regardless of the level of potential harm to marine mammals. As a result, limited agency resources can be wasted reviewing relatively insignificant permit applications, while insufficient attention is paid to more worrisome activities. A shift to programmatic permitting would enable more proactive and efficient handling of the bulk of permit applications, while reducing the costs and burdens on agency personnel.

Programmatic permitting would allow for quick approval of activities on a defined list, specifying broad parameters within which those activities could occur. A programmatic permit could also include required mitigation and data collection measures, such as requiring that whale-watching boats keep at a certain distance from the animals and maintain records of species observed and their locations.

In addition to streamlining permitting, clear and consistent enforcement is needed to ensure compliance with permit conditions, and penalties must be stiff enough to discourage noncompliance. Any changes to the permitting processes under the MMPA will have to be consistent with the requirements of the National Environmental Policy Act.

Recommendation 20–7. The National Oceanic and Atmospheric Administration (NOAA) should implement programmatic permitting for activities that affect marine mammals, wherever possible. Case-by-case permitting, which is more resource intensive, should be used for activities that do not

fit within any programmatic category or when circumstances indicate a greater likelihood of harm to marine animals. The National Ocean Council (NOC) should create an interagency team to recommend activities appropriate for programmatic permitting, those that are inappropriate, and those that are potentially appropriate pending additional scientific information.

To carry this out:

- *the interagency team, under the oversight of the NOC's Committee on Ocean Resource Management, should include representatives from NOAA, the National Science Foundation, U.S. Army Corps of Engineers, Minerals Management Service, and U.S. Navy, with input from the Marine Mammal Commission.*
- *programmatic permits should be subject to periodic review, and remain valid for a limited time to ensure that the best available science can be incorporated into permit requirements.*
- *enforcement efforts should be strengthened and the adequacy of penalties reviewed.*

While programmatic permitting would reduce much of the uncertainty about whether a permit is required, some cases will continue to be unclear. To ensure a smooth process for all concerned, it will be best for potential permittees to approach the regulatory agencies as soon as a question arises about possible interactions with marine mammals. In particular, the potential impacts of new ocean technologies on marine mammals will need to be examined and the permit application process started early in the developmental stages.

Communication must also be improved so that permitting agencies have sufficient time and resources to meet their responsibilities while the action agency or permit applicant can be sure that decisions will be made in a confidential, timely and consistent manner. This has been a particular problem in the past with regard to naval exercises and oceanographic research activities.

EXPANDING RESEARCH AND EDUCATION

Although much more is known about marine animals today than even a decade ago, scientists still do not understand the life history or physiology of most marine species. Because the decline of such populations tends to be caused by multiple environmental factors, enhanced research on a range of subjects is necessary to find ways to reduce the harmful effects of human activities and to implement effective ecosystem-based management plans.

Understanding Behavior and Human Impacts

Minimizing disruptions to the most important life stages of marine mammals and endangered or threatened species will aid in their survival. To maximize reproductive rates in declining populations, more needs to be learned about breeding grounds and essential habitat. If information were available that showed a particular species could benefit from higher levels of protection during times of mating or birth, management practices could evolve accordingly. Actions could include temporarily closing fisheries that overlap with these activities or requiring vessel traffic to slow down or avoid critical areas. Knowledge of migration patterns and feeding locations is also critical to maintaining healthy populations.

While many human activities can harm individual marine animals, the extent to which humans affect the long-term status of protected species is poorly understood. Coastal development, offshore oil and gas exploration, vessel traffic, military activities, and marine debris all have the potential to threaten protected populations. Understanding the danger of these activities relative to bycatch, hunting, and natural predation is critical to focus attention, research, and enforcement efforts where they are most needed.

Point and nonpoint source pollution threaten the health of all ocean organisms. Much more study is needed about the effects of contaminants, especially on marine mammals' immune functions, and the possible results

of exposure to human pathogens and toxic algal blooms. In addition, the differing impacts of chronic versus acute exposures need to be measured—long-term exposure to relatively low levels of some pollutants may be more damaging to a population's continued success than a single, high-impact event.

Although not always caused by human activities, strandings of marine mammals, sea turtles, and other endangered species along the shore can be an invaluable tool to learn more about the potential causes of mortality in these species. In the late 1980s, NOAA established a Marine Mammal Health and Stranding Response Program, in response to growing concerns about the numbers of dead and dying marine mammals washing up on U.S. shores. Between 1991 and 2004, NOAA documented twenty-eight unusual mortality events involving marine mammals in U.S. waters alone. These events have included a wide range of species and numerous causative factors including diseases, starvation, toxins from harmful algal blooms, and human interactions. However, the causes of at least 25 percent of these events are as yet undetermined. No similar federal program exists for endangered sea turtles. A sustained and appropriately funded response and analysis program could help NOAA and its partners and volunteers to respond to strandings, identify causes, and recommend actions to prevent further deaths. A similar program for sea turtles could also provide valuable information to managers.

Increased research into the biological, chemical, and psychological stresses to marine mammal, sea turtles, and other protected species populations will allow for more comprehensive, ecosystem-based management. Furthermore, for activities where interaction with protected populations is likely and unavoidable, better scientific data will lead to more effective permitting procedures.

Recommendation 20–8. The National Oceanic and Atmospheric Administration and U.S. Department of the Interior agencies should develop an expanded program, coordinated through the National Ocean Council, to examine and mitigate the effects of human activities on marine mammals and endangered species.

The program should focus on two areas:

- *research, monitoring, and assessment to better understand the basic biology, physiology, life history, and population dynamics of marine mammals, sea turtles, and other endangered or vulnerable marine species and to understand how disease, contaminants, harmful algal blooms, human activities, and other stressors may impact these animals. An important goal of this program will be to enhance the capability to respond quickly to strandings and unusual mortality events of marine mammals and sea turtles.*
- *a technology and engineering program to eliminate or mitigate human impacts on marine mammals, sea turtles, and other endangered species.*

Effects of Noise on Marine Mammals

One particular area that requires better understanding is the effect of sound on marine mammals. Many marine mammals use sound to communicate, navigate, feed, and sense their surroundings. These natural behaviors can be disrupted when other sounds interfere. In the ocean, sound emanates from a variety of sources, both natural, such as storms, volcanic eruptions, and earthquakes, and human-generated, including shipping, scientific and commercial surveys, and commercial and military sonar.

Scientists know relatively little about the biological, psychological, and behavioral changes in marine mammals that are caused by human-generated sound. Activities such as commercial shipping, construction, geological exploration, and sonar certainly can produce noises intense enough to elicit reactions from marine mammals. However, because of the complexity of the biological and physical interactions being studied, and the difficulty of conducting studies on marine mammals, many important questions remain unanswered.[16] For example, the scientific community currently understands very little about marine mammal hearing and how these animals react to sound. It is not known whether health and behavioral problems will arise only from

acute exposures to very loud sound, or whether chronic exposure to lower-intensity sounds (such as passing ship traffic) may also result in long-term effects.

Currently, the U.S. Navy and, to a lesser extent, the Minerals Management Service, are the only federal agencies with significant marine mammal acoustic research programs, including studies to examine the impact of noise on marine mammals. Expanded research efforts and data dissemination are needed to understand marine mammal interactions with sound and reduce or prevent the negative impacts of human-generated noise on these animals.

Recommendation 20–9. The National Science Foundation, National Oceanic and Atmospheric Administration, U.S. Geological Survey, and Minerals Management Service should expand research on ocean acoustics and the potential impacts of noise on marine mammals. These additional sources of support are important to decrease the reliance on U.S. Navy research in this area. The research programs should be complementary and well coordinated, examining a range of issues relating to noise generated by scientific, commercial, and operational activities.

Public Education and Outreach

The general public increasingly has opportunities to come into contact with marine species through diving, aquarium shows, and similar activities. These interactions can increase public awareness and sensitivity about the needs and vulnerabilities of these animals and the ways in which human activities can affect them. Aquariums and other exhibitors can also showcase how larger environmental issues affect marine species and the ecosystems on which they rely.

While human contact with marine mammals raises public awareness, there is also growing concern about activities such as feeding programs, whale-watching excursions, and facilities that allow humans to swim with captive dolphins. For example, feeding programs in the open ocean, most prevalent in Florida, can disrupt natural behaviors and expose animals to harm by decreasing their natural fear of humans.[17] Education programs should point out the harm that too much human interaction with animals in the wild can inadvertently cause.

APPLYING ECOSYSTEM-BASED MANAGEMENT PRINCIPLES

The purpose of ecosystem-based management approaches is to recognize the full nature of ocean and coastal systems and to allow for better coordination of management actions, reduce duplication and conflicts, and take full advantage of available resources. As they are implemented, ecosystem-based management practices can enhance the protection of marine mammals and endangered species.

Domestic Action

The MMPA and ESA currently provide powerful statutory and regulatory tools to address direct impacts to marine mammals and endangered species. However, there are no mechanisms in place for decreasing broad, long-term threats and concerns. The basic tenets of ecosystem-based management require an assessment of all important components and processes in a system, and evaluation of all potential threats. Improved scientific assessments will allow managers to create ecosystem-based management plans, an essential part of which would describe threats to marine mammals, sea turtles and other protected species. Once an ecosystem is analyzed, managers can prioritize protection efforts, addressing the most critical risks first.

For marine mammals and endangered marine species, such as sea turtles and sea birds, fisheries bycatch and to a lesser degree, hunting, would be at the top of the list of risks. For other species, impacts on breeding and foraging habitat are critical. For certain highly endangered species, such as North Atlantic right whales and manatees, reduction of ship strikes is a pressing need. Once the major risks are identified, managers can use a

combination of the tools available to them to address these concerns. For example, the use of marine protected areas has been shown to be effective in addressing a number of the impacts on protected species.

Unfortunately, in most cases little is known about the relative effects of different factors on the survival and recovery of a protected species. The lack of baseline biological data on most marine mammals and endangered marine species, coupled with limited stock assessment data, make it difficult to evaluate population abundance and trends, isolate causes of mortality, or distinguish management successes from failures.

The listing of several salmon species as endangered and threatened highlights both the promise of an ecosystem-based management approach and the difficulties in achieving it. The threat of large-scale economic disruptions in the Pacific Northwest has led many state, local, and tribal entities to push for a more collaborative, ecosystem-based management approach to avoid severe federal sanctions under the ESA. However, initial results indicate that the federal government needs to do a better job of supporting and encouraging such efforts. The enhancement of such ecosystem-based, regional approaches is discussed in Chapter 5.

International Coordination

Expanding the concept of ecosystem-based management to its logical conclusion will require attention to impacts that occur beyond U.S. waters. For many of the marine species discussed in this chapter, the ecosystem in which they live encompasses the high seas and the waters of many other countries. In order to address impacts to these species throughout their ecosystem, the United States will need to use international agreements and other diplomatic means to strengthen protections for species beyond U.S. waters.

For example, sea turtles are truly members of the global commons and their recovery will require action on a global scale. Reversing the impacts of human predation on nesting turtles and their eggs will take long-term concerted international efforts by the United States and other nations. The United States can use ecosystem-based regional and multi-national agreements, including technical and financial assistance, to promote international sea turtle conservation activities.

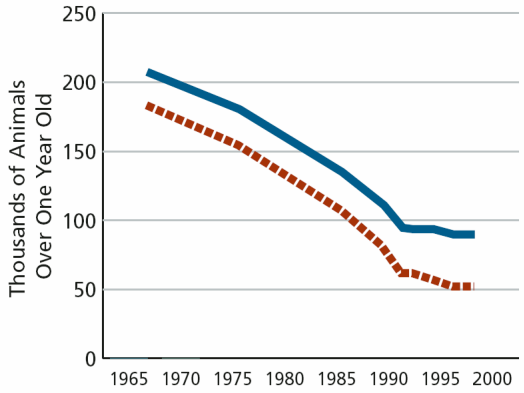
The development of bycatch reduction methods for U.S. fishermen should be complemented by efforts to persuade foreign fishermen to implement similar methods. This comprehensive approach makes sense from a conservation perspective and creates a more level playing field for U.S. and foreign fishermen.

Recommendation 20–10. The U.S. Department of State, working with the National Oceanic and Atmospheric Administration and the U.S. Department of the Interior, should continue to actively pursue efforts to reduce the impacts of human activities on marine species at risk in foreign and international waters.

Box 20.1 Making a Case for Ecosystem-based Management: The Steller Sea Lion

The story of the Steller sea lion illustrates the conflicts that can arise between human activities and protection of marine mammals. The Steller sea lion is the largest of the sea lions and is found along coastal areas of the northern Pacific Rim. Its primary sources of food are groundfish, including pollock and mackerel, and cephalopods, including octopus and squid. Since the mid-1970s, the western population near Alaska has declined by about 85 percent (Figure 20.1).[18] Analyses indicate that the decline may be due in part to environmental changes, legal and illegal hunting, predation by killer whales, competition with fishermen for food, and incidental catch in fisheries. A 2003 report by the National Research Council found that none of these causes could be ruled out and called for scientifically-designed adaptive management experiments to find out more.[19]

Figure 20.1 Sea Lion Populations in Danger



Although Steller sea lions have been protected since the early 1970s, the Alaskan populations have continued to decline, particularly those located along the Aleutian Islands. This decline cannot be traced to a single cause, underscoring the need for an ecosystem-based approach for protecting these animals.

Source: National Oceanic and Atmospheric Administration. <http://stellersealions.noaa.gov/> (Accessed January 2004).

Under the Marine Mammal Protection Act, the National Oceanic and Atmospheric Administration (NOAA) is responsible for managing Steller sea lions. It is also the agency responsible for management of Alaskan fisheries, resulting in potential statutory conflicts. In 1991, a number of environmental groups sued NOAA for failing to take into account the potential role of Alaskan fisheries in the decline of the Steller sea lion. After years of litigation, the problem has yet to be resolved to the satisfaction of any of the litigants. In addition, Steller sea lions were listed under the Endangered Species Act (the western population as endangered and the eastern as threatened), adding that statute's requirements to the mix.

The continued decline of the Steller sea lion population highlights the importance of moving toward an ecosystem-based management approach, where such factors as predators, quality and quantity of food, essential habitat, and incidental catch are all weighed when deciding the best course of action for protection of a species. In addition, a more ecosystem-based focus would have identified the problem much more quickly, enabling managers and scientists to develop a comprehensive and timely research strategy to determine the various causes of the decline and develop a management regime to address the problems. Instead, the situation was allowed to reach a crisis stage, requiring emergency measures.

[1] World Wildlife Fund. *Reducing Global Cetacean Bycatch: A Call to Action*. Washington, DC, 2002.
[2] Jensen, A.S., and G.K. Silber. 2003. *Large Whale Ship Strike Database*. Technical Memorandum NMFS-F/OPR– 25. Silver Spring, MD: National Oceanic and Atmospheric Administration, National Marine Fisheries Service, 2003.
[3] Lewison, R.L, S.A. Freeman, and L.B. Crowder. 2004. "Quantifying the Effects of Fisheries on Threatened Species: The Impact of Pelagic Longlines on Loggerhead and Leatherback Sea Turtles." *Ecology Letters* 7: 221–231.
[4] National Academy Press. *Decline of the Sea Turtles: Causes and Prevention.* Washington, DC: National Academy Press, 1990.
[5] Crouse, D.T., L.B. Crowder, and H. Caswell. 1987. "A Stage-Based Population Model for Loggerhead Sea Turtles and Implications for Conservation." *Ecology* 68 (1987):1412–1423.
[6] Spotila, J.R., et al. "Pacific Leatherback Turtles Face Extinction." Nature, 405 (2000): 529–30.

[7] Lewison, R.L, S.A. Freeman, and L.B. Crowder. 2004. "Quantifying the Effects of Fisheries on Threatened Species: The Impact of Pelagic Longlines on Loggerhead and Leatherback Sea Turtles." *Ecology Letters* 7: 221–231.
[8] National Oceanic and Atmospheric Administration, National Marine Fisheries Service. "Major Threats and Impacts to pacific Salmonids." <www.nmfs.noaa.gov/prot_res/PR3/Fish/salmon_impacts.html> Accessed July 13, 2004.
[9] Flint, E. and Swift, K. eds. 2000. Second International Conference on the Biology and Conservation of Albatrosses and Other Petrels, Honolulu, Hawaii, 8–12 May 2000. Abstracts of Oral and Poster Presentations. *Marine Ornithology* 28: 125–52.
[10] Marine Mammal Commission. *Annual Report to Congress*. Washington, DC, 2002.
[11] Czech, B., and P.R. Krausman. "Public Opinion on Species and Endangered Species Conservation." *Endangered Species Update* 14, nos. 5 and 6 (1997): 7–10.
[12] National Research Council. *Science and the Endangered Species Act*. Washington, DC: National Academy Press, 1995.
[13] U.S. Congress. Senate. Committee on Commerce. 92nd Cong. S. Rept. 92-863.
[14] U.S. Congress. House of Representatives. Committee on Merchant Marine and Fisheries. 92nd Cong. H. Rept. 92-707.
[15] National Research Council. *Marine Mammals and Low-Frequency Sound, Progress Since 1994*. Washington, DC: National Academy Press, 2000.
[16] Ibid.
[17] Spradlin, T.R., et al. "Interactions between the Public and Wild Dolphins in the United States: Biological Concerns and the Marine Mammal Protection Act." Presented at the 13th Biennial Conference on the Biology of Marine Mammals. Maui, HI, November 1999.
[18] Marine Mammal Commission. *Annual Report to Congress*. Washington, DC, 2002.
[19] National Research Council. *The Decline of the Steller Sea Lion in Alaskan Waters: Untangling Food Webs and Fishing Nets*. Washington, DC: National Academy Press, 2003.