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LIST OF ABBREVIATIONS AND ACRONYMS

ACCOBAMS Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea, and contiguous Atlantic Area
ALWTRT Atlantic Large Whale Take Reduction Team
APPS Act to Prevent Pollution from Ships
ATBA Area to be Avoided
ATSDR Agency for Toxic Substances and Disease Registry
BOEM U.S. Bureau of Ocean Energy Management
CCAMLR Convention on the Conservation of Antarctic Marine Living Resources
CITES Convention on International Trade in Endangered Species of Wild Fauna and Flora
COLREGS International Regulations for Avoiding Collisions at Sea
CWA Clean Water Act
EEZ Exclusive Economic Zone
EPA U.S. Environmental Protection Agency
ESA Endangered Species Act
IFAW International Fund for Animal Welfare
ICRW International Convention for the Regulation of Whaling
IMO International Maritime Organization
IWC International Whaling Commission
LFAS low-frequency active sonar
MARPOL International Convention for the Prevention of Pollution from Ships
MFAS mid-frequency active sonar
MMPA Marine Mammal Protection Act
MPPRCA Marine Plastic Pollution Research and Control Act
MPRSA Marine Protection, Research, and Sanctuaries Act
NGO nongovernmental organization
NMFS National Marine Fisheries Service
NOAA National Oceanic and Atmospheric Administration
PBR Potential Biological Removal
PCI Potential Cumulative Impact
POP Persistent Organic Pollutant
RMP Revised Management Procedure
RMS Revised Management Scheme
SOLAS International Convention for the Safety of Life at Sea
TRT Take Reduction Team
UNECE United Nations Economic Commission for Europe
USGS U.S. Geological Survey
ZMRG Zero Mortality Rate Goal
EXECUTIVE SUMMARY

The relationship between humans and whales has rarely if ever been mutually advantageous. Whales have provided meat and blubber for food; baleen (or “whalebone”) for corsets; oil for lighting, heating, and cleaning; and teeth for scrimshaw. But they have paid a price for their unwitting beneficence. Although some populations of humpback whales, gray whales, and Southern right whales have increased, most populations of large whales remain severely depleted.

Historically, by far the greatest cause of reductions in whale numbers has been commercial whaling. Although such whaling is much reduced from its peak, it continues in the guise of “scientific research” and under objection to a moratorium by the International Whaling Commission that was supposed to take full effect more than a quarter-century ago. Meanwhile, other threats increase in number and intensity. Whales face an increasingly toxic environment. They regularly become ensnared in underwater fishing gear. They are killed in collisions with ships. And while ocean noise, such as that from high-intensity sonar and oil extraction, turns up the volume in the sea, marine pollution and climate change alter the ecosystem of the entire ocean.

This Blueprint describes each of these issues and threats, reviews some of the steps that have already been taken to address them, and makes recommendations for appropriate next steps that the United States could and should take. We also take a step back to look at some broader potential policy and management actions that can be taken beyond the purview of the specific issues or threats that have just been identified.

A world where whales are once again abundant is almost within our grasp. Much has been accomplished, as outlined in this Blueprint, but much also remains to be done. Clearly, immediate attention needs to be focused on whale populations that are threatened with extinction, but populations that are currently stable also need protection. Quite simply, it is easier and cheaper to protect species and populations before they face extinction. Delaying action until threats have become so acute that they result in severe and visible population declines may also result in the loss of many opportunities for effective long-term conservation.

We should protect whales because it benefits the ecosystem and the economy, and because it is the right thing to do. Indeed, the protection and conservation of whales enjoys worldwide public support. Even in Japan, a 2008 Greenpeace poll found that only 31 percent of respondents were in favor of the country’s long-standing “scientific research” whale hunting program.

In a 2012 poll commissioned by IFAW, 89 percent of American voters stated that they believe the United States should help the IWC enforce the ban on commercial whaling. This issue resonates strongly among voters of both parties: Among self-identified Republicans, 89 percent want the United States to help enforce the ban. Among Democrats, this number reaches 92
percent. In addition, 78 percent of respondents support having high-level U.S. government officials speak out publicly against commercial whaling by Japan, Norway, and Iceland.

Fortunately, the United States has consistently been among the leaders in efforts to protect whales and whale populations. The 1972 Marine Mammal Protection Act is a landmark law that sets the benchmark for nations everywhere. Within the IWC, the United States proposed the adoption of a commercial whaling moratorium in 1972, 1973, and 1974 and was a strong advocate of the moratorium proposal that was eventually adopted in 1982. U.S. diplomatic efforts were key to the adoption of the Southern Ocean Sanctuary in 1994. The continuation of such leadership is vital, as whales face a growing array of increasingly complex and interacting threats, directly and indirectly, in the 21st century.

Ultimately, protection of the whales’ ocean ecosystem requires a suite of management solutions working together that identifies areas of resource use and of conservation concern and attempts to maximize environmental protection while efficiently prioritizing human activity. Adopting the following recommendations can bring us far closer to providing the protection that so many of us desire for the world’s whales and the ocean in which they live.
WHALES AND WHALE PROTECTION

STATUS OF THE WORLD’S WHALES

The relationship between humans and whales has rarely, if ever, been mutually advantageous. Whales have provided meat and blubber for food; baleen (or “whalebone”) for corsets; oil for lighting, heating, and cleaning; and teeth for scrimshaw. But they have paid a price for their unwitting beneficence.

The Atlantic gray whale probably disappeared in the 18th century. Bowhead whales off Spitsbergen number in the tens and are almost never seen; neither are right whales in the eastern North Pacific.

Indeed, most populations of large whales remain severely depleted. Although some populations of humpback whales, gray whales, and Southern right whales have increased, there still remain populations within those species about which there are serious conservation concerns. The Arabian Sea humpback whale population, western Pacific gray whale, and Southern right whales off Chile are all believed to be isolated populations with just tens of breeding females.

Even the relatively large global numbers of minke whales, the smallest of the great whales and thus the last to be targeted by commercial whalers, conceal the fact that at least some populations may be trending downward or even severely depleted. Populations of minke whales in the sea between Japan and South Korea were once heavily hunted and now are subject to high rates of bycatch and illegal whaling, which may be causing their numbers to decline.

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(IWC) suggest that minke whale numbers may have declined, but even after years of intense surveying, there are still no agreed estimates of abundance or trends—a clear illustration of the difficulties in estimating whale population sizes and trends.

Historically, by far the greatest cause of reductions in whale numbers has been commercial whaling. Although such whaling is much reduced from its peak, it continues in the guise of “scientific research” and under objection to an IWC moratorium that was supposed to take full effect more than a quarter-century ago. Meanwhile, other threats increase in number and intensity. Whales face an increasingly toxic environment. They regularly become ensnared in underwater fishing gear. They are killed in collisions with ships. And while ocean noise, such as that from high-intensity sonar and oil extraction, turns up the volume in the sea, marine pollution and climate change alter the ecosystem of the entire ocean.

**WHY SAVE WHALES?**

*We should protect whales because it benefits the ecosystem and the economy, and because it is the right thing to do.*

The major reasons why whales should be protected from the threats they face fall into three principal categories:

**Ecological:** Whales fulfill vital roles in marine ecosystems, and the diminishment of their numbers has had profound effects on some of those ecosystems. For example, whales’ feces is so nutrient-rich that whales in the Gulf of Maine alone add 23,000 metric tons of nitrogen to the ocean each year—a greater nutrient input than all the rivers that feed into the gulf combined. In this way, whales there and elsewhere increase primary productivity; that is, they create conditions that allow the growth of greater amounts of phytoplankton, the basis of the marine food web, which feed on those nutrients. Whales are even ecologically productive after death. Their carcasses sink to the seabed where they support unique ecosystems dubbed “whale falls.”

**Economic:** For many years, whales have been the backbone of an industry that provided many goods and services—to the considerable detriment of the whales, however. Now, nonconsumptive use of whales is generating money from the mere act of watching whales in their natural environment. A comprehensive 2009 IFAW report found that whale watching worldwide generated more than $2 billion in tourism revenues and employed more than 13,000 workers. Nearly half of that expenditure is in the United States alone, but even countries more associated with whale hunting have seen significant increases in their whale watching industry. For example, in 1994, approximately 200 people paid to go on whale

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watching tours in Iceland; in 2008, that number had swelled to 114,500. In Japan, the number of whale watchers rose from a fraction under 11,000 in 1992 to almost 200,000, generating more than $22 million in total expenditure in 2008.

**Ethical:** We should protect whales because it benefits the ecosystem and the economy, and because it is the right thing to do. Over the last 40 years, whales have become the totems of the environmental movement and are increasingly widely appreciated worldwide as living beings and not as sources of meat or oil. Deciphering the reasons for such changes in people’s attitudes is necessarily speculative, but it is unlikely to be coincidental that those attitudes have shifted at the same time that research has cast ever more light on the nature of whales: the long, complex songs of humpback whales; the lengthy migrations of humpback and gray whales, the longest in the mammalian world; the sheer size of blue whales—creatures so large that an elephant could stand on the whale’s tongue; the complex social interactions of many whale species; and the size of their brains and complexity of their behavior. All of these factors point to a high if unquantifiable degree of intelligence that, in turn, suggests that whales may be especially capable of suffering, emotionally as well as physically, thus making their protection imperative on humane grounds.

**Public Support**

*Eighty-nine percent of American voters believe the United States should help the IWC enforce the ban on commercial whaling.*

The protection and conservation of whales enjoys worldwide public support. For example, in a 2009 poll in the United Kingdom, 82 percent of Britons declared themselves opposed to whaling by Iceland, with 64 percent stating that they were prepared to boycott Icelandic fish products. In 2006, World Wildlife Fund polled citizens in 10 Pacific Island and Caribbean nations, whose governments had consistently sided with Japan to vote against conservation measures in the IWC. In not one instance did a majority of respondents support their government’s voting pattern, and in some cases disapproval was vehement: 79 percent of respondents in Antigua and Barbuda, 69 percent in Palau, and 63 percent in the Solomon Islands were opposed to their governments’ pro-Japan, pro-whaling stance. Even in Japan, a 2008 Greenpeace poll found that only 31 percent of respondents were in favor of the country’s long-standing “scientific research” whale hunting program.

In a 2012 poll commissioned by IFAW, 89 percent of American voters stated that they believe the United States should help the IWC enforce the ban on commercial whaling. This issue resonates strongly among voters of both parties: Among self-identified Republicans, 89 percent want the United States to help enforce the ban. Among Democrats, this number reaches 92 percent. In addition, 78 percent of respondents support having high-level U.S. government officials speak out publicly against commercial whaling by Japan, Norway, and Iceland. Sixty-two percent of respondents even stated that they would be more likely to vote for a presidential candidate who took a firm stand against Japanese whaling.
Fortunately, through domestic legislation and regional and international bodies, the United States has consistently been among the leaders in efforts to protect whales and whale populations. The 1972 Marine Mammal Protection Act (MMPA) was a landmark law that set the benchmark for nations everywhere. Within the IWC, the United States proposed the adoption of a commercial whaling moratorium in 1972, 1973, and 1974 and was a strong advocate of the moratorium proposal that was eventually adopted in 1982. U.S. diplomatic efforts were key to the adoption of the Southern Ocean Sanctuary in 1994. The United States also has been a leader in addressing other threats that face whales—for example, adopting the 1987 Driftnet Impact Monitoring, Assessment, and Control Act and, five years later, supporting the U.N. General Assembly ban on high seas driftnets. The continuation of such leadership is vital, as whales face a growing array of increasingly complex and interacting threats, directly and indirectly, in the 21st century.

A Vision of Whale Protection

A world where whales are once again abundant is almost within our grasp. Much has been accomplished, as outlined in this Blueprint, but much also remains to be done. Clearly, immediate attention needs to be focused on whale populations that are threatened with extinction, but populations that are currently stable also need protection. Quite simply, it is easier and cheaper to protect species and populations before they face extinction. Delaying action until threats have become so acute that they result in severe and visible population declines may result in the loss of many opportunities for effective long-term conservation. It is frequently difficult to evaluate the conservation impacts of particular human activities in isolation; often, the cumulative impacts of all threats need to be taken into account. For example, short-term disturbances like offshore drilling or sonar testing, coupled with changes in prey distribution, could affect whales at a population level.

Commercial whaling, whether disguised as “scientific research” or in any other form, has no place in the modern world and should be ended. However, addressing the other, perhaps less well-known and obvious threats will need forward thinking. Some simple actions now will benefit whales long into the future. A combination of international diplomacy, good science, sound laws, collaboration, and strategic regulation will achieve a better world for whales.
INTERNATIONAL AGREEMENTS AND FORUMS

The United States has historically played a vital role in measures to protect whales and whale populations. It continues to play that role today as a member of several multilateral agreements that are important for whale conservation.

Three agreements in particular have a global mandate to make binding decisions affecting whale conservation: the International Convention for the Regulation of Whaling (ICRW), the agreement that forms the basis of operations for the IWC; the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES); and the International Maritime Organization Convention (IMO), the forum in which measures to address threats from shipping can be adopted. The United States is in a position to undertake initiatives that would achieve the pressing need for action that exists in each of these forums and is also uniquely placed to assert diplomatic pressure and economic leverage to ensure that all the member governments abide by the decisions made within such forums.

The International Whaling Commission

In 1946, the ICRW was negotiated in Washington, D.C., under U.S. leadership. All of the 15 signatories to the original convention, including the United States, were whaling countries. As of March 1, 2011, the IWC, the body that oversees and implements the ICRW, included 88 member governments. The great majority of these members have no direct interest in commercial whaling and, in fact, actively oppose it.

Throughout its history, the IWC has made a number of decisions that have progressively restricted whaling for commercial purposes. These include the protection of blue whales (1966), the ban on factory ship whaling for species other than minke whales (1979), the Indian Ocean Whale Sanctuary (1979), the indefinite moratorium on commercial whaling (1982), and the Southern Ocean Whale Sanctuary (1994).

Despite these provisions, Iceland, Japan, and Norway have continued whaling for commercial purposes. Norway has mainly relied on a formal objection to the moratorium decision.\(^9\) Japan, which does not maintain an objection to that decision, conducts “scientific whaling,”\(^10\) and Iceland conducts a mixture of “scientific whaling” and commercial whaling under a legally dubious reservation to the moratorium decision.\(^11\)

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\(^9\) Norway also conducted special permit whaling for minke whales from 1988 to 1994.

\(^10\) Article VIII of the ICRW allows IWC members to unilaterally set catch limits and issue special permits for scientific purposes, regardless of other regulations. Japan conducts whaling in contravention of the moratorium, the ban on factory ship whaling, and the Southern Ocean Sanctuary.

\(^11\) Iceland did not object to the moratorium at the time but left the IWC in 1992 and rejoined in 2002 with a reservation to the moratorium. The Icelandic reservation was legally controversial, and 11 countries, including the United States, filed formal diplomatic statements indicating that they did not accept Iceland’s reservation.
The IWC also regulates whaling by indigenous people for subsistence purposes and issues separate quotas for such whaling.

**Convention on International Trade in Endangered Species of Wild Fauna and Flora**

CITES restricts international trade in endangered species of plants and animals by listing species in its appendices and regulating the global trade in those species accordingly. An Appendix I listing entirely prohibits international commercial trade; whereas an Appendix II listing requires international trade to be controlled and exploitation to be within sustainable limits.

The CITES convention was finalized at a meeting in Washington, D.C. in 1973. Eighty countries attended the meeting, and the convention came into force two years later. As of March 1, 2011, the CITES convention included 175 countries, making it one of the largest global environmental agreements.

As with the IWC, measures within CITES to provide protection for whales unfolded in a number of stages. Also, as with the IWC, the United States often played a key part. Decisions on whales at CITES have taken their lead from IWC decisions. Thus, at the first meeting (or Conference of the Parties) in 1976, the United States proposed the listing of most populations of fin whales and sei whales in Appendix I (with the remainder to be listed in Appendix II). In 1981, there was a further U.S. proposal to transfer to Appendix I all remaining populations of fin and sei whales that were protected by the IWC. Finally, in 1983, a year after the IWC moratorium decision, all the remaining populations of great whales were moved to Appendix I.

Norway, Iceland, and Japan maintain reservations to some of these CITES decisions with respect to certain species. Attempts by Norway, Iceland, and Japan to weaken whale protection at CITES, largely by pushing for whale populations or species to be moved from Appendix I to Appendix II or removed entirely from under CITES’ protective umbrella, began in 1994 but have so far failed.

**The International Maritime Organization**

In 1958, the IMO convention entered into force. In March 2011, the IMO had 169 member states. IMO’s purview is the oversight of measures to restrict shipping activities outside of territorial waters. Although maritime safety is its main responsibility, the IMO has also addressed the environmental effects of shipping, beginning with the International Convention for the Prevention of Pollution from Ships in 1973.

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12 With the exception of the West Greenland minke whales.

13 For a complete list of CITES reservations to the listing of great whales in Appendix I, see http://www.cites.org/eng/app/reserve_index.shtml.

14 Japan does not have a reservation to the Appendix I listing of sei whales, and legal opinions have indicated that the landing of meat from this species for sale within Japan is in breach of CITES regulations related to introduction from the sea.
In addition, the IMO can take a number of measures that reduce the impacts of shipping on whales. These include moving shipping lanes, creating areas to be avoided, or designating particularly sensitive sea areas. The United States has taken the initiative in recent years to add minimizing collisions with whales and impacts of shipping noise to the IMO’s agenda. The IMO has prepared a guidance document on minimizing ship strikes and is working on non-mandatory technical guidelines for reducing underwater noise.

U.S. LEGISLATION

In addition to being a significant player in a number of multilateral treaties, the United States has also shown leadership in its development of national legislation to protect wildlife, including marine wildlife such as whales. The Marine Mammal Protection Act (MMPA) remains the definitive piece of national legislation on the protection and conservation of marine mammals. Whereas the MMPA seeks to regulate activities that might have an impact on marine mammals, the Endangered Species Act (ESA) works to protect species that are already considered threatened. The ESA’s mandate is to prevent the extinction of imperiled plant and animal life and to recover and maintain those populations by removing or lessening threats to their survival. As under CITES, which was begun the same year, species are granted different levels of protection according to the degree to which they have been depleted or the severity of the threats they face.

The Marine Mammal Protection Act

The MMPA is the single most important law for protecting and preserving marine mammals within the United States. In some respects, the MMPA was a ground breaking piece of legislation, shifting a national policy focus away from individual species and toward ecosystems. The act was written to prevent marine species from diminishing below a point at which they would cease “to be a significant functioning element in the ecosystem of which they are a part.” The act also includes requirements to conserve discrete populations as well as species or subspecies. By incorporating a broad definition of takes and including ecosystem-based management, the MMPA effectively shifts the burden of proof from resource managers to resource users, who now must prove that their activities will not adversely affect marine mammal populations.

As originally passed, the MMPA was designed to provide protection to all marine mammal stocks in waters under U.S. jurisdiction, as well as to prevent U.S. citizens from contributing to declines through importation of marine mammals or their products.

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16 Supra, n.1.
17 Marine Mammal Protection Act of 1972, as amended.
Since its passage in 1972, the MMPA has been amended numerous times although the basis of the legislation remains intact. The MMPA focuses primarily on direct “takes” of marine mammals. As defined in the act, the term take means to “harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal.”\(^{18}\) The MMPA provides very little, if any, protection from threats like climate change. The National Marine Fisheries Service (NMFS) of the National Oceanic and Atmospheric Administration (NOAA) is tasked with enforcement of the MMPA as it applies to all whale species.

**The Endangered Species Act**

After signing the ESA into law on December 28, 1973, President Richard Nixon declared, "Nothing is more priceless and more worthy of preservation than the rich array of animal life with which our country has been blessed."\(^{19}\) At the time of the ESA’s passage, the United States had already listed 392 species as endangered or threatened under a prior version of the legislation.\(^{20}\) Almost four decades later, the act protects nearly 2,000 foreign and domestic species through the designation of critical habitats, development of recovery plans and by regulating activities directly affecting threatened and endangered species. As with the MMPA, the ESA, as it pertains to whales, is administered by NOAA’s NMFS.

Of the 13 great whale species identified by the IWC, 10 species—blue, bowhead, fin, gray (western North Pacific population), humpback, North Atlantic right, North Pacific right, Southern right, sei, and sperm—are listed as endangered under the ESA.\(^{21}\) (These species are also listed in Appendix I of CITES.)

The ESA requires the designation of critical habitat for these 10 species because of their endangered status. Whereas many aspects of the ESA focus on preventing extinction, critical habitats are geared toward promoting recovery. The original 1973 version allowed for the designation of such critical habitat areas; and a 1978 amendment mandated their establishment for all threatened and endangered species, while adding a caveat that such critical habitat designation should “take into consideration the economic impact”—a caveat that was removed four years later.

The ESA remains the strongest federal law providing protection for threatened and endangered species and is credited for enabling the recovery of some species such as the American bald eagle. Furthermore, listing of foreign species contributes to global conservation efforts by restricting U.S. citizens from importing animals listed as protected under the ESA.

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\(^{18}\) Marine Mammal Protection Act of 1972 as amended, Sec 3(13).


Unfortunately, critical habitat designation has limitations with regard to whales. Many of the great whales are highly migratory, are distributed across large areas, and require measures to reduce threats throughout their range. In most cases, not enough is known about the location of areas within that range that could be designated as critical habitat. Although the United States has designated critical habitat for certain species and populations, particularly those whose range is relatively limited and that face spatially concentrated threats (for example, North Atlantic right whales), much more needs to be done to protect all areas that are necessary to maintain healthy whale populations.
THREATS TO WHALES

Historically, by far the greatest damage to whale populations has come about as a direct result of over-hunting by the commercial whaling industry. That threat has been significantly diminished, partly by IWC regulation, partly by reductions in the market for whale products and partly by the fact that many whale populations were so severely diminished that hunting them no longer made commercial sense. Even so, commercial whaling remains an issue, is still responsible for the deaths of more than 1,000 whales a year, and is at the heart of an ongoing political dispute manifested most directly in the IWC.

Whaling is not the only threat to whales, nor is it necessarily the most severe long-term issue. Globally and in the waters of the United States, whales become entangled in fishing gear, leading to suffering, injury, and death. In addition to being a major animal welfare issue, entanglement is also a significant conservation concern, particularly when concentrated fishing effort affects a relatively small population of whales, such as, for example, the right whales of the Northwest Atlantic. Whales are also threatened by collisions with ships, and shipping noise is also greatly interfering with whales’ ability to communicate with each other. Shipping also may be the greatest source of background noise pollution, but it is not the only source of sounds that are problematic to whales at various levels. Other noise pollution affecting whales includes low-frequency and mid-frequency active sonar and industrial activities such as pile drivers and seismic testing. Additionally, widespread oil and gas exploration and other industrial activities contribute to pollution of the marine environment. All of these issues are occurring in the context of global climate change, which also has an impact on ocean ecosystems. Therefore, the cumulative nature of these many threats must also be considered in any plans to protect whales.

This Blueprint describes each of the issues and threats just mentioned, reviews some of the steps that have already been taken to address them, and makes recommendations for appropriate next steps that the United States could and should take.

Finally, the Blueprint takes a step back to look at some broader potential policy and management actions that do not necessarily directly address the specific issues or threats that have just been identified. These actions have the potential to make profound and significant improvements to U.S. conservation and management of large cetaceans specifically and the marine environment more generally, and are eminently achievable at minimal economic, political, or logistical cost. In the long term, such changes could provide a framework that would enable decisions about the protection of whales to be better informed, more responsive, more precautionary, and likely to carry greater weight in the international arena.
COMMERCIAL WHALING

There is no humane way to kill a whale at sea.

THE PROBLEM

After three centuries of commercial exploitation, many whale populations have been reduced to remnant numbers. The population of gray whales that used to live in the Atlantic is now extinct; and others, such as the North Atlantic right whale, remain at very low numbers. There used to be a quarter of a million blue whales in the Southern Ocean but surveys estimate that only a couple of thousand remain in this area. Fortunately, some populations (including some humpback whales, eastern Pacific gray whales, and Southern right whales) that were hit very hard by whaling operations are recovering. But the overall situation is one of dramatic reductions in almost every whale population the world over.

Only three of the IWC’s 88 members hunt whales for commercial purposes. In 2011, Japan, Norway, and Iceland altogether caught 1,443 whales, a figure far larger than the 326 whales taken in 1989.

There is no humane way to kill a whale at sea.

Whaling often starts with a high speed chase so the stress for the whale begins some time before it is even harpooned. Fewer than one in five of the whales observed by Greenpeace in the Southern ocean were killed instantaneously. For those remaining, the average time to death was 10 minutes, and one whale survived for at least 35 minutes. Some whales simply suffocate as a result of being unable to raise their heads out of the water.

The killing of larger whales (fin, sei, Bryde’s, and sperm) is likely to be even crueler because of their size. Greenpeace observed an instance where a struggling whale was lashed to the side of the catcher ship, which then steamed off. Being able to hit a whale cleanly, without having to do so repeatedly, in rough weather from a pitching vessel is just as hard as it was in the 1950s when animal welfare concerns were first raised in the IWC.

Norway now conducts its whaling under a formal objection to the IWC moratorium, which means that it is not bound by that decision. Iceland left the IWC in 1992 and rejoined 10 years later with a legally dubious reservation to the moratorium, which it invokes to conduct commercial whaling. In addition, Iceland has previously conducted “scientific whaling.” Japan
initially filed a formal objection to the moratorium decision, which it was forced to remove as a result of U.S. pressure related to Japan’s access to fishing within U.S. waters and other sanctions. Since 1986, Japan’s whaling has been conducted solely under the guise of “scientific research.”

Following the adoption of the moratorium, the IWC embarked on a process to determine a formula for setting catch limits if commercial whaling were to resume. The outcome, known as the Revised Management Procedure (RMP), represents the IWC’s attempt to balance conflicting objectives and define sustainability in practice. In addition to contravening IWC agreements, catches by Iceland, Japan, and Norway have exceeded the limits that would be allowed by the agreed RMP and therefore cannot be considered sustainable by IWC criteria.

<table>
<thead>
<tr>
<th>Country</th>
<th>Whale Population/Whaling Area</th>
<th>2010 Catch Limit</th>
<th>RMP Catch Limit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Japan</td>
<td>Western North Pacific Bryde’s whales</td>
<td>50</td>
<td>5</td>
</tr>
<tr>
<td>Iceland</td>
<td>North Atlantic fin whales</td>
<td>150</td>
<td>46</td>
</tr>
<tr>
<td>Iceland</td>
<td>Minke whales/coastal Iceland</td>
<td>100</td>
<td>224</td>
</tr>
<tr>
<td>Norway</td>
<td>Minke whales/Norwegian coast &amp; Svalbard area</td>
<td>1,016</td>
<td>372</td>
</tr>
<tr>
<td>Norway</td>
<td>Minke whales/Jan Mayen area</td>
<td>270</td>
<td>135</td>
</tr>
</tbody>
</table>

For all other whaling by Japan (sei, minke, and sperm whales in the North Pacific and fin and minke whales in the Southern Ocean), the IWC Scientific Committee has not been in a position to calculate RMP catch limits.

In addition to the RMP, negotiations continued for a number of years over elements of a regulatory regime called the Revised Management Scheme (RMS), which would ensure, primarily through monitoring, that any catch limits set by the IWC would not be exceeded. However, the negotiations over the RMS reached a stalemate in 2006, primarily because of a failure to agree on whether only the whaling countries should bear the costs and on how comprehensive the scheme needed to be.

Iceland, Japan, and Norway have all used the potential for competition between whales and fishermen as a justification for their whaling policies. The whalers argue that the whales are eating all the fish. Despite a scientific consensus that it is not possible to predict the effects on commercial fisheries of changes in whale numbers, despite the fact that that few whale species eat the fish that whalers insist would be diminished by increased numbers of whales, and despite the fact the complexities of marine systems are such that more whales could actually *lead* to increases in commercially viable fish species, government representatives from Japan, Norway, and Iceland all continue to make scientifically unsupported claims of competition.

In 2007, a negotiation process was started to address seemingly intractable differences within the IWC. A proposal for a compromise solution was released by the IWC’s chairman in April...
2010. The proposal included a table of catch limits that were to be fixed for 10 years and a number of changes to the IWC Schedule (in which binding decisions are recorded).

The proposal attempted to appeal to countries that have opposed commercial whaling in the past by claiming to offer a reduction in the total number of whales killed in the short term, in addition to an increased focus by the IWC on other whale conservation issues. The actual catch limit numbers that the negotiators were proposing were never made public, but the numbers in the April 2010 proposal would have initially allowed catches of around 90 percent of the total whales killed in 2009 and catches similar to the numbers actually killed in 2010.

The negotiations collapsed at the 2010 IWC meeting, in part because of strong opposition from the Latin bloc and Australia, who were primarily opposed to the fact that the proposal would have sanctioned continued whaling in the Southern Ocean Sanctuary and legitimized ongoing commercial whaling, despite the existence of the moratorium and an EU position that did not support the proposal as it stood for the same reasons. In addition, it was unclear as to whether the proposal had much support from whaling countries.

Two major issues emerged from the 2011 IWC meeting. First, a proposal to improve the transparency and accountability of IWC operations, which had been put forward by the United Kingdom, was adopted by consensus. Among other things, the proposal prevents countries from paying membership fees in cash and should therefore help address the problems of corruption that have dogged the IWC for years. There is strong evidence that Japan encouraged the participation of developing countries in the IWC in order to try to secure a majority. Second, Japan’s bloc walked out of the IWC meeting in order to break the quorum and therefore prevent a vote on a South Atlantic Whale Sanctuary. This problem needs to be addressed if the IWC is to regain its functionality.

In addition, at the United Nations, Monaco raised the issue of the protection of whales on the high seas (in areas outside national jurisdiction), despite considerable support for Monaco’s proposed Oceans resolution, Iceland, Norway, and Japan ensured that it was not adopted.

**CURRENT SOLUTIONS**

*International Whaling Commission:* In 1946, a meeting convened by the United States resulted in the creation of the International Convention for the Regulation of Whaling and, through that, the establishment of the IWC. At that time, all 15 of the original signatories to the convention, including the United States, were whaling nations. In 1982, the IWC adopted an indefinite moratorium on commercial whaling, which entered into effect in the 1985-86 whaling season. In 1994, the IWC created the Southern Ocean Sanctuary for whales in the seas surrounding Antarctica, where whaling is prohibited. Twenty-three nations voted in favor of the sanctuary with only Japan voting against.
**Convention on International Trade in Endangered Species (CITES):** In 1983, the year after the IWC moratorium vote, CITES decided to list all the remaining species of great whales in Appendix I, thus banning international commercial trade in their products.

**RECOMMENDATIONS**

The U.S. government should make ending whaling for commercial purposes a consistent foreign policy objective in every relevant forum and through diplomatic means by . . .

- Encouraging the IWC to focus on whale conservation, rather than whale hunting.
  - Leading conservation initiatives on entanglement, ship strikes, ocean noise, pollution, and other threats.
  - Ensuring that sufficient pro-whale countries attend the 2012 IWC to prevent Japan from breaking the quorum.
  - Ensuring, in conjunction with allies, that the rules for a quorum are adjusted so that the IWC can conduct its business without the threat of walkouts.
  - Actively supporting creation of a South Atlantic Whale Sanctuary.
  - Debunking unscientific arguments on whales depleting fish stocks and other ill-founded justifications for whaling in all relevant forums by publishing on the Web and otherwise circulating NOAA’s leaflet on this issue.

- Prioritizing bilateral and multilateral diplomatic measures to halt whaling for commercial purposes by Japan, Iceland, and Norway.
  - Challenging Japan’s importation of sei whales without a treaty reservation at CITES in March 2013 by submitting a document prior to the October 2012 deadline.
  - Encouraging Japanese officials to halt whaling in the Southern Ocean Sanctuary, abandon plans for construction of a new factory whaling ship, and end government subsidies for whaling.
  - Maintaining pressure on Iceland to secure a permanent cessation of its whaling of fin and minke whales and to prevent efforts to resuscitate the trade in whale products with Japan.
  - Certifying Iceland under the Pelly Amendment as a means of enacting pressure to prevent further hunting of fin whales by that country.
Encouraging Norway to withdraw its reservations to CITES Appendix I listings of whale populations and species to force Norway to end international trade in whale meat.

- Actively supporting initiatives at the United Nations to end directed takes of cetaceans on the high seas.
ENTANGLEMENT AND ENTRAPMENT

“Our greatest concern remains the number of animals we never saw…. Evidence suggests that only 3 to 10 percent of entanglements are witnessed and reported.” —Tim Cole, National Marine Fisheries Service

THE PROBLEM

The rapid expansion of global fisheries since the turn of the last century has led to an increasingly large presence of fishing gear in whale habitat.22 Because many baleen whale populations inhabit and migrate across continental shelf waters, where over 95 percent of fishing effort occurs, they are at serious risk of encountering and becoming entangled in gear.23

The percentage of whales assessed to have been entangled in fishing gear at some time in their lives ranges as high as 78 percent. In Alaska, analysis of scars on humpback whales showed that 71 percent of individuals had been entangled at some time in their lives with about 8 percent of the population acquiring scars annually.24

Examination of beached carcasses is often the first indication of an entanglement problem, but it is difficult to estimate numbers when only a small fraction of the animals killed are likely to wash ashore. It has been estimated that 12 percent of the Gulf of Maine humpback whale population suffer nonlethal entanglements each year (although that same study suggested the figure could be as high as 25 percent) and that fewer than 10 percent of entanglements for this population are witnessed and reported. These estimates from a well-studied population suggested a mortality rate of around 3 percent per year, much higher than previously supposed.25

It is likely that many other populations suffer much higher mortality from entanglement than is currently recognized. Part of the reason for this is that a large proportion, perhaps a majority of whales that become entangled either fatally or nonfatally, may not be observed or reported. As noted by Tim Cole and colleagues from the NMFS, in a 2006 review of baleen whale mortality along the eastern seaboard, “Our greatest concern remains the number of animals we never saw … Humpback whale scar evidence suggests that only 3 to 10 percent of entanglements are

23 Ibid.
witnessed and reported. Thus, whales may succumb to entanglement before the event can be detected.\textsuperscript{26}

Whether it ends in mortality or not, the process of entanglement can be an almost incomprehensibly painful and inhumane experience. Initially, adult baleen whales often have enough strength to break away from fishing gear and evade death. However, a portion of the gear may remain affixed to one or more body parts. As a result, the whale can become further entangled with those body parts becoming constricted as the animal struggles to free itself or flexes and extends its body during swimming. Many of the entanglement injuries that result are deep and extensive, penetrating through multiple tissue layers and even bone. Death may ultimately be caused by infection of the deep wounds, through exhaustion, or through restriction of movement leading to starvation. Whatever its ultimate cause, death, when it occurs, is likely to be slow and painful. Indeed, as one team of scientists wrote, “from a welfare perspective, lethal entanglements of baleen whales are, arguably, one of the worst forms of human-caused mortality in any wild animal.”\textsuperscript{27} A study of six North Atlantic right whales that had died from entanglement found that the average time to death was 5.6 months; however, some whales with potentially fatal entanglement injuries have survived considerably longer, up to 18 months.\textsuperscript{28}

The risk to whales of entanglement in fishing gear varies widely depending on the type of gear, with bycatch most commonly involving gillnets, mobile trawls, and fixed pot and trap fisheries. Examples of the most common types of fixed gear include lobster and crab pots and traps, anchored gill nets, and demersal longlines. One of the biggest problems for whales with fixed gear is the number and amount of vertical fishing lines used by fishermen to locate and identify the gear. Because this gear is deposited on the sea floor, long vertical lines at each end of the gear are used to locate the gear. Whales become entangled in these vertical “buoy lines,” especially when the gear is fished closely together. Some fixed fishing gear, such as sink gill nets, is laid out along the sea floor and literally anchored at each end so that it will not move. When lobster or crab traps are fished in trawls (multiple traps strung together along the bottom), they are not anchored; but the weight of the gear has the same effect as an anchor. When whales dive to the bottom, they become entangled in the horizontal lines used to string the nets or pots together. Floating horizontal lines fished on lobster and crab trawls are known hazards for whales, which is why there has been a big push for fishermen to use sinking line between traps and pots.

Driftnets are also known to entangle whales. Unlike fixed gear, driftnets are deployed at the water’s surface and allowed to drift with the ocean currents. Typically driftnets are constructed out of monofilament mesh with a float line used to keep the nets afloat and a sink line. The sink


\textsuperscript{28} Ibid.
line is at the bottom of the net and keeps the net taught and upright. Driftnets can stand 10 to 15 feet tall when deployed, which is why they have been labeled “walls of death.” Fortunately, because of international pressure to eliminate this destructive type of fishing, the United Nations adopted a ban on drift net fishing on the high seas in 1992 and took measures to eliminate the use of these nets in national waters. Florida and other U.S. states have banned drift gillnet fishing in state waters due to the indiscriminate nature of the gear. Collaborative efforts are also underway among scientists, fishermen, and gear manufacturers to reduce the risk from certain types of fishing gear, particularly in the lobster trawl fishery in the Northwest Atlantic. Right and humpback whales that encounter this gear appear to become entangled frequently. Scientists have determined that whales become entangled in the floating horizontal groundline used to connect a string of lobster traps laid on the sea floor.

By developing and using sinking groundline between traps, the potential for whale entanglement is greatly reduced. In 2005, IFAW sponsored a project to eliminate, as much as possible, the use of lethal floating line in the waters off Massachusetts. The goal of the project was to provide Massachusetts lobstermen with financial assistance to purchase whale-friendly nonbuoyant groundline, thus reducing the possibility of North Atlantic right whale entanglements in state coastal waters. The successful project involved more than 300 fishermen and replaced more than 2,100 miles of hazardous floating line. As a result of IFAW’s successful lobster gear exchange program, the Commonwealth of Massachusetts became the first state in the nation to require all lobstermen fishing in state waters to use sinking groundline on lobster trawls. Following this progress, the NMFS issued a final rule in October 2007 that expanded the requirement of sinking groundlines for trap and pot fisheries across the east coast.

Most fishermen would rather not catch whales, and the loss and damage to gear from entanglements can be very expensive. However, in countries where there is an active market for whale meat, the high value of incidentally caught whales (fishermen can reportedly make up to $100,000 from a minke whale) provides an incentive to set fishing gear in a way that might be more, rather than less likely to catch a whale. In both Japan and South Korea, it is legal to kill and sell by-caught whales. In South Korea, whaling is not permitted, but the large bycatch of whales supports an active market. Market surveys have also shown that the number of minke whales entering the South Korean market is likely to be double that of the official reports. It is likely that the large financial incentive to report by-caught whales in Japan and South Korea,

which then allows the meat to be legally sold, has resulted in a higher reporting rate than elsewhere. The fact that these two countries stand out in international statistics for the very high bycatch rates may be more related to reporting than to the actual take. In some developing countries, bycatch can also promote a market in illegal cetacean meat, sometimes leading to directed takes. 

**CURRENT SOLUTIONS**

**United Nations:** The United Nations adopted a ban on driftnet fishing on the high seas in 1992 and took measures to eliminate the use of these nets in national waters.

**United States:** Amendments to the MMPA in 1994 require the NMFS to implement Take Reduction Plans for reducing bycatch and injury from commercial fisheries for certain specified populations of marine mammals. These Take Reduction Plans are developed through ongoing dialogue among Take Reduction Teams (TRTs) made up of officials and interested parties including the fishing industry.

Compared to other countries, the United States has well-developed mechanisms for both monitoring bycatch and implementing mitigation measures. These include the nine TRTs and the National Marine Mammal Stranding Network consisting of more than 120 organizations. Under the Marine Mammal Protection Act, the incidental serious injury and mortality of marine mammals in commercial fishing operations must be reduced to insignificant levels approaching a zero mortality and serious injury rate. This has become known as the Zero Mortality Rate Goal (ZMRG). The NMFS has defined a threshold for what is considered to be an insignificant level of bycatch from a conservation perspective as less than 10 percent of the Potential Biological Removal (PBR) level for any population of whales. Florida and other states also have banned drift gillnet fishing in state waters due to the indiscriminate nature of the gear. All U.S. fishing vessel owners or operators are also required to report all incidental injuries and mortalities of marine mammals that occur during commercial fishing operations.

Commercial fisheries are classified into three categories based on the risk to marine mammals. Category I fisheries cause frequent mortality (that is, greater than 50 percent PBR). Category II fisheries cause occasional mortality (1 to 50 percent PBR). Category III fisheries are those with a remote likelihood of or no known mortality or serious injury. Category I or II fisheries must comply with any applicable take reduction plan regulations, including the placement of fisheries observers on board if required.

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35. For a discussion of PBR, please see “Cumulative Threats,” p. 55.

In 2004, the United States developed a national strategy for monitoring bycatch in U.S. fisheries. Nevertheless, while there have been some successes in reducing bycatch of small cetaceans such as porpoises, there still remain serious problems. This is largely because the most effective measure, reducing the amount of fishing with gear that poses entanglement risks, is difficult for social and economic reasons. Unlike other TRTs, the Atlantic Large Whale Take Reduction Team (ALWTRT) has not been able to meet targets, despite many regulations imposed by the NMFS including the groundline requirements that took effect in 2008. Bycatch of large whales along the east coast of the United States remains a serious conservation and welfare problem. For the Atlantic populations of fin, humpback, minke, North Atlantic right, and sei whale, the latest stock assessment reports conclude that entanglement mortalities are not less than 10 percent of the calculated PBR and therefore cannot be considered insignificant and approaching the ZMRG.

There is also a need for a better understanding of those fisheries that are involved in large whale entanglements. Most large whale species make long migrations and may come into contact with a number of different fisheries. Studies to examine gear on entangled right whales found that only 45 percent of the gear could be identified as belonging to a given fishery.

Although disentanglement can never be thought of as a solution to the problem—prevention is always better than cure—disentanglement teams have been established in many of the high-risk areas around U.S. coasts, and expertise developed by these has been used in other countries, including an international workshop held in Hawaii in 2010.

While research continues to better understand the problem and investigate various technological solutions, there is a need for forward-looking fishery management that takes marine mammal bycatch into account as part of overall efforts to improve fisheries by reducing fishing effort. Fishery restrictions and seasonal and area closures can all cause economic hardship, but well-designed measures may also benefit the industry in the long term.

RECOMMENDATIONS

The U.S. government should replace piecemeal attempts to address entanglement with a longer-term approach engaging stakeholders in developing specific measures to reduce large whale entanglement by . . .

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38 http://www.nmfs.noaa.gov/pr/sars/species.htm#largewhales
• Exploring the risk of large whale entanglement in fishing gear in all domestic fisheries and working to reduce that risk.
  
  o Allowing experimental pot and trap fishing without vertical lines in selected areas or considering closing specific areas so that such experimental fisheries could operate.

  o Reconvening the Atlantic and Pacific Offshore Cetacean TRTs. The Atlantic Offshore Cetacean Team was disbanded in August 2001 and should be reestablished with a new Take Reduction Plan proposed by the end of 2012. The Pacific Offshore Cetacean Team, while not disbanded, has not made recommendations since 2009 and should reconvene and reassess its plan.

  o Finalizing and implementing the ALWTRT proposed vertical line rule by 2013, using an established level of legally binding risk reduction.

  o Addressing the risk of vertical lines to humpback whales, in addition to the risk to North Atlantic right whales.

  o Reducing endlines associated with gillnet gear, as this problem is not being addressed by the ALWTRT’s proposed vertical line rule. This can be accomplished through measures such as imposing caps on the number of endlines and panels or requiring that some gillnets be tended during deployment with nets retrieved and kept aboard when vessels return to port.

  o Securing funding for disentanglement, stranding response, and necropsies through renewal of the Prescott Grant and other funding programs.

  o Basing future regulations on best available technologies and practices to achieve quantified risk reduction by consolidating ongoing gear engineering and bycatch research results into a formal, public report by the end of 2012.

• Leveraging U.S. expertise in bilateral relationships and multilateral forums to promote and replicate disentanglement solutions in fisheries around the world.

  o Finalizing a whale conservation agreement with Canada to reduce entanglement of whales in fishing gear and identify effective measures in both countries to prevent such entanglement.

  o Expediting work within the IWC and its Scientific and Conservation Committees to gather data on, and develop solutions to, entanglement of large whales worldwide, especially in areas where such entanglement may be “directed” as a means of providing whale meat.
SHIP STRIKES AND SHIPPING NOISE

Between 2004 and 2008, there were 57 verified ship strike events of large whales along the eastern seaboards of the United States and Canada. Whales killed further offshore are much less likely to be noticed and reported.

THE PROBLEM

Beneath the sea’s surface, whales swim, feed, and communicate over many miles of water. At the surface, they feed, swim, rest, and breathe. Whale sightings are rare. Those who spend much time at sea may occasionally spot a hint of breath or the glimpse of a tail. However, the presence of whales is more frequent than may always be obvious, even though in most areas of the ocean there are far fewer whales than in centuries past. For example, the sighting of several blue whales off the coast of Washington State in early 2012 led researchers to suggest that the species may actually be more common in the area than presumed but that local conditions, such as high swells, limit the whales’ visibility.  

The most ubiquitous human presence on the ocean is through shipping that ranges from pleasure craft to large container vessels. The presence of such vessels leads to conflicts with whales in two principal ways: First, at least partly because whales are not always easy to spot, whether at the surface or just below it, ships may strike whales, injuring or killing them. Second, the sound generated by large vessels in particular can travel large distances under water and affect the ability of whales to hear and communicate.

Ship Strikes

The types of vessels that tend to collide with whales include sailing yachts, pleasure craft, passenger ferries, fishing boats, and large merchant ships. The impact of such collisions on whales—and indeed, on the vessels themselves—runs the gamut from immediate mortality to injuries to the whales, to vessel loss and human fatalities. Although small yachts can be severely damaged, the crew of large merchant vessels may be completely unaware that collisions have occurred. At speeds greater than 15 knots, collisions will almost certainly be fatal, but the risk begins to decrease with reduced speed. Once a vessel’s speed is reduced to 10 knots or slower, the odds of a strike resulting in lethal injury to the whale are significantly diminished.

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45 Ibid.
The United States has been at the forefront of international efforts to address ship strikes. Along the country’s east coast, several important areas for whales overlap with high densities of shipping. For three large whale species in this region—North Atlantic right whale, humpback whale, and sei whale—confirmed cases of deaths have exceeded the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population (the PBR).\textsuperscript{46} The species that has attracted the greatest concern is the North Atlantic right whale, whose small population of around 450 to 500 individuals remains much depleted as a result of centuries of commercial whaling, making it especially vulnerable to the high rates of mortality it suffers from ship strikes and entanglement.\textsuperscript{47} That such collisions are potentially a major factor in impeding whale population recovery has come to light principally because the United States boasts a well-developed network of scientists responding to whale strandings: Many whale carcasses washed ashore have no visible external injuries but, following detailed internal examinations, are found to have been hit by ships.

\begin{table}[h]
\centering
\begin{tabular}{|l|c|c|c|c|c|c|c|}
\hline
Species & North Atlantic right whale & Humpback whale & Fin whale & Sei whale & Minke whale & Unidentified whale & Total \\
\hline
Confirmed ship strike events & 17 & 14 & 13 & 3 & 2 & 8 & 57 \\
\hline
Confirmed ship strike deaths or serious injury & 10 & 8 & 10 & 2 & 2 & 0 & 30 \\
\hline
\end{tabular}
\caption{Numbers of Whales Involved in Collisions off the Northwest Atlantic Coast}
\end{table}

\begin{quote}
For the period 2004–2008, NOAA identified 57 ship strike events involving large whales along the eastern seaboard of the United States and Canada. Although this is an area of particularly well-developed reporting networks, the figures below are acknowledged as a minimum count that is assumed to underestimate the total number of whales struck by ships. Whales killed further offshore are much less likely to be noticed or reported.
\end{quote}


Few other countries have such established stranding networks, and fewer still have the facilities for full examination of large whale carcasses. Hence, knowledge of ship strike incidents elsewhere may be patchy, disguising a serious problem that has yet to be uncovered. The paucity of information about collisions has made developing mitigation strategies more difficult. To address this, the United States and the IWC have made efforts to develop databases of ship strike incidents. These databases can help scientists assess the conservation implications for whale populations and understand how different factors affect collision risk. These data can also help prioritize high-risk areas where the most urgent action is needed.

**CURRENT SOLUTIONS**

**United States:** In the early 1990s, it became apparent that ship strikes were one of the two major threats to the survival of the North Atlantic right whale, which migrate along the east coast of the United States and Canada, crossing busy shipping lanes and also congregating in areas of high shipping traffic to breed and feed. The most effective measure to reduce collision risk is to keep whales and vessels apart. Consequently, in a few areas, a relatively straightforward solution has been to adjust shipping lanes to avoid the highest densities of whales. The United States has moved and narrowed the shipping lanes crossing Stellwagen Bank National Marine Sanctuary, a marine protected area north of Cape Cod, MA, and has established a seasonal Area to be Avoided (ATBA) in the Great South Channel, an area in the Gulf of Maine where North Atlantic right whales congregate in the spring.

Elsewhere within the range of the North Atlantic right whale, it has been more difficult to move shipping lanes or predict where concentrations of whales may occur. In areas where a high risk has been identified but keeping ships and whales apart has not been possible, speed restrictions have been imposed. The Final Rule to Implement Speed Restrictions to Reduce the Threat of Ship Collisions with North Atlantic Right Whales, the “Ship Strike Rule,” as established by the NMFS took effect December 9, 2008, imposing “speed restrictions of no more than 10 knots applying to all vessels 65 feet or greater in overall length in certain locations and at certain times of the year along the east coast of the U.S. Atlantic seaboard.” These areas and times when the rule applies are delineated in the Federal Register (50 CFR Part 224). Unfortunately, without renewal, this rule is set to expire December 9, 2013.

There is also a system of dynamic management areas involving voluntary speed restrictions around concentrations of North Atlantic right whales. These have typically been imposed for periods of 14 days following observations of high numbers of whales. Mariners are requested to route around the areas or transit through them at 10 knots or less; mariners may subscribe, via the NOAA website, to email alerts advising them of these restrictions. Unfortunately,
monitoring studies have generally found poor compliance with these temporary and voluntary measures compared to changes to shipping lanes.\(^{48}\)

Additionally, NOAA and the U.S. Coast Guard developed, and the IMO adopted, a mandatory ship reporting system requiring all commercial vessels of more than 300 gross tons to report to a shore-based station when they enter areas of critical right whale habitat. These two areas are year round off the Massachusetts and in winter off the Georgia-Florida coasts. The main objective is to raise mariner awareness about the risk of collisions with right whales and provide information on recent whale locations. This mandatory reporting system was modeled after the voluntary ship reporting system that IFAW pioneered with the shipping industry.

Elsewhere, the National Park Service imposes and implements seasonal speed and distance restrictions to protect humpback whales in Alaska’s Glacier Bay National Park and Preserve;\(^{49}\) while in Hawaiian waters, NOAA requires boaters to stay more than 100 yards away from humpback whales and encourages traveling at slow, safe speeds in areas where humpbacks are prevalent.\(^{50}\)

These mitigation measures have minimal economic implications for the shipping industry and the industry has shown a willingness to work toward solutions. For example, in a May 3\(^{rd}\), 2007 letter, the World Shipping Council stated that it “supported and continues to support the establishment of Areas to be Avoided and Dynamic Management Areas based on known aggregations of right whales.”\(^{51}\)

With further research and cooperation with mariners there is considerable potential to improve on the measures currently in place. For example, for the last several years, a consortium of research teams, including the Massachusetts Division of Marine Fisheries, the Center for Coastal Studies, Cornell University, and the Woods Hole Oceanographic Institution, have deployed acoustic monitoring buoys each spring and fall to listen for right whales as they enter and depart Cape Cod—an initiative for which IFAW contributed funding and research.\(^{52}\) These buoys enable researchers to identify whales’ whereabouts and can be set up to relay information automatically to shore stations or directly to vessels. Released in April 2012, IFAW’s Whale Alert app for iPads and iPhones utilizes the information about right whale presence obtained from these buoys along with up to date information on regulations to put real-time visual, acoustic and nautical chart information at the fingertips of ship captains on the bridge of their vessels. This technology saves mariners time and hassle, and it will save right whale lives.

\(^{49}\) http://www.nps.gov/glba/planyourvisit/boatregs.htm
\(^{50}\) http://hawaiihumpbackwhale.noaa.gov/explore/whale_guidelines.html
\(^{52}\) http://environment.blog.state.ma.us/blog/2010/01/tis-almost-the-season-for-right-whales.html
**Canada:** Canada has moved the shipping lanes in the Bay of Fundy and established an Area to be Avoided in the Roseway Basin, both areas where the whales congregate to feed in summer.

**International Maritime Organization:** As the sole recognized authority for the establishment and endorsement of changes to lanes for international shipping, the IMO has endorsed and adopted changes that the United States made to its shipping lanes and has subsequently produced a guidance document for minimizing the risk of collisions with cetaceans. In October 2008, the IMO included shipping noise in its environmental work program.

**Shipping Noise**
In recent decades, noise from human activities has resulted in dramatic changes in background noise levels in the world’s oceans. Depending on its frequency, sound can travel great distances in sea water. As a consequence, underwater noise pollution spreads throughout the marine environment. Because whales live in an acoustic-dominant world, they may be especially vulnerable to such noise pollution, particularly when their vocalizations overlap in frequency with the dominant components of shipping noise.

According to Christopher Clark of Cornell University, noise pollution is “doubling every decade in an urbanized marine environment.” As a consequence, he says, a blue whale that was born in 1940 would have seen its acoustic bubble—the distance over which its vocalizations can travel and the vocalizations of others can be heard—shrink from 1,000 miles to 100 miles. In Cape Cod Bay, noise pollution created primarily by shipping traffic has shrunk the acoustic space of right whales by 80 percent. Susan Parks of Penn State University adds that right whales have been forced to increase the volume of their calls and that the frequency of those calls has also increased by approximately 30 hertz in order to evade the cacophony of anthropogenic noise. All of this matters not least because, as Clark expresses it, “If females can no longer hear the singing males through the [acoustic] smog, they lose breeding opportunities and choices.”

Large commercial vessels produce relatively loud and predominately low-frequency sounds. The propulsion systems of large commercial ships are a dominant source of radiated underwater noise at frequencies lower than 200 Hz. Individual vessels produce unique

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55 Ibid.
57 Carey, op. cit.
acoustic signatures, although these signatures may change with such things as ship speed and vessel load.\textsuperscript{59,60}

Most of the acoustic field surrounding large vessels is the result of propeller cavitation (when vacuum bubbles created by the motion of propellers collapse), causing ships to emit low-frequency tonal sounds quite near to vessels.\textsuperscript{61} Smaller, but potentially significant, amounts of radiated noise can arise from onboard machinery (engine room and auxiliary equipment).\textsuperscript{62} Hydrodynamic flow over the ship’s hull and hull attachments is an important broadband sound-generating mechanism, especially with increased ship speed.\textsuperscript{63} Source (propeller) depth is also important in terms of long-range sound propagation. Large vessels are loud near-field sources in both offshore (in shipping routes and corridors) and coastal waters (mainly in traffic lanes, waterways/canals, or ports). Because of their loud and low frequency signatures, large vessels dominate low-frequency background noise in many marine environments worldwide.\textsuperscript{64,65}

Tugboats, crewboats, supply ships, and many research vessels in the medium-sized category typically have large and complex propulsion systems, often including bow-thrusters.\textsuperscript{66} Many fishing vessels also fall within this category. Most medium-sized ships are similar to large vessels in that most of the sound energy is low-frequency. While broadband source levels are usually slightly lower for medium-sized vessels than for the larger commercial vessels, there are some exceptions (for example, because of the age or maintenance of the ship), and medium-sized ships can produce sounds of sufficient level and frequency to contribute to marine ambient noise in some areas.\textsuperscript{67}

Small boats with outboard or inboard engines produce sound that is generally highest in the mid-frequency (1 to 5 kHz) range and at moderate source levels although the output characteristics can be highly dependent on speed.\textsuperscript{68,69} Because of the generally higher

\textsuperscript{61} Ibid.
\textsuperscript{66} Ibid.
acoustic frequency and near-shore operation, noise from smaller vessels is regarded as having more geographically limited environmental impacts. Small craft and boats are of less concern in terms of overall increases in low-frequency marine ambient noise from so-called “distant shipping,” but can dominate some coastal acoustic environments, particularly partially enclosed bays, harbors, and/or estuaries.\textsuperscript{71}

The extent to which shipping traffic can affect whales was demonstrated through an accidental discovery in the wake of the terrorist attacks of September 11, 2001. Two teams of scientists had been in the Bay of Fundy area, which is home to the busy Saint John Port and the principal summer feeding waters for right whales, and were studying whale singing and whale health when commercial transportation around the world was brought to a standstill to assess security measures following the attacks. The slowdown resulted in a significant decrease in underwater noise from large ships, which can overlap the low-frequency acoustic signals whales use to communicate for feeding or mating. The decrease in noise also resulted in decreases in stress-related hormones in whale feces. The study’s authors observed that “this is the first evidence that exposure to low-frequency ship noise may be associated with chronic stress in whales and has implications for all baleen whales in heavy ship traffic areas and for recovery of this endangered right whale population.”\textsuperscript{72}

Reducing background noise can most effectively be addressed by a long-term program of collaboration with the shipping industry to ensure that reducing noise output is a consideration throughout the process of design and operation of merchant vessels. The target endorsed by the Scientific Committee of the IWC is to reduce the contribution of shipping to ambient noise levels in the 10 to 300Hz range by 3 decibels in 10 years and by 10 decibels in 30 years, relative to current levels. Simple calculations suggest that the overall contribution to ambient noise from shipping is dominated by the noisiest 10 percent of vessels. These are also the vessels for which it is likely that noise-reduction measures will be the most effective. Thus, achieving a reduction in ambient noise due to shipping may be achievable alongside improvements in vessel efficiency.

\section*{CURRENT SOLUTIONS}

\textbf{The United States:} Recognizing the potential impacts of shipping noise, NOAA hosted international symposia in 2004 and 2007 to consider the effects of noise from large vessels on marine life and how to reduce noise outputs. However, it is the IMO that has primary responsibility for addressing the problem. In October 2008, on the basis of a U.S. proposal,\textsuperscript{73}

\begin{itemize}
\end{itemize}
the IMO included shipping noise in its environmental work program. A correspondence group has been working to identify ways to minimize underwater noise from commercial shipping, including developing non-mandatory technical guidelines for ship-quieting technologies.74

RECOMMENDATIONS

The U.S. government should reduce the risk of ship strikes in U.S. waters and lead efforts to do so internationally by . . .

• Identifying high-risk areas in U.S. waters and enacting rules on vessel speeds and shipping lanes to reduce the risk of strikes to large whales.
  
  o Developing a new Ship Strike Rule, well in advance of the current rule’s (50 CFR Part 224) expiration date in December 2013, that improves and strengthens the rule. This can be accomplished by expanding Seasonal Management Areas from 20 nautical miles to 30 nautical miles, requiring that U.S. government vessels comply with the 10-knot speed restrictions in the same way that U.S. government vessels comply with other maritime regulations (for example, SOLAS, the International Convention for the Safety of Life at Sea, and COLREGS, the International Regulations for Avoiding Collisions at Sea), and improving compliance monitoring and enforcement, including more awareness and education programs.

  o Assessing and reporting on trends in whale ship strike deaths and serious injuries, as well as the effectiveness of and compliance with the Ship Strike Rule every five years.

• Continuing to support acoustic, aerial, and other monitoring of whales to provide ongoing assessments of their location and their risk from ship strikes and methods to relay information about whales effectively to mariners.

  o Maintaining funding for aerial surveys to determine North Atlantic right whale counts.

• Identifying high-risk areas for ship strikes throughout the world and actively engaging countries to develop plans to decrease this risk.

  o Leading, through dedicated NOAA staff, work on entanglement and ship strike issues at the IWC and IMO to keep the U.S. delegation updated on new developments and to disseminate relevant information and guidelines.

74 This group has produced reports MEPC 59/19, MEPC 60/18 and MEPC 61/19.
Examining the feasibility of U.S. research funding for identifying high-risk areas for ship strikes globally, to be administered by the IWC in a similar way to the funding provided by Australia for developing conservation management plans.

The U.S. government should reduce noise in the ocean, including shipping noise, by . . .

- Establishing within NOAA a research fund specifically dedicated to implementing research on noise reduction as recommended by the IMO.
  - Providing tax and registration fee incentives to the shipping industry to encourage deployment of quiet ship technology.
  - Conducting a national fleet inventory, as requested by the IMO, to identify ships that could benefit most from noise-reduction measures.

- Funding research to fill knowledge gaps related to the impact of shipping noise on large whales.
  - Reviewing, through NOAA, the benefits and feasibility of limiting or rerouting vessel traffic in Biologically Important Areas and Seasonal Management Zones.
NAVY SONAR

There have been 40 mass stranding events of Cuvier’s beaked whales since 1960, and 28 of these events occurred at the same time and place as naval maneuvers or the use of active sonar or near naval bases.

THE PROBLEM

Over the past decade, evidence of a link between military sonar exercises and strandings of beaked whales has been steadily growing. In 2004, the Scientific Committee of the IWC stated that “there is now compelling evidence implicating military sonar as a direct impact on beaked whales in particular.”75 Few studies have been able to quantify the long-term effects on whales of exposure to underwater noise pollution.76 There is also considerable uncertainty and debate about what levels of noise exposure can cause significant impacts. Although there are more studies demonstrating behavioral responses than either direct auditory or physiological effects, the level of response associated with a particular exposure varies substantially.77 Although brief high-intensity sources of noise may injure the individual whales that are close by, long-term continuous noise may have effects on population levels through changes in behavior or habitat use.

Two specific types of naval sonar have been linked to problems affecting cetaceans: low-frequency active sonar and mid-frequency active sonar.

Low-frequency active sonar (LFAS) is used for broad-scale military surveillance, allowing listening platforms to detect submarines over scales of hundreds of miles.78 Specialized support ships are used to deploy LFAS, which consists of arrays suspended vertically below the ship. The U.S. Navy’s Surveillance Towed Array Sensor System LFAS uses an array of up to 18 projectors operating in the frequency range from 100 to 500 Hz.79 These systems are designed to project beams of energy in a horizontal direction with a vertical beam width that can be steered above or below the horizontal. Signal transmissions are emitted in patterned sequences that may last for days or weeks.

Mid-frequency active sonar (MFAS) is used for detecting submarines over a shorter range of approximately five or six miles or less. There are about 300 MFAS in active service in the world’s...

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navies. These MFAS were formerly used mainly in offshore waters but now also scan shallower inshore environments to detect submarines that are able to operate closer to shore.

Atypical mass stranding events of mainly beaked whales first began to be reported in the mid 1980s and usually coincided with the use of MFAS by the military. Necropsies of beaked whales stranded in the Bahamas in 2000 clearly revealed that the animals had suffered acoustic trauma resulting in hemorrhaging around the brain, in the inner ears, and in the acoustic fats located in the head that are involved in sound transmission. The official interim report for the mass stranding event concluded that an acoustic or impulse injury caused the animals to strand and that MFAS used by the navy on a nearby exercise was the most plausible source of the acoustic trauma or impulse. Analysis of subsequent mass stranded beaked whales found acute systemic micro-hemorrhages and gas and fat emboli in individuals that mass stranded during a naval exercise in the Canary Islands in 2002.

Further mass stranding events of beaked whales and other cetaceans have been reported in a range of locations around the world. Research on Cuvier’s beaked whales indicates that there have been 40 mass stranding events of two or more individuals since 1960, and 28 of these events occurred at the same time and place as naval maneuvers or the use of active

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86 Ibid.
sonar or near naval bases.\textsuperscript{92} A number of other species such as minke whales and pygmy sperm whales have stranded concurrently with beaked whales in sonar-related stranding events, while other species including long-finned pilot whales, melon headed whales, dwarf sperm whales and harbor porpoises, have stranded in noise-related events.\textsuperscript{93} The fact that stranded deep-diving cetaceans other than beaked whales have been shown to have gas embolism disease, which leads to symptoms in cetaceans similar to decompression sickness in humans, suggests that sonar or other noise impacts may be more widespread than previously thought.\textsuperscript{94} Mortality may be underestimated if based solely on stranded individuals as affected cetaceans are also highly likely to die at sea and not be washed up or detected, which is likely to be related to local environmental conditions.\textsuperscript{95}

**CURRENT SOLUTIONS**

**The United States:** In 2001, the U.S. Navy acknowledged that its active sonar played a role in the stranding deaths of 14 beaked whales, two minke whales, and a dolphin in the Bahamas in 2000. The navy’s report stated that the strandings were caused by “the unusual combination of several contributory factors acting together”—specifically, that calm water and undersea topography focused the sound generated by the sonar in the top 200 meters of the ocean. In 2005, the Natural Resources Defense Council filed a lawsuit contending that the use of active, submarine-hunting sonar posed threats to cetaceans and violated, among other laws, the MMPA, the National Environmental Policy Act and the ESA. Although a Los Angeles federal court agreed, and ordered the navy to enact a number of safety measures to protect whales, navy officials appealed to the Supreme Court, which in 2008 overturned two of six mitigation measures while leaving the rest in place.

In January 2009, the incoming Obama Administration asked NOAA to conduct a comprehensive review of all mitigation measures applicable to the use of sonar. On January 19, 2010, NOAA informed the White House Commission on Environmental Quality that NOAA had “identified the relevant uncertainties regarding the impacts of the proposed training on marine mammals. Two are worth highlighting. One involves lack of knowledge about the mechanisms whereby some species of marine mammals, particularly beaked whales, are adversely affected by mid-frequency active sonar. The other concerns the difficulties of limiting the impact of active sonar where the mitigation efforts depend on visual sighting of whales. The ongoing mitigation efforts, in our view, must do more to address both of these uncertainties. NMFS included adaptive management provisions in the rules as a mechanism for improving the effectiveness of

\textsuperscript{93} Ibid.
\textsuperscript{94} Ibid.
mitigation, as appropriate. NMFS also required the Navy to provide after-action reports following each exercise, which NMFS will monitor and use to modify mitigation measures, as appropriate. Thus, there are some mechanisms already in place to improve mitigation measures in the long run as new information becomes available."97

The results of that review are expected to be made available in the first half of 2012 with the likely conclusions expected to include the identification of areas of particularly important habitat for cetaceans. Such areas are likely to be ones in which cetaceans are at heightened risk from use of active sonar, among other threats.

RECOMMENDATIONS

The U.S. government should end its use of low- and mid-frequency active sonar in areas of high risk to cetaceans and reduce this risk elsewhere by . . .

- Accelerating efforts to determine the impact of active sonar on the behavior and physiology of cetaceans and the times and places where use may cause the greatest harm, with regular reporting of those findings to NOAA.
  - Identifying and delineating areas of high cetacean density through the NOAA workshop process and requiring the U.S. Navy to incorporate recommended restrictions that emerge from that process into its training practices.

- Ensuring that ongoing U.S. and NATO deployment of active sonar reflects the best available knowledge and a precautionary approach that minimizes risks to cetaceans.

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97 Letter may be viewed at http://www.nrdc.org/media/docs/100119.pdf.
A total of 101 carcasses were found washed ashore following the [Deepwater Horizon] incident. This figure likely accounted for only 2 percent of the total number of cetaceans...killed during the spill, with the great majority sinking at sea and the overall total closer to 5,000.

THE PROBLEM

Over the past 100 or so years as the ocean has become more industrialized, it has also become noisier. In addition to the impact of shipping noise and military sonar, industrial activity, as it expands from land to shore to sea, fills the underwater world with a veritable cacophony of sounds from activities such as explosives, pile drivers, drilling, dredging, and seismic blasts.

For example, pile driving is used for harbor works, bridge construction, oil and gas platform installations, and the construction of offshore wind farm foundations. The noise produced enters the water column directly but also travels through the seabed with sound propagation varying according to the type of seabed.\textsuperscript{98} Dredging in the marine environment is undertaken to maintain shipping lanes, extract geological resources such as sand and gravel, and to route seafloor pipelines. Offshore wind farms create low-frequency noise at high source levels during their construction but at moderate source levels during their operation. Operational source levels of offshore wind farms depend on construction type, size, environmental conditions, wind speed, and probably also the size of the wind farm.\textsuperscript{99}

An issue of increasing significance is sand mining in which beaches are being mined to provide for sand for a variety of uses, such as aggregate in concrete, fill, and beach rehabilitation. But the activity that raises the most concern, in terms of noise pollution and other forms of disturbance, is oil and gas exploration and drilling. Exploration for oil and gas frequently involves the use of blasts from seismic vessels. There are approximately 100 such vessels available globally,\textsuperscript{100} and roughly 20 percent of them are conducting field operations at any one time.\textsuperscript{101}

Essentially, a seismic or seabed survey involves directing a high energy sound pulse into the sea floor and measuring the pattern of reflected sound waves. The main sound-producing elements used in oil exploration are air-gun arrays, which are towed from marine vessels.\textsuperscript{102} Air guns


release a volume of air under high pressure, creating a sound wave from the expansion and contraction of the released air bubble.\textsuperscript{103} To yield high acoustic intensities, multiple air guns are fired with precise timing to produce a coherent pulse of sound. During a survey, guns are fired at regular intervals (for example, every 10 to 15 seconds) as the towing source vessel moves ahead.

Marine animals have been recorded fleeing survey areas during seismic surveying, and displacement from habitat is a major concern. In the areas of oil and gas development off Russia’s Sakhalin Island, whales were recorded leaving their feeding areas during surveys only to return days after the surveys stopped—a clear indicator of habitat displacement.

Many types of marine mammals have reacted strongly to the intense sound of seismic surveys, including a number of species of baleen whales.\textsuperscript{104} \textsuperscript{105} An assessment of cetacean responses to 201 seismic surveys resulted in the suggestion that toothed whales may adopt a strategy of moving out of the affected area entirely while slower moving baleen whales move away from the seismic survey to increase the distance from the source but do not leave the area completely.\textsuperscript{106} Observations of sperm whales that were resident in an area with seismic surveys occurring over many years did not record any avoidance behavior, which may indicate habituation, but there were more subtle changes in foraging behavior at sound levels that were considerably below the threshold level used to predict a disruption of behavior.\textsuperscript{107} It is thought that repeated short-term changes in behavior may lead to long-term impacts at the population level through continual avoidance leading to habitat displacement\textsuperscript{108} \textsuperscript{109} or by reducing energy acquisition in terms of lost feeding opportunities.\textsuperscript{110} The displacement of numerous cetacean species has been well documented in the scientific literature.\textsuperscript{111} \textsuperscript{112} In some cases, individual whales have been displaced for a number of years, only returning when the activities causing

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\textsuperscript{105} D. E. Bain and R. Williams. 2006. “Long-range Effects of Air Gun Noise on Marine Mammals: Responses as a Function of Received Sound Level and Distance.” \textit{IWC-SC/58E35}.
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the anthropogenic noise ceased. If the displacement results in the animals being excluded from important feeding, breeding, or nursery habitats, there is likely to be a deleterious impact on survival and growth of the population group.

Where seismic testing does take place, mitigation measures do exist. Prior to commencement of a seismic survey, visual observers must examine the area for marine mammals for a period of at least 30 minutes. Assuming the coast is clear, the survey must ramp up slowly by firing first one seismic gun and then others over a period of between 20 and 40 minutes until the desired level is reached. However, should a whale or other marine mammal appear within an exclusion zone of 500 meters from the center of the seismic array, the operation must shut down, and visual examination must resume for 30 minutes.

The most effective mitigation of noise is to reduce the number, duration, and intensity of seismic surveys or sonar exercises while at the same time conducting them at times of year or in areas where whale density is believed to be low. The U.S. Marine Mammal Commission has also highlighted the need for coordination to avoid “repetitious seismic surveys of the same area when a single survey would suffice.”

There are several techniques for reducing the noise levels from seismic surveys and pile driving. For seismic surveys, this involves either using alternative methods for generating the necessary sound, improved analysis methods allowing lower source levels to be used, or removing the sound frequencies not used in analysis. These methods were reviewed at a workshop in 2007, but it is not clear how much progress has been made with practical implementation. For pile driving, noise may be reduced at the source by using continuous pressure or suction rather than a hammer action to place the pile into the sea bed. Noise propagation may also be reduced by fixed screens or bubble curtains around the piles. Both physical barriers and bubble curtains can effectively reduce noise propagation, but bubble curtains are only practicable in low tidal currents and relatively shallow water. A review in 2007 suggested that

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115 See, for example, U.S. Department of the Interior Minerals Management Service Gulf of Mexico (GoM) OCS Region NTL No. 2007-G02, viewable at http://www.gomr.boemre.gov/homepg/regulate/regs/ntls/2007NTLs/07-g02.pdf.
118 Ibid.
120 Ibid.
an inflatable sleeve was potentially the most effective option, but such methods are not yet commonly used.

Once oil or gas is found, the drilling or extraction phase adds even greater amounts of noise, albeit in a more constant manner than the intermittent bangs associated with seismic surveys. The more constant nature of this noise from platforms and drill ships does not necessarily make it any less of an issue. Prolonged exposure of marine mammals to intermittent or continuous anthropogenic noise has the potential to induce a state of chronic stress if the exposures are of sufficient intensity, duration, and frequency. Chronic stress is known to have adverse health consequences for populations of terrestrial animals by affecting fertility, mortality, and growth rates. Moreover, the following range of biological systems and processes in animals are affected by exposure to noise: the neuroendocrine system, reproduction and development, metabolism, cardiovascular health, cognition and sleep, audition and cochlear morphology, the immune system, and DNA integrity and genes. Therefore, it is logical to infer that noise-induced chronic stress has the potential to detrimentally alter similar critical life history parameters in marine mammals (for example, disease susceptibility, reproductive rates, mortality rates) that may have long-term consequences for populations and should be taken into consideration in terms of conservation planning and management.

The impact of oil on large whales is not well known, but given what is known about both cetaceans and about oil, and given oil’s known impact on other species, the effects can be reasonably inferred. Externally, oil and other chemicals on skin and body may result in skin and eye irritation, burns to mucous membranes of eyes and mouth, and increased susceptibility to infection. For baleen whales, oil can foul the baleen they use to filter-feed, thereby potentially decreasing their ability to eat. Internally, inhalation of volatile organics from oil or dispersants may result in respiratory irritation, inflammation, emphysema, or pneumonia. Ingestion of oil or dispersants may result in gastrointestinal inflammation, ulcers, bleeding, diarrhea, and poor digestion. Absorption of inhaled and ingested chemicals may damage organs such as the liver or kidney, result in anemia and immune suppression, or lead to reproductive failure or death.

Whale species that occur in restricted areas for at least part of their lives, such as humpback, gray, right, and bowhead whales, are more likely to encounter oil than those that range widely. Cetaceans with large ranges may contact some oil as they move quickly through a fouled area but are less at risk for long-term exposure. Cetaceans that feed either at the surface or at the bottom are more likely to contact oil than those that generally feed in the water column. These species include skim-feeding right and bowhead whales, surface-lunging rorquals, and the bottom-feeding gray whales—in other words, all baleen whales, except possibly the minke whale. As a group, baleen whales appear to be the most vulnerable in view of low population sizes in some the right and bowhead species, their feeding strategies generally, and their dependence on selected, restrictive habitats for feeding and reproduction.

123 http://edocs.dlis.state.fl.us/fldocs/oilspill/federal/18892759.pdf
Twenty-three years after it occurred, the effects of the Exxon Valdez oil spill are still being felt in parts of the marine environment of Alaska’s Prince William Sound. Neither Pacific herring nor pigeon guillemot populations in the area appear to be recovering. Although the region’s killer whales are officially listed as slowly recovering by the Exxon Valdez Oil Spill Trustee Council, research indicates that at least one resident pod, which lost nine of its 22 members in the spill’s immediate aftermath, appears doomed, with no calves having been born since the tanker ran aground.

In 2010, the Deepwater Horizon incident in the Gulf of Mexico overtook the Exxon Valdez as the largest oil spill in U.S. history, ultimately dwarfing it in terms of the amount of oil spilled. Because the oil leaked out over a longer period and was dispersed over a much larger area there remains uncertainty over the amount of wildlife that was killed. This latter point is particularly true of cetaceans, of which a total of 101 carcasses were found washed ashore following the incident. However, a study published in early 2011 argued that, based on previous analyses of annual carcass recovery rates relative to natural mortality, this figure likely accounted for only 2 percent of the total number of cetaceans of various species actually killed during the spill, with the great majority sinking at sea and the overall total closer to 5,000. The possible significance of such figures is emphatically illustrated by the suggestion that the loss of just three sperm whales as a result of the spill could be sufficient to put that population at risk of extirpation.

The potential for spills to occur is higher and the likelihood of a successful cleanup is significantly reduced if oil and gas development takes place in the ice-strewn waters of the Arctic. Unfortunately it is to these waters, specifically the Beaufort and Chukchi seas, that oil companies are presently turning in their quest to expand offshore drilling on the outer continental shelf. The U.S. Bureau of Ocean Energy Management (BOEM) is presently considering proposed lease sales in the Beaufort and Chukchi seas for the years 2012 to 2017.

Weather and ocean current data are severely lacking for the Arctic, and the body of knowledge available with respect to oil weathering in the context of Arctic oil spills is limited. When combined with the uncertainties related to climate change, ice force, and storm severity, it must be concluded that BOEM’s ability to accurately estimate the risk of development is also limited. Detailed information on ocean currents and wind fields is needed before development of oil and gas in the Arctic can be allowed to proceed. Based on currently available spill response procedures, an effective rapid response is unfounded and not yet feasible. Therefore, the true risk is much higher than is estimated. A U.S. Geological Survey (USGS) report points out that if one or more large spills were to occur, oil would be likely to persist in tidal and subtidal sediment for decades (emphasis added). Even assuming that the risk of a large oil spill remains

124 http://www.evostc.state.ak.us/recovery/status.cfm
relatively low, the long-term impacts of a spill, regardless of the probability, would be very high.\textsuperscript{127}

Because technologies and techniques applicable to oil spill response and cleanup in Arctic waters have yet to be developed, their effectiveness has not been proven. Although there have been several recent advances made in mechanical containment and recovery devices, there has been little to no testing of their effectiveness in ice conditions. In-situ burning as an oil spill response tool for icy waters has been studied in more detail, but it has not yet been tested to see if the scientific results translate to effectiveness in real-world conditions with uncertain weather and ice conditions. Chemical herders, an important component to increased effectiveness of in-situ burning, have not yet been developed to function in offshore rough waters. Lacking this added tool, in-situ burning might not be feasible at all. Likewise, the toxicity of the emissions or residues from in-situ burning and chemical herders is not well understood.\textsuperscript{128}

**CURRENT SOLUTIONS**

**The United States:** In 1995, the NMFS set criteria for exposure of marine mammals to underwater pulses from seismic air guns. Subsequently, a panel of scientists reviewed the available information and proposed revised criteria for levels above which there was a scientific basis for expecting that exposure would cause auditory injury.\textsuperscript{129} However, the panel was unable to develop broadly applicable, quantitative criteria for behavioral disturbance. The U.S. Navy and seismic survey operators have acknowledged the need for mitigation measures to reduce impacts but in most cases the effectiveness of these mitigation measures has been difficult to evaluate, making it difficult for regulators to make informed decisions.

**RECOMMENDATIONS**

The U.S. government should improve its approach to offshore oil, gas, and industrial development to address impacts from seismic surveys, oil spills, and increased shipping traffic by . . .

- Working with industry to limit the number, duration, and intensity of seismic surveys to seasons and areas in which whale density is known to be low.
  - Compiling relevant data and coordinating the work of various agencies (NOAA, BOEM, and USGS) and industry representatives to avoid repeated seismic

\textsuperscript{128} Ibid.
surveys of the same area, as recommended by the U.S. Marine Mammal Commission.

- Establishing, within agencies and industries involved in Arctic oil and gas exploration and extraction, a research fund to reduce source levels in seismic surveys implemented by industry within U.S. waters and by U.S. companies internationally.

- Moving toward reducing noise levels while, in the interim, using best available mitigation measures to reduce risk as much as possible.
  - Funding and facilitating expanded NOAA research and development in noise-reduction measures for seismic surveys.
  - Requiring that industries prioritize use of continuous pressure, suction, and other noise-reduction technologies, rather than hammer action, when placing pilings in the sea bed. Noise propagation can be further reduced by placing fixed screens or bubble curtains around the piles. While bubble curtains are only effective in low tidal currents and shallow water, inflatable sleeves are also effective in reducing noise pollution. Likewise, seismic arrays should be replaced with low-energy propagation techniques such as vibroseis.

- Taking a more precautionary approach to offshore industrial development, especially in very sensitive areas at higher risk, such as the Arctic.
  - Developing a stakeholder advisory committee of government, industry, and conservation organizations to work to create guidelines for offshore energy development, including risk mitigation for oil spills, with an emphasis on wildlife habitat use. This could be modeled after the process used by the U.S. Fish and Wildlife Service in consultation with the Wind Turbine Advisory Committee to develop guidelines for land-based wind energy.
  - Prioritizing research on temporal and geographic mapping of marine mammal habitat use and incorporating this information into a process of defining deferral areas in which industrial development is prohibited. This research should focus on distribution surveys for species with insufficient data, satellite telemetry studies, aerial and ship-based surveys, and passive acoustic monitoring for beluga and gray whales.
  - Reducing marine mammal interactions with oil and gas industry vessels through rerouting and speed restrictions in sensitive areas determined to be key marine mammal habitat used for feeding, breeding, or calving. Included in this activity should be a process for annual review to update and reroute shipping or to make adjustments to ship speed regulations.
POLLUTION

Marine pollution is both more pervasive and, in a way, more elusive than other threats to whales.

THE PROBLEM

Eighty percent of pollution of the marine environment comes from land-based sources: sewage, industrial discharges, leakages from landfills, wastewater treatment facilities, power plants, urban and industrial runoff, agricultural runoff, military installations, spillage, explosions, sea dumping operations, oil production, and mining. Some forms of marine pollution have been dealt with elsewhere in this Blueprint. The following three forms of marine pollution remain to be discussed: chemical contaminants and heavy metals, nutrient pollution, and marine debris.

Chemical Contaminants and Heavy Metals

According to the Agency for Toxic Substances and Disease Registry (ATSDR), more than 100,000 chemicals are commonly used in household cleaners, solvents, pesticides, food additives, lawn care, and other products in the United States alone, with another 1,000 or so chemicals introduced each year. Of particular concern to the health of marine mammals are the Persistent Organic Pollutants (POPs) such as PCBs (electrical insulators), DDT and HCB (pesticides), dioxins and furans, and PBDEs (flame retardants). Other chemical groups of concern include trace metals such as mercury, chromium, and cadmium.

For whales, and particularly toothed whales, the greater risk from such contaminants is not through absorption of material that is deposited directly into the marine environment, but through consumption of prey that is contaminated. Whales are long-lived and have extensive fat stores. Many species are top predators, resulting in some populations accumulating pollutant burdens that are among the highest on record.

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For example, mercury released into the environment, the bulk of which is anthropogenic and comes from combustion of fossil fuels and waste incineration, is highly toxic and persistent. When bioaccumulated in marine organisms, mercury can be transformed into methyl mercury, which is even more toxic and more readily absorbed into internal organs like the liver and muscle tissue. There is a long-established correlation between mercury poisoning and irreversible neurological damage in humans, although the impacts on cetaceans are presently less clear.

The potential toxic effects of POPs on whales include immunosuppression, disruption of neurological functions, impairment of reproduction and early development issues, cancer, increased susceptibility to disease, and changes in behavior. These contaminants are harbored in whales’ fatty tissue and organs and may become released into the bloodstream at times of environmental or nutritional stress. In addition, the toxins that whales ingest are passed on to their calves in fat-rich milk, resulting in significant accumulations over generations.

**Nutrient Pollution**

The input of nitrogen-based and other nutrients from land is profoundly altering many coastal ecosystems. The principal source is agriculture—particularly synthetic nitrogen fertilizer and animal wastes, which are washed into rivers and streams and then carried to coastal waters. The burning of fossil fuels by industry and automobiles also contributes, adding nitrogen oxide to the atmosphere that is deposited by rainfall. Just as fertilizer on land stimulates grass growth, nutrients entering coastal waters can stimulate the growth of toxic and otherwise harmful forms of phytoplankton, which can explode rapidly in number in what are known as harmful algal blooms.

Although the factors involved are complex—including not just the total amount of nutrients entering coastal waters, but also, the form in which those nutrients occur and the ratios of nutrients such as nitrogen and phosphorous—the correlation between nutrient pollution and increased harmful algal blooms is clear. In the Puget Sound area, scientists have found a strong correlation between the growth in the human population over the past four decades, and increased records of paralytic shellfish toxins produced by certain types of algae, the growth of which is fed by nutrient runoff.

Such toxic algae can have fatal effects on cetaceans. In 1987, 14 humpback whales died in Cape Cod Bay after eating mackerel containing saxitoxin, which can cause paralytic shellfish.

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poisoning in humans and is produced by a species of phytoplankton. Sixteen years later, the same toxin was blamed for the deaths of a dozen humpbacks in the same area.

**Marine Debris**

Marine debris is defined by NOAA as “any persistent solid material that is manufactured or processed and directly or indirectly, intentionally or unintentionally, disposed of or abandoned into the marine environment.” Marine debris has many different sources and comes in many different forms, including plastic products, fishing gear, bottles and cans, cigarette filters, and other trash. Although it was originally assumed that most oceanic marine waste stemmed directly from ocean dumping, it has been suggested that around four-fifths of oceanic debris is from rubbish blown seaward from landfills and urban runoff washed down storm drains. Once in the water, debris can be persistent, carried by ocean currents, ending up in the middle of oceanic gyres where currents are weakest. The Great Pacific Garbage Patch is one such example, comprising a vast region of the North Pacific Ocean rich with anthropogenic wastes. Double the size of Texas, the area has been estimated to contain more than 3 million tons of plastic.

Plastic debris, such as bags, may be ingested by whales, creating blockages in digestive tract systems, leading to suffocation or starvation as the presence of the bags in the digestive system fools the whale’s body into thinking that the stomach is full. Tiny floating plastic particles from weathered debris resemble zooplankton, which can lead filter feeders to consume them. In samples taken from the North Pacific Gyre in 1999 by the Algalita Marine Research Foundation, the mass of plastic exceeded that of zooplankton by a factor of six.

Whales may become entangled in debris, particularly fishing gear, which can wound animals, impair their mobility, and strangle them. “Ghost fishing,” the entanglement of fish and marine mammals in lost fishing gear represents a serious threat to whales.

Given its use as a catchall term for an almost infinite number of introduced objects and substances from a wide variety of sources, marine pollution is inevitably subject to a multitude of mitigation measures. Additionally, whatever its nature or source, once pollution enters the water or atmosphere, pollution can easily and rapidly become a transboundary issue.

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144 Ibid.
CURRENT SOLUTIONS

The United States: The United States is party to a number of international agreements regulating the emission and disposal of pollutants and waste, both generically and as they apply specifically to the marine environment and to marine mammals.

The United States has taken strong action to reduce emissions of POPs. For example, along with several other member nations, the United States has signed (though not yet ratified) a legally binding protocol on POPs under the Convention on Long-Range Transboundary Air Pollution, which seeks to eliminate production and reduce emissions of POPs in the United Nations Economic Commission for Europe (UNECE) region. The United States has also signed (though not yet ratified) the Stockholm Convention, a treaty that commits governments internationally to reduce the production and distribution of POPs. None of the original POPs pesticides listed in the convention are registered for sale or distribution in the United States today.¹⁴⁵

Since 1987, the Environmental Protection Agency (EPA), aided by voluntary efforts by U.S. industry, has succeeded in reducing releases of dioxins and furans from U.S. sources into the environment by more than 85 percent. Over the years, the United States has also taken a number of steps to restrict the use of DDT, culminating in the prohibition of its use in the United States.¹⁴⁶

In 1988, the International Convention for the Prevention of Pollution from Ships (MARPOL) established international guidelines to prevent ship pollution for items such as oil discharge, hazardous liquid control, hazardous material transportation, sewage discharge, plastic and garbage disposal, and air pollution. Of the six annexes to MARPOL, the United States is a party to five: oil, hazardous liquid control, hazardous materials, garbage disposal (Annex V), and air pollution.

To enforce MARPOL Annex V, which governs garbage, the U.S. enacted the Act to Prevent Pollution from Ships (APPS) to grant the U.S. Coast Guard the authority to develop regulations and enforcement mechanisms concerning ship garbage disposal. APPS applies to all U.S. flag ships anywhere in the world and all foreign flag vessels operating in U.S. waters or in ports or terminals under U.S. jurisdiction. APPS also establishes regulations for operational discharges and dumping of wastes from vessels. To support Annex V of MARPOL, the United States also enacted the Marine Plastic Pollution Research and Control Act (MPPRCA), which makes it illegal to throw plastic trash off any vessel within the U.S. Exclusive Economic Zone (EEZ) or to throw any other garbage overboard within three miles of the shore.

In the early 1970s, as key international protocols were being adopted and ratified, the Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA), P.L. 92-532, was enacted to

¹⁴⁶ http://www.epa.gov/aboutepa/history/topics/ddt/02.html
regulate disposal of wastes in marine waters within U.S. jurisdiction. MPRSA has two basic aims: to regulate intentional ocean disposal of materials and to authorize related research. A portion of the act, often referred to as the Ocean Dumping Act, contains the permit and enforcement provisions for ocean dumping. MPRSA banned the dumping of radiological, chemical, and biological warfare agents, high-level radioactive waste, medical waste, sewage sludge, and industrial waste in the ocean.

Working in conjunction with MPRSA, the Clean Water Act (CWA) regulates discharges into navigable waters. The CWA brought under control discharges from “point sources” like industrial plants and municipal treatment plants. Other sources, including urban runoff, are contributing to water quality problems. As a result, the EPA now classifies urban runoff as a significant cause of impairment to water quality.

The MPPRCA requires that the EPA, in consultation with NOAA, study the adverse effects on the environment and on waste disposal of improper disposal of plastics, and devise various methods to reduce or eliminate such adverse effects. MPPRCA also requires the EPA, NOAA, and the U.S. Coast Guard to work together to assess the feasibility of using volunteer groups in monitoring floatable debris on the nation’s coastlines.

In 2006, Congress passed the Marine Debris Research, Prevention, and Reduction Act “with the purpose of identifying, determining the sources of, assessing, reducing, and preventing marine debris and its adverse impacts on the marine environment and navigation safety.” As part of the act, a Marine Debris Prevention and Removal Program was established within NOAA to reduce the occurrence of marine debris, and to prevent adverse impacts of marine debris on the marine environment. The Shore Protection Act, which applies to transportation of municipal and commercial wastes in coastal waters, is designed to minimize the deposit of trash, medical debris, and other harmful material into coastal waters as a result of inadequate waste handling procedures by vessels transporting waste.

Additionally, the Beaches Environmental Assessment and Coastal Health Act establishes criteria to enable cleaner beaches so as to help reduce pollutants from entering the ocean. The act requires minimum health-based water quality criteria, comprehensive water testing, and public notification when water contamination levels are unsafe.

\[148\] 33 USC Chapter 33A – Marine Debris research Prevention and Reduction.
http://uscode.house.gov/download/pls/33C33A.txt
RECOMMENDATIONS

The United States should reduce the threat of marine pollution to whales by...

- Leading efforts globally to address marine pollution, and honoring the goals set forth by international commitments.
  - Ratifying and becoming a party to the Stockholm Convention on Persistent Organic Pollutants (POPs).
  - Ratifying the protocols on POPs and heavy metals in the United Nations Economic Commission for Europe Convention (UNECE) on Long-range Transboundary Air Pollution.
  - Working through NOAA and other relevant national and international bodies like the IMO to determine sources of PCBs in the ocean and whether PCB dumping at sea continues and, if so, in what guise. In at least some of the world’s oceans, research has shown PCB levels have plateaued and are no longer decreasing; efforts must be made to determine the reason for this shift.
  - Establishing an interagency task force to ensure that the United States implements the Honolulu commitments on marine debris.
  - Supporting, through the U.S. delegation, a working group on marine debris at the IWC.

- Developing a NOAA database to track changes in pollutant levels in cetacean tissues and the marine ecosystem through necropsies and other research methods to aid in development of clear priorities to mitigate the impact of these pollutants on animals.
CUMULATIVE THREATS

Cumulative impacts occur when more than one threat acts on a population [of whales] but not necessarily at the same time or in the same place.

Most whale populations face some combination of entanglement, ship strike, climate change, and chemical and underwater noise pollution threats. Some populations are also subject to whaling.

Although this Blueprint discusses several impacts on whales independently of each other and lists separate recommendations for each, these impacts can rarely if ever be viewed in isolation. For example, to locate new oil and gas reserves, seismic surveys must be carried out on the ocean floor, adding to the already high level of ocean noise. Shipping traffic increases around new oil and gas platforms, heightening the risk that whales will face deadly collisions with ships.

In the Arctic, climate change alters the ecosystem in a variety of ways, including a decrease of approximately 12 percent per decade in seasonal sea ice cover; this is likely to negatively affect some species, such as bowhead whales and narwhals, while potentially benefiting more open-ocean species such as humpbacks. Climate change is also likely to open up more of the region to oil exploration and drilling, further increasing exposure to the aforementioned noise and vessel traffic—and, of course, ultimately adding to the burning of fossil fuels, the warming of the climate, and the melting of Arctic sea ice.

As was seen with the Deepwater Horizon spill, the operation of offshore oil rigs presents a significant and potentially disastrous threat to humans, the economy, and the environment. If oil and gas exploration is pursued near breeding or feeding grounds of whales, or within their migratory pathways, the synergy of these threats could cause severe behavioral disturbances.

There is now overwhelming evidence that the scale and rate of climate change is unprecedented in human history. The ocean plays a large role in regulating global climate and is also sensitive to the impacts of climate change. Changes in the ocean will affect all aspects of climate through storage and transportation of heat, evaporation, changes in sea level due to the amount of ice in polar regions, and gas storage and exchange, including CO₂. These changes within the oceans also affect all aspects of marine ecosystems with many unforeseen consequences.

In 2009, the IWC called on contracting governments to “incorporate climate change considerations into existing conservation and management plans” in a consensus resolution cosponsored by the United States. Changes in human activities as a result of climate change (often referred to as a tertiary impact) may be as important for whales as direct impacts such as temperature change, or secondary impacts such as changes in prey availability.

The following management, legal, and research issues should be considered to provide a broader framework from which to address cumulative threats to whales.

**Management**

The MMPA defines PBR as the maximum number of animals, not including natural mortalities, that may be removed from a marine mammal stock while allowing that stock to reach or maintain its optimum sustainable population. This concept has allowed a quantitative benchmark to trigger management actions for populations where more animals are being killed than is safely sustainable. A simple formula, the PBR is based on estimates of population growth rates and numbers and has been subject to extensive simulation testing. The PBR formula also takes uncertainty into account by using a minimum estimate of the population numbers rather than a single best estimate. The formula provides quantitative target ceilings for human-caused direct mortality (hunting, fatal entanglements, fatal ship collisions) for both data-rich and data-poor marine mammal populations.

Application of the PBR formula ensures that a red flag is raised for populations subject to potentially unsustainable removals and provides a target toward which TRTs can work. The PBR takes explicit account of uncertainty in that the precision of population estimates, as well as their point values, enter the formula. However, it is not perfect, and it can be improved upon.

The 2009 Asilomar Workshop on Assessing the Cumulative Impacts on Marine Mammals recommended development of the concept of Potential Cumulative Impact (PCI, sometimes referred to as Maximum Cumulative Impact) to include sublethal effects—that is, those like noise, disturbance, toxic contaminants, and habitat alteration and degradation that do not involve immediate, observable mortality, but that, over time, reduce survival and reproductive rates. The goal is to develop a means to specify maximum acceptable levels of cumulative impact that serve as targets or thresholds for management strategies or to provide a red flag for populations where the cumulative impact exceeds the threshold. To make this possible, the different effects, lethal and sublethal, should be expressed in a common currency so that the combined effects can be examined, taking account of synergies where these can be expected to occur.

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Legal

The United States has been a key member of a number of international treaties, including CITES and the IWC, that are of direct and ongoing relevance to whale conservation. However, the nation remains on the outside of one vital treaty that is, in fact, the most wide-ranging and overarching piece of international legislation on marine matters: the Third United Nations Convention on the Law of the Sea, more informally referred to as the Law of the Sea Treaty.

The treaty came into force in 1994, and so far 162 countries have ratified it. It contains important provisions for the protection of the marine environment and for the conservation of highly migratory species, marine mammals, and cetaceans in particular. Articles 65 and 120 allow for the exploitation of marine mammals to be regulated more strictly than the minimum standards required for other species, as is the case in the United States under the MMPA, and obliges parties to work with the appropriate international organizations for the management, conservation, and study of marine mammals, both within EEZs and on the high seas (areas beyond national jurisdiction). The United States played a key role in drafting these treaty provisions.

Although the United States already implements the main provisions of the Law of the Sea at the national level, becoming a party to the treaty will greatly increase the weight and influence that the United States can exert in various international forums and in bilateral contexts to ensure that the requirements of the Law of the Sea are implemented globally. It is particularly important that the U.S. voice be heard in negotiations to develop the Law of the Sea, particularly with respect to the conservation of marine biodiversity, including cetaceans, on the high seas.

Research

In addition to being worthy of saving and studying in their own right, whales are worthy of studying because doing so may also yield useful insights into the changes that are occurring in the oceans.\(^{154}\) Within both governmental and nongovernmental arenas, there is an immense wealth of knowledge on whales and whale conservation that is unrivalled elsewhere. On a research level, cooperation between NOAA scientists and nongovernmental organizations (NGOs) is generally excellent and open, and information sharing is encouraged by both sides. However, because of the disparate array of researchers and interest areas, this cooperation is not always coordinated. As a result, such information exchanges frequently rely on personal contacts and established lines of communication. For this reason, a new online database should be established by the IWC as a cooperative clearinghouse for research on cetacean biology, as well as conservation and management measures.

It is vital to emphasize that, although each of the threats and issue areas have been discussed separately in this Blueprint and specific recommendations have been made for actions directly

relevant to those areas, many of these threats do indeed work synergistically and cumulatively. While not precluding ongoing efforts to address each of those threats, as appropriate and as individual solutions present themselves or are available, ultimately protection of the whales’ ocean ecosystem requires a suite of management solutions working together—such as, for example, through marine spatial planning, which identifies areas of resource use and of conservation concern and attempts to maximize environmental protection while efficiently prioritizing human activity. Although much research has been directed at identifying critical habitat and areas of high whale use, effective marine spatial planning should also identify areas of least importance to whales and other sensitive marine life. Suitable sites for offshore development should then be identified for areas with the least potential for conflict.

Some protective measures for the world’s whales are relatively straightforward. Others are more complex. It will require a combination of both to provide the protection for the world’s whales, and the ocean in which they live, that so many of us desire. A final set of recommendations provides a broader framework from which to address the threats discussed in this Blueprint in the context of cumulative impacts.

RECOMMENDATIONS

The U.S. government should take the lead in addressing cumulative impacts of multiple threats to our planet’s great whales by . . .

- Extending and replacing Potential Biological Removal (PBR) with Potential Cumulative Impact (PCI) when assessing possible impacts of activities on whale populations at the national and international level. The PCI concept can be used to develop specific cumulative impact management plans for populations or can be incorporated into the recovery plans developed under the MMPA and the conservation plans currently being considered by the IWC, the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic Area (ACCOBAMS) and other multilateral bodies.


- Supporting marine spatial planning approaches to ocean development in which impacts on whales are minimized.

- Ensuring adequate funding for U.S. whale population surveys in order to assess the cumulative impacts of climate change, shipping, entanglement, and other threats.

- Contributing relevant national information to current IWC databases on ship strikes and fishing operations and promoting development of a new online repository for global whale conservation research and data to promote 21st century whale conservation efforts worldwide.
COMMERCIAL WHALING

The U.S. government should make ending whaling for commercial purposes a consistent foreign policy objective in every relevant forum and through diplomatic means by . . .

• Encouraging the International Whaling Commission (IWC) to focus on whale conservation, rather than whale hunting.
  o Leading conservation initiatives on entanglement, ship strikes, ocean noise, pollution, and other threats.
  o Ensuring that sufficient pro-whale countries attend the 2012 IWC to prevent Japan from breaking the quorum.
  o Ensuring, in conjunction with allies, that the rules for a quorum are adjusted so that the IWC can conduct its business without the threat of walkouts.
  o Actively supporting creation of a South Atlantic Whale Sanctuary.
  o Debunking unscientific arguments on whales depleting fish stocks and other ill-founded justifications for whaling in all relevant forums by publishing on the Web and otherwise circulating NOAA’s leaflet on this issue.

• Prioritizing bilateral and multilateral diplomatic measures to halt whaling for commercial purposes by Japan, Iceland, and Norway.
  o Challenging Japan’s importation of sei whales without a treaty reservation at the Convention on International Trade of Endangered Species (CITES) in March 2013 by submitting a document prior to the October 2012 deadline.
  o Encouraging Japanese officials to halt whaling in the Southern Ocean Sanctuary, abandon plans for construction of a new factory whaling ship, and end government subsidies for whaling.
  o Maintaining pressure on Iceland to secure a permanent cessation of its whaling of fin and minke whales and to prevent efforts to resuscitate the trade in whale products with Japan.

155 IFAW BLUEPRINT FOR U.S. WHALE CONSERVATION (www.ifaw.org/whaleblueprint) Email: blueprint@ifaw.org; Phone: 202.296.3860
• Certifying Iceland under the Pelly Amendment as a means of enacting pressure to prevent further hunting of fin whales by that country.

• Encouraging Norway to withdraw its reservations to CITES Appendix I listings of whale populations and species to force Norway to end international trade in whale meat.

• Actively supporting initiatives at the United Nations to end directed takes of cetaceans on the high seas.

ENTANGLEMENT AND ENTRAPMENT

The U.S. government should replace piecemeal attempts to address entanglement with a longer-term approach engaging stakeholders in developing specific measures to reduce large whale entanglement by . . .

• Exploring the risk of large whale entanglement in fishing gear in all domestic fisheries and working to reduce that risk.
  
  o Allowing experimental pot and trap fishing without vertical lines in selected areas or considering closing specific areas so that such experimental fisheries could operate.
  
  o Reconvening the Atlantic and Pacific Offshore Cetacean Take Reduction Teams. The Atlantic Offshore Cetacean Team was disbanded in August 2001 and should be reestablished with a new Take Reduction Plan proposed by the end of 2012. The Pacific Offshore Cetacean Team, while not disbanded, has not made recommendations since 2009 and should reconvene and reassess its plan.
  
  o Finalizing and implementing the Atlantic Large Whale Take Reduction Team (ALWTRT) proposed vertical line rule by 2013, using an established level of legally binding risk reduction.
  
  o Addressing the risk of vertical lines to humpback whales, in addition to the risk to North Atlantic right whales.
  
  o Reducing endlines associated with gillnet gear, as this problem is not being addressed by the ALWTRT’s proposed vertical line rule. This can be accomplished through measures such as imposing caps on the number of endlines and panels or requiring that some gillnets be tended during deployment with nets retrieved and kept aboard when vessels return to port.
o Securing funding for disentanglement, stranding response, and necropsies through renewal of the Prescott Grant and other funding programs.

o Basing future regulations on best available technologies and practices to achieve quantified risk reduction by consolidating ongoing gear engineering and bycatch research results into a formal, public report by the end of 2012.

• Leveraging U.S. expertise in bilateral relationships and multilateral forums to promote and replicate disentanglement solutions in fisheries around the world.

o Finalizing a whale conservation agreement with Canada to reduce entanglement of whales in fishing gear and identify effective measures in both countries to prevent such entanglement.

o Expediting work within the IWC and its Scientific and Conservation Committees to gather data on, and develop solutions to, entanglement of large whales worldwide, especially in areas where such entanglement may be “directed” as a means of providing whale meat.

SHIP STRIKES AND SHIPPING NOISE

The U.S. government should reduce the risk of ship strikes in U.S. waters and lead efforts to do so internationally by . . .

• Identifying high-risk areas in U.S. waters and enacting rules on vessel speeds and shipping lanes to reduce the risk of strikes to large whales.

o Developing a new Ship Strike Rule, well in advance of the current rule’s (50 CFR Part 224) expiration date in December 2013, that improves and strengthens the rule. This can be accomplished by expanding Seasonal Management Areas from 20 nautical miles to 30 nautical miles, requiring that U.S. government vessels comply with the 10-knot speed restrictions in the same way that U.S. government vessels comply with other maritime regulations (for example, SOLAS, the International Convention for the Safety of Life at Sea, and COLREGS, the International Regulations for Avoiding Collisions at Sea), and improving compliance monitoring and enforcement, including more awareness and education programs.

o Assessing and reporting on trends in whale ship strike deaths and serious injuries, as well as the effectiveness of and compliance with the Ship Strike Rule every five years.
• Continuing to support acoustic, aerial, and other monitoring of whales to provide ongoing assessments of their location and their risk from ship strikes and methods to relay information about whales effectively to mariners.
  
  o Maintaining funding for aerial surveys to determine North Atlantic right whale counts.

• Identifying high-risk areas for ship strikes throughout the world and actively engaging countries to develop plans to decrease this risk.
  
  o Leading, through dedicated NOAA staff, work on entanglement and ship strike issues at the IWC and International Maritime Organization (IMO) to keep the U.S. delegation updated on new developments and to disseminate relevant information and guidelines.
  
  o Examining the feasibility of U.S. research funding for identifying high-risk areas for ship strikes globally, to be administered by the IWC in a similar way to the funding provided by Australia for developing conservation management plans.

The U.S. government should reduce noise in the ocean, including shipping noise, by . . .

• Establishing within NOAA a research fund specifically dedicated to implementing research on noise reduction as recommended by the IMO.
  
  o Providing tax and registration fee incentives to the shipping industry to encourage deployment of quiet ship technology.
  
  o Conducting a national fleet inventory, as requested by the IMO, to identify ships that could benefit most from noise-reduction measures.

• Funding research to fill knowledge gaps related to the impact of shipping noise on large whales.
  
  o Reviewing, through NOAA, the benefits and feasibility of limiting or rerouting vessel traffic in Biologically Important Areas and Seasonal Management Zones.

NAVY SONAR

The U.S. government should end its use of low- and mid-frequency active sonar in areas of high risk to cetaceans and reduce this risk elsewhere by . . .
• Accelerating efforts to determine the impact of active sonar on the behavior and physiology of cetaceans and the times and places where use may cause the greatest harm, with regular reporting of those findings to NOAA.
  o Identifying and delineating areas of high cetacean density through the NOAA workshop process and requiring the U.S. Navy to incorporate recommended restrictions that emerge from that process into its training practices.

• Ensuring that ongoing U.S. and NATO deployment of active sonar reflects the best available knowledge and a precautionary approach that minimizes risks to cetaceans.

OIL, GAS, AND OTHER INDUSTRIAL DEVELOPMENT

The U.S. government should improve its approach to offshore oil, gas, and industrial development to address impacts from seismic surveys, oil spills, and increased shipping traffic by . . .

• Working with industry to limit the number, duration, and intensity of seismic surveys to seasons and areas in which whale density is known to be low.
  o Compiling relevant data and coordinating the work of various agencies (NOAA, BOEM, and USGS) and industry representatives to avoid repeated seismic surveys of the same area, as recommended by the U.S. Marine Mammal Commission.
  o Establishing, within agencies and industries involved in Arctic oil and gas exploration and extraction, a research fund to reduce source levels in seismic surveys implemented by industry within U.S. waters and by U.S. companies internationally.

• Moving toward reducing noise levels while, in the interim, using best available mitigation measures to reduce risk as much as possible.
  o Funding and facilitating expanded NOAA research and development in noise-reduction measures for seismic surveys.
  o Requiring that industries prioritize use of continuous pressure, suction, and other noise-reduction technologies, rather than hammer action, when placing pilings in the sea bed. Noise propagation can be further reduced by placing fixed screens or bubble curtains around the piles. While bubble curtains are only effective in low tidal currents and shallow water, inflatable sleeves are also effective in reducing noise pollution. Likewise, seismic arrays should be replaced with low-energy propagation techniques such as vibroseis.
• Taking a more precautionary approach to offshore industrial development, especially in very sensitive areas at higher risk, such as the Arctic.

  o Developing a stakeholder advisory committee of government, industry, and conservation organizations to work to create guidelines for offshore energy development, including risk mitigation for oil spills, with an emphasis on wildlife habitat use. This could be modeled after the process used by the U.S. Fish and Wildlife Service in consultation with the Wind Turbine Advisory Committee to develop guidelines for land-based wind energy.

  o Prioritizing research on temporal and geographic mapping of marine mammal habitat use and incorporating this information into a process of defining deferral areas in which industrial development is prohibited. This research should focus on distribution surveys for species with insufficient data, satellite telemetry studies, aerial and ship-based surveys, and passive acoustic monitoring for beluga and gray whales.

  o Reducing marine mammal interactions with oil and gas industry vessels through rerouting and speed restrictions in sensitive areas determined to be key marine mammal habitat used for feeding, breeding, or calving. Included in this activity should be a process for annual review to update and reroute shipping or to make adjustments to ship speed regulations.

POLLUTION

The United States should reduce the threat of marine pollution to whales by . . .

• Leading efforts globally to address marine pollution, and honoring the goals set forth by international commitments.

  o Ratifying and becoming a party to the Stockholm Convention on Persistent Organic Pollutants (POPs).

  o Ratifying the protocols on POPs and heavy metals in the United Nations Economic Commission for Europe Convention (UNECE) on Long-range Transboundary Air Pollution.

  o Working through NOAA and other relevant national and international bodies like the IMO to determine sources of PCBs in the ocean and whether PCB dumping at sea continues and, if so, in what guise. In at least some of the world’s oceans, research has shown PCB levels have plateaued and are no longer decreasing; efforts must be made to determine the reason for this shift.
Establishing an interagency task force to ensure that the United States implements the Honolulu commitments on marine debris.

Supporting, through the U.S. delegation, a working group on marine debris at the IWC.

Developing a NOAA database to track changes in pollutant levels in cetacean tissues and the marine ecosystem through necropsies and other research methods to aid in development of clear priorities to mitigate the impact of these pollutants on animals.

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