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OCEANS UNDER SIEGE

ENVIRONMENTAL THREATS TO WHALES, DOLPHINS AND PORPOISES

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INTRODUCTION

When the International Convention for the Regulation of Whaling (ICRW) was signed in 1946, few imagined it would be the environment that would eventually present the greatest challenge for cetacean conservation. Human activities now threaten whales, dolphins and porpoises the world over with increasing noise, high pollutant burdens, depleted food resources and long-term habitat disruption due to global climate change.

The International Whaling Commission (IWC) responded admirably to the catastrophic over-hunting of whales with the 1986 moratorium on commercial whaling. In contrast, its response to the increasingly serious and often synergistic impacts of environmental degradation has been slow; in part due to the overshadowing of IWC business with the politics of commercial whaling, but also due to the complexity and sheer breadth of environmental issues that affect cetaceans.

In 1980, the IWC urged its member governments to take *"every possible measure"* to prevent degradation of the marine environment that resulted in harm to whale populations, and requested governments to: *"...submit reports to the IWC on activities that might adversely affect whale populations, and describe appropriate measures to prevent such damage."* [1] However, concerted action was lacking until 1993, when the IWC decided that its Scientific Committee should prioritise research into the effects of environmental changes: *"...in order to provide the best scientific advice for the Commission to determine appropriate response strategies to these new challenges".* [2] To address this, the Scientific Committee held two special workshops, on climate change and on chemical pollution, in 1995 and 1996 respectively. Subsequent to these workshops, two long-term multi-disciplinary research programmes were generated, initially funded using the Commission's reserves. These research programmes, known as SOWER[3] 2000 and POLLUTION 2000+, are ongoing but continually hampered by a lack of follow-up funds from the Scientific Committee's budget. The Scientific Committee has continued to develop its environmental work through the Standing Working Group on Environmental Concerns, which was established in 1997. Most recently, the Scientific Committee held a successful symposium on noise pollution at the July 2004 IWC meeting and a workshop on habitat degradation in November 2004.

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This report compiles recent scientific studies and global action related to some of the more pressing issues likely to affect cetaceans, namely climate change, commercial fisheries and chemical pollution. Other equally serious threats that have been identified by the IWC Scientific Committee as priority concerns, but are not covered in this report, include disease and mass mortality events, noise pollution and ozone depletion. Though not a comprehensive review, this briefing provides a compelling case for the IWC to take immediate and decisive action.

Since its inception, the Commission has adopted 16 resolutions expressing concern regarding the conservation of cetaceans and their environment. The establishment of the IWC Conservation Committee provides an opportunity for the IWC to rationalise and strategically expand its work to address environmental concerns. This body should work together with the Scientific Committee to establish a long-term programme of research to evaluate and mitigate the environmental threats to all whales, dolphins and porpoises. The time has come to put words into action, to confirm the IWC's role as the global conservation body for cetaceans – a body that is able and willing to address the real conservation issues facing cetaceans today and in the future.

Clare Perry

EIA Cetacean Campaign Manager,
June 2005

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Page 2

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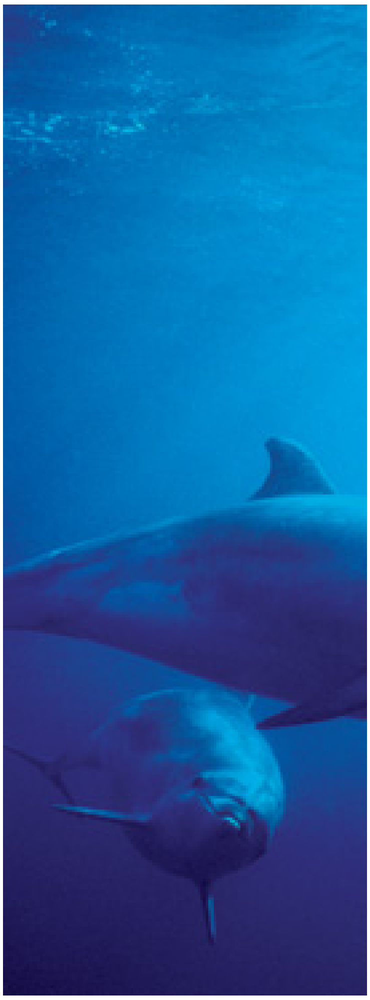
GLOBAL COMMERCIAL FISHERIES

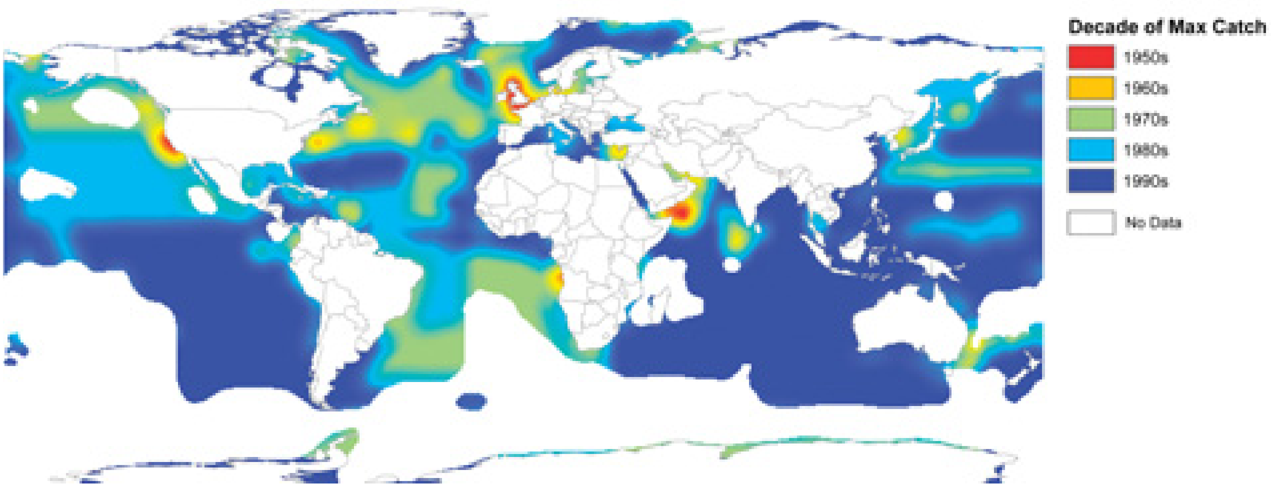
Commercial fisheries cause the death of more cetaceans than any other human activity. In addition to the direct threat of bycatch and injury through entanglement in fishing gear, commercial fisheries cause depletion of cetacean prey resources, and significantly alter or even destroy the complex marine ecosystems that cetaceans depend upon.[4] Humans are irreversibly reducing the biodiversity of marine ecosystems, and the loss of biomass due to overfishing is unprecedented, leaving marine ecosystems considerably more susceptible to environmental change.[5]

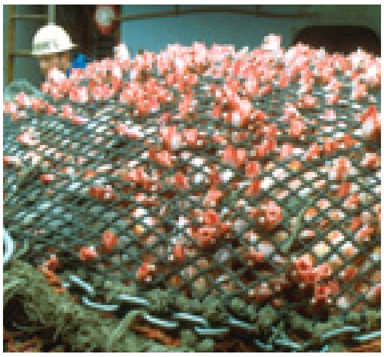


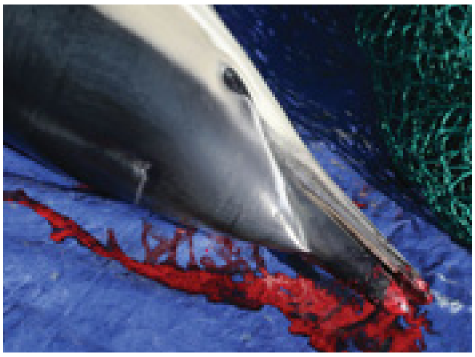
OVERFISHING AND CETACEAN PREY DEPLETION

The most recent *State of World Fisheries and Aquaculture* report from the Food and Agriculture Organisation (FAO) paints a worrying picture, with 75% of global fish stocks at maximum sustainable yield, or already depleted or over-fished. Seven of the top ten marine fish species, which account for around 30% of all capture fisheries products, are fully or over-exploited.[6] The trend since the 1970s has been a decrease in the number of stocks with potential for expansion, and an increase in the number of over-exploited and depleted stocks, from about 10% in the mid-1970s to close to 25% in the early 2000s.[7] With no corresponding decline in global demand, the coverage and depth of commercial fishing has increased dramatically as technological advances allow us to fish anywhere, at any depth, and for any species.[8]

The problem is likely to be significantly larger than that quantified by the FAO since under-reporting is a common phenomenon.[9] The FAO has reported that IUU (illegal, unreported and unregulated) fishing commonly surpasses fishing quotas by 30%, with some fisheries exceeding total allowable catches by 300%.[10] Moreover, millions of tonnes of non-target marine species are discarded. Although recent reports indicate a decrease in discards, this is likely due to fishermen keeping previously unwanted catch as target-fish biomass has decreased by up to 99% of pre-industrial levels.[11] Despite a clear and urgent need for management measures, to date less than 1% of the ocean is protected, leaving doubts over international commitment to tackling the problem.[12]







MARINE ECOSYSTEM EFFECTS

Over-exploitation of marine ecosystems has had a highly significant negative impact on biodiversity in the last fifty years.[13] Recent studies indicate that the world's oceans may already have lost up to 90% of top predators, and widespread extinctions of top predators are predicted if current trends continue.[14] The practice of 'fishing down' marine food webs as the larger species disappear is resulting in impoverished, less valuable ecosystems, biased towards species of lower trophic levels.[15] In just forty years time, the unmitigated result of this will be ocean ecosystems dominated by plankton. Commercial fisheries' interests are already switching to lower trophic level dominated ecosystems, with southern ocean krill predicted to become a key target to supply the demand of aquaculture feed, a scenario with clear implications for baleen whale populations.[16]

BYCATCH

Bycatch is possibly the single greatest threat facing cetaceans, with more whales, dolphins and porpoises killed every year from entanglement in fishing gear than from any other cause. Recent studies estimate global bycatch to be more than 300 000 cetaceans annually, with the vast majority of mortalities caused by gill-net fisheries. Although a preliminary value, this is thought to be a conservative estimate.[17] Bycatch is an important factor in a number of cetacean population declines, and threatens several species with extinction, including the vaquita (*Phocoena sinus*) and baiji (*Lipotes vexillifer*).[18]

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Top: Chub mackerel fishing © *Teobaldo Dioses / National Oceanic & Atmospheric Administration / Department of Commerce*

Bottom: © *Jeffrey Waibel*

Page 4

Graphic: Analysis of historical catch statistics show declines in once productive inshore fishing grounds have forced the rapid expansion of offshore commercial fisheries. © *Dr. Daniel Pauly / Sea Around Us Project / University of British Columbia*

Bottom Left: © *Alaska Fisheries Science Centre Marine Observer Program*

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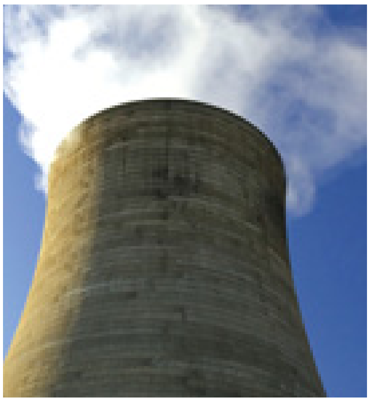
Bottom Right: Dolphin killed in fishing gear © *Greenpeace / Davison*

GLOBAL CLIMATE CHANGE



A landmark global agreement to reduce greenhouse gas (GHG) emissions, the Kyoto Protocol, entered into force on the 16th February 2005. Canada will play host to the first Meeting of the Parties in Montreal in November 2005.[19]

The 1992 UN Framework Convention on Climate Change set voluntary goals to reduce global GHG emissions, and established a long-term objective of stabilising greenhouse concentrations in the atmosphere "*at a level that would prevent dangerous anthropogenic interference with the climate system.*"[20] However, recognising that stronger action was needed, the 1997 Kyoto Protocol was negotiated, which commits industrialised nations (Annex 1 Parties) to individual, legally-binding targets to limit or reduce their greenhouse gas emissions. As of March 2005, 144 states have ratified the agreement, representing 61.6% of Annex 1 emissions.[21] The Protocol originally obliged Parties to reduce collective emissions of six key GHGs by 5.2% below 1990 levels by 2012, but this was reduced to 2% after US withdrawal and other factors made original targets impossible.[22]

Whilst ratification of the Kyoto Protocol is a significant achievement, a much stronger worldwide commitment to reducing GHG emissions is required to curb global climate change. By current trends, developing countries' emissions are expected to more than double between 2002 and 2030, and global carbon dioxide emissions could be 50% higher.[23] The International Climate Change Task Force has predicted that catastrophic global events, such as the melting of the Greenland and Antarctic ice sheets and the shut down of thermohaline ocean circulation, could occur in a matter of decades if carbon dioxide levels rise as projected.[24]

In February 2005, scientists presented the first clear evidence of human-produced warming in the world's oceans using a combination of computer models and observed data. In all of the ocean basins, the warming in the upper 700m predicted by the models corresponded to the measurements obtained at sea with more than 95% statistical confidence, a result that should remove any further debate over the human contribution to global warming.[25]

THE PLIGHT OF POLAR REGIONS

Recent scientific studies and consensus findings of expert international bodies confirm that we are already moving into an era of dangerous climate change. High-latitude ecosystems in particular are already showing the effects of climate change.[26] In 2004, the eight countries with Arctic territories published the Arctic Climate Impact Assessment (ACIA). Conducted by more than 250 scientists and members of Arctic indigenous organisations over a period of four years, it is the most comprehensive study of regional climate to date. The ACIA concluded that increased emissions of carbon dioxide and other greenhouse gases are causing temperatures in the Arctic to rise two to three times faster than the global average. These temperature increases are already contributing to profound environmental changes, despite

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Top: © *Michael Van Woert / National Oceanic & Atmospheric Administration / Department of Commerce*

Middle: © *Joe Gough*

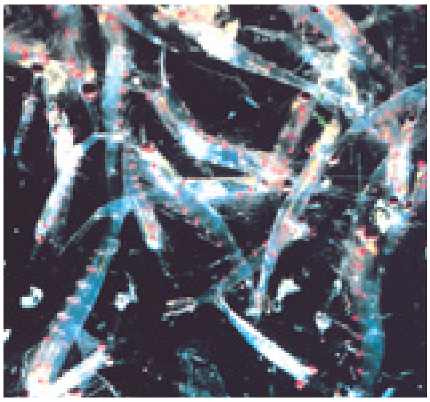
Bottom: Minke Whale

Page 6

Top Left: Arctic climate change is likely to significantly affect the prey of Arctic cetaceans such as beluga whales

Top Right: Studies show large declines in Antarctic krill, the main prey species of baleen whales © *Jamie Hall / National Oceanic & Atmospheric Administration / Department of Commerce*

Boxed : © *Kerry Finley / CMEPS*



the region having among the lowest population density and greenhouse gas emissions in the world.[27] In the most extreme cases, in Alaska for example, winter temperatures have increased as much as 3-4°C in the last 50 years.[28] Average annual Arctic sea-ice extent has decreased by around 8% (nearly one million square kilometres) over the last 30 years and average sea-ice thickness has decreased by 2.9% per decade since 1978.[29] Several climate models predict an almost ice-free summer Arctic Ocean by the end of the century.[30]

Though the pattern in the Antarctic is less uniform, there has been a marked warming trend in the Antarctic peninsula over the past half-century. Studies have revealed a 25% decrease in Antarctic sea-ice extent since the 1950s, equating to a 9% reduction in ice-edge length.[31]

IMPACT ON CETACEANS

The effects of continued global climate change are potentially devastating for cetaceans, in particular the effect on ocean productivity. A recent study has shown that Southern Ocean krill stocks have declined since the 1970s, in one region by as much as 80%, due to the retreat of winter sea ice in the region.[32] Many baleen whales rely on krill in the Southern Ocean as their main food source, and given that many of the great whale populations are still highly depleted, this raises serious concerns over the potential for recovery. Research indicates that even in the 1990s, krill abundance was not sufficient to support the demands of top predators, such as Antarctic fur seals and macaroni penguins.[33]

"BY THE END OF THE CENTURY, CLIMATE CHANGE AND ITS IMPACTS MAY BE THE DOMINANT DIRECT DRIVERS OF BIODIVERSITY LOSS AND THE CHANGE IN GLOBAL ECOSYSTEMS"

United Nations Millennium Ecosystem Assessment, March 2005.

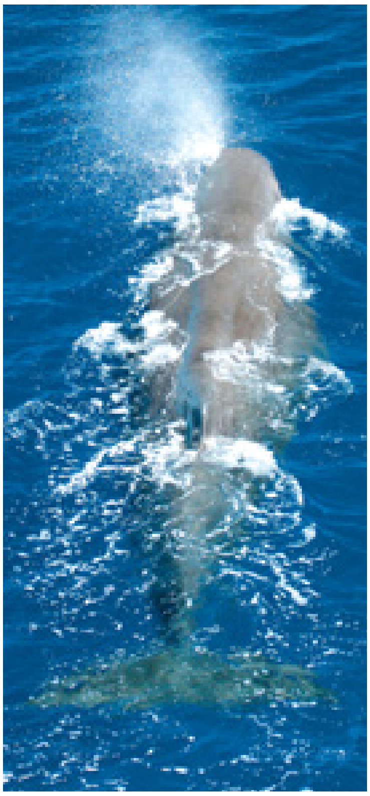
Changes in sea ice extent and distribution will also affect nutritional status and reproductive success of Arctic whale species. The Siberian Arctic, noted for its recent and extensive loss of ice, is predicted to be one of the first areas to experience climate-induced spatial shifts in marine mammal populations.[34] The loss of ice-edge habitat will inevitably lead to lower productivity of ice-associated marine fauna, such as copepods and plankton-feeding fish – a serious concern for species such as beluga and narwhal.[35] The loss of ice will also open up previously inaccessible ocean areas, encouraging activities such as oil and gas exploration and marine shipping, which bring further threats to cetaceans from noise, pollution and ship strikes.[36]

NARWHAL

A THREATENED SPECIES

While it is clear that the overall Arctic trend is warming, recent research has discovered notable regional anomalies. The climate around West Greenland, Baffin Bay and the Canadian High Arctic has cooled significantly since 1970, and ice coverage has increased by around 7.5% per decade.[37] Baffin Bay is one of the few areas expected to experience increased ice coverage and thickness in the next 50 years, and there are particular concerns over the plight of the Baffin Bay narwhal, with trends indicating that its major feeding zone habitat is becoming increasingly marginalised by sea-ice.[38]

GLOBAL CHEMICAL POLLUTION



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Brominated flame retardants have been found in sperm whales, indicating that they have reached deep ocean waters © *Chris Johnson / Ocean Alliance*

Page 8

Top Right: Pacific orcas carry very high PCB levels. © *Adrian Dorst*

Middle: Common dolphin showing skin lesions © *Peter Evans / Sea Watch Foundation*

Bottom Left: Testing cetacean tissues for chemical pollutants © *Mari Park / Environmental Investigation Agency*

Bottom Right: © *Loic Bernard*

Marine pollution poses a major threat to cetaceans. The world's oceans are simply unable to absorb the limitless quantities of a huge variety of pollutants from industrial and agricultural waste, radioactive discharges and oil and plastic debris, dumped directly into the sea or transported indirectly via rivers and the atmosphere.[39] The UN Convention on Migratory Species (CMS) has estimated that 21% of all reported threats to small cetaceans come from pollution.[40]

PERSISTENT ORGANIC POLLUTANTS

Persistent organic pollutants (POPs) are chemicals that persist in the environment for long periods and are spread readily in the atmosphere and oceans. These include pesticides (e.g. DDT), industrial chemicals (e.g. PCBs) and by-products from industrial processes (e.g. dioxins and furans). POPs accumulate in the fatty tissue of living organisms and are toxic to humans and wildlife, including cetaceans.[41]

Levels of some POPs such as PCBs and DDT are slowly falling in coastal regions due to widespread restrictions on their production and use.[42] However it is thought that oceanic water masses are the final sink for POPs, and studies have shown that deep sea biota carry significantly higher PCB burdens than surface organisms.[43]

Moreover, levels of newer-generation chemicals such as polybrominated flame retardants are generally rising in the environment, alongside a current trend of increasing global production for many of these chemicals.[44] Their toxic properties are similar to PCBs and concentrations in marine mammals appear to have significantly increased over the last decade.[45]

The Stockholm Convention on Persistent Organic Pollutants entered into force on 17th May 2004, with 151 signatories and 96 Parties. The Convention is a legally binding instrument designed to eliminate or reduce the release of POPs into the environment, initially covering PCBs, dioxins and furans, and nine pesticide groups.[46]

MERCURY

Of all the heavy metals, mercury is one of the most dangerous environmental poisons.[47] Due to its persistence and high mobility in the marine ecosystem, mercury shows a high level of biomagnification in the upper levels of the food web. Cetaceans are top food-chain predators, and can be highly contaminated with mercury and its more toxic organic form, methylmercury.[48]

While there are some natural emissions, anthropogenic sources are the major contributors to releases of mercury.[49] Human related activities are thought to have increased overall mercury levels in the atmosphere roughly three-fold, with coal-fired power production being the single largest global source of atmospheric mercury emissions.[50] In North America and Europe, mercury emissions have decreased over the past two decades, while levels in Asia have grown steadily and now contribute more than half of global anthropogenic emissions. Recent studies have estimated Asian emissions to be 1460 tonnes per year, almost double previous best estimates.[51]

In 2003 the United Nations Environment Programme (UNEP) concluded that there was "*…sufficient evidence of significant global adverse impacts from mercury to warrant further international action to reduce the risks to humans and wildlife…*" and established the UNEP Mercury Programme.[52] At the UNEP biennial meeting in 2005, world governments concluded an agreement on voluntary measures to reduce production and use of mercury, but stopped short of setting up a legally binding global treaty in the face of opposition by the United States and others.[53]

IMPLICATIONS FOR CETACEANS

The sheer number of toxic substances introduced by man into the marine environment makes establishing the effects of any one substance very difficult.[54] Levels found in cetaceans are highly variable, depending on diet, age, species, sex and geographical location.[55] Toothed cetaceans tend to accumulate higher pollutant loads than baleen whales, due to their position at the top of the food chain.[56]

Organochlorines (such as PCBs and DDT) can cause immuno-suppression, endocrine disruption, reproductive failure and developmental problems, as well as cancer.[57] First-born calves are particularly at risk and may suffer increased mortality through the transfer from mother to calf of large POP burdens, primarily via lactation.[58] POPs have been implicated in a number of cetacean mass mortalities from morbillivirus-associated epizootics, and their immunotoxic effects warrant special concern in the context of emerging infectious diseases.[59] A recent study revealed that California sea lions with cancer had PCB levels some 85% higher than sea lions without cancer, indicating that PCBs play a role in the development of the disease.[60] While cancer in cetaceans is rare, the highly organochlorine-contaminated beluga whales in the St Lawrence estuary suffer from an exceptionally high rate of cancer, and account for 40% of reported cetacean cancer cases world-wide.[61]

High levels of mercury may present a significant risk to cetaceans, particularly in animals weakened by disease and therefore less able to detoxify organic mercury as efficiently as healthy animals.[62] In a study of stranded dead porpoises on the coast of England and Wales, scientists found higher levels of methylmercury in the livers of those that had died from infectious disease than those that had died as a result of physical trauma.[63] Studies have also linked liver abnormalities in bottlenose dolphins with chronic accumulation of mercury.[64]

RECOMMENDATIONS

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The Environmental Investigation Agency urges IWC member governments to work towards the development of a strategic long-term plan to address environmental threats to all whales, dolphins and porpoises.

Through a series of workshops or special sessions, the Scientific Committee should: identify and consider the key threats to cetaceans, including populations most at risk; collate details of relevant ongoing research and management programmes; and identify immediate, mid-term and long-term research needs.

Taking into account the recommendations of the IWC's 2004 habitat degradation workshop, special attention should be given to the synergistic effects of environmental changes on critical cetacean habitats, with a view to developing an 'early warning system' in the identification of serious cetacean conservation issues. As a priority, the Scientific Committee should consider the status of Arctic cetaceans, especially narwhal and beluga, taking into account the direct and indirect effects of climate change, pollution, direct and incidental takes and other threats. Other priority case studies could include threatened cetacean populations in degraded coastal areas, which are subject to a variety of human-related activities resulting in incidental takes, prey depletion, range reduction and fragmentation, and high pollutant levels.

Based on the initial series of case studies, workshops and special sessions, the Scientific Committee should prioritise the development of long-term multi-disciplinary research programmes to fully evaluate the identified threats and, where appropriate, propose specific mitigation measures. Opportunities for collaboration with other national, regional and global organisations, such as CMS, should be fully explored and utilised. The work will necessitate participation by a wide range of scientists with expertise outside the normal range of Scientific Committee work, and will require a wide range of invited experts.

As members of the IWC, governments should:

- agree priorities and a timetable of action for the Scientific Committee;
- identify funding sources and opportunities for collaboration with other multi-national bodies;
- disseminate relevant research findings to guide governmental and inter-governmental decisions world-wide that may affect cetaceans;
- send environmental scientists to take part in the Scientific Committee and its Standing Working Group on Environmental Concerns, as recommended in IWC Resolution 1998-5;
- report to the Commission annually on national and regional efforts to monitor and address the impacts of environmental change on cetaceans, as required by IWC Resolution 1998-5.

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