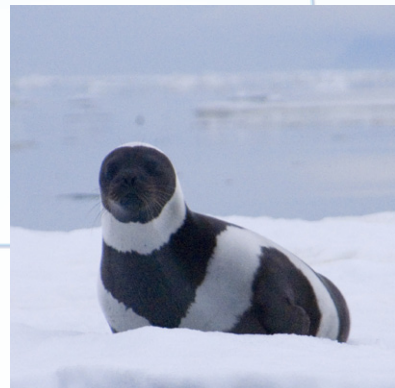




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**INTERNATIONAL MARINE MAMMAL
ACTION PLAN
2012–2016**

October 2012

INTERNATIONAL MARINE MAMMAL ACTION PLAN

2012–2016

National Marine Fisheries Service

October 2012

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International Marine Mammal Action Plan: Executive Summary

“For [marine mammals], 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.”

Report of the U.S. Commission on Ocean Policy
An Ocean Blueprint for the 21st Century

Marine mammals are distributed throughout the world’s oceans, and their conservation and recovery requires action on a global scale. Whales, dolphins, porpoises, seals, and sea lions¹ face an array of threats from human activities, domestic and international, including incidental killing as a result of entanglement in fishing gear, deliberate killing of some species for food and predator control, depletion of prey resources from commercial and artisanal fishing, climate change, collision with vessels, and habitat degradation and loss. Disturbances also are caused by ship noise, seismic operations and military readiness activities, drilling, and other acoustic inputs to the marine environment. Further, exceptionally high levels of chemical contaminants in their tissues potentially affect marine mammals’ immune and reproductive systems.

Although population status and trends are poorly known for many marine mammal stocks outside U.S. waters, the International Union for the Conservation of Nature estimates that 25 percent of marine mammal species are now threatened with extinction. The status of an additional 30 percent is unknown because data are lacking.

Increasingly, scientists and policymakers find that marine mammal research and conservation are linked to several critical issues: environmental (e.g., climate change), economic (e.g., fisheries and resource development), national security (e.g., military readiness), food security (e.g., harvests), and ocean health (e.g., pollution). Marine mammals are sentinels of ocean health. As such, the health of marine mammals and the oceans can have significant impacts on human lives and livelihoods, and on coastal communities. Reducing and mitigating the impact of human activities on marine mammals, and acquiring the scientific data to conserve them, require strategic planning and long-term coordinated international efforts by the United States and its international partners.

The Marine Mammal Protection Act (MMPA) mandates that NOAA’s National Marine Fisheries Service (NMFS) protect and conserve marine mammals both domestically and internationally, and manage impacts of U.S. activities on them, including negotiating with other nations to protect and con-

¹ This Action Plan focuses solely on marine mammals managed by the National Marine Fisheries Service, intentionally omitting manatees, sea otters, walrus, and polar bears; these marine mammals are managed by the U.S. Fish and Wildlife Service.

serve all marine mammals. Internationally, NMFS is responsible for implementing measures to protect marine mammals from U.S. activities on the high seas. The agency also is required to demonstrate that domestic efforts to protect marine mammals ultimately do not place U.S. industries at a competitive disadvantage to foreign industries that are not constrained by such conservation measures.

This International Marine Mammal Action Plan provides a strategic framework that integrates NMFS' Regional Offices, Science Centers, and Headquarters offices to leverage science and policy strengths to achieve conservation goals and mandates of the MMPA and other environmental statutes. The Action Plan is guided by two sets of goals: NOAA's Next Generation Strategic Plan and the statutory goals of the MMPA. One goal of the Next Generation Strategic Plan is "Healthy oceans," where "[m]arine fisheries, habitats, and biodiversity are sustained within healthy and productive ecosystems." Two other Next Generation goals—improved understanding of ecosystems to inform resource management decisions, and recovered and healthy marine and coastal species—are particularly relevant to international marine mammal conservation and management.

The Action Plan is also designed to meet primary MMPA goals to:

- Maintain marine mammals as functioning elements of their ecosystem(s) and preserve the health and stability of the marine ecosystem(s).²
- Reduce the adverse impacts of fishing and other practices on marine mammals to sustainable, and ultimately insignificant, levels.³
- Recover marine mammal populations and protect essential habitats.⁴
- Promote international efforts to encourage research on, and conservation of, marine mammals.⁵

These MMPA goals inform the overarching objective of this Action Plan, to *conduct research and collaborate with international partners to conserve marine mammals in international or foreign waters, emphasizing the recovery of depleted or endangered marine mammals*. To meet this objective over the next 5 years NMFS must:

- Improve its ability to assess and manage transboundary and shared marine mammal stocks on a biologically relevant, ecosystem scale.
- Improve its ability to monitor, detect, and respond to shifts in distribution and trends of marine mammals across the globe; identify marine mammal areas in need of protection; and inform marine spatial planning decisions.
- Work with foreign nations and multilateral institutions to identify, prevent, and mitigate human impacts on marine mammals in international and foreign waters.
- Improve the capacity of nations and international organizations to adequately assess, evaluate, manage, and reduce threats to marine mammal stocks.

Threats to marine mammals in international waters are often the same as or similar to those in U.S. waters. For 40 years NMFS has implemented MMPA domestic provisions, making it uniquely qualified to lead international efforts to address these threats. Implementation of the MMPA's international

² MMPA §2(6)

³ MMPA §101(a)(2), §118(a)(1)

⁴ MMPA §2(2)

⁵ MMPA §2(4)

goals has lagged behind domestic efforts. The Action Plan's Seven Strategic Priorities that emerged from this strategic planning process will guide NMFS' international work.

The Action Plan's Seven Strategic Priorities will improve research and understanding of marine mammal biology, global stewardship of marine mammals, and cooperation and collaboration with national and international partners. These priorities, ranked in order, are:

1. Reduce the bycatch of marine mammals in international and foreign fisheries to sustainable levels.
2. Improve understanding of climate change impacts on marine mammals.
3. Reduce the threat of prey depletion by considering predator-prey relationships under an ecosystem approach to fishery management.
4. Reduce the threat of marine debris to marine mammals by decreasing the presence of marine debris—including derelict fishing gear—in the ocean.
5. Reduce the number of vessel strikes in international and foreign waters.
6. Prevent habitat loss, degradation, and disturbance through marine spatial planning and marine protected area designation.
7. Improve understanding of, and response to, the occurrence of disease and die-offs in marine mammal populations.

The Seven Strategic Priorities focus on the greatest international threats to marine mammals. The National Marine Fisheries Service operates bilaterally, multilaterally, regionally, and globally to build capacity and negotiate conservation and management measures to address these multinational threats. The complexity of cultural, societal, economic, and environmental impacts on conservation and management requires systematic, rapid, and sustained diplomatic and grassroots efforts with international partners and stakeholders. The agency will use regional and multinational agreements, supported by technical and financial assistance, as appropriate, to promote international marine mammal conservation. The agency's scientific capabilities will increase understanding of marine mammal populations and threats, and its international policy authority can provide the technical expertise for strategies to mitigate these threats. In Fiscal Year (FY) 2011, implementation of this Action Plan could have been accomplished largely through existing levels of funding; however, budget reductions in FY 2012 and additional reductions anticipated in FY 2013 mount a serious challenge to NMFS' ability to accomplish this Action Plan's goal. Investment beyond current levels of support for research, assessment, and mitigation will be required to ensure its success. Conserving the planet's diverse and abundant marine mammal fauna will require not only rapid progress on the work laid out in this Action Plan, but also the resources and will to pursue this vision without delay.

List of Acronyms and Abbreviations

Acronym	Full Name
ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black and Mediterranean Seas
ACSCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
AERD	Antarctic Ecosystem Research Division
AIDCP	Agreement on the International Dolphin Conservation Program
AIS	Automatic Identification System
AFSC	Alaska Fisheries Science Center [of NMFS]
AKR	Alaska Regional Office [of NMFS]
AMLR	Antarctic Marine Living Resources Program
CAFF	Conservation of Arctic Flora and Fauna
CCAMLR	Convention for the Conservation of Antarctic Living Marine Resources
CCAS	Convention on the Conservation of Antarctic Seals
CERD WG	Cetacean Resurging and Emerging Disease Working Group
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CONAPESCA	Comisión Nacional de Acuicultura y Pesca (National Commission of Aquaculture and Fishing)
CPPS	Comisión Permanente del Pacífico Sur (Permanent Commission for the South Pacific)
DDT	Dichlorodiphenyltrichloroethane
DFO	Department of Fisheries and Oceans, Canada
EAM	Ecosystem Approaches to Management
EBSAs	Ecologically and Biologically Significant Areas
EEZ	Exclusive Economic Zone
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ETP	Eastern Tropical Pacific
F/IA	Office of International Affairs [of NMFS]
FAO	United Nations Food and Agriculture Organization
FFA	Forum Fisheries Agency
F/PR	Office of Protected Resources [of NMFS]
F/ST	Office of Science and Technology [of NMFS]
FTE	Full-Time Equivalent
HSDFMPA	High Seas Driftnet Fishing Moratorium Protection Act
IATTC	Inter-American Tropical Tuna Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
ICES	International Council for the Exploration of the Sea
ICRW	International Convention for the Regulation of Whaling
ICMMPA	International Committee on Marine Mammal Protected Areas
IFAW	International Fund for Animal Welfare
IMO	International Maritime Organization

Acronym	Full Name
IPOA(s)	International Plan of Action
IUCN	International Union for the Conservation of Nature
IUU	Illegal, Unreported, Unregulated
IWC	International Whaling Commission
LRIT	Long-Range Identification and Tracking System
MARPOL	International Convention for the Prevention of Pollution from Ships
MMHSRP	Marine Mammal Health and Stranding Response Program
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSRA	Magnuson-Stevens Fishery Conservation and Management Reauthorization Act of 2006
NAFO	Northwest Atlantic Fisheries Organization
NAMMCO	North Atlantic Marine Mammal Commission
NEFSC	Northeast Fisheries Science Center [of NMFS]
NERO	Northeast Regional Office [of NMFS]
NGSP	NOAA's Next Generation Strategic Plan
NMFS	National Marine Fisheries Service
NMML	National Marine Mammal Lab
NOAA	National Oceanic and Atmospheric Administration
NWFSC	Northwest Fisheries Science Center [of NMFS]
NWRO	Northwest Regional Office [of NMFS]
PAME	Protection of the Arctic Marine Environment Working Group
PBDEs	Polybrominated diphenylethers
PBR	Potential Biological Removal Level
PCBs	Polychlorinated Biphenyls
PIFSC	Pacific Islands Fisheries Science Center [of NMFS]
PIRO	Pacific Islands Regional Office [of NMFS]
RFMO	Regional Fisheries Management Organization
SARA	Species at Risk Act
SBNMS	Stellwagen Bank National Marine Sanctuary
SEFSC	Southeast Fisheries Science Center [of NMFS]
SEGARPA	Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación (Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food)
SEMARNAT	Secretaría del Medio Ambiente y Recursos Naturales (Secretariat of Environment and Natural Resources)
SERO	Southeast Regional Office [of NMFS]
SPAW Protocol	The Protocol concerning Specially Protected Areas and Wildlife
SPREP	South Pacific Regional Environment Program
SRKW	Southern Resident killer whales
SWFSC	Southwest Fisheries Science Center [of NMFS]
SWRO	Southwest Regional Office [of NMFS]
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Program
VMS	Vessel monitoring system
VOS	Voluntary Observing Ships
WCPFC	Western and Central Pacific Fisheries Commission

INTRODUCTION

The National Marine Fisheries Service's Emerging Role in International Marine Mammal Conservation and Management

In the Marine Mammal Protection Act (MMPA),⁶ Congress recognized that marine mammals are valuable resources of great international significance. The animals have substantial intrinsic aesthetic, recreational, and economic value, and affect marine ecosystems including fish and shellfish species commercially important to both domestic and international trade.⁷ Further, as apex predators, marine mammals have major impacts on the structure and function of food webs and serve as sentinels for ecosystem health, environmental changes, and potential threats to human health.

Marine mammals are threatened by human activities in all of the world's oceans, including: fisheries bycatch and prey depletion, marine debris, vessel strikes, habitat degradation and disturbance, direct harvest or removals, and pollution. The effects of human activities in predominantly coastal areas now extend to high seas as fisheries, and oil and gas exploration and development, become more technologically and economically feasible in the deep sea. In addition to direct human impacts, marine mammals face increasing ecological pressures and ecosystem shifts associated with climate change.

The MMPA mandates, among other things, that NOAA's National Marine Fisheries Service (NMFS) protect and conserve marine mammals domestically, manage impacts of U.S. activities on marine mammals domestically and internationally, and negotiate with other nations to protect and conserve all marine mammals. Internationally, NMFS is responsible for implementing measures to protect marine mammals from U.S. activities on the high seas, including the issuance of permits for high seas fishing vessels and other anthropogenic activities (e.g., seismic exploration for oil and gas development, military operations, pile driving, and scientific research).

The agency is also required to demonstrate that domestic efforts to protect marine mammals ultimately do not place U.S. industries at a competitive disadvantage with foreign industries that are not constrained by such conservation measures. Thus, the MMPA requires that the United States ban imports of fish and fish products from nations whose fisheries exceed U.S. marine mammal bycatch reduction standards. Specifically, MMPA Section 101(a)(2) applies U.S. marine mammal bycatch standards to the importation of commercial fish and fish products, and Section 102(c)(3) prohibits the importation of fish caught using methods and gear prohibited by the United States. Sections 2 and 108 of the MMPA call for the development of international arrangements for research on, and conservation of, all marine mammals, and Section 108 also calls for the negotiation of a binding international convention to protect and conserve all marine mammals.

⁶ MMPA §2

⁷ MMPA §2(5)(B) and (6)

In addition, since marine mammals are also listed under the Endangered Species Act (ESA), Section 8 of the ESA calls for engagement and cooperation with foreign nations on the recovery of endangered or threatened species.

The High Seas Driftnet Fishing Moratorium Protection Act authorizes additional responsibilities, with Congress, recognizing the importance of U.S. leadership in establishing international measures to end or reduce bycatch of protected living marine resources, such as marine mammals. Section 610(a) requires the Secretary of Commerce to identify nations whose fishing vessels (regardless of gear type) engage in bycatch of marine mammals or other protected living marine resources, and certify that each nation has (1) adopted a regulatory program governing the conservation of marine mammals that is comparable to that of the United States and (2) established a management plan that will assist in gathering species-specific data to support international stock assessments and conservation enforcement efforts for marine mammals.

Congress recognized that the application of these stringent laws solely within U.S. waters and to U.S. citizens is insufficient to protect and conserve marine mammals, given the statutory goals of maintaining marine mammal stocks as functioning elements of their ecosystems and at optimum sustainable population levels. Many marine mammals are migratory and/or have geographic ranges that span international boundaries (transboundary), and are subject to some of the most severe threats beyond U.S. waters. However, the ability of the United States to take effective action to protect and conserve marine mammals outside U.S. waters is constrained by:

1. A lack of information on marine mammal stock status⁸ and threats on the high seas and within the territorial seas of many nations.
2. The limited number and efficacy of marine mammal conservation measures implemented by international fisheries management organizations and other multilateral arrangements.
3. A lack of capacity in many nations and international organizations to adequately assess and manage human activities affecting marine mammal stocks.
4. Few international conservation and management measures to reduce marine mammal bycatch, and poor enforcement of existing national measures.

This Action Plan identifies and describes a strategy for implementing actions NMFS can and should undertake to overcome these constraints. The agency's legal and regulatory authorities, operational and international agreements, and capacity-building capabilities provide the framework for action to conserve marine mammals and the ecosystems they inhabit.

⁸ The MMPA endeavors to manage marine mammals at the level of "population" or "stock," defined as a group of marine mammals of the same species or smaller taxa in a common spatial arrangement that interbreed when mature. Although we use these terms, we recognize that most marine mammals on the high seas and in the Exclusive Economic Zones (EEZ) of foreign nations have not been delineated to the stock level.

Action Plan Goals and Objectives

Alignment of This Action Plan with NOAA's Next Generation Strategic Plan

The Action Plan is guided by two sets of goals: NOAA's Next Generation Strategic Plan and the statutory goals of the MMPA. One of the long-term goals of NOAA's Next Generation Strategic Plan is "healthy oceans" where "marine fisheries, habitats, and biodiversity are sustained within healthy and productive ecosystems." The Strategic Plan identified two objectives under this goal relevant to international marine mammal conservation and management.

1. Improved understanding of ecosystems to inform resource management decisions.

Fewer than 25 percent of all protected species within the U.S. Exclusive Economic Zone (EEZ) have been adequately assessed,⁹ and an even smaller percentage of international marine mammal species. To preserve the wide range of benefits humans derive from healthy ecosystems, decision-makers dealing with marine mammal recovery planning need information on individual species, the quantity and quality of habitat they occupy, the effects of human activities on ecosystem health and resilience, and the consequences of ecosystem condition on human populations. Accurate status assessments for protected and potentially at-risk species—based on enhanced, consistent, long-term observations—are key. Next Generation Strategic Plan benchmarks include increased use of climate considerations in protected resource decisions and in coastal and marine spatial planning processes; next-generation protected resource stock assessments incorporating habitat, ecosystem, and climate information; and the use of high-quality data to inform management plans and decisions. This Action Plan proposes to develop international marine mammal stock assessments for use with information on climate, habitat, prey availability, and ecosystem health to elevate protected species management decisions to an ecosystem level.

2. Recovered and healthy marine and coastal species.

To ensure the sustainability, long-term health, and resilience of marine mammals and the ecosystems supporting them, science-based policy guidance, economic incentive programs, and sound regulations and enforcement are needed. Benchmarks for success include stabilized or increased abundance of species that are depleted, threatened, or endangered; decreased bycatch of protected species; and an increased number of protected species with improving status. International dimensions require participation in multinational species. This Action Plan uses international cooperation, management, and capacity building to ensure agreements and conservation efforts are robust, practical, and implemented.

By aligning the Action Plan's strategies with the Next Generation Strategic Plan, NMFS' international efforts support the goals and objectives of the Strategic Plan and will realize global progress in marine mammal conservation and management.

⁹ http://www.ppi.noaa.gov/wp-content/uploads/NOAA_NGSP.pdf

MMPA Goals and Objectives

The MMPA's primary marine mammal conservation goals are to:

- Maintain marine mammals as functioning elements of their ecosystem(s) and preserve the health and stability of the marine ecosystem(s).¹⁰
- Reduce the adverse impacts of fishing and other practices on marine mammals to sustainable, and ultimately insignificant, levels.¹¹
- Recover marine mammal populations and protect essential habitats.¹²
- Promote international efforts to encourage research on, and conservation of, marine mammals.¹³

Based on NOAA and MMPA goals, the overarching objective of this Action Plan is to *conduct research and collaborate with international partners to conserve marine mammals in international or foreign waters, emphasizing the recovery of depleted or endangered marine mammals*. To meet this objective over the next 5 years, NMFS must:



Northern elephant seals are thriving and have increased their population numbers significantly under the protection of the Marine Mammal Protection Act. Credit: NOAA National Ocean Service

- Improve its ability to assess and manage transboundary and shared marine mammal stocks on a biologically relevant, ecosystem scale.
- Improve its ability to monitor, detect, and respond to shifts in distribution and trends of marine mammals across the globe, identify marine mammal areas in need of protection, and inform marine spatial planning decisions.
- Work with foreign nations and multilateral institutions to identify, prevent, and mitigate human impacts on marine mammals in international and foreign waters.

organizations to collect information on marine mammal stock status and threats in international and foreign waters; (2) develop, and negotiate the adoption of, effective international marine mammal conservation measures; and (3) improve the capacity of nations and international organizations to adequately assess, evaluate, manage, and reduce threats to marine mammal stocks. The United States

To achieve this objective in international and foreign waters, NMFS must: (1) collaborate with nations and work through international

¹⁰ MMPA §2(6)

¹¹ MMPA §101(a)(2), §118(a)(1)

¹² MMPA §2(2)

¹³ MMPA §2(4)

and its international partners will benefit from a coordinated effort to improve global marine mammal conservation and management.

Threats to marine mammals in international waters are often similar to threats in U.S. waters. For 40 years NMFS has implemented the domestic provisions of the MMPA, making the agency uniquely qualified to lead internationally. Implementation of the MMPA's international goals has lagged behind domestic efforts. But now the priorities that emerged from this strategic planning process will guide and provide a framework that integrates NMFS Regional Offices, Science Centers, and Headquarters science and policy strengths to achieve the goals and mandates within the MMPA and other environmental statutes.

Strategic Planning Process to Develop the Action Plan

A working group of experts from NMFS Science Centers, Regional Offices, and Headquarters offices¹⁴ reviewed information on the status of marine mammals worldwide, threats to these species, and existing NMFS conservation efforts. The working group identified and ranked 11 primary threats (Table 3). The working group then organized these into a list of seven strategic priorities that form the core of this Action Plan. To address these seven strategic priorities, the working group developed regional action plans, provided in Appendix 1, integrating science, policy, capacity building, and international (government-to-government) actions to better use limited funds, achieve greater coordination and integration across NMFS, and improve the likelihood for success. This section discusses the historic achievements of marine mammal conservation, determination of species covered in the plan, and the strategic priorities.

Building on Past Accomplishments to Advance Marine Mammal Conservation in the Future

From 2005 through 2009, NMFS invested substantial funds and staff time in efforts to conserve and protect marine mammals outside U.S. waters through the following international agreements:

- Agreement on the International Dolphin Conservation Program (AIDCP) in the Eastern Tropical Pacific Ocean, which focuses on controlling bycatch of pelagic dolphins in tuna purse seine fisheries and also includes broader ecological and ecosystem research.
- Various international bycatch working groups and workshops, including leadership of the U.S. delegation to the UN Food and Agriculture Organization (FAO) Technical Consultation to Develop International Guidelines on Bycatch Management and the Reduction of Discards.
- International Whaling Commission (IWC) Scientific Committee.
- Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).
- Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR).
- Marine mammal bycatch measures introduced or adopted in regional fisheries management organizations (e.g., the Western and Central Pacific Fisheries Convention).
- Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas.
- First and Second International Conferences on Marine Mammal Protected Areas.

¹⁴ Working Group members are listed in Appendix 2.

- Protocol Concerning Specially Protected Areas and Wildlife (SPA Protocol).
- United Nations Environment Programme Regional Seas Programme.

NMFS sponsored many international workshops, policy guidance, and recovery projects, including:

- Assessments and working groups on foreign harvest of shared pinniped stocks.
- Reviews of historic whaling data.
- Analyses of tissues from marine mammal species around the world to evaluate the prevalence of pollution (contaminants) and disease.
- Workshops on diseases, in order to better coordinate and promote information exchange on disease research and outbreak/stranding occurrence and investigations.
- Eight workshops to evaluate and mitigate the impact of marine debris on marine mammals.
- Evaluation of the potential impacts of human-origin sound in the ocean on marine mammals.
- Development of recovery plans for endangered species (e.g., vaquita), including activities for international cooperation and joint management.
- Development and adoption of appropriate dolphin- and whale-watching guidelines in the Caribbean and Canada.
- Integration of marine mammal issues in planning documents of Arctic Council working groups (especially Conservation of Arctic Flora and Fauna, and the Protection of the Arctic Marine Environment Working Group), and designation of Ecologically and Biologically Significant Areas (EBSAs) for the Arctic under the International Union for the Conservation of Nature (IUCN).
- Efforts to control trade in live dolphins through CITES.

Because building the capacity of foreign nations and multilateral organizations is essential, NMFS has invested significantly in this area, through:

- Collecting relevant data on threats facing marine mammals.
- Studying the impacts of prey depletion on the transboundary, endangered stock of Southern Resident killer whales (SRKW).
- Developing acoustic monitoring methods, population abundance estimates, and risk assessment models for vaquita in Mexico.
- Training and supporting the development of stranding (including necropsy training) and disentanglement response networks.
- Assessing and/or mitigating bycatch of marine mammals outside U.S. waters.

Table 1 and Figure 1 show these NMFS financial and staff time investments from 2005 through 2009.

Table 1. Total NMFS funding and staff time (FTEs) investments to protect and conserve marine mammals outside U.S. waters during 2005–2009, by threat (source: NMFS Marine Mammal Working Group).

Threat*	Funding (\$1000s)	Funding and FTEs** (\$1000s)
Bycatch – AIDCP	6,300	17,138
Bycatch	460	700
Direct harvest - IWC	3,099	7,959
Direct harvest	61	256
Lack of information	1,211	2,186
Lack of information - capacity building	694	1,519
Pollution and diseases	677	1,652
Disturbance and habitat degradation	334	1,197
Prey depletion	90	840
Multiple threats	126	4,176
TOTAL	13,052	37,623

*Investments are summarized in categories that are exclusive and non-overlapping. For example, “Bycatch” investments include all investments focused on bycatch except those included in the “Bycatch-AIDCP” category.

**Staff time investments estimated at \$150,000 per full-time equivalent (FTE).

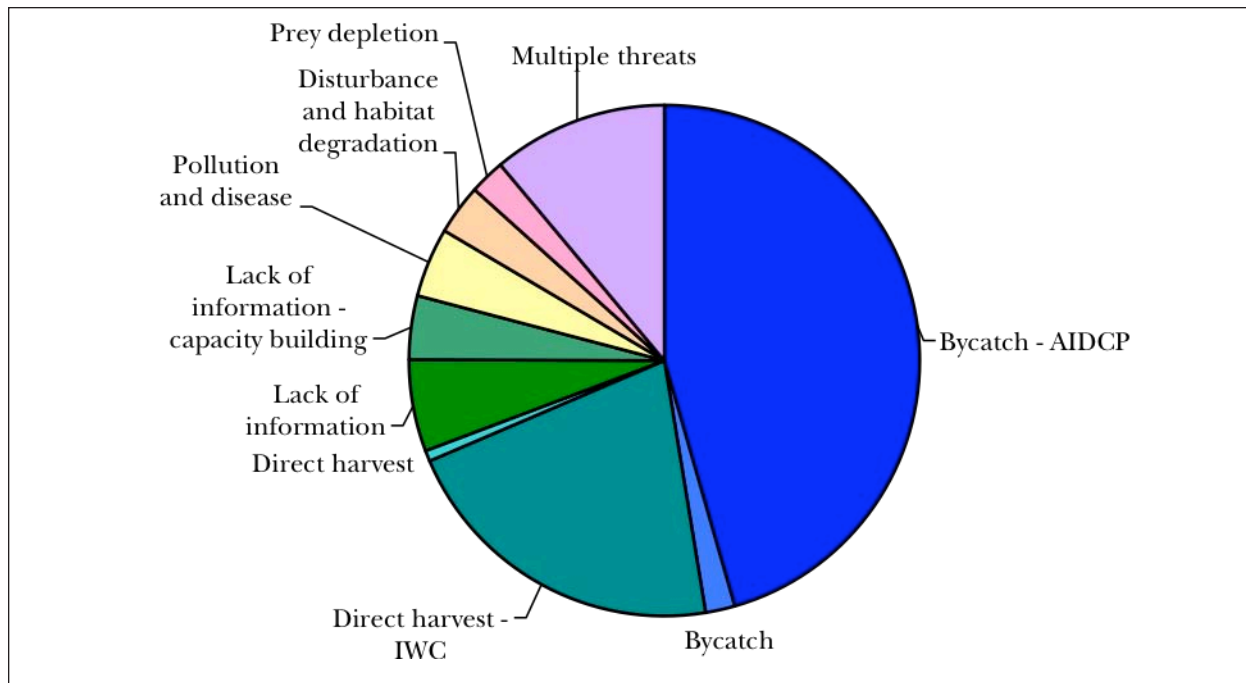


Figure 1. Relative NMFS investment (including staff time) in efforts to protect and conserve marine mammals outside U.S. waters during 2005–2009, by threat.

Assessing International Marine Mammal Species to be Covered by the Action Plan

This Action Plan focuses on the marine mammal species that have been identified by the IUCN as most at risk of extinction. The IUCN Red List of Threatened Species is considered the global standard for evaluating the risk of extinction for marine species, and is the foundation for the identification of marine conservation priorities worldwide. While both the ESA threatened and endangered list and the MMPA depleted list include marine mammals that inhabit international and foreign waters, the IUCN identifies marine mammals of concern beyond the scope of the ESA and MMPA. Although population status and trends are poorly known for many marine mammal stocks outside U.S. waters, the IUCN estimates that 25 percent of marine mammals are now threatened (including species ranked as Critically Endangered, Endangered, Vulnerable, and Near Threatened). More than 30 percent of marine mammals are considered “data deficient,” where not enough information is available to assess the species’ or stock’s status.

Table 2 illustrates at-risk marine mammal species and stocks listed as Near Threatened, Vulnerable, Endangered, and Critically Endangered and the primary threats to their continued survival. Several of these stocks are “transboundary” or shared with the United States; others are found in international waters or EEZs of other nations, but are impacted by threats that also affect marine mammal stocks within U.S. waters. Thus, efforts to assess, protect, and recover many of these stocks would improve NMFS’ efforts to address threats facing U.S. domestic, transboundary, and shared marine mammal stocks. Table 2 is not a comprehensive list of species covered by this Action Plan. The Action Plan includes work on species not currently listed as threatened or endangered under the ESA or as depleted under the MMPA or that are listed as “Data Deficient” or “Least Concern” under the IUCN Red List (e.g., ice seals and bowhead whales).

Table 2. At-risk marine mammal species covered by the Action Plan, their IUCN Red List classification,¹⁵ population trends, and primary threats (Source: IUCN Red List).¹⁶

COMMON NAME	SCIENTIFIC NAME	POP. TREND	PRIMARY THREAT(S)
<i>Species or stocks considered “Critically Endangered” under the IUCN Red List Classification</i>			
Vaquita	<i>Phocoena sinus</i>	decreasing	Bycatch (gillnet)
Mediterranean monk seal	<i>Monachus monachus</i>	decreasing	Harvest bycatch
Hawaiian monk seal*	<i>Monachus schauinslandi</i>	decreasing	Competition, prey depletion, shark predation
Maui’s dolphin	<i>Cephalorhynchus hectori maui</i>	decreasing	Bycatch (gillnet)
Bowhead whale (Svalbard-Barents Sea-Spitsbergen subpopulation)	<i>Balaena mysticetus</i>	unknown	Harvest, climate change
Blue whale (Antarctic subpopulation)	<i>Balaenoptera musculus intermedia</i>	increasing	Harvest, prey depletion, climate change
Beluga (Cook Inlet subpopulation) *	<i>Delphinapterus leucas</i>	decreasing	Harvest, habitat degradation
Southern right whale (Chile-Peru subpopulation)	<i>Eubalaena australis</i>	unknown	Harvest, bycatch, vessel strikes
North Pacific right whale (Northeast Pacific subpopulation) *	<i>Eubalaena japonica</i>	unknown	Harvest, bycatch, vessel strikes
Western gray whale*	<i>Eschrichtius robustus</i>	increasing	Bycatch (various), disturbance, habitat degradation
Harbor porpoise (Baltic Sea subpopulation and North Sea subpopulation)	<i>Phocoena phocoena</i>	decreasing	Bycatch (gillnet), pollution, contaminants
Irrawaddy dolphin (includes Ayeyarwaddy River, Chilika Lagoon, Mahakam River, Malampaya Sound, Mekong River, and Songkhla Lake)	<i>Orcaella brevirostris</i>	decreasing	Bycatch, vessel strikes, electrofishing
Indo-Pacific hump-backed dolphin (Eastern Taiwan Strait subpopulation)	<i>Sousa chinensis</i>	decreasing	Bycatch (gillnet)
Bottlenose dolphin (Fiordland subpopulation)	<i>Tursiops truncatus</i>	decreasing	Bycatch
<i>Species or Stocks considered “ Endangered” under the IUCN Red List Classification</i>			
Hector’s dolphin	<i>Cephalorhynchus hectori</i>	decreasing	Bycatch (gillnet)
Sei whale*	<i>Balaenoptera borealis</i>	unknown	Bycatch, vessel strikes
Bowhead whale (Okhotsk Sea subpopulation)	<i>Balaena mysticetus</i>	unknown	Bycatch, harvest, climate change
Blue whale*	<i>Balaenoptera musculus</i>	increasing	Bycatch, vessel strikes

* Denotes marine mammal species or stock that is found in the United States or is transboundary.

¹⁵ This list focuses on Critically Endangered, Endangered, Near Threatened, Vulnerable classifications.

¹⁶ This list only includes marine mammal species for which the MMPA provides management authority to NMFS (i.e., it does not include polar bear, walrus, sea and marine otters, or the dugong or manatees).

COMMON NAME	SCIENTIFIC NAME	POP. TREND	PRIMARY THREAT(S)
Fin whale*	<i>Balaenoptera physalus</i>	unknown	Bycatch, vessel strikes
North Atlantic right whale*	<i>Eubalaena glacialis</i>	increasing	Bycatch (fixed gear), vessel strikes
North Pacific right whale*	<i>Eubalaena japonica</i>	unknown	Bycatch (various)
Humpback whale (Arabian Sea and Oceania subpopulations)	<i>Megaptera novaeangliae</i>	unknown/ increasing	Bycatch, vessel strikes
Steller sea lion*	<i>Eumetopias jubatus</i>	decreasing**	Prey depletion
Galápagos fur seal	<i>Arctocephalus galapagoensis</i>	decreasing	Bycatch (various)
Saimaa seal	<i>Phoca hispida saimensis</i>	unknown	Bycatch, harvest
Caspian seal	<i>Pusa caspica</i>	decreasing	Harvest, bycatch, disease, climate change
Galapagos sea lion	<i>Zalophus wollebaeki</i>	decreasing	Disease, climate change
Australian sea lion	<i>Neophoca cinerea</i>	decreasing	Harvests bycatch
Killer whale southern resident*	<i>Orcinus orca</i>	stable	Prey depletion, pollution, disturbance
South Asian river dolphin or Ganges river dolphin	<i>Platanista gangetica subsp. gangetic, subsp. minor</i>	decreasing	Habitat degradation, pollution, harvest, bycatch
Short-beaked common dolphin (Mediterranean subpopulation)	<i>Delphinus delphis</i>	decreasing	Bycatch
Finless porpoise	<i>Neophocaena phocaenoides subsp. asiaorientalis</i>	unknown	Bycatch, habitat degradation
Harbor porpoise (Black Sea subpopulation)	<i>Phocoena phocoena subsp. relicta</i>	decreasing	Bycatch
Bottlenose dolphin (Black Sea subpopulation)	<i>Tursiops truncatus subsp. ponticus</i>	unknown	Bycatch
<i>Species or Stocks considered "Vulnerable" under the IUCN Red List Classification</i>			
Franciscana (Rio Grande de Sul/Uruguay subpopulation)	<i>Pontoporia blainvillei</i>	decreasing	Bycatch
Atlantic humpbacked dolphin	<i>Sousa teuszii</i>	decreasing	Bycatch (gillnet)
Finless porpoise	<i>Neophocaena phocaenoides</i>	decreasing	Bycatch (gillnet), habitat degradation
Short-beaked common dolphin (Black Sea subpopulation)	<i>Delphinus delphis ponticus</i>	unknown	Bycatch (gillnet), habitat degradation
Irrawaddy dolphin	<i>Orcaella brevirostris</i>	decreasing	Bycatch, vessel strikes, electrofishing
Eastern spinner dolphin*	<i>Stenella longirostris orientalis</i>	increasing	Bycatch
Sperm whale*	<i>Physeter macrocephalus</i>	unknown	Bycatch, contaminants, vessel strikes

* Denotes marine mammal species or stock that is found in the United States or is transboundary.

** Western distinct population segment (DPS) is decreasing whereas the Eastern DPS is increasing.

COMMON NAME	SCIENTIFIC NAME	POP. TREND	PRIMARY THREAT(S)
Northern fur seal*	<i>Callorhinus ursinus</i>	decreasing	Bycatch, prey depletion, climate change, pollution
Hooded seal*	<i>Cystophora cristata</i>	decreasing	Harvest, bycatch (trawl)
New Zealand sea lion	<i>Phocartos hookeri</i>	decreasing	Disease, bycatch, prey depletion, disturbance
<i>Species or Stocks considered "Near Threatened" under the IUCN Red List Classification</i>			
Chilean dolphin	<i>Cephalorhynchus eutropia</i>	decreasing	Bycatch, harvest (for bait)
Australian snubfin dolphin	<i>Orcaella heinsohni</i>	unknown	Bycatch, habitat degradation
Indo-Pacific hump-backed dolphin	<i>Sousa chinensis and S. plumbea</i>	decreasing	Bycatch (gillnet)
Beluga (Beluga—West Greenland, St. Lawrence River and Ungava Bay, eastern Hudson Bay)	<i>Delphinapterus leucas</i>	unknown	Pollution, harvest, bycatch
Narwhal	<i>Monodon monoceros</i>	unknown	Harvest, climate change, habitat degradation
Juan Fernández fur seal	<i>Arctocephalus philippii</i>	increasing	Disease, climate change
Guadalupe fur seal*	<i>Arctocephalus townsendi</i>	increasing	Disease, pollution, contaminants

* Denotes marine mammal species or stock that is found in the United States or is transboundary.

Identifying Strategic Priorities for the Marine Mammal Action Plan

The working group evaluated and prioritized international threats to marine mammals to develop strategic priorities based on geographic scope, severity of impact on one or more species or stocks, and trend in severity and scope. The group also considered the types of actions NMFS could take to address the threats and how relevant those actions were to legislative mandates, NOAA's priorities, and the Next Generation Strategic Plan. Finally, the group assessed the feasibility of NMFS actions to address each threat—given the agency's expertise, capabilities, and jurisdiction—as well as ongoing efforts and the availability of interested foreign and international partners and stakeholders. Since the working group included representatives from NMFS Science Centers, Regional Offices, and Headquarters offices, the rankings represent all inputs and regional priorities, and, therefore, may differ from one region's priorities. For example, NMFS has specific mandates to address climate change and prey depletion (especially as they relate to ecosystem-based management), which resulted in the elevation of these two threats in the overall list of priorities. The priorities are not cast in stone and circumstances such as the Deepwater Horizon oil spill in 2010 may elevate lower priorities to greater prominence so they can be adequately evaluated and, where possible, threats and damage mitigated. Table 3 summarizes the working group's assessment and prioritization of the threats.

Table 3. Assessment and prioritization of international threats facing marine mammals and the feasibility and relevance of NMFS actions to address those threats.

Threat	Scope	Severity	Trend	Relevance	Feasibility	Strategic Priorities
Bycatch						HIGHEST – lead international bycatch reduction
Climate Change						HIGHEST – lead international research efforts
Prey Depletion						HIGH – lead international effort to reduce overfishing
Marine Debris						MEDIUM – work with NOS Marine Debris Program
Vessel Strikes						MEDIUM – lead international efforts
Habitat Loss/Degradation						MEDIUM – support MPA efforts
Disturbance (Including Noise)						MEDIUM – research and monitor threat
Direct Removals						MEDIUM – work through IWC and CITES
Disease						Low – continue international disease surveillance efforts
Pollution/Contaminants						Low – support EPA and UNEP efforts
Harmful Algal Blooms						Low – continue research and support international efforts

Color Code	Scope	Severity	Trend	Relevance	Feasibility
	Global	Strong impacts on many stocks	Increasing	Core mission	High – clear course of action
	Regional or localized but in many areas	Strong impacts likely but unknown	Stable or increasing, or mixed	High explicit mandate	Moderate – limited by international cooperation
	Localized in few areas or targeting few stocks	Strong impacts on few stocks or sublethal impacts	Stable or decreasing	Relevant – no explicit mandate or led by other agency	Low – challenging to address, involves many sectors

Strategic Priorities for the Action Plan

The working group identified four tiers of threat priorities: highest, high, medium, and low (Table 3), pointing to seven strategic priorities that are the core of this Action Plan. The working group clustered some of the threats together according to their rank, pairing similar or linked threats that would benefit from actions applicable to both threats. The seven strategic priorities encompass the main threats to the marine mammals listed in Table 2. These seven strategic priorities are:

1. Reduce the bycatch of marine mammals in international and foreign fisheries to sustainable levels.
2. Improve understanding of climate change impacts on marine mammals.
3. Reduce the threat of prey depletion by considering predator-prey relationships under an ecosystem approach to fishery management.
4. Reduce the threat of marine debris to marine mammals by decreasing the presence of marine debris—including derelict fishing gear—in the ocean.
5. Reduce the number of vessel strikes in international and foreign waters.
6. Prevent habitat loss, degradation, and disturbance through marine spatial planning and marine protected area designation.
7. Improve understanding of, and response to, disease and die-offs in marine mammal populations.

Currently, NMFS participates in or leads ongoing international efforts to address all of the identified threats, and the working group generally agreed that these should be maintained even for lower-priority efforts. The working group recognized that some restructuring may be necessary to improve coordination and better align these efforts with NMFS priorities. For higher-priority threats, the working group recommends enhanced international efforts, as described below; although bycatch, climate change, and prey depletion were all identified as high priorities, bycatch was overwhelmingly identified as the highest priority for NMFS international efforts. The Action Plan focuses primarily and in most detail on those top priorities, and then provides more general guidance for the medium and low priorities. For each priority, the plan provides a goal statement for action, a description of the threat and effects on marine mammals, and a description of NMFS' 5-year strategy to address the issue. Detailed regional action plans that describe initial or continuing actions to implement the strategy are provided in Appendix 1.



*Humpback entangled in marine debris. The animal was disentangled by an experienced team from the Hawaiian Islands Humpback Whale National Marine Sanctuary
Credit: NOAA National Ocean Service*

they both tend to occur in areas of high productivity and dense prey (or target fish) concentrations. Marine mammals, initially taken as bycatch, can become the target of direct harvests for food, oil, leather, bait, and other uses.

HIGH PRIORITIES

1. Reduce the Bycatch of Marine Mammals in International and Foreign Fisheries to Sustainable Levels

Goal Statement: *Build the capacity in developing countries and implement international agreements and U.S. laws to reduce marine mammal bycatch and harvest in international and foreign fisheries that export commercial fish products to the United States.*

What is the threat?

Bycatch, resulting in the serious injury and mortality of marine mammals incidental to fishing operations, is regarded as the most severe threat impacting most marine mammal stocks outside U.S. waters. Direct exploitation/harvest¹⁷ is bycatch retained for utilization as bait in the fishery where the marine mammal was caught or in another commercial fishery; for food to be consumed or exchanged in local areas or villages (subsistence); or for meat, blubber, oil, and other commodities sold in national and international markets (commercial).¹⁸ Without harvest and trade controls, the demand for products can lead to overexploitation.

Why are marine mammals impacted by the threat?

Marine mammals and fishing operations are often concentrated in the same regions because

¹⁷ Direct exploitation or harvest, while ranked as a medium threat, is included here because it is often a natural extension of bycatch. Many marine mammals initially taken as bycatch become targets for harvests for food or bait. This combining of bycatch and harvest is not intended to elevate as a high priority or include in this priority scientific, commercial, drive fisheries (beaching animals) or subsistence whaling.

¹⁸ Robards, M.D. and Reeves, R.R. The global extent and character of marine mammal consumption by humans: 1970–2009. *Biological Conservation*, 2011; 144 (12): 2770 DOI: 10.1016/j.biocon.2011.07.034

How are marine mammals impacted by the threat?

Nearly all commercial fishing gear types are known to incidentally catch marine mammals and most, if not all, marine mammal species that occur in areas with active fisheries are known to be caught incidentally in at least one fishery. Bycatch is the primary threat facing many marine mammal stocks, including several critically endangered species (Table 2). For example, dolphin and porpoise bycatch retained and utilized for bait fisheries in South America and “bush meat” harvests of dolphins in Africa have led to dramatic declines in the abundance of these species.¹⁹ Bycatch can occur in aquaculture and predator nets: in Australia, dolphins attracted to “tuna feedlots” become entangled and die in predator-exclusion nets,²⁰ and the anti-shark nets that protect prime bathing areas along the coasts of South Africa and Australia kill cetaceans²¹ as well as the large sharks they are meant to deter. Finless porpoise, and Indus and Ganges river dolphins are subjected to captures in gillnet fisheries.

NMFS 5-Year Strategy: Over the next 5 years NMFS will strongly enhance its international efforts to assess, prevent, and reduce marine mammal bycatch globally. The overexploitation of small and medium cetaceans by developing nations for food and bait further emphasizes the need for an international regulatory regime to conserve and sustainably manage marine mammals that are still the targets of direct harvest. As an initial step, NMFS will identify the nations that export fish and fish products to the United States from fisheries that have bycatch of marine mammals and, to the extent possible using available literature, estimate the abundance of the individual marine mammal species and quantify the estimated bycatch (Appendix 1, Fisheries International Affairs Objective 1). The agency will then consult with these nations and help them develop scientific and regulatory programs to assess marine mammal populations and to estimate and mitigate bycatch (Appendix 1, Fisheries International Affairs Objective 2).

Coincident with this effort, NMFS will host a series of international workshops on bycatch, to develop and share assessment and mitigation methods, and regulatory and other frameworks to address bycatch in artisanal and commercial fisheries. The goal of these workshops will be the identification of best practices, or the development of a toolkit/framework for assessing and mitigating bycatch in artisanal and commercial fisheries (Appendix 1, Fisheries International Affairs Objective 2). In addition, NMFS will engage with FAO to develop guidelines for reducing the entanglement of marine mammals in commercial and artisanal fishing gear, following the successful International Plans of Action for seabirds, sea turtles, and sharks, and the sea turtle guidelines developed under the FAO to reduce sea turtle entanglement. These guidelines will provide the basis for action within Regional Fisheries Man-

¹⁹ Costello, M.J. and Baker, C.S. Who eats sea meat? Expanding human consumption of marine mammals. *Biological Conservation*, 2011; 144 (12): 2745 DOI:10.1016/j.biocon.2011.10.015

²⁰ Kemper, C.M. & S.E. Gibbs (2001). Dolphin interactions with tuna feedlots at Port Lincoln, South Australia and recommendations for minimizing entanglements. *Journal of Cetacean Research and Management*. 3:283-292.

²¹ Cockcroft, V.G. 1990. Dolphin catches in the Natal shark nets, 1980 to 1988. *South African Journal of Wildlife Research* 20(2), 44–51. Cockcroft, V.G. 1992. Incidental capture of bottlenose dolphins (*Tursiops truncatus*) in shark nets: an assessment of some possible causes. *Journal of Zoology, London* 226, 123–134. Cockcroft, V.G. and Ross, G.J.B. 1991. Bottlenose dolphins in Natal shark nets, 1980 through 1987: catch rates and associated contributing factors. Pp.115–127 in: *Cetaceans and Cetacean Research in the Indian Ocean Sanctuary* (eds. S. Leatherwood and G.P. Donovan). UNEP Marine Mammal Technical Report No. 3, Nairobi, Kenya. Parra, G.J., Azuma, C., Preen, A.R., Corkeron, P.J., and Marsh, H. 2002. Distribution of Irrawaddy dolphins, *Orcaella brevirostris*, in Australian waters. *Raffles Bulletin of Zoology*, Supplement, 141–154. Paterson, R.A. 1990. Effects of long-term anti-shark measures on target and non-target species in Queensland, Australia. *Biological Conservation* 52, 147–159.

agement Organizations (RFMO) and other international agreements to achieve a global reduction in marine mammal bycatch (Appendix 1, Fisheries International Affairs Objective 2).

Regional efforts

Bycatch reduction efforts in NMFS regions will focus on threatened and endangered species and critical data gaps. For example:

- The Northeast will continue its efforts with Canada to reduce the bycatch of North Atlantic right whales and humpback whales in gillnet and pot gear (Appendix 1, Northeast Objective 1).
- The Southwest and Northwest will work collaboratively with Mexico and Canada to assess levels and trends of bycatch and develop an effective reporting program, disentanglement response, and entanglement mitigation of Eastern gray whales and humpback whales, as well as fin, blue, and sperm whales, in commercial fisheries (Appendix 1, Northwest Objective 1 and Southwest Objective 7).
- The Southeast will work through the Marine Mammal Action Plan under the Specially Protected Areas and Wildlife (SPA) Protocol to evaluate bycatch data throughout the wider Caribbean with the goal of estimating and ultimately reducing bycatch in that region (Appendix 1, Southeast Objectives 1 and 2).
- The Southwest also will work with Mexican scientists and gear experts to assess and monitor trends in abundance of vaquita, and develop gear that can be substituted for gillnets (Appendix 1, Southwest Objective 1).
- The Southwest will continue efforts to further reduce dolphin mortality in the Eastern Tropical Pacific tuna purse-seine fishery and, working with Mexican scientists, assess populations of short- and long-beaked common dolphins and their bycatch in coastal fisheries (Appendix 1, Southwest Objectives 2 and 4).
- Alaska will document the bycatch of marine mammals in Russian and Canadian fisheries through a literature survey, and information gathered at workshops and international meetings, to help evaluate the extent of bycatch in Russian and Canadian fisheries and identify possible mitigation measures (Appendix 1, Alaska Objective 2).
- The Pacific Islands will improve fisheries observer data quality to better assess and reduce marine mammal bycatch in South Pacific fisheries (Appendix 1, Pacific Islands Objective 1).

2. Improve Understanding of Climate Change Impacts on Marine Mammals

Goal Statement: *Improve the ability to monitor, detect, and respond to shifts in distribution and population trends of marine mammals across the globe, in response to changes in climate and ocean conditions.*

What is the threat?

Predicted climate changes will profoundly affect marine ecosystems and some species and/or populations of marine mammals, principally in polar regions (e.g., the Arctic and Antarctic) but also in temperate and tropical regions, which in turn will result in changes in prey distribution, abundance, and habitat availability for marine mammals and will alter human interactions with marine mammals.

Why are marine mammals impacted by the threat?

At least eight pinniped and three cetacean species are closely associated with or dependent upon ice-related habitat.²² Many of the most threatened cetacean populations are in temperate and tropical areas where the manifestations of climate change—e.g., greater frequency and severity of storms, flooding, and drought—will exacerbate resource-use conflicts between people and wildlife, especially for Asian and South American rivers inhabited by cetaceans.²³

How are marine mammals impacted by the threat?

Physical changes in polar sea ice and freshwater discharge are ongoing and influencing ocean productivity, human activities, and contaminant flux, with implications for marine mammal populations.²⁴ Cetaceans may respond to increases in water temperature by changing their range (e.g., expand, shift



The ribbon seal may become a victim of climate change due to habitat loss from shrinking sea ice. Credit: Michael Cameron, NOAA National Marine Fisheries Service.

²² Moore, Sue E., and Henry P. Huntington. 2008. Arctic Marine Mammals and Climate Change: Impacts And Resilience. *Ecological Applications* 18:S157–S165. [doi:10.1890/06-0571.1] Ragen, Timothy J., Henry P. Huntington, and Grete K. Hovelsrud. 2008. Conservation of Arctic Marine Mammals Faced With Climate Change. *Ecological Applications* 18:S166–S174. [doi:10.1890/06-0734.1]

²³ Würsig, B., Reeves, R.R., and Ortega-Ortiz, J.G. 2001. Global climate change and marine mammals. Pp.589–608 in: *Marine Mammals: Biology and Conservation* (eds. P.G.H. Evans and J.A.Raga). Kluwer Academic/Plenum Publishers, New York.

²⁴ Moore, Sue E., and Henry P. Huntington. 2008. Arctic Marine Mammals and Climate Change: Impacts And Resilience. *Ecological Applications* 18:S157–S165. [doi:10.1890/06-0571.1] Ragen, Timothy J., Henry P. Huntington, and Grete K. Hovelsrud. 2008. Conservation of Arctic Marine Mammals Faced With Climate Change. *Ecological Applications* 18:S166–S174. [doi:10.1890/06-0734.1] Laidre, Kristin L., Ian Stirling, Lloyd F. Lowry, Øystein Wiig, Mads Peter Heide-Jørgensen, and Steven H. Ferguson. 2008. Quantifying the Sensitivity of Arctic Marine Mammals to Climate-Induced Habitat Change. *Ecological Applications* 18:S97–S125. [doi:10.1890/06-0546.1]

poleward, or contract, based on their current distributions). Scientists anticipate that the ranges of 88% of cetaceans may be affected by changes in water temperature resulting from global climate change. For 47% of species, these changes are anticipated to have unfavorable implications for their conservation, and for 21% the changes may put at least one geographically isolated population of the species at high risk of extinction.²⁵ Several ice-dependent pinnipeds (ice seals) have been proposed for listing under the ESA.

Climate change indirectly affects marine mammals by changes in prey availability affecting distribution, abundance, migration, community structure, and susceptibility to disease and contaminants.²⁶ Establishing direct links between climate change and the health of individual cetaceans or pinnipeds, or indirect links between climate change and the availability of marine mammal prey resources or habitat, is difficult. But advanced technology and analytical tools—e.g., satellite tracking, ecosystem modeling, climate downscaling, multi-sensor ocean observing systems, multi-species tagging studies, unmanned systems, and stomach content analysis and tissue sampling (isotopic and fatty acid signatures)—hold promise for investigating linkages.

NMFS 5-Year Strategy: Some species are more sensitive to a changing climate than others. Baseline data on marine mammal health, distribution, and population abundance and trends are needed to investigate the impact of climate change on the overall viability of marine mammals. Staff at NMFS have participated in each of the three International Whaling Commission (IWC) workshops on climate change and will take a leadership role in an upcoming workshop on the anthropogenic effects of climate change on cetaceans.

Regional efforts

At the regional level, the focus will be the continuation of long-term studies and review of stranding records to shed light on climate change impacts on distribution, marine mammal migration, habitat use, and prey availability. For example:

- Staff in the Alaska Region will continue to monitor bowhead, gray, and beluga whale populations to better assess variations in migration, habitat use, and prey availability in response to climate change. They also will work with Canada and Russia to improve the understanding of stock structure, abundance, and vital rates for key stocks, such as Steller sea lions and ribbon, spotted, bearded, and ringed seals. This information may help develop conservation, management, and recovery efforts in an ice-diminishing Arctic (Appendix 1, Alaska Objective 1).
- Because there are many killer whale ecotypes in the Antarctic, the Southwest will conduct boat-based surveys to satellite-tag Antarctic killer whales to understand movement patterns and foraging behavior, and the killer whale's role in a changing Antarctic ecosystem (Appendix 1, Southwest Objective 5).

²⁵ Macleod, C.D. 2009. Global climate change, range changes, and potential implications for the conservation of marine cetaceans: a review and synthesis. *Endangered Species Research*. 7:125-136.

²⁶ Learmonth, J.A., Macleod, C.D., Santos, M.B., Pierce, G.J., Crick, H.Q.P. and Robinson, R.A. 2006. Potential effect of climate change on marine mammals. *Oceanography and Marine Biology: An Annual Review* 44:431-464.

- With over 25 years of ecosystem-based monitoring in the Southern Ocean around the Antarctic Peninsula, the U.S. Antarctic Living Marine Resources (AMLR) program provides a model for detecting and predicting the impacts of climate change on pinniped populations in the Antarctic and the southern portions of all the major oceans. The Southwest Region will continue to assess trends in Antarctic fur seal populations and the variability in prey availability, foraging ecology, reproductive success, movement, and condition in response to climate change. The AMLR program provides information to support U.S. policy on the conservation and management of the living marine resources in the Antarctic through CCAMLR (the Convention for the Conservation of Antarctic Living Marine Resources) (Appendix 1, Southwest Objective 3).

3. Reduce the Threat of Prey Depletion by Considering Predator-Prey Relationships Under an Ecosystem Approach to Fishery Management

Goal Statement: *Work toward an ecosystem-based management approach in international and foreign fisheries management to reduce the likelihood of prey depletion due to overfishing.*

What is the threat?

The removal of one or more prey species from an ecosystem can have repercussions throughout the food web, altering predator-prey relationships, competition for resources, and the distribution, abundance, or recruitment of marine mammals and their prey.

Why are marine mammals impacted by the threat?

Prey depletion may have serious long-term consequences for marine mammal survival and reproduction. Of special concern are large-scale high-seas commercial fisheries that extract vast amounts of fish and squid biomass from the world's oceans, and in so doing may transform biological communities or reduce the environmental carrying capacity for marine mammal populations. And in the Mediterranean, North Sea, and Southwest Atlantic Ocean, thousands of small gillnet fishing boats, plus large bottom trawlers and longliners, have depleted numerous fish, crustacean, and mollusk populations that serve as prey for numerous marine mammal species.²⁷ Some say Antarctic killer whales may be affected by depletion of toothfish.²⁸



In western Alaska, where the Steller sea lion population is listed as endangered, the potentially highest risk factor for their recovery is competition with fisheries.
Credit: NOAA, Alaska Fisheries Science Center

²⁷ Bearzi G, Politi E, Agazzia S, Azzellino A (2006) Prey depletion caused by overfishing and the decline of marine megafauna in eastern Ionian Sea coastal waters (central Mediterranean). *Biological Conservation* 127:373-382.

²⁸ Ainley D.G., Ballard, G., Olmastroni, S. (2009) An Apparent Decrease in the Prevalence of "Ross Sea Killer Whales" in the Southern Ross Sea. *Aquatic Mammals* 35(3), 335-347.

How are marine mammals impacted by the threat?

Depending on the amount extracted of both target and non-target species and the level of prey depletion, marine mammals may respond to the reduced prey supply by either switching their prey or moving to another area to capitalize on alternative prey aggregations. Reduction in local prey abundance or dispersion of prey schools could make it more energetically costly for foraging marine mammals to obtain enough food for successful growth and reproduction.

It is rarely possible to show a direct link between prey depletion and reduced numbers of a particular marine mammal species or stock. One exception is in the Bering Sea and Gulf of Alaska, where substantial declines in the numbers and/or reduced fitness or productivity of Steller sea lions and northern fur seals may be linked to a decline in food availability resulting from commercial fisheries targeting key prey species of these mammals. Another example is the link between reduced salmon stocks in the Pacific Northwest and the declining southern resident killer whales (SRKW), which also exhibit reduced fitness and productivity.

NMFS 5-Year Strategy: Prey depletion and ecological cascades highlight the complex nature of ecological interactions in marine ecosystems and the lack of knowledge about the inter-relationships of many marine species. Prey depletion can largely be avoided through ecosystem-based management in international fisheries and by requiring nations to consider marine mammals and other predators when setting harvest control rules and targets to end overfishing. The agency will continue to advocate in RFMOs for ecosystem-based management and catch limits, allocations, and harvest control rules that consider the marine ecosystem and predator-prey relationships of keystone species such as marine mammals.

Regional efforts

- In Alaska and the Northwest region, much of the existing research on population abundance, distribution, vital rates, and habitat use will be used in studies of prey availability and utilization by transboundary stocks of Steller sea lions, northern fur seals, and southern resident killer whales (SRKW) (Appendix 1, Alaska Objective 1 and Northwest Objective 2).
- The Northwest Region will work with Canada to understand the effects of prey depletion on SRKW and may develop transboundary regulations for the recovery and management of ESA-listed threatened and endangered salmon runs—the primary prey of SRKW. Specifically, NMFS and Fisheries and Oceans Canada sponsored a series of three workshops in 2011–2012 to review available scientific information on the effects of salmon fisheries on SRKW (Appendix 1, Northwest Objective 2).²⁹
- The Southwest Region will conduct studies on the prey habits of Antarctic killer whales to improve understanding of energetics, prey utilization patterns, and potential impacts on pinnipeds, cetaceans, and fishes (e.g., Patagonian tooth fish) in the Southern Ocean (Appendix 1, Southwest Objective 5).

²⁹ Background information on the workshop process and presentations from the first workshop are available at: <http://www.nwr.noaa.gov/Marine-Mammals/Whales-Dolphins-Porpoise/Killer-Whales/ESA-Status/KW-Chnk.cfm>.

MEDIUM PRIORITIES

1. Reduce the Threat of Marine Debris to Marine Mammals by Decreasing the Loss of Marine Debris, Including Derelict Fishing Gear, into the Ocean

Goal Statement: *Reduce the amount of derelict fishing gear and marine debris posing a threat to marine mammals in the marine ecosystem, through international agreements, conservation actions, and education.*

What is the threat?

Marine debris impacts the economy, human health and safety, and the health and survival of fishery resources, wildlife, and habitat. Packing bands, net fragments, lost traps and pots, and ropes and lines can drift at or below the water surface or along the bottom and ensnare wildlife. Ocean garbage such as abandoned and lost fishing gear, plastic bags, and tires can have potentially significant adverse impacts on the marine environment, including:

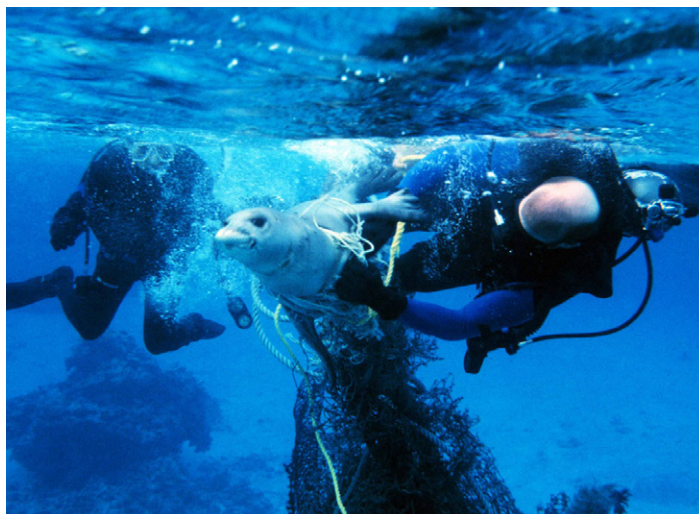
- Hazards posed by floating derelict fishing gear to vessel navigation and to life and property when encountered at sea by water-craft of all sizes.
- Mortality of commercial fish species from derelict fishing gear (“ghost fishing”).
- Introduction of foreign or invasive species to new areas.
- Diminished tourism, recreation, and beach use when marine debris washes ashore onto coastlines and beaches.

Why are marine mammals impacted by the threat?

Marine mammals can become entangled in marine debris, causing serious injury or death. They can also mistake marine debris for food or accidentally consume debris particles while feeding.

How are marine mammals impacted by the threat?

Entanglement leads to suffocation, starvation, drowning, increased vulnerability to predators, reduced productivity, or other injury. It can also restrict the animal’s movement, resulting in exhaustion or infection from the deep wounds caused by tightening material or by drag. Derelict fishing gear, especially, is a serious threat to northern fur seals and such endangered species as Hawaiian monk seals and North Atlantic



Divers free a Hawaiian monk seal from derelict fishing nets. Credit: NOAA National Ocean Service

right whales. Entanglement is also exacerbating declines in Antarctic fur seal³⁰ and Australian fur seal populations.³¹

Ingestion, on the other hand, can lead to starvation or malnutrition when the marine debris prevents absorption of vital nutrients, and can allow pollutants to enter the body, compromise the immune system, and increase susceptibility to disease or result in death. At least 31 species of marine mammals are known to ingest plastic debris,³² including harbor porpoise, pygmy sperm whales, and Blainville's beaked whales.

NMFS 5-Year Strategy: In 2009, the United Nations Environment Programme (UNEP) concluded in *Marine Litter, a Global Challenge* that “deficiencies in the implementation and enforcement of existing international, regional, and national regulations and standards that could improve the situation, combined with a lack of awareness among main stakeholders and the general public, are other major reasons why the marine litter problem not only remains, but continues to increase worldwide.”³³ In March 2011, UNEP and NOAA organized the Fifth International Marine Debris Conference in Honolulu,³⁴ bringing together 440 participants from 38 countries and adopting the “Honolulu Commitment,” 12 actions to reduce marine debris. International organizations, governments at national and sub-national levels, industry, non-governmental organizations, citizens, and other stakeholders were invited to help develop, review, and implement the Honolulu Strategy, a framework to prevent, reduce, and manage marine debris. The Honolulu Commitment requires collective action at global, regional, country, local, and individual levels; NMFS, working through the IWC, can pursue multilateral initiatives to successfully implement the Honolulu Strategy. These include improving global knowledge, understanding, and monitoring of the scale, nature, source, and impact of marine debris, as well as raising awareness of its impact on biodiversity.

A second advance is facilitated through the International Maritime Organization (IMO), which in 2011 adopted a revised Annex V to the International Convention for the Prevention of Pollution from Ships (MARPOL Annex V), which prohibits the discharge of all garbage into the ocean, with regulated exceptions for protection of vessels, mariners, and the environment. Within RFMOs, NMFS can elevate the issue of marine debris and compliance with MARPOL Annex V; NMFS has already led marine debris removal efforts in the Pacific Northwest and the Northwest Hawaiian Islands, removing hundreds of tons of marine debris and derelict fishing gear. Training and capacity-building assistance could be provided by NMFS in world areas where marine debris hot spots overlap marine mammal habitat. Information on the sources of derelict fishing gear removed from the marine environment would be used to increase awareness and encourage compliance with national and international laws, such as MARPOL Annex V.

³⁰ Croxall, J. P., Rodwell, S. and Boyd, I. L. 1990. Entanglement in man-made debris of Antarctic fur seals at Bird Island, South Georgia. *Marine Mammal Science* 6: 221-223.

³¹ Pemberton, D., Brothers, N. P. and Kirkwood, R. 1992. Entanglement of Australian fur seals in man-made debris in Tasmanian waters. *Wildlife Research* 19: 151-159. Jones, M.M., 1995. Fishing debris in the Australian marine environment. *Marine Pollution Bulletin* 30, 25–33.

³² Baird, R.W., and S.K. Hooker. 2000. Ingestion of plastic and unusual prey by a juvenile harbor porpoise. *Marine Pollution Bulletin* 40:719-720.

³³ UNEP, 2009. *Marine Litter: A Global Challenge*. Nairobi: UNEP. 232 pp.

³⁴ <http://www.5imdc.org/>

2. Reduce the Number of Vessel Strikes in International and Foreign Waters

Goal Statement: *Reduce the number of marine mammals struck by vessels through continuing education programs, notifying mariners, and implementing speed restrictions and rerouting vessels in heavily used marine mammal habitats.*

What is the threat?

Serious injury and death can result from marine mammal collisions with vessels. Accurate rates of mortality and injury from ship strikes are difficult to estimate because many carcasses are never recovered and because the cause of death may not be evident when a carcass is found and not thoroughly examined.

Why are marine mammals impacted by the threat?

Marine mammals and shipping operations (e.g., container vessels, tankers, ferries, and whale-watching and recreational vessels) are often concentrated in the same areas. Marine mammals tend to forage in areas of high productivity and dense prey (or target fish) concentrations, and these can overlap with areas used for vessel traffic and other maritime activities. Whale-watching and recreational boats viewing marine mammals may also increase the likelihood of a vessel strike. The magnitude of this threat increases as vessel manufacturing produces larger, faster vessels that increase the risk to marine mammal populations, including those that may already be depleted.

How are marine mammals impacted by the threat?

Many species of whales, dolphins, seals, and sea lions are vulnerable to ship collisions. Cetaceans can be injured or killed outright, depending on the angle, duration of onset, and force of impact (dependent on vessel speed and size). Ship propellers can cut a whale's skin including blubber, and slice off pieces of its tail. Collisions can cause fracturing, internal bleeding, and bruising that is not always noticeable, although wounds and scars seen on the bodies of living animals indicate that some animals survive the initial injuries from collisions. The problem is most serious for populations that are small or already subject to other stressors, such as North Atlantic right whales,³⁵ fin and sperm whales in the Mediterranean Sea,³⁶ southern right whales



This 36-foot, 8.5 ton endangered sei whale was struck by an 800-foot container ship. Credit: Maryland Department of Natural Resources

³⁵ Kraus SD, Brown MW, Caswell H, Clark CW, Fujiwara M, Hamilton PK, Kenney RD, Knowlton AR, Landry S, Mayo CA, McLellan WA, Moore MJ, Nowacek DP, Pabst DA, Read AJ, Rolland RM. North Atlantic right whales in crisis. *Science* 2005; 309: 561-562; and/or Clapham PJ, Young SB, Brownell Jr. RL. Baleen whales: conservation issues and the status of the most endangered populations. *Mammal Review* 1999; 29(1): 35-60.

³⁶ Cagnolaro, L. and Notarbartolo di Sciara, G. 1992. Attivit di ricerca sui cetacei e loro status di conservazione in Italia. *Boll. Mus. Ist. biol. Univ. Genova* 56–57, 53–85.

in Argentina,³⁷ and sperm whales around the Canary Islands.³⁸ Vessel collisions are also a factor in the mortality of the endangered Hector's dolphins in New Zealand,³⁹ Indo-Pacific hump-backed dolphins and finless porpoises in Hong Kong,⁴⁰ and probably many other species of small cetaceans around the world.⁴¹

NMFS 5-Year Strategy: Data on shipping and vessel use areas can provide information on where they collocate with marine mammal aggregations, pointing to potential high-risk areas. Recent developments in electronic navigation and reporting systems have greatly increased the available data on shipping movements and density; of particular value are Automatic Identification System (AIS) and Long-Range Identification and Tracking systems. The Voluntary Observing Ships Scheme may also provide data on historical shipping patterns. International risk assessments are needed, using shipping and whale data overlays to identify probable high-encounter areas and compare them with locations of known ship strike fatalities. Since 2007, the IWC has been developing a global database of collisions between vessels and marine mammals. NMFS will continue contributing to the IWC ship strike database, and help develop a standardized protocol for record entry and data usage. In addition, NMFS will continue its work with the IWC's Ship Strike Working Group to develop worldwide ship strike reduction measures, starting in particular with the ship strike issue in the Mediterranean. This group is collaborating with the IMO to identify ways vessel operators can use risk assessment data to reduce the likelihood of hitting large whales and other marine mammals, such as alternative routing measures. The agency is also working through formal and informal channels with shipping industry representatives, maritime communities, and government representatives to reduce collisions, and NOAA has developed various AIS vessel-monitoring programs for communities attempting to reduce ship strikes.

Regional efforts

The Southwest Region is working with other agencies, scientists, and industry to consider alternative routes into ports to reduce the overlap with whale hot spots, such as cruise industry vessels traveling to Canada and Mexico (Appendix 1, Southwest Objectives 7 and 8). The Alaska Region is working with the USCG and other stakeholders to address the expected increased vessel traffic through the Bering Strait as a result of climate change. Potential marine mammal mitigation or avoidance measures include vessel speed and routing restrictions, establishing cooperative international protocols, and action through the IMO (Appendix 1, Alaska Objective 1).

³⁷ Rowntree, V.J., Payne, R.S., and Schell, D.M. 2001. Changing patterns of habitat use by southern right whales (*Eubalaena australis*) on their nursery ground at Península Valdés, Argentina, and in their long-range movements. *Journal of Cetacean Research and Management* (Special Issue) 2, 133–143.

³⁸ André, M., Ramos, A.G., and Lopez-Jurado, L.F. 1994. Sperm whale acoustic survey off the Canary Islands, in an area of heavy maritime traffic: preliminary results. *European Research on Cetaceans* 8, 65.

³⁹ Stone, G. and Yoshinaga, A. 2000. Hector's dolphin (*Cephalorhynchus hectori*) calf mortalities may indicate new risks from boat traffic and habituation. *Pacific Conservation Biology* 6, 162–171.

⁴⁰ Parsons, E.C.M. and Jefferson, T.A. 2000. Post-mortem investigations on stranded dolphins and porpoises from Hong Kong waters. *Journal of Wildlife Diseases* 36,342–356.

⁴¹ Van Waerebeek K, Baker AN, Felix F, Gedamke J, Iniguez M, Sanino GP, Secchi E, Sutaria D, Helden AV, Wang Y. Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere; building a standardized database. Paper to the IWC Scientific Committee. 16 p. St Kitts and Nevis, West Indies, June (SC/58/BC6), 2006.

3. Prevent Habitat Loss, Degradation, and Disturbance through Marine Spatial Planning and Marine Protected Area Designation

Goal Statement: *Protect critical marine mammal foraging, breeding, and calving areas through the application of marine spatial planning to identify key habitats that are in need of additional regulations or marine protected area designation and management.*



Vessel noise and presence from whale watching vessels pose a risk to southern resident killer whales. Credit: Dawn Noren, NOAA National Marine Fisheries Service

What is the threat?

Marine mammal habitat can be degraded in several ways.⁴² Large dead zones have been created in coastal regions due to runoff of agricultural chemicals. Harmful algal blooms resulting from human-generated runoff are becoming more common and are more severe. Seagrass beds are being lost to trawling, dredging, and coastal construction, including alternative energy sites. Ecotourism activities, such as whale watching and swim-with programs, and increased noise from anthropogenic sources (e.g., shipping, sonar, and seismic testing) are increasingly disturbing marine mammals. Damming, water diversion, and pollution threaten river dolphins.

Why are marine mammals impacted by the threat?

Marine mammals have preferred locations for breeding, giving birth, rearing young, and feeding. These locations have certain physical (including acoustic) and biological oceanographic features that cause marine mammals to select them, but human activities can affect the animals if the habitats are significantly altered, damaged, or destroyed.

How are marine mammals impacted by the threat?

Many activities have reduced the available habitat for freshwater and coastal cetaceans, including harbor construction, land “reclamation,” shoreline development, hydroelectric and water diversion (e.g., irrigation) and flood control projects, alternative energy site construction, oil and gas exploration and development, and aquaculture. Ice seals are losing haul-out sites, particularly important during the pupping season, as warming temperatures degrade and reduce sea ice, and vessels further break up the available ice sheets in the Arctic ecosystem.

Aquatic noise generated by humans is also a serious problem. Sound levels in many oceans, seas, rivers, and lakes have increased dramatically, potentially disrupting important marine mammal activities (e.g., nursing, foraging, and resting), impairing communication by masking the animals’ signals, and even potentially displacing marine mammals from key habitat (e.g., feeding grounds and migration routes). Over the past decade, some mass stranding events of beaked whales have

⁴² Harwood, J. 2001. Marine mammals and their environment in the twenty-first century. *Journal of Mammalogy* 82, 630–640.

been attributed to high-intensity noise from military ship mid-frequency sonars, and airguns used for geophysical research.

NMFS 5-Year Strategy: The preservation and restoration of marine mammal habitat are among the goals of U.S. laws (e.g., MMPA and ESA). International treaties and agreements must be used to conserve important habitat, and marine protected areas are a means to achieve habitat protection. Internationally, marine mammal protected areas (MPAs) are a patchwork of boxes drawn around hot spots and, although growing in number, their effective coverage for many wide-ranging species remains low. Many MPAs have been slow to set up management plans with effective monitoring and enforcement. Management must be continuous and science-based, incorporate ecosystem-based management and monitoring, take into account socioeconomic concerns and larger environmental issues (particularly those related to fisheries, ecotourism and whale watching, anthropogenic sound,⁴³ and ship strikes), and include public participation and education programs. In addition, MPAs must be large enough to be effective and contiguous along national boundaries; for example, the Wadden Sea Agreement for seals covers areas in Germany, Denmark, and Netherlands.⁴⁴ MPAs can be an effective tool to address many of the threats discussed in this Action Plan.

There is an urgent need for a worldwide effort to identify and define key marine mammal habitats and the threats to them. This information must be mapped with other species data and ecogeographic data to: (1) assess data gaps, (2) justify the need for protected area status, and (3) identify specific conservation and management requirements for MPA networks in national waters and on the high seas. National Marine Fisheries Service staff will work through national governments and various regional and international fora, and in collaboration with the International Committee on Marine Mammal Protected Areas, to promote the development and management of these protected areas, as well as to ensure that marine mammals are well represented and included in larger MPA, ocean zoning, and marine spatial planning initiatives. National Marine Fisheries Service was a major sponsor of, and an active participant in, two International Conferences on Marine Mammal Protected Areas and will work to implement the resulting recommendations.

National Marine Fisheries Service staff will work through the International Maritime Organization to institute ship-quieting technologies, the Arctic Council to secure Arctic oil spill response and prevention measures, and the SPAW Protocol to improve coastal zone management in the Caribbean. To ensure the health of marine and coastal habitats, NMFS staff will continue scientific efforts to evaluate and define acoustic thresholds for marine mammals and will establish industry best practices for

⁴³ See Joint Subcommittee on Ocean Science and Technology (2009) *Addressing the Effects of Human-Generated Sound on Marine Life: An Integrated Research Plan for U.S. Federal Agencies*: <http://www.nmfs.noaa.gov/pr/pdfs/acoustics/jsost2009.pdf>

⁴⁴ The trilateral Agreement was concluded between Denmark, Germany, and the Netherlands on October 16, 1990 in Bonn, Germany, and entered into force one year later. The Secretariat is located in Wilhelmshaven, Germany. The trilateral conservation area is situated within the Wadden Sea, and consists of certain areas in the Netherlands, Germany, and Denmark. The geographical range of the Wadden Sea Plan is the Trilateral Wadden Sea Cooperation Area (or Wadden Sea Area), which is an offshore zone three nautical miles from the baseline as fixed nationally including all islands. The aim of the Agreement is to promote close cooperation among the Parties in order to achieve and maintain a favorable conservation status for the Common seal population, which is an irreplaceable component of the Wadden Sea and an important indicator of its environmental health.

seismic surveys and international standards or guidelines for mitigating acoustic impacts on marine mammals.

Regional efforts

Regional efforts will focus on identifying key habitats and implementing measures to reduce disturbances to threatened and endangered species.

- The Northeast will continue its work with Canada to identify North Atlantic right whale critical habitat under the ESA and Species at Risk Act (SARA), and additional conservation measures that should be adopted (Appendix 1, Northeast Objective 1).
- The Northeast will also work with other researchers to coordinate and improve humpback whale research efforts in the Cape Verde Islands, with the goal of defining the threats to, and key habitat of, these whales (Appendix 1, Northeast Objective 4).
- The Southeast will develop transboundary plans for regulating vessels, especially for whale watches and cruise ships in the Gulf of Mexico and wider Caribbean (Appendix 1, Southeast Objective 1).
- The Northwest will work with Canada to develop transboundary regulations for whale watch operations in order to reduce the disturbance to SRKW (Appendix 1, Northwest Objective 2).
- The Southwest will continue to evaluate the impact of oil and gas exploration on the western population of gray whales (Appendix 1, Southwest Objective 6).
- The Pacific Islands will work with the Hellenic Society for the Study and Protection of the Mediterranean monk seal to improve protected area designation and management for this species (Appendix 1, Pacific Islands Objective 2).



International Fund for Animal Welfare staff and volunteers assess white-sided dolphins during a mass stranding event. Credit: International Fund for Animal Welfare

LOW PRIORITIES

Improve Understanding of, and Response to, Disease and Die-offs in Marine Mammal Populations⁴⁵

Goal Statement: *Build the capacity to establish international stranding networks to document and investigate the occurrence of die-offs, disease outbreaks, and mass strandings, and to evaluate the role human activities play in these events.*

What is the threat?

Diseases occur naturally in animal populations, but human activities can introduce them, potentially alter their transmission routes and geographic spread, and alter the animals' sus-

ceptibility to them. Environmental contamination is increasing worldwide (by 1999, some 20 million chemicals had been registered, with 2,000 to 3,000 new chemicals registered every year); these contaminants have increasingly found their way into the marine environment, where their effects on marine mammals are largely unknown. Harmful algal blooms also occur naturally, but some human activities may exacerbate them, as well. The frequency and severity of algal blooms have increased due to greater nutrient loading of coastal waters and the inadvertent transport of harmful species of algae to new places, posing a threat to marine mammals. The prevalence and severity of disease outbreaks or marine mammal die-offs may be exacerbated by contaminants, harmful algal blooms, habitat loss, and reduced amount or quality of prey.

Why are marine mammals impacted by the threat?

Many marine mammals are at the top of the food chain, putting them at risk for accumulating high levels of contaminants in their tissues over their lifetime or assimilating biotoxins present in their prey. Very high levels of PCBs, DDT, and polybrominated diphenylethers (PBDEs) have been documented in the blubber of beluga whales from the St. Lawrence River (Canada) and killer whales off Washington and British Columbia. And freshwater cetaceans may be at greater risk from pollutants than marine cetaceans because they inhabit areas where the pollutant discharges are high and extremely concentrated due to the diminished river flow (e.g., South Asian rivers) caused by extensive damming and abstraction.⁴⁶ Because coastal areas are particularly susceptible to harmful algal blooms, marine

⁴⁵ As this Action Plan was being drafted, the Deepwater Horizon oil spill occurred in the Gulf of Mexico. The lessons learned from that event demonstrated that very little is known about marine mammal health and the effect of oil spills to the well-being of marine mammals. This oil spill renewed interest in oil and gas exploration and development, and an unusual mortality event involving several species of ice seals in the Arctic will likely result in this priority being revisited and possibly elevated.

⁴⁶ Dudgeon, D. 1992. Endangered ecosystems: a review of the conservation status of tropical Asian rivers. *Hydrobiologia* 248, 167–191.

mammals that inhabit these coastal waters and remain in the area of a bloom are subject to the cumulative effects of biotoxins ingested or toxic aerosols inhaled over a period of days or weeks.

How are marine mammals impacted by the threat?

Disease outbreaks and mass mortality events (die-offs), some involving thousands of animals, can affect the long-term survival and reproduction of marine mammal populations, particularly small ones. Examples of major disease events include outbreaks of phocine distemper virus in European harbor seals in 1988 and again in 2002; dolphin morbillivirus in bottlenose dolphins along the U.S. Atlantic coast in 1987–1988, striped dolphins in the Mediterranean Sea,⁴⁷ and various cetacean species in the Gulf of California;⁴⁸ and morbillivirus in Baikal seals in Lake Baikal (1988) and Caspian seals in the Caspian Sea (2000). The lower immunocompetence induced by contaminants aggravated these die-offs, and exposure to high levels of contaminants played a key role in facilitating the transmission of the virus and increasing the susceptibility of individuals to the disease.

Marine mammal die-offs linked to harmful algal blooms include multiple large-scale events in sea lions, dolphins, and southern sea otters along the California coast attributed to domoic acid from an algal diatom. Die-offs of manatees and bottlenose dolphins were linked to brevetoxin produced by red tides in Florida. Saxitoxin-related deaths of humpback whales in Cape Cod Bay and bottlenose dolphins in Florida's Indian River Lagoon were caused by dinoflagellate protozoa. Phycotoxins were suspected as a cause of mortality of endangered Mediterranean monk seals in West Africa.

NMFS 5-Year Strategy: Establishing or supporting international stranding response networks, and improving coordination and communication among disease specialists, regional stranding response groups, and marine mammal biologists, are vitally important to marine mammal protection and conservation. Stranding events offer a window of opportunity to learn about emerging diseases, harmful algal blooms, and pollution/contamination problems for marine mammals. Determining the cause and effect of disease outbreaks and die-offs of marine mammal populations is challenging because baseline data are often lacking. While many well-coordinated national stranding programs are conducted around the world, disease research activities and outbreak/stranding information for marine mammals traditionally have been poorly coordinated in terms of field methods, data collection, reporting, and information exchange. Because some marine mammal species are migratory and use waters within the jurisdiction of many countries and regions, health and disease assessment is particularly challenging. For example, infectious diseases may be introduced in one area and disseminated rapidly across national boundaries and ocean basins, making response coordination and communication key components of any conservation strategy.

Enhancing the capacity and support for stranding response networks and sampling programs in developing nations improves data quality and helps to ensure a timely response to emerging situations that threaten marine mammal populations.

⁴⁷ Aguilar, A. 2000. Population biology, conservation threats and status of Mediterranean striped dolphins (*Stenella coeruleoalba*). *Journal of Cetacean Research and Management* 2, 17–26.

⁴⁸ Vidal, O. and Gallo-Reynoso, J.-P. 1996. Die-offs of marine mammals and sea birds in the Gulf of California, México. *Marine Mammal Science* 12, 627–635.

The agency will develop a Marine Mammal Stranding Response Training Strategic Plan that will lay out the goals, resources, and priorities related to marine mammal stranding response training, research, and conservation efforts, and will standardize the “stranding response tool kit and protocol” for countries seeking to formalize their stranding response, including an interactive web-based training. The tool kit will include marine mammal identification guides, training materials, necropsy tools, protective gear, and other materials tailored to the needs of individual countries. In addition, NMFS will develop a comprehensive list of Marine Mammal Stranding Response professionals in the United States (chiefly within NOAA), including veterinarians, pathologists, biologists, taxonomic specialists, disentanglement specialists, and oil spill response experts (Appendix I, Fisheries International Affairs Objective 3) .

NMFS will convene international training workshops for individuals from international organizations and governments in Africa, Latin America, the Caribbean, the Pacific Islands, Asia, and other interested countries to provide stranding network and disentanglement training where none exist; enhance the capabilities of existing networks; and improve data collection, communication, and coordination between stranding programs, fishery observer programs, and regional networks (Appendix I, Southeast Objective 2 and Northwest Objective 3). This training will significantly improve the response to live/dead marine mammal strandings and entangled marine mammals, data gathering and stranding investigations, necropsies, mass stranding response, epidemiology, identification of emerging diseases, oil spill response, and identification of human impacts (e.g., fishery bycatch and marine debris). Over the long term, the outcomes of these hands-on stranding training and mock disentanglement demonstrations will contribute significantly to marine mammal medicine, our understanding of the biology and threats facing marine mammals, and our ability to effectively disentangle marine mammals and respond to human-caused disasters such as oil spills.

Through the IWC’s Cetacean Emerging and Resurging Disease Working Group, NMFS will continue to support efforts to increase communication and understanding of disease and pollution/contaminants; further our ability to monitor, detect, and respond to trends in marine mammal disease outbreaks across the globe; and assist in the conservation of critically endangered species.

Regional efforts

The Pacific Islands Region is examining the impact of contaminants on Hawaiian monk seals and developing vaccines and vaccination strategies should a disease outbreak occur. These scientific designs, vaccines, or protocols will be shared, refined, and implemented to assist researchers with the conservation of the critically endangered Mediterranean monk seal (Appendix I, Pacific Islands Objective 2).

Conclusion

Because they are often highly migratory and transboundary, many marine mammals and their habitats are affected by the activities of more than one nation. Marine mammals and threats to them are thus most effectively studied and managed through international cooperation. The National Marine Fisheries Service proposes to lead capacity-building projects, champion marine mammal bycatch monitoring and reduction measures in RFMOs, develop cooperative arrangements to address these multinational threats, and lead collaborative research efforts. Cooperation may be sharing information on transboundary stocks and technologies to reduce threats to marine mammals or formal agreements to study and manage resources in international waters (e.g., RFMOs or intergovernmental agreements).

The NMFS leadership believes that these Action Plan strategies are essential to achieve NOAA's Next Generation Strategic Plan goals: (1) improved understanding of ecosystems to inform resource management decisions and (2) recovered and healthy marine and coastal species. These actions also meet the MMPA's international mandate and goals to: (1) maintain marine mammals as functioning elements of their ecosystem(s) and preserve the health and stability of the marine ecosystem, (2) reduce the adverse impacts of fishing and other practices on marine mammals to sustainable and ultimately insignificant levels, (3) recover marine mammal populations and protect essential habitats, and (4) promote international efforts to encourage research on and conservation of marine mammals.

The agency's capabilities can address emerging environmental and economic issues related to marine mammal conservation and management. The complex cultural, societal, economic, and environmental impacts associated with international marine mammal conservation and management requires a concerted, systematic, rapid, and sustained effort with international partners from the diplomatic and grassroots levels. The agency's scientific capabilities can increase understanding of marine mammal populations and threats, and its international policy capacity can offer technical expertise to develop policy options and conservation and management strategies to mitigate threats. In FY 2011, implementation of this Action Plan could have been accomplished largely through existing levels of funding; however, budget reductions in FY 2012 and additional reductions anticipated in FY 2013 have mounted a serious challenge to NMFS' ability to accomplish the Plan's goals. Therefore, an investment beyond current levels of support for research and mitigation will be required for success. The Action Plan strengthens NMFS budget planning should funds become available.

APPENDIX 1

DETAILED REGIONAL MARINE MAMMAL ACTION PLANS

Introduction

This appendix provides detailed objectives currently planned in the regions and headquarters to implement the Action Plan's strategic priorities. The objectives are actions likely to occur over the next 5 years, even without significant additional staff or money.

These objectives integrate NMFS' international work across NMFS Regional Offices, Science Centers, and Headquarters Offices (e.g., International Affairs, Science and Technology, Protected Resources); where appropriate, objectives also pertain to international and government organizations, U.S. agencies, non-governmental organizations, and academia. These partnerships can leverage limited funds for collaborative scientific research projects, support bilateral and multilateral forums, and apply the science to inform international conservation and management decisions.

Considered together, the objectives describe a comprehensive approach that includes activities in the areas of science, policy, capacity building, and government-to-government actions. The integrated approach of the Action Plan capitalizes on the diverse capabilities of NMFS, supports existing priorities, and leverages the strengths of all partners. Implementation of these objectives will advance international marine mammal conservation and management efforts. The Action Plan will be a living document with the working group continuing to refine, adjust as necessary, and implement its strategies to accomplish these objectives.

Northeast Action Plan

Objective 1: Mitigate principal threats of bycatch and ship strikes in the United States and Canada.

Species: North Atlantic right whale (other transboundary marine mammal stocks, e.g., harbor porpoise).

Threat: Bycatch and habitat degradation.

Partners: NERO, NEFSC, SERO, SEFSC, Stellwagen Bank National Marine Sanctuary, F/IA, F/PR.

Strategies

- **Science:** Conduct passive acoustic monitoring of right whales around the U.S./Canadian transboundary line to better define habitat use. Share information on ship traffic (e.g., AIS data) and entanglement.
- **Policy:** Develop with Canada an international plan to identify western north Atlantic right whale critical habitat. Work with Canada to identify additional conservation measures that should be adopted within critical habitat.
- **Capacity building:** Investigate the need for additional cooperative disentangle-ment training in Canada and consider joint research efforts to develop effective mitigation measures to reduce right whale entanglement in pot and gillnet gear.
- **International government-to-government:** Continue convening NMFS Northeast Region and DFO Maritime Region Species at Risk Working Group meetings (two meetings annually). Also, include right whale bycatch mitigation and critical habitat issues as part of the Canadian Bilateral discussions, and continue transboundary coordination of entanglement reporting, disentangle-ment efforts, and collaboration on conservation activities.



The Northeast objectives include reducing the threats of bycatch and ship strikes to North Atlantic right whales. Credit: NOAA National Marine Fisheries Service

Expected Conservation Outcome: Implementation of this objective will improve information on right whales (and other transboundary marine mammal stocks) and the threats facing them, and improve management of those threats in the United States and Canada.

Justification: The whereabouts of western north Atlantic right whales are generally not known for a large portion of the year. Passive acoustics is an effective tool to determine right whale presence, aggregation, and movements along the U.S./Canadian maritime boundary. These acoustic data may provide clues to valuable right whale habitat and fill a data void in seasons when sightings are not

available. An international and collaborative U.S.-Canada effort will result in actions to protect western north Atlantic right whale habitat on both sides of the border, mitigate ship strikes, and reduce bycatch. Current management of right whales is limited by lack of effective action to address entanglement in Canadian waters; continued engagement in bilateral fora, supported by new research findings, may lead to improved management of right whales and will support NOAA's efforts to recover this species.

Objective 2: Coordinate and improve bycatch monitoring and mitigation across the North Atlantic.

Species: All marine mammal bycatch species in the North Atlantic.

Threat: Bycatch.

Partners: NEFSC, F/IA, F/PR.

Strategies

- **Science:** NEFSC staff will participate in ICES Working Groups to publish a report on member nation fisheries, estimating bycatch in these fisheries, summarizing lessons learned from research, and identifying mitigation measures that can be used in U.S. domestic fisheries and foreign fisheries in the North Atlantic that export fish and fish products to the United States.
- **Policy:** NEFSC staff will work within the ICES Bycatch Working Group to draft recommendations for implementing or improving member nation marine mammal bycatch assessment, monitoring, and mitigation programs.
- **Capacity building:** Lessons and tools used in U.S. Atlantic fisheries and those identified in the ICES report will be used to recommend bycatch observer strategies and mitigation actions for specific regional fisheries.
- **International government-to-government:** NEFSC will attend the ICES meeting and participate in the ICES Working Group on Bycatch. F/IA staff working with F/PR, NEFSC, and NERO will prepare a resolution for consideration at North Atlantic Fisheries Organization (NAFO) that calls upon member nations to collect marine mammal bycatch data and, where possible, adopt bycatch mitigation strategies.

Expected Conservation Outcome: Implementing this objective will improve information on the bycatch of marine mammals, and identify, develop, and implement bycatch mitigation strategies in North Atlantic commercial fisheries.

Justification: The MMPA requires that nations exporting fish and fish products to the United States do not have a marine mammal incidental mortality or serious injury in excess of U.S. standards. Therefore, it is vital that NOAA share its expertise in bycatch assessment and mitigation with other North Atlantic nations through the multilateral processes of NAFO and ICES in order to promote improved management of fishery interactions with shared or high seas marine mammal stocks, including fisheries that could or do involve U.S. fishermen/vessels.

Objective 3: Convene a series of workshops on gillnet bycatch to develop and share mitigation methods and regulatory frameworks to address bycatch in artisanal gillnet fisheries.

Species: Marine mammal species globally.

Threat: Bycatch.

Partners: F/IA, F/PR, NEFSC, New England Aquarium; other partners sought.

Strategies

- **Science:** NEFSC staff has planned three workshops over the next 5 years. Workshop 1 (October 2011) documented the state of the art in gillnet bycatch mitigation and developed recommendations for future research and actions to mitigate bycatch. Workshop 2 (November 2011 at Society for Marine Mammalogy Biennial) identified key nations where bycatch in artisanal gillnets is a problem for marine mammals, informational needs, and initial actions that can be taken to address marine mammal bycatch in these gillnet fisheries. Workshop 3 (2012) will focus on catalyzing action to address bycatch in artisanal gillnet fisheries that pose the greatest threat to marine mammals.
- **Policy:** To further compliance with the MMPA, the mitigation measures developed through these workshops can be used to address bycatch in coastal gillnet fisheries where the fish and fish products are exported to the United States.
- **Capacity building:** A toolkit or framework developed through these workshops could be used for capacity-building discussions and/or negotiations for common mitigation requirements.
- **International government-to-government:** The first two workshops were international in scope; the third workshop likely will be regional and include involvement of government agencies in the chosen region. The follow-up capacity-building work in other nations/regions will assist nations in their compliance efforts with the MMPA and the Magnuson-Stevens Fishery Conservation and Management Reauthorization Act (MSRA). This toolkit also can be used to establish guidelines under the FAO to reduce the bycatch of marine mammals in commercial fisheries (discussed below).

Expected Conservation Outcome: This objective will result in a set of best practices for mitigating artisanal gillnet bycatch, a serious threat to coastal marine mammals, including several critically endangered species. These best practices can then be used in international negotiations and various capacity-building efforts, for example, the third workshop.

Justification: In 1990, the SWFSC brought scientists from around the world to La Jolla, California, to discuss fishery bycatch of cetaceans. The proceedings of this workshop are still relevant, but bycatch requirements of the MSRA and Section 101 of the MMPA require a sharper, more detailed regional focus to document international, national, and artisanal fisheries; review the information on marine mammal populations; estimate the bycatch in these fisheries; and explore possible mitigation measures. Such information will be instrumental in capacity building and may contribute to regional international agreements similar to the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas. These workshops will allow NMFS to share its expertise in bycatch assessment and mitigation with developing nations. Finally, mitigation measures identified in these workshops could provide insight into management approaches for mitigating bycatch in coastal gillnet fisheries in the United States.

Objective 4: Coordinate, collaborate, and improve humpback whale research efforts in the Cape Verde Islands, Northeast Atlantic Ocean.

Species: Humpback whales.

Threat: Bycatch and habitat loss/degradation.

Partners: NEFSC, College of the Atlantic, Allied Whale.

Strategies

- **Science:** Expedite the collection of humpback whale acoustic recordings and fluke identification photographs and attempt to gather humpback whale genetic samples for future analysis.
- **Policy:** Provide information on current regulations and guidelines from other regions of the globe that have breeding/calving humpbacks and conflicts with development and tourism (i.e., whale watching regulations, jet skis, etc.).
- **Capacity building:** Provide letters of support for NGO grant applications to support further research; suggest guidance to the Cape Verde government on potential negative impacts (i.e., harbor development, dredging, jet skis, whale watching etc.) that may affect humpback whales breeding and calving in these waters.
- **International government-to-government:** Work directly with the Cape Verde government to identify areas that could be designated marine mammal protected areas and assist it in developing management plans and regulations to address threats to humpback whales in its waters.

Expected Conservation Outcome: Implementing this objective will improve information on humpback whales and the threats facing them, and improve management of those threats in both the United States and the Cape Verde Islands.

Justification: There is a need for scientific collaboration to improve our baseline understanding of north Atlantic humpback whales and threats facing them and to improve international management of shared stocks of humpback whales.

Northwest Action Plan

Objective 1: Improve transboundary coordination of large whale entanglement reporting and response.

Species: Humpback and gray whales.

Threat: Bycatch.

Partners: NWRO, NWFSC, SWRO, AKR, F/IA, DFO-Canada, Mexico.

Strategies

- **Science:** Collect data on entanglement events, live sightings, and strandings. Use photo identification and genetic studies to define stock involvement. Use longitudinal studies to provide information on the rate and evidence of entanglement and survival.
- **Policy:** Develop and implement domestic take reduction strategies for ESA-listed humpback whales. Develop with Canada and Mexico an international plan to share information on the rate of entanglement, response to entanglement events, and survival rate of disentangled whales. Work with these nations to identify additional conservation measures that should be adopted to reduce the entanglement of large whales.
- **Capacity building:** Initiate a system to promote data sharing across states and nations to better define the risk. Enhance entanglement reporting to quantify the risk and support intervention (disentanglement) and mitigation.
- **International government-to-government:** Organize a trilateral workshop with Mexico and Canada on Disentanglement Response and Entanglement Mitigation of large whales.

Expected Conservation Outcome: By implementing this objective NMFS will determine whether humpback whale entanglement events are confined only to U.S. fisheries or if Canadian and Mexican fisheries also pose an entanglement risk. National Marine Fisheries Service will identify and implement fishery management actions to reduce the risk of entanglement, maintain sustainable fisheries harvest production, and reduce reliance on high-risk on-the-water disentanglement, and will determine whether the current level of entanglement is delaying species recovery.

Justification: Current entanglement levels of humpback whales in fixed gear fisheries may be approaching or exceeding the stock potential biological removal (PBR) level. Stock identification of whales in the NWRO/transboundary area is uncertain but both potential stocks (CA/OR/WA and Central North Pacific/SE AK) appear to be increasing. Gear and vessel mitigation options are limited in this high-value fishery. Transboundary efforts would complement domestic take reduction priority planning on the West Coast in SWRO/NWRO.

Objective 2: Continue coordination of transboundary research and recovery efforts for threatened and endangered species, specifically southern resident killer whales and several salmon stocks.



The Northwest objectives include coordinating research and recovery efforts with Canada on southern resident killer whales. Credit: NOAA National Marine Fisheries Service

- **Capacity building:** Work with DFO-Canada to undertake capacity-building projects to implement transboundary regulations.
- **International government-to-government:** Continue research and management collaboration between NWFSC, NWRO, and DFO-Canada on SRKW vessel interactions, prey depletion, and distribution and movement patterns; on management and recovery of salmon stocks; and on SRKWs and salmon critical habitat. For example, NMFS and DFO-Canada are holding a series of three workshops in 2011–2012 to review available scientific information on the effects of salmon fisheries on SRKWs.

Expected Conservation Outcome: Collaboration between the United States and Canada will assist recovery of the SRKW.

Justification: SRKWs are a small population, listed as endangered under both the U.S. ESA and Canada's SARA, and recovery is uncertain. Both countries have identified similar risk factors and data gaps relevant to the population's recovery. Two main issues that are transboundary in nature are (1) regulations to minimize vessel disturbance (particularly during the summer season within both countries' designated critical habitats for SRKWs), and (2) management actions to ensure there is an adequate prey base (several salmon species, but primarily Chinook salmon) during the summer months in both critical habitats. Additionally, in 2011 NMFS issued regulations governing vessel behavior near SRKWs to minimize vessel effects. The international boundary with Canada bisects a key area where killer whales encounter concentrated recreational and commercial vessel activity. Transboundary coordination is recommended to avoid mixed messaging between the United States and Canada. Another issue is the data gap on winter distribution and habitat use patterns of SRKWs, so continued research collaboration, particularly to determine habitat use and movement patterns, is needed to meet management goals for both countries.

Species: Southern resident killer whales.

Threat: Prey depletion, disturbance, habitat degradation/loss, disease/pollution contaminants.

Partners: NWRO, NWFSC, SWRO, AKRO, F/IA, DFO-Canada.

Strategies

- **Science:** Conduct research to address risk factors and data gaps identified in the SRKW ESA Recovery Plan and the SRKW SARA Recovery Strategy (Canada).
- **Policy:** Develop transboundary plans for vessel regulations, and recovery and management actions for runs of threatened and endangered salmon (the preferred prey of SRKW).

Objective 3: Continue coordination of transboundary research on marine mammal strandings and diseases (fund essential analyses and travel to encourage international collaboration on shared stocks).

Species: Eastern North Pacific marine mammals.

Threat: Bycatch, marine debris, vessel strikes, disease, pollution/contaminants, harmful algal blooms.

Partners: NWRO, NWFSC, AKRO, AKFSC, F/PR, F/IA, DFO-Canada.

Strategies

- **Science:** Collect data on stranding events and post-mortem examination to determine the incidence of human interaction; collect samples for disease detection and cause of death determination.
- **Policy:** Monitor current stranding events against the baseline to detect unusual events or trends that could signal new resource conflicts with fisheries or humans.
- **Capacity building:** Capacity building for stranding investigations is gaining momentum in Canada. Established responders in NWRO can share response strategies and expertise. Transboundary data sharing may assist the understanding of events affecting both countries.
- **International government-to-government:** Continue research and management collaboration between NWFSC, NWRO, and DFO-Canada on response to marine mammal strandings.

Expected Conservation Outcome: Collaborative work with Canada will enhance transboundary investigations of stranding events involving shared species or unusual mortality events, and improve the potential for management partnerships on human interactions that result in transboundary strandings.

Justification: The objective addresses multiple-level priorities on scientific exchanges and analysis on several endangered or threatened species, such as SRKW, Steller sea lions, North Atlantic and North Pacific right whales, and other species (e.g., harbor porpoises and ETP dolphins). Stranding reporting and investigation is improving on both sides of the international boundary with Canada, providing data on impacts of bycatch/marine debris, ship strikes, and contaminants. This objective would explore the potential for resource sharing in the transboundary area.

Southeast Action Plan

Objective 1: Undertake coordinated transboundary research and recovery efforts for marine mammals, especially species that are threatened or endangered.

Species: Marine mammals in the Gulf of Mexico and wider Caribbean.

Threat: Prey depletion, disturbance, habitat degradation/loss, disease, pollution/contaminants.

Partners: SERO, SESC, F/IA, F/PR.

Strategies

- **Science:** Conduct collaborative research with Mexico, Cuba, and Caribbean nations to identify risk factors and data gaps pertaining to marine mammals in the Gulf of Mexico and wider Caribbean.
- **Policy:** Develop transboundary plans and management actions for marine mammals in the Gulf of Mexico and the wider Caribbean based on identified risk factors.
- **Capacity building:** Advocate for regulations/guidelines for whale watching within the Specially Protected Areas and Wildlife (SPAW) protocol and undertake capacity-building projects to implement the transboundary guidelines and regulations.
- **International government-to-government:** Continue research and management collaborations with Cuba, Mexico, and Caribbean nations to document vessel interactions, and marine mammal distribution and movement patterns, and to evaluate management and recovery efforts. Work collectively to implement the Marine Mammal Action Plan under the SPAW protocol.



Stranding training workshop in Panama.
Credit: Nancy Daves, NOAA National Marine Fisheries Service

Expected Conservation Outcome: This collaborative work will greatly assist in understanding the threats facing marine mammals in the Gulf of Mexico and the wider Caribbean.

Justification: Information is lacking on marine mammals and the threats to them in the Gulf of Mexico and the wider Caribbean region. To better understand the threats facing marine mammals, it is necessary to conduct coordinated stock assessments or work with neighboring countries to conduct assessments of shared stocks.

Objective 2: Improve marine mammal stranding response throughout the wider Caribbean through workshops and training.

Species: Marine mammals in the Gulf of Mexico and wider Caribbean.

Threat: Prey depletion, disturbance, habitat degradation/loss, disease, pollution/contaminants.

Partners: SERO, SESC, F/IA, F/PR, non-governmental organizations, and international organizations (e.g., SPAW, Eastern Caribbean Cetacean Network, IFAW).

Strategies

- **Science:** Improve data collection and management for stranding events, post-mortem examination to determine the incidence of human interaction, tissue collection and analysis for disease detection, and cause of death determination.
- **Policy:** Facilitate an enhanced stranding response, training and equipment acquisition to ensure preparedness for stranding events, data collection, and data management. Through partnerships with SPAW, Mexico, and the Bahamas, monitor current stranding events against the baseline to detect unusual events or trends that could signal new resource conflicts with fisheries or humans and/or other anthropogenic impacts.
- **Capacity building:** Capacity building for stranding investigations is ongoing in the wider Caribbean. Established responders in the Caribbean can share response strategies and expertise to build greater preparedness for large-scale events (e.g., oil spills, natural disasters, disease, etc.). Trans-boundary data sharing may improve the understanding of events that affect the region.
- **International government-to-government:** Continue capacity-building collaboration among SPAW parties, including France and Spain, to enhance response to marine mammal strandings.

Expected Conservation Outcome: Collaborative stranding response throughout the wider Caribbean will help document the threats facing marine mammals in the Gulf of Mexico and the wider Caribbean.

Justification: Information is lacking on marine mammals in the Gulf of Mexico and the wider Caribbean region. In most cases, stranding data are the only data available to assess threats facing marine mammals.

Objective 3: Implement the provisions of this Action Plan under the SPAW protocol that calls for an evaluation of bycatch data and documentation of its rate and occurrence in the wider Caribbean.

Species: Marine mammals in the Gulf of Mexico and wider Caribbean.

Threat: Bycatch.

Partners: SERO, SESC, F/IA, F/PR. Technical collaboration with academic, non-governmental, and international organizations (e.g., FAO, Global By-Catch Assessment Project of Duke University and Blue Ocean Institute, IWC).

Strategies

- **Science:** Use observer data and other databases to provide bycatch rates and estimates from U.S. fisheries and international fisheries operating in the wider Caribbean, including fishery characterizations. Collect data on stranding events, post-mortem examination to determine incidence of human interaction, tissue collection and analysis for disease detection, and cause of death determination.
- **Policy:** Through the regional Fishery Management Councils, NOAA regional collaborative teams, and the SPAW Protocol, characterize fisheries in the wider Caribbean, emphasizing Puerto Rico, Cuba, and Mexico. Collect stranding data, reports of marine mammal–fishery interactions, and other pertinent data to better understand the geographic scope and intensity of marine mammal bycatch and identify areas for bycatch reduction. Work with Mexico will yield information on the potential impact of gillnet fisheries on transboundary stocks of bottlenose dolphins and other marine mammals.
- **Capacity building:** Several countries have established commercial fisheries catch-and-effort data collection programs and improvements should include Caribbean region-wide databases, and training programs on species identification and natural history data collection by fishermen (both commercial and recreational) and other stakeholders. Such programs should encourage fishermen to report to national authorities any incidental catches or damage to animals that are later released but have a low chance of survival, and should also encourage consistent reporting on stranded marine mammals.
- **International government-to-government:** The Southeast will provide support for an evaluation of data and documentation of marine mammal bycatch and depredation in the wider Caribbean. The project will quantify the magnitude of marine mammal takes (direct and bycatch) by both commercial and recreational gear and distribution of fishing effort by gear type. Information will be disseminated to appropriate technical and scientific fora on progress and barriers as well as the most problematic interactions and those causing serious injury and mortality.

Expected Conservation Outcome: This effort will evaluate and promote the mitigation of marine mammal bycatch in the wider Caribbean.

Justification: The population-level significance of marine mammal mortality or injury due to bycatch generally is unknown in the wider Caribbean region. Also, in some locations in the wider Caribbean, marine mammals are captured intentionally as bait for artisanal fishing. An improved understanding of the magnitude and impact of these events is needed. Information on marine mammal bycatch is also needed from onboard observer programs.

Southwest Action Plan

Objective 1: Work to prevent extinction of the vaquita.

Species: Vaquita (*Phocoena sinus*).

Threat: Bycatch.

Partners: SWFSC, F/IA, F/PR, SERO; Mexican agencies; and environmental NGOs.

Strategies

- **Science:** Work collaboratively with Mexico to: (1) conduct passive acoustic monitoring of the vaquita population to detect trends in abundance, (2) design and analyze data on spatial distribution of vaquita and fishing effort and evaluate the efficacy of conservation efforts and protected areas, (3) estimate vaquita abundance and trends, and (4) develop alternative fishing gear that eliminates vaquita bycatch.
- **Policy:** Work collaboratively with Mexico and with gear experts to develop and test new smaller trawl nets that can reduce bycatch and be substituted for gillnets.
- **Capacity building:** Work collaboratively with Mexico to provide training in acoustic monitoring and analysis, provide space for visiting scientists on surveys and research expeditions, and engage in alternative gear development.
- **International government-to-government:** Continue scientific collaborations with the Instituto Nacional de Ecología (INE), and Secretary of Environment and Natural Resources (SEMARNAT), Mexico; and encourage renewed attention to this issue in the Canada/Mexico/U.S. Trilateral Committee of Wildlife and Ecosystem Conservation and Management, and during the U.S.-Mexus meetings. Seek continued engagement of the Marine Mammal Commission, IUCN, and IWC and the continued efforts of the Vaquita Recovery Team to develop gear alternatives and continue population assessments.

Expected Conservation Outcome: These efforts will yield improved information on vaquita distribution, abundance, and trends, and serve as a model of passive acoustic monitoring methods for other regions and coastal species, such as harbor porpoise populations in U.S. waters. Similarly, the development of alternative gear to reduce vaquita bycatch may help in mitigating bycatch of coastal small cetaceans in other regions.

Justification: The vaquita is the most endangered marine mammal species in the world, with a surviving population of only approximately 250 individuals. Scientists from the SWFSC were invited by the Government of Mexico to engage in collaborative efforts to design a monitoring and research plan using passive acoustics—the only practical method for determining whether vaquita populations are continuing to decline or whether efforts to remove gillnets are working and the population is increasing.



Vaquita in the Gulf of California. Credit: Thomas A. Jefferson (Permit Oficio No. DR/488/08 Secretaría de Medio Ambiente y Recursos Naturales).

Objective 2: Continue efforts to reduce the bycatch of pelagic dolphins in the Eastern Tropical Pacific (ETP) purse seine tuna fishery to levels approaching zero.

Species: All ETP cetaceans with a focus on stocks of spinner and spotted dolphins impacted by the purse seine fishery for tuna.

Threat: Bycatch.

Partners: SWFSC, SWRO, F/PR, F/IA.

Strategies

- **Science:** Monitor trends in abundance using multidisciplinary approaches during at-sea surveys; research to evaluate hypotheses explaining the lack of recovery of ETP dolphin stocks.
- **Policy:** Develop and advance a management plan to further restrict dolphin mortality to meet the goals of the AIDCP, including limits on the size of the herd that can be set upon, limits on dolphin sets, and the renewal of tuna boat research. Continue to conduct skipper workshops to reduce bycatch for U.S. captains who operate in international waters.
- **Capacity building:** The United States will work through the Scientific Advisory Board of the AIDCP to offer space for scientists to collaboratively evaluate whether current management measures are sufficient to promote recovery of ETP dolphin stocks over the long term.
- **International government-to-government:** SWFSC research supports the U.S. delegation to the AIDCP. For the survey cruises, research clearance is needed from 11 countries (France, and Central American and South American countries between and including Mexico and Peru). Through the AIDCP, the United States should use the Scientific Advisory Board to develop a multinational research plan for investigating explanations for the lack of dolphin recovery.

Expected Conservation Outcome: These efforts will yield up-to-date estimates of population abundance and trends as well as information on the failure to recover ETP dolphin stocks.

Justification: Since the 1970s the SWFSC has been responsible for monitoring and conducting research on dolphins incidentally taken in the ETP purse seine fishery for tuna. This research is mandated by the MMPA, and it provides critical support to the AIDCP. A primary goal of the AIDCP is to reduce dolphin mortality in the fishery and ensure the long-term sustainability of these stocks. The SWFSC is the only entity that provides dolphin monitoring and research results to AIDCP parties. This information forms the basis for management measures, including setting annual dolphin mortality limits, while the AIDCP independent observer program monitors dolphin mortalities and provides the certification that tuna meet “dolphin-safe” labeling standards. Without the research cruises conducted by the SWFSC, the AIDCP parties would have no information about the effectiveness of current management measures or the need for new measures. Research cruises provide the data needed for these stock assessments, and research conducted by SWFSC scientists focuses on why the dolphin stocks are failing to recover despite a 99.9 percent decline in mortality. Without the abundance data obtained from cruises, the U.S. “dolphin-safe” labeling standard for tuna will be vulnerable to challenges as is currently occurring in the World Trade Organization.

Objective 3: Detect, monitor, and predict the effects of harvest and climate change on Antarctic pinnipeds.

Species: Antarctic fur seal and other Southern Ocean pinniped species.

Threat: Prey depletion, climate change, and exploitation.

Partners: F/IA, NOAA Office of International Affairs, Department of State, and research partners: UCSC, Sonoma State University, Old Dominion University, Dalhousie University, Australian Antarctic Program, Vallejos, Instituto Antártico Chileno.

Strategies

- ***Science:*** The NMFS U.S. Antarctic Marine Living Resources (AMLR) Program assesses the status of Southern Ocean krill and krill-dependent predators by conducting annual multifaceted collaborative land, sea, and aerial surveys. The primary objectives of the AMLR pinniped research program are to investigate factors that influence the population dynamics (especially feeding ecology, reproductive success, growth, and condition), demography, and abundance of Antarctic fur seals. Efforts are focused on, but not limited to, krill-dependent predators and the potential influence of commercial fisheries on long-term reproductive performance. Monitoring protocols have been designed to measure foraging and reproductive performance over a range of temporal scales (summer, winter, or multiyear) and spatial scales (inshore, offshore, or regional). Investigations of Antarctic fur seals, using standard protocols of the Convention for the Conservation of Antarctic Marine Living Resources (CCAMLR) Ecosystem Monitoring Program, are conducted at Cape Shirreff.
- ***Policy:*** The United States is one of 25 nations that regulate fishing activities in waters surrounding the southern continent under the CCAMLR. AMLR is a national program providing information needed to develop and support U.S. policy on the conservation and management of the living marine resources in the ocean areas surrounding Antarctica.
- ***Capacity building:*** Since it began 25 years ago, AMLR has been an international leader in collaboration, bringing together scientists and students from around the world, both in the field and at CCAMLR headquarters in Australia.
- ***International government-to-government:*** Field surveys are conducted *in situ* each year, with subsequent analyses and results presented to the international community during the CCAMLR working group meetings. The data and results collected and presented by the U.S. AMLR Program form a basis for many fisheries management decisions by CCAMLR. Commercial U.S. fishing activities are also monitored, with results again presented to and used by CCAMLR for managing fisheries resources.

Expected Conservation Outcome: Implementing this objective will improve estimates of predator biomass and demands; estimates of population abundance and trends and predictions of growth or decline; ability of CCAMLR to allocate the commercial catch of krill to include the needs of krill-dependent predators; and understanding of the impacts of climate change in the Antarctic Peninsula, South Shetland region, up to South Georgia and the South Atlantic. Another outcome would be an agreement on a Ross Sea Marine Protected Area for ecosystem and living marine resource protection needed by Ross Sea marine mammals.

Justification: NOAA's Antarctic Ecosystem Research Division (AERD) has studied the ecosystem around the South Shetland Islands and the Antarctic Peninsula since the 1980s, as mandated by the AMLR Convention Act, a ratification of the international CCAMLR (CCAMLR was signed in 1980, after many Antarctic populations were decimated due to unmanaged exploitation). Today, populations of whales, penguins, seals, fish, and krill face the challenge of adapting to a rapidly changing habitat, as sea surface temperatures are rising in this ecosystem faster than in most areas of the world. Additional legislative mandates include the Convention for the Conservation of Antarctic Seals and the MMPA.

Objective 4: Increase the understanding of abundance, stock structure, morphology, life history parameters, and bycatch of short- and long-beaked common dolphins in coastal fisheries.

Species: Short- and long-beaked common dolphin (*Delphinus delphis* and *D. capensis*, respectively).

Threat: Bycatch.

Partners: SWFSC, SWRO, F/IA, F/PR.

Strategies

- **Science:** Based on data collected during the joint U.S.-Mexico ecosystem survey of *Delphinus*, and in collaboration with Mexico, conduct studies to estimate pregnancy rates, calf production, and timing-of-reproduction, and delineate stock structure and estimate bycatch in the nearshore waters of northern Baja California and southern California.
- **Policy:** Use the bycatch data of common dolphins and small cetaceans in coastal fisheries as a basis to work with Mexico to assess mitigation measures, especially in fisheries involving bycatch of shared cetacean stocks, and/or whose fish and fish products are exported to the United States.
- **Capacity building:** Work collaboratively with Mexico to provide space for visiting scientists on surveys and research expeditions. Also, U.S. scientists and gear experts should work together to develop effective mitigation measures that reduce the bycatch of shared cetacean stocks and cetaceans taken in fisheries where the mortality and serious injury exceed U.S. standards.
- **International government-to-government:** Through U.S./Mexus Bilateral strengthen scientific collaborations with Mexican colleagues at Instituto Nacional de Ecología (INE), SEMARNAT and Conapesca, SAGARPA in addition to researchers from the Universidad Autónoma de Baja California Sur.

Expected Conservation Outcome: These efforts will yield up-to-date estimates of population abundance, improve the understanding of anthropogenic impacts on coastal populations, and help establish bycatch reduction standards in compliance with the MMPA.

Justification: The SWFSC is responsible for monitoring and estimating abundance of all cetacean species (whales, dolphins, and porpoises) in the California Current Ecosystem along the U.S. West Coast. This research is mandated domestically by the MMPA and the ESA. Species and stocks with a significant portion of their distributions spanning political boundaries, such as the U.S.-Mexico border, require dedicated research efforts in order to meet these mandates. In 2009, the Ecosystem Survey of *Delphinus* Species Research Cruise was dedicated to furthering the understanding of abundance, stock structure,

and morphology and life history parameters for the short- and long-beaked common dolphin (*Delphinus delphis* and *D. capensis*, respectively). Both are important members of the California Current Ecosystem, and the range of at least one stock extends south into Mexican waters. A large and growing coastal human population in southern California impacts the Southern California Bight and a wide range of anthropogenic impacts (e.g., commercial and recreational fisheries, pollution, and ocean noise) are emerging as potential threats to *Delphinus* populations in this region. This research took a multidisciplinary approach and collected data on distribution, school size, reproduction, health, and habitat of both *Delphinus* species. Results will be used to estimate abundance, key reproductive parameters (e.g., pregnancy rates and calving interval), and contaminant concentrations as an index of health by species.

Objective 5: Improve the understanding of the global taxonomy and role of killer whales in a changing Antarctic ecosystem.

Species: Antarctic killer whales.

Threat: Climate change and prey depletion (Ross Sea toothfish).

Partners: SWFSC, NWFSC, AFSC (National Marine Mammal Lab).

Strategies

- **Science:** Conduct boat-based surveys to estimate abundance and observe prey preferences of different types of killer whale in the Antarctic; deploy satellite tags to monitor movement patterns; collect photogrammetry data to estimate size, energetic requirements, and morphometric differences between types; collect tissue samples for genetics, contaminants, and diets, and acoustic recordings for taxonomic revision.
- **Policy:** The dynamics of killer whales in the Antarctic ecosystem can be used to inform international efforts to understand the impact of prey depletion and climate change in polar ecosystems.
- **Capacity building:** Work collaboratively with the international community in Antarctica to access remote sites and develop study methods (e.g., tagging, sample analyses) for species of mutual interest.
- **International government-to-government:** Working in the Southern Ocean provides collaboration opportunities with the international community in logistics, science, and policy.

Expected Conservation Outcome: These efforts will improve the understanding of killer whale's role as the top predator in the Antarctic ecosystem. This information is the foundation of an ecosystem-based management approach in the Antarctic, which is experiencing rapid physical alterations due to climate change. Implementing this objective will improve understanding of how the population sizes, movement patterns, and foraging behavior of Antarctic killer whales change in relation to warming and climate-induced changes in prey distribution and abundance. In addition, these studies improve estimates of predator demands and potential impacts on prey populations that may be recovering (e.g., minke whales) or commercially harvested (e.g., Ross Sea toothfish).

Justification: The killer whale (*Orcinus orca*) is the top marine predator and perhaps the most widespread vertebrate species on Earth, occurring in all the world's oceans. Although currently considered to be a single species worldwide, SWFSC research in Antarctic waters suggests that there are at least three distinctly different-looking forms (ecotypes) with differential prey preferences, and these may represent

genetically different killer whale species. The role of killer whales in the Antarctic ecosystem depends on their respective population sizes, their seasonal movements in and out of Antarctic waters, and the amount and types of prey they consume. The SWFSC's research in the Antarctic seeks to answer these questions in order to understand the taxonomy and role of killer whales in marine ecosystems.

Objective 6: Prevent the extinction of the Western North Pacific population of gray whales.

Species: Western Pacific population of gray whales.

Threat: Habitat destruction, bycatch, disturbance, climate change.

Partners: Russian government, oil and gas industry, and IUCN Western Gray Whale Advisory Panel.

Strategies

- ***Science:*** Conduct boat-based surveys to estimate population size, to photo-ID individuals, and to take biopsy samples for genetic analysis. Deploy satellite tags on a select number of whales to better determine range boundaries, migratory routes, and wintering areas. Conduct genetic analyses to determine the degree of differentiation between Western and Eastern gray whale populations.
- ***Policy:*** Five female gray whales have died in Japanese fishing gear. The United States and Russia will work with Japan to develop and implement measures to reduce the bycatch of Western North Pacific gray whales.
- ***Capacity building:*** Since the inception of the collaborative research program for Western gray whales, this program has been an international collaboration of scientists and students from the United States and Russia. This work will continue to develop effective protection strategies for Western gray whales and their habitat.
- ***International government-to-government:*** The United States will continue to work within the International Whaling Commission; IUCN–Western Gray Whale Advisory Panel; CITES; Sakhalin Energy; Cetacean Research Institute, Korea; Kamchatka Branch of Pacific Institute of Geography, Russian Academy of Science; Tokyo University of Marine Science and Technology; and the Institute of Cetacean Research, Japan, to prevent the extinction of the Western gray whale.

Expected Conservation Outcome: Implementing this objective will facilitate recovery efforts by improving estimates of abundance, and individual survival; improving the understanding of geographic distribution, site fidelity patterns, genetic relationships between Eastern (recovered) and Western (critically endangered) populations; and impacts of anthropogenic activities (particularly oil and gas exploration) and bycatch.

Justification: The Western Pacific population is one of two surviving populations of gray whale. While both were brought near to extinction by commercial whaling, the Eastern population now numbers close to 20,000 individuals. However, the Western population is estimated at about 135, including perhaps 30 to 35 reproductive females, and is listed as endangered under the ESA, depleted under the MMPA, and critically endangered under the IUCN Red List. Since 1995, the SWFSC and Russian colleagues have engaged in a binational field and research program to determine population trends, estimate life history characteristics, and work together through international fora to mitigate threats (primarily oil and gas exploration).

Objective 7: Mitigate risks to large whales in the northeastern Pacific from multiple anthropogenic threats.

Species: Blue whales, fin whales, gray whales, humpback whales, right whales, and sperm whales.

Threat: Bycatch and ship strikes.

Partners: SWRO, SWFSC, NWRO, NWFSC, F/IA, F/PR, NOAA NOS (U.S. West Coast sanctuaries); DFO-Canada; Mexico.

Strategies

- **Science:** Assess risk to large whales, using spatially referenced whale and oceanographic data to model and predict whale density and overlaying these predictions with spatially referenced anthropogenic threat data.
- **Policy:** Work with national and international partners to characterize and mitigate risks to large whales. For example: (1) develop a “fixed gear guide” that can be used as an outreach tool for the general public and state, tribal, and federal agencies to identify fishing gear reported in large whale entanglement events; (2) characterize fishing gear used in the northeastern Pacific Ocean to understand effort, seasonality, and types of lines, traps, etc. that may entangle whales; (3) work with agencies that manage shipping traffic schemes to consider alternative port access routes and, if appropriate, vessel speed restrictions that reduce the risk of collisions with whales; (4) increase the capacity to respond to and necropsy whale carcasses to determine cause of death, (5) increase outreach to shipping industry and boating communities on methods to avoid and report, to the relevant agencies, collisions with large whales; and (6) characterize the risk of ship strikes to Eastern North Pacific whale populations.
- **Capacity building:** Work with agencies to collect information on large whale hot spots, seasonality, and habitat use, and assist in developing modeling efforts to: (1) assess the risk that fixed gear poses to large whales, and work to develop technological or management solutions to reduce the risk of large whales becoming entangled in fishing gear; and (2) assess the risk of ship strikes and consider alternatives to reduce ship collisions with whales.
- **International government-to-government:** Use bilateral, trilateral, and international conferences and organizations (e.g., IWC) to evaluate large whale survey data—both research-based and opportunistic. Continue collaborations with Canada and Mexico to share scientific research and policy development. Work with Canada and begin to engage Mexico in characterizing its fishing gear and the risk posed to large whales that migrate through Mexican waters. To reduce the threat of ship strikes, consider possible changes in vessel speed and routing through the IMO.

Expected Conservation Outcome: This work will promote the mitigation of risks to large whales from multiple anthropogenic threats. Most large whales are endangered under the ESA and SARA, with two of the primary threats being entanglement in fishing gear and collisions with ships. Reducing these threats is of primary interest to the United States and Canada as they seek to recover these populations. Efforts should extend to Mexico, since many of these species migrate to Mexican waters.

Justification: In the Eastern North Pacific Ocean, entanglement in fishing gear and ship strikes are known threats to large whales. Reducing these threats, particularly to endangered and threatened populations of whales, is a top priority in U.S. recovery plans. These threats are likely severely

underestimated, so fully understanding the risk (both in the United States and internationally) is key to reducing threats and recovering large whales.



A blue whale near a cargo ship in the Santa Barbara Channel off the California coast. Credit: John Calambokidis, Cascadia Research

Objective 8: Identify priority habitat for large whales in the Eastern Pacific.

Species: Blue whales, fin whales, gray whales, humpback whales, and Bryde's whales.

Threat: Habitat loss and degradation.

Partners: SWRO, SWFSC, F/PR, F/IA, Comisión Permanente del Pacífico Sur (CPPS), UNEP.

Strategies

- **Science:** Generate predictions of large whale densities in the Eastern Pacific Ocean using methods such as habitat models and interpolation

of sightings data. These predictions will be overlaid with areas of known threats to identify areas of concern. Multiple criteria will then be used to identify priority habitats to inform the ESA “critical habitat” designation for listed species and international efforts to designate marine protected areas.

- **Policy:** Identified priority habitats will be included in marine spatial planning efforts and proposed for designation as marine protected areas.
- **Capacity building:** Collaborate with scientists from Canada to Chile to share scientific knowledge and skills that provide the groundwork to identify priority habitat, undertake marine spatial management, and designate marine protected areas.
- **International government-to-government:** Through international organizations and workshops, engage international partners in characterizing priority habitats throughout the Eastern Pacific, developing conservation metrics for priority habitat areas, and evaluating marine protected areas.

Expected Conservation Outcome: These efforts will result in the identification of important large whale habitat, which can be prioritized for designation as marine protected areas and included in marine spatial management efforts.

Justification: Many species of baleen whales migrate long distances between breeding and feeding areas. Throughout their journey these species are exposed to anthropogenic threats such as entanglement in fishing gear, ship strikes, ocean noise, contaminants, and climate change. Mitigating these threats requires a transboundary, systematic spatial planning approach. Results from the habitat models facilitate the development of management strategies such as establishing marine protected areas, altering shipping routes and speeds, and designating fishing times and areas. More than 20 years of offshore large-scale surveys conducted by the SWFSC, combined with data from other national and international research programs, provide the basis to develop management methods to identify priority habitat and data gaps and, ultimately, foster the recovery of large whales.

Alaska Action Plan

Objective 1: Coordinate and improve research on marine mammals that cross international boundaries to better understand population dynamics, and the proximal causes for the population dynamics, that are critical to conservation and management.

Species: Steller sea lions, northern fur seals, ribbon seals, ringed seals, spotted seals, bearded seals, humpback whales, gray whales, bowhead whales, right whales, and beluga whales.

Threat: Climate change, prey depletion, direct harvest, oil/gas exploration, ocean acidification.

Partners: AFSC, AKRO, NWRO, F/IA, F/PR; Russian Federation; Alaska Native organizations; DFO-Canada.

Strategies

- **Science:** Conduct scientific research on pinnipeds and cetaceans to improve the understanding of abundance, distribution, vital rates, habitat use, and environmental covariates. Continue meeting with Russian scientists concurrent with the U.S.-Russia Marine Mammal Working Group (Area V of the U.S.-Russia Environmental Agreement) to exchange information and develop collaborative research efforts on marine mammals of joint interest.
- **Policy:** When appropriate, use the information from these surveys to develop conservation and management measures in the United States and internationally.
- **Capacity building:** Share standard and unique research methodologies with Russian and Canadian biologists and provide critical information needed to manage transboundary marine mammal species.
- **International government-to-government:** Establish a multilateral dialog with all Arctic nations to develop a conservation strategy for Arctic marine mammals, especially for ESA-listed species. The F/IA and Department of State will work to improve mechanisms for sharing research platforms (vessels and aircraft), technology (e.g., satellite tags), and data with Russia for collaborative research on transboundary marine mammal species.

Expected Conservation Outcome: Implementing this objective will improve population assessments of marine mammals occurring in the North Pacific Ocean and the Bering, Chukchi, Beaufort, Okhotsk, and Siberian Seas, and increase understanding of marine mammal vital rates in Russia, which could improve the understanding of vital rates in the declining endangered western population of Steller sea lions and other listed species

Justification: Several marine mammal species that occur in the waters around Alaska—and that spend a significant portion of their life in the waters of other countries—are of significant conservation concern. Much information is needed on these stocks in order to develop thorough and accurate NOAA Stock Assessment Reports for marine mammal populations of Alaska. A few examples of particularly critical transboundary stock assessment issues are listed here.

- The western stock of Steller sea lions is declining rapidly, particularly in the western Aleutian Islands. It is critical to assess survival and reproduction rates of Steller sea lions in Russia, and to conduct index counts, to understand the extent of and reasons for the decline in U.S. waters.
- At this time, there are no reliable estimates of abundance, trends, or stock structure for ribbon, spotted, bearded, and ringed seals. The National Marine Mammal Laboratory, AFSC, needs to coordinate with Russia, and possibly other Arctic countries, to conduct research in the Chukchi, Beaufort, and Okhotsk Seas.



Beluga whales are circumpolar in distribution. Beluga whales inhabit the Arctic and subarctic regions of Russia, Greenland, and North America.

Objective 2: Improve understanding of marine mammal bycatch in Russian and Canadian fisheries.

Species: All transboundary marine mammal species in Russian, Canadian, and U.S. waters.

Threat: Bycatch.

Partners: AKFSC, AKRO, F/IA, F/PR; Russian Federation; DFO-Canada.

Strategies

- **Science:** Translate relevant literature on marine mammal bycatch in the North Pacific to document marine mammal bycatch in Russian fisheries.

classify the level of marine mammal bycatch in various fisheries, especially those involving shared stocks of marine mammals, or fisheries that export fish and fish products to the United States. This information is a critical component of implementation of the MMPA.

- **Policy:** Using observer data, understand and

- **Capacity building:** Identify capacity-building needs through international meetings and workshops, and distribute promising mitigation strategies to relevant nations.
- **International government-to-government:** Hold an international workshop as part of the new regional fishery management organization to review and discuss options to mitigate marine mammal bycatch in North Pacific fisheries.

Expected Conservation Outcome: These efforts will improve understanding of the rate and extent of marine mammal bycatch in Russian and Canadian fisheries, as well as identify possible bycatch mitigation measures.

Justification: NOAA Stock Assessment Reports for marine mammals of Alaska should include information on bycatch in foreign fisheries. This information should be considered when managers consider conservation efforts for U.S. marine mammals, a step that traditionally has been difficult to accomplish for Russian and Canadian fisheries. Additional efforts will be made in the next 5 years to include this information in the Stock Assessment Reports for transboundary stocks such as Steller sea lions, Dall's porpoise, killer whales, humpback whales, and other large cetaceans and pinnipeds.

Pacific Islands Action Plan

Objective 1: Improve regional fisheries observer data quality to better assess the bycatch of marine mammals in the Western and Central Pacific fisheries.

Species: Marine mammal species throughout the Pacific.

Threat: Bycatch and direct removals.

Partners: PIFSC, PIRO, F/IA, F/PR; Forum Fisheries Agency, Honiara, Solomon Islands; Secretariat of the Pacific Community, Noumea, New Caledonia; national fisheries authorities and agencies of Pacific nations.

Strategies

- **Science:** Further refine the Fishery Observer Toolkit and improve the observer training course that will be used in preparing observers in the Western and Central Pacific fisheries.
- **Policy:** Use observer data to assess the level of marine mammal bycatch in fisheries, especially those involving shared stocks of marine mammals and fisheries that export fish and fish products to the United States. This information is a critical component of MMPA implementation.
- **Capacity building:** Work collaboratively with partners to improve and provide training and debriefing programs, and support the use of advanced technology in observer programs.
- **International government-to-government:** With regional fishery management partners, implement the efforts of the Joint Technical Working Group on Bycatch, part of the Kobe Process. Use multi-lateral and bilateral discussions to gain support for adoption of mitigation measures at the Western and Central Pacific Fisheries Commission, Pacific Cetacean Memorandum of Understanding, and other relevant regional fisheries management organizations.

Expected Conservation Outcome: These efforts will lead to high-quality data that may be used as a basis for developing effective conservation measures for protected species that are bycatch in Western and Central Pacific Ocean fisheries.

Justification: Fisheries observer data provide valuable information about the threats to marine mammals in the Pacific, and population dynamics and bycatch. However, many nations lack the capacity to effectively train observers and ensure data are of adequate quality to use in decision making. Training and guidance will improve data that could provide a basis for conservation measures.

Objective 2: Support collaboration with international monk seal program partners to enhance the scientific and conservation programs for the Mediterranean monk seal and the Hawaiian monk seal.



A juvenile monk seal risks entanglement by resting on derelict fishing gear at Pearl and Hermes Atoll in the Northwestern Hawaiian Islands Credit: NOAA National Marine Fisheries Service

Species: Mediterranean monk seal and Hawaiian monk seal.

Threat: Bycatch, prey depletion, habitat loss/ degradation, disturbance, disease, pollution/contaminants.

Partners: PIFSC, PIRO, F/IA, F/PR; MOm/ Hellenic Society for the Study and Protection of the Mediterranean monk seal, Fundación CBD-Habitat.

Strategies

- **Science:** Provide support to the Mediterranean Monk Seal program for the use of advanced technology for biological work, and enhancement of population assessment techniques.
- **Policy:** Use data to identify additional areas for marine protected area status to assist in the

recovery of Mediterranean monk seals.

- **Capacity building:** Continue the dialogue between U.S. and foreign programs as events occur to enhance understanding of rehabilitation methods for both programs. Continue dialogue regarding conservation initiatives to share successful management techniques. Support scientific technological work to enhance population assessment techniques and genetic work.
- **International government-to-government:** Highlight at government-to-government levels the need for greater enforcement of existing marine protected areas and the need to work with the fishing industry to develop mechanisms for reducing the bycatch of Mediterranean monk seals in fishing gear.

Expected Conservation Outcome: These efforts will increase understanding of monk seals to inform management decisions promoting monk seal conservation.

Justification: Continued support for collaboration between NMFS staff and international research partners will increase the scientific knowledge and improve conservation efforts for these species. This collaborative effort supports NOAA's international and national goals by enhancing conservation efforts for monk seals that are endangered in foreign waters, while simultaneously supporting conservation efforts for Hawaiian monk seal. These collaborative efforts are meant to benefit the recovery of both species.

Objective 3: Enhance population assessments for transboundary stocks of marine mammals.

Species: Marine mammal species throughout the Pacific.

Threat: Bycatch, prey depletion, direct removals, disease, pollution/contaminants, harmful algal blooms, habitat degradation.

Partners: PIFSC, PIRO, SWRO, SWFSC, F/IA, F/PR; Department of State; Treasury Department; and international partners.

Strategies

- **Science:** Use passive acoustic monitoring with fixed sensors and mobile platforms (i.e., gliders) to assess occurrence, and photo-identification in near-shore regions of appropriate nations to evaluate species movements.
- **Policy:** Use information from population assessments to better manage marine mammal bycatch within the Western and Central Pacific Fisheries Commission (WCPFC). Use assessment data to calculate bycatch limits for transboundary stocks and share these data with nations that export fish and fish products to the United States. This information is a critical component of MMPA implementation.
- **Capacity building:** Support initiatives to incorporate traditional ecosystem knowledge of marine mammals into marine mammal management and conservation planning, and involve indigenous peoples in these efforts. Also, provide training and data-sharing capabilities for sampling and assessment programs to small island nations.
- **International government-to-government:** The United States through the WCPFC should continue its effort to enact a resolution that calls upon nations to provide information on marine mammal populations and bycatch, and efforts to reduce bycatch. Use multilateral and bilateral discussions to gain support for adoption of data collection measures at the WCPFC, and other relevant regional fisheries management organizations, and through the Pacific Cetacean Memorandum of Understanding.

Expected Conservation Outcome: These efforts will improve population and abundance data on marine mammals that may be used as a basis for effective conservation measures and protected species management.

Justification: Our ability to effectively take action to protect marine mammals in the Pacific is hindered by the lack of information on marine mammal stock status and threats. Support for population assessments throughout the region is crucial to fill information gaps in order to provide a basis to initiate conservation measures.

Fisheries International Affairs Action Plan

Objective 1: Identify countries that have an unsustainable harvest of marine mammals.

Species: All marine mammal species.

Threat: Bycatch, direct removals.

Partners: F/IA, F/PR, F/ST, NEFSC, SEFSC, SWFSC, NWFSC, AKFSC, PIFSC.

Strategies

- **Science:** Using the best available science, identify the nations and fisheries exporting to the United States that have a bycatch of marine mammals. To the extent possible, quantify the marine mammal species, abundance, and bycatch rate or estimate.
- **Policy:** The scientific data will be used to classify international fisheries based on their level of interaction, and to prioritize nations that are required to develop a program comparable to that of the United States.
- **Capacity building:** National Marine Fisheries Service will look for opportunities to assist nations with the development of their regulatory program to assess marine mammal populations and estimate and mitigate bycatch.
- **International government-to-government:** Consultations associated with the identification and findings required under the MMPA will require numerous bilateral discussions between the United States and import-supplying nations.

Expected Conservation Outcome: These efforts will reduce global marine mammal bycatch.

Justification: Marine mammal bycatch is the greatest threat facing marine mammals. An emerging conservation issue is the development of markets for cetacean bycatch, which often lead to direct harvest of these species. In addition, small cetaceans are often used as bait in various commercial fisheries. In many instances the potential impact of this threat on cetacean populations is either unknown or unsustainable. National Marine Fisheries Service would gather the emerging and historical data related to this issue and begin to explore mechanisms to reduce the bycatch, discourage market development for cetacean meat and products, and, especially, look for viable bait alternatives to cetacean meat and oil.

Objective 2: Reduce the bycatch of marine mammals in global fisheries.

Species: Numerous species of cetaceans and pinnipeds, including all of the critically listed marine mammals (Appendix 1) in this Action Plan.

Threat: Bycatch, direct removals.

Partners: F/IA, F/PR, F/ST, NEFSC, SEFSC, SWFSC, NWFSC, AKFSC, PIFSC.

Strategies

- **Science:** Using the best available science, develop FAO guidelines to mitigate and reduce the incidental entanglement, injury, and mortality of marine mammals in commercial fisheries.
- **Policy:** These FAO guidelines can be, in part, the standards envisioned in Section 101 (a)(2) of the MMPA.
- **Capacity building:** Once guidelines are complete (longer term), work with nations to undertake capacity-building projects to implement the guidelines. Additionally, as part of efforts to develop these guidelines, NOAA should continue to provide workshops or training for Large Whale Disentanglement Response and Entanglement Mitigation.
- **International government-to-government:** Work within FAO to garner support for an expert technical working group to develop these guidelines. Then work within the FAO Committee on Fisheries (COFI) to secure the guidelines' adoption.

Expected Conservation Outcome: Developing these guidelines will lead to a reduction in the bycatch of marine mammals in global fisheries.

Justification: Seabirds, sea turtles, and sharks all have International Plans of Action, and the guidelines to reduce sea turtle entanglement were developed with the input of scientists through FAO. These guidelines provide the basis for action within RFMOs and international agreements to reduce bycatch or address other threats facing marine mammals. Staff at F/IA should work to identify scientists and initiate discussions with FAO with the goal of developing guidelines to reduce marine mammal entanglement in fisheries. The International Plan of Action could encompass guidelines for assessment and monitoring as well as effective bycatch mitigation measures that have been developed in the United States and worldwide. A finalized FAO document for marine mammals could assist efforts to reduce bycatch in tuna RFMOs and meet the mandate of the bycatch provisions of MSRA and MMPA. Additionally, there should be follow-up workshops to the 2010 IWC workshop on Maui to continue a dialogue with countries that have participated in, or requested training in, disentanglement response and entanglement mitigation. This training will be included in the guidelines and will ultimately be part of comprehensive marine mammal response training.

Objective 3: Develop a Marine Mammal Stranding Response Training Strategic Plan, a 5-year long-term plan that outlines goals, resources, and priorities related to marine mammal stranding response training, research, and conservation efforts.

Species: Numerous species of cetaceans and pinnipeds, including all of the critically listed marine mammals (Appendix 1) in this Action Plan.

Threat: Bycatch, marine debris, disease, pollution/contaminants.

Partners: F/IA, F/PR, F/ST, NEFSC, SEFSC, SWFSC, NWFSC, AKFSC, PIFSC, PIRO, SWRO, NERO, NWRO, SERO; Hawaii Pacific University; National Institute of Standards and Technology; South Pacific Regional Environment Program.

Strategies

- **Science:** Develop a standardized stranding response toolkit and protocol that can be provided to countries seeking help, and include marine mammal identification guides, training materials, necropsy tools, protective gear, and other materials designed to meet individual countries' needs.
- **Policy:** Develop a comprehensive list of Marine Mammal Stranding Response professionals in the United States, chiefly within NOAA, and including veterinarians, pathologists, taxonomic specialists, disentanglement specialists, and oil spill response experts.
- **Capacity building:** As part of a capacity-building program, NMFS will: (1) transfer sampling techniques and protocols to regions to ensure data quality and continuity; (2) create open communication between NMFS programs to facilitate awareness of arising disease or pollution/contamination issues; (3) provide training and support to nascent stranding programs; and (4) support initiatives to recognize and involve cultural leaders in stranding events.
- **International government-to-government:** Convene international training workshops in Africa, Latin America, the Caribbean, the Pacific, and other interested countries to help guide and establish a stranding network capable of responding to live/dead marine mammal strandings and collecting important biological data.

Expected Conservation Outcome: These efforts will provide a greater understanding of the biology and threats facing marine mammals and will provide tools to effectively respond to human-caused disasters such as oil spills. Acknowledgement and involvement of native cultural practices facilitates community participation and improves relationships, which may enhance local interest in marine mammal conservation.

Justification: It is becoming vitally important to enhance the capacities and communications between stranding programs, to build or initiate stranding programs in areas having no program, or to better coordinate regional networks. This training can significantly improve stranding investigations, necropsies, mass stranding response, epidemiology, identification of emerging diseases, oil spill response, and identification of human impacts (e.g., fishery bycatch and marine debris), and can contribute to marine mammal medicine. Further, by targeting key individuals and countries, as well as empowering and training individuals from international organizations and governments, nations can reduce bycatch and address larger issues (e.g., human and climate impacts that lead to strandings, population decline, distribution changes, and deterioration of the marine environment). Organizing stranding response workshops and establishing observer capabilities are two of the most effective solutions to

bycatch. Finally, these capacity-building activities and continued bilateral engagement can eventually lead to strong partnerships that can be leveraged at international meetings such as WCPFC, International Commission for the Conservation of Atlantic Tunas (ICCAT), CITES, Convention on the Conservation of Antarctic Seals, and IWC. Supporting efforts to increase communication and understanding of disease and pollution/contaminants supports NOAA's efforts to mitigate impacts on marine mammals outside U.S. waters; improves abilities to monitor, detect, and respond to trends in marine mammals across the globe; and assists in the conservation of critically endangered species.

Objective 4: Develop a 5-year, long-term strategic plan that outlines the goals, resources, and priorities to expand the international observer training program.

Species: Numerous species of cetaceans and pinnipeds, including all of the critically listed marine mammals (Appendix 1) in this Action Plan.

Threat: Bycatch, direct removal.

Partners: F/IA, F/ST, F/PR; Alaska Sea Grant.

Strategies

- **Science:** Develop a standardized observer training course that can be readily used at various workshops.
- **Policy:** Develop a comprehensive list of funding sources and of professionals who can provide training at international locations.
- **Capacity building:** As part of a capacity-building program NMFS will convene on-site workshops for fisheries observer training to address IUU fishing and minimize bycatch of protected species, including marine mammals, turtles, seabirds, and sharks. This workshop will be either a part of the marine mammal stranding workshop or a separate workshop.
- **International government-to-government:** Initiate scientific exchange programs to fund short-term travel for NMFS marine mammal experts to share expertise, or to bring foreign marine mammal scientists/managers to the United States for workshops, symposia, and conferences related to marine mammal population assessments and bycatch estimation through observer programs.

Expected Conservation Outcome: These workshops will provide participants with the skills necessary to collect fisheries interaction data to better understand the biology and threats facing marine mammals, effectively document bycatch and direct removals, and devise mechanisms to disentangle marine mammals.

Justification: Observer training programs provide individuals and countries with the skills needed to document fisheries interactions. By empowering and training individuals from international organizations and governments, bycatch and other fisheries management issues can be addressed. Organizing observer program training workshops and establishing observer capabilities is an effective way to document and mitigate bycatch. Enhancing the capacity and support for observer programs improves data quality; helps ensure a timely response to bycatch that threatens marine mammal populations; assists in the ability to monitor, detect, and respond to trends in marine mammals across the globe; and aids in the conservation of critically endangered species.

APPENDIX 2**NATIONAL MARINE FISHERIES SERVICE INTERNATIONAL
MARINE MAMMAL WORKING GROUP**

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U.S. Government – 2012

