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ACTION PLAN

2012

WWF SPECIES ACTION PLAN

Marine and freshwater cetaceans 2012-2020

This WWF Species Action Plan was compiled by Valerie Burgener, Wendy Elliott, and Aimée Leslie.

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A bowhead whale (*Balaena mysticetus*) surfaces at Isabella Bay, Canada. As climate change causes loss of sea ice, vessel and oil drilling related interactions may increase threats to Arctic cetaceans

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ACRONYMS

ACCOBAMS	Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas
BMP	Best Management Practices
SAP	Cetacean Species Action Plan
CBD	Convention on Biological Diversity
CEA	Coastal East Africa
CCAMLR	Convention on the Conservation of Antarctic Marine Living Resources
CIESM	Mediterranean Science Commission
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CMS	Convention for Migratory Species
DDT	Dichlorodiphenyltrichloroethane
EAP	Ecoregion Action Programmes
GI	Global Initiatives
GPF	Global Programme Framework
IGO	Intergovernmental organizations
IMO	International Maritime Organization
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
IWC	International Whaling Commission
MPA	Marine Protected Area
NGO	Non-governmental organizations
PCB	Polychlorinated biphenyl
SPAW	Specially Protected Areas and Wildlife
WAMER	West Africa Marine Ecoregion
WWF	World Wide Fund for Nature

A narwhal (*Monodon monoceros*) surfacing for breath in the Arctic. The tusk, scientists recently discovered, forms a sensory organ of exceptional size and sensitivity, making the living appendage one of the planet's most remarkable

1.FOREWORD

Whales, dolphins and porpoises (cetaceans) have captured human imagination since ancient times and are without doubt some of the most fascinating animals on earth. The 87 recognized cetacean species demonstrate a myriad of characteristics and behaviours, and have adapted to an enormous range of habitats – from the polar regions to the tropics, from the high seas to rivers and lakes.

Dr Carlos Drews
Director Global Species Programme
WWF International
September 12, 2012

The largest animal ever known to have lived on this planet is a cetacean – the majestic blue whale, with a weight of up to 150 tonnes and a length of 33 metres, and a heart the size of a small car.

Cetaceans are among the most intelligent species on the planet. Bottlenose dolphins, for example, have distinct personalities, a strong sense of self, and the innate ability to learn languages: their own and – even more remarkably – a rudimentary symbol-based language created to bridge the communication chasm between dolphins and the human species. In the wild, cetaceans communicate with members of their own species using a range of sounds – including what are called signature whistles – and postures and signals, such as breaching and striking the water surface. Several of the migratory whale species travel thousands of miles between breeding and feeding grounds, navigating the vast oceans in ways we still don't fully understand.

It is no wonder that one of the fastest-growing forms of tourism is whale watching, with over 10 million people in more than 110 countries each year taking to the seas in search of a glimpse of these incredible and majestic animals.

However, even while cetaceans hold a special place in human hearts, it is a tragedy that they are also greatly threatened by human activities. Among other threats, destructive fishing practices, the construction of bigger and deeper harbours, the growing web of global shipping routes, unsustainable direct takes, chemical and acoustic pollution, marine debris, the expansion of oil and gas exploration in our oceans, and the carving up of river systems through the construction of dams are all taking their toll.

This action plan provides the strategic framework to ensure that WWF is doing the right things in the right places to best help conserve cetaceans in need across our planet. But above all, this plan is a call to action for all those interested in ensuring that this amazing group of animals is able to survive in our oceans and rivers, both to fulfil their important ecological role and to inspire and delight generations to come.

2. IMPORTANCE OF CETACEANS AS FLAGSHIP SPECIES

Cetaceans are a large, diverse and widely distributed species group, inhabiting all of our planet's oceans and seas as well as some rivers and lakes. These 87[i] very different marine species range in size from the world's largest animal – the 150-tonne blue whale (*Balaenoptera musculus*) – to New Zealand's endemic Maui's dolphin (*Cephalorhynchus hectori maui*), measuring 1.4m and weighing just 50kg on average.

"How an animal so huge can be so calm in the water gives us an example of peace and respect. I cannot understand their language, but it resonates in my body and my soul. Through their sounds I can see the complexity and perfection of the universe I inhabit,"

Guadalupe Urbina, Costa Rican singer-songwriter

Some cetaceans are highly localized, occurring in very restricted habitat ranges, whereas others migrate thousands of miles each year between feeding, breeding, calving and nursery grounds. Whales and dolphins display many fascinating behaviours:

- The fin whale, called the "greyhound of the sea", can reach speeds of up to 47 km/hr Humpback and Irrawaddy dolphins cooperate in some places with local fishermen to increase both their catches.
- The blue whale can communicate with others of its own kind more than a thousand kilometres away using low-frequency calls.
- River dolphins can swim in low-visibility waters by partly or totally replacing eyesight with echolocation.

Marine cetaceans play an important role as flagship species. They put a tangible face to anthropogenic threats in the marine environment, increasing public awareness and political will to mitigate such threats and providing a focal point around which broader marine conservation objectives can be achieved.

The rapid and alarming decline of freshwater cetaceans and the strong links to human health and livelihoods are good reasons for intensifying and scaling up the work on them, in addition to the significant value of using freshwater cetaceans as flagship species for freshwater ecosystem management. Three river dolphins are only found in freshwater ecosystems:

- The South Asian river dolphin, with two subspecies: the Ganges river dolphin or susu (*Platanista gangetica gangetica*), and the Indus river dolphin or bhulan (*Platanista gangetica minor*);
- The Orinoco and Amazon river dolphin or boto (*Inia geoffrensis*) with three recognized subspecies: *I. g. geoffrensis* in the Amazon river basin, *I. g. boliviensis* in the upper Rio Madeira drainage in Bolivia, and *I. g. humboldtiana* in the Orinoco river system[ii]
- The Yangtze river dolphin or baiji (*Lipotes vexillifer*), although the baiji is considered functionally extinct[iii].

Described by scientists as "living fossils", freshwater dolphins are believed to have evolved from primitive marine dolphins which remained in large freshwater river systems of South America and Asia as sea levels fell. They exhibit some extreme characteristics in their morphology and sensory systems. Until quite recently, their morphological similarities persuaded taxonomists that they were closely related, but

genetic evidence shows that they have been separated for millions of years and that their similarity is due largely to convergent evolution. There are four other dolphin and one porpoise species that are found in both marine and freshwater ecosystems: La Plata dolphin or Franciscana (*Pontoporia blainvillei*), the Irrawaddy dolphin (*Orcaella brevirostris*), the tucuxi (*Sotalia fluviatilis*), and the narrow-ridged finless porpoise (Neophocaena asiaeorientalis). There is also the Australian snubfin dolphin (*Orcaella heinsohni*), which is found in some estuarine environments and near river mouths, and the Guiana dolphin (*Sotalia guianensis*), which inhabits the Caribbean and Atlantic coasts of South America, including some estuarine and riverine areas.[iv]

In addition to their contribution to the biological diversity on Earth and to the fascination they have provided to mankind since ancient times, cetaceans play important ecological, cultural and socio-economic roles, as briefly described below.

2.1. ECOLOGICAL ROLE OF CETACEANS[v]

In 2010, a lone female humpback whale travelled more than 9,800 kilometres from breeding areas in Brazil to those in Madagascar, setting a record for the longest mammal migration ever documented

The potential influence of cetaceans on marine ecosystems is clear because of the long history of cetacean evolution, the diversity of foraging modes employed by various baleen (mysticete) and toothed (odontocete) whales, and because cetaceans comprise far more biomass than any other marine mammal group.[vi] This latter feature suggests that cetaceans have a strong influence on their associated ecosystems and that the removal of large numbers of cetaceans is likely to have cascading impacts on the ecosystems in which they occur.

As large, and in many places numerous, predators, cetaceans are ecologically significant since they store and move nutrients (carbon and nitrogen especially) and energy, within and between ecosystems. For example, most of the baleen whales which feed on plankton carry biological production directly from the bottom of the animal food chain (the small zooplankton) to the top trophic level. Small cetaceans and the large toothed whales, on the other hand, have a diet based on much larger species and therefore fulfil a different top predator role in ecosystem dynamics. Even in death, whales play an important ecological role: a whale's carcass which is left to descend to the ocean floor (known as a "whale fall") is used by a wide and diverse assemblage of species, some of which appear to be entirely dependent on whale falls for their survival.[vii]

As top predators, freshwater dolphins also have a key role in controlling and maintaining healthy fish and crustacean populations. River dolphins' presence is seen as an indicator of the ecological health state of a river.

Due to the complexities of marine and freshwater systems and the lack of information on many cetacean species, the true extent of the ecological roles of cetaceans is yet to be fully understood. However, it is clear that whales and dolphins are critical components of the delicately balanced ecosystems in which they live.

2.2. CULTURAL ROLE OF CETACEANS[ix]

Whales and dolphins have been part of humankind's cultural heritage since ancient times and are widely described in classical and modern literature – for example in the writings of Homer, Aristotle, Pliny the Elder and Herman Melville. For many coastal communities, especially for those still practising traditional or aboriginal subsistence hunting, cetaceans hold important cultural and often spiritual significance. For instance, the Inuit and other indigenous peoples have hunted marine mammals for thousands of years in the Arctic. In modern times, the technology and techniques of hunting cetaceans have changed, but the cultural importance remains the same. Marine mammal hunting provides status within the community and a sense of self-worth for a generation of indigenous peoples struggling to cope with the burdens of cultural assimilation. Another

"Responsible whale watching is comprised of four pillars: economic benefit for coastal communities, research and monitoring of target species, education for operators and tourists on cetaceans and their threats, and ultimately the conservation of the cetacean populations that are sighted. A live whale provides much more benefits to a community throughout its entire life than a dead one,"

M.Sc. Miguel Iñíguez, Argentinian field naturalist

example is the strong link that exists between riverine cultures and river dolphins. Many myths and legends exist. In South America it is believed that the boto will bring luck to fishermen and, at night, will transform into a handsome man. Conversely in the Indus, the legend implies that the bhulan was a woman who was cursed by a saint to become a dolphin and live in the river forever.

Our activities will have little real conservation value if we ignore the intrinsic value and importance of marine mammals in the wild. Nowadays, interest in cetaceans is at fever pitch. Excursions to view whales and dolphins in the wild draw countless participants from many cultures and age groups (see section 2.3). The past two decades have seen an explosion of books and videos about marine mammals. There seems to be a groundswell of respect, hope and compassion for cetaceans. However, the ability of humans to form emotional attachments to whales and dolphins risks encouraging small-scale, high-profile publicity events that seem to be noble but do little to save marine mammal populations. We need to ramp up our efforts to ensure that all the negative impacts of human activities on cetaceans in their natural habitats are eliminated or minimized.

2.3. SOCIOECONOMIC ROLE OF CETACEANS

Around 3.6 billion people, or 60% of the world's population, live within 60km of the coast, making coastal areas the most densely populated regions on Earth. Despite the natural richness of coastal areas, communities in developing countries that depend on the sea for their basic needs are among the poorest in the world. The diet, health and livelihoods of these communities rely heavily on their ability to access natural marine resources – not just for food but also as sources of long-term, sustainable revenue. However, this ability is being increasingly compromised by ongoing issues of tenure, ownership and access rights, as well as the rapid and increasing degradation of fisheries, habitats and other marine resources.

An important link between cetaceans and coastal communities has come from the development of whale-, dolphin- and porpoise-watching tourism (henceforth termed "whale watching"). Some 80% of all tourism takes place in coastal areas, and whale watching has grown exponentially in recent decades. By 2008, 13 million tourists participated in whale-watching activities per year in 119 countries and territories, generating a total expenditure of US$2.1 billion. Around 3,300 operators offer whale-watching trips, and these operators employ an estimated 13,200 people. Tourists can be attracted to remote coastal areas for whale watching, providing important income not only through direct ticket sales but also through expenditure in restaurants, accommodation and buying souvenirs. Responsible whale watching can thus substantially increase the incentive within coastal communities to conserve cetaceans and ensure that coastal ecosystems are healthy and well managed. Dolphin-watching ecotourism is also being promoted in freshwater habitats (see the dolphin-watching strategy in the Mekong river basin in this SAP) as a means to secure community commitment for freshwater dolphin conservation.

Humpback whale (*Megaptera novaeangliae*) breeching near whale watching boat, Cape Cod

3. THREATS TO CETACEANS

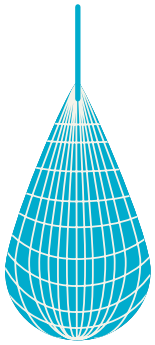
The major threats to cetaceans described below have been illustrated in two distinct conceptual models, one on freshwater dolphins and one on marine cetaceans (Annexes I and II). The models were drafted separately for these two groups of species, as the threats they face are very different. Conceptual models are simplified versions of reality: most often, a variety of threats occur simultaneously, and their cumulative impact on cetacean populations is much more severe as a result.

Threats can also act synergistically, causing a greater overall impact on cetaceans. For example, entanglement in fishing gear (bycatch), if it does not kill the animal concerned, can result in significant injuries and leave open wounds. If cetaceans are also exposed to the kind of chemical contamination which results in immunosuppression, this will greatly compromise their ability to recover from such injuries, making the impact of bycatch and chemical contamination much more severe when the two threats occur simultaneously.

3.1 . BYCATCH[xv] AND ENTANGLEMENT

300,000

MORE THAN 300,000 CETACEANS DIE DUE TO BYCATCH IN FISHING OPERATIONS EACH YEAR



Cetaceans can easily become caught up and killed in fishing operations. According to the Cetacean Bycatch Resource Centre[xii] it is estimated that more than 300,000 cetaceans are killed every year in this way. In many cases these deaths are entirely unintentional and are incidental to the main fishing operation. They are therefore mostly referred to as incidental catches or "bycatch". Most types of fishing gear have been reported to ensnare cetaceans at one time or another. Some captures seem to defy reason. Large whales, for example, may become caught in a single lobster pot line, and porpoises can get caught in simple fish traps that they are able to find their way into, but not out of. Other forms of bycatch are more obvious, such as the entanglement of cetaceans in vast gillnets that can extend up to 3km in length when nets are tied together. These nets act as a "wall" that cetaceans cannot get around; once entangled, the cetacean is unable to come to the surface to breathe, and drowns.

In rivers and lakes, dolphins and porpoises are particularly vulnerable to bycatch in gillnets. Other harmful fishing techniques, such as rolling hook lines in the Yangtze River, explosives, electricity and poisoning, also kill large numbers of finless porpoises and probably contributed to the extinction of the Yangtze river dolphin. In the past, and indeed in many parts of the world today, cetaceans caught as bycatch have been treated as a useful bonus and landed for human consumption or used as bait (e.g. for attracting catfish in the Amazon basin).

Bycatch is well recognized as one of the most important sources of anthropogenic mortality among many species of cetaceans.[xiii] This SAP therefore sees the mitigation of cetacean bycatch as a fundamental priority and will place a high priority on liaising with the work of our fisheries programmes to address this.

3.2. COMMERCIAL WHALING[xiv]

During the last several centuries, most populations of great whales were systematically over-exploited, with several species brought to the brink of extinction.[xi] Despite the existence of a global moratorium on commercial whaling for over 25 years, many species and populations have still failed to recover to their pre-whaling levels. In the

Antarctic alone, more than 2 million whales were killed during the 20th century, reducing the large Southern Ocean populations to a small fraction of their original size. For example, between 1904 and 1971, 369,000 blue whales were killed in the Southern Hemisphere; today it is estimated that 2,280 remain.[xvi] A few populations or species, such as the northern right whale (*Eubalaena glacialis* in the North Atlantic and *Eubalaena japonica* in the North Pacific), were reduced to such an extent that their recovery is now likely to be seriously compromised by demographic and genetic factors (i.e. inbreeding) and further human impacts.

"How can we get ourselves and others to care sufficiently about natural organisms and processes that we become willing to make fundamental changes in how we live? This is about values, and religious beliefs, and views of our role in the great scheme of things,"

Dr. Randall Reeves, chairman of the IUCN Species Survival Commission's Cetacean Specialist Group

The maintenance of the commercial whaling moratorium, implemented by the International Whaling Commission (IWC) in 1986, has ensured that commercial whaling is no longer a major threat to most of the large whale species. However, several IWC parties continue to hunt whales either under objection/reservation to the moratorium or by using another loophole in the moratorium, which allows lethal takes of whales for scientific purposes. Countries using this loophole decide the size of their own scientific takes. Current whaling includes takes of species listed by the International Union for Conservation of Nature (IUCN) as endangered, such as fin whales (*Balaenoptera physalus*) (Iceland) and sei whales (*Balaenoptera borealis*) (Japan). WWF acknowledges the widely varied cultural attitudes toward the conservation and management of whales, but continues to oppose commercial whaling. We will do so until whale stocks have fully recovered, and the governments of the world have brought whaling fully under international control with a precautionary, conservation-based, enforceable and transparent management and compliance system adhered to by all whaling nations.

3.3. UNSUSTAINABLE DIRECT TAKES

Direct hunting for commercial and subsistence use remains a threat to several populations of small and medium-sized cetaceans. In comparison to large-scale commercial whaling, hunting of dolphins, porpoises and other small cetaceans has received relatively little international oversight or management, in spite of their highly migratory nature.

Measures to regulate direct takes of small cetaceans have been at the centre of IWC controversy for decades. There is an urgent need for an international management regime for direct takes of small cetaceans, but several IWC Contracting Parties (primarily the whaling nations) still deny that the IWC has the competence to manage small cetaceans as well as large whales. WWF has addressed this in its recent report Small cetaceans: the forgotten whales, presented at the IWC meeting in 2009.

Directed hunts of small cetaceans that the Scientific Committee of the IWC has assessed as unsustainable in recent years include the Japanese hunt of Dall's porpoises (*Phocoenoides dalli*) and striped dolphins (*Stenella coeruleoalba*). In recent years the belugas (*Delphinapterus leucas*) and narwhals (*Monodon monoceros*) taken in aboriginal hunts off west Greenland have been of concern. Removals from bottlenose dolphin (*Tursiops truncatus*) populations – where data does not allow judgements to be made about sustainability – have also been highlighted. These and other takes are a continued issue of concern for the IWC, both in the Scientific Committee and plenary. It is important to underline that, while the overall health of a species may be robust, individual populations can easily become locally extinct.

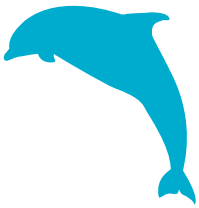
Although little is known regarding direct takes of many small cetaceans other than those addressed on an ad hoc basis by the IWC, live capture for display in dolphinaria is an issue of concern for several species. Riverine populations, such as the Irrawaddy dolphin, have been targeted due to their ability to survive in freshwater tanks. Direct takes of river dolphins for use as fishing bait occurs in the Amazon and Orinoco river

basins and is considered to be a threat to their survival. The dolphins are used to catch a type of catfish known as "mota" (*Calophysus macropterus*) which is sold in the cities of Colombia, Ecuador, Peru and Venezuela.

3.4. SHIP STRIKES

"Plastic debris is choking the life out of marine animals and ecosystems. It is an insidious and growing threat to marine wildlife worldwide and whilst we do not yet have a full picture of the scale of the threat that it poses to many populations and species, in some cases this threat is clearly substantial and urgently needs to be addressed whilst research continues,"

Mark Peter Simmonds, author of Whales and Dolphins of the World



Collisions between cetaceans and vessels (known as "ship strikes" or "vessel strikes") have only relatively recently become recognized as a significant cause of mortality and traumatic injury for cetaceans. They are likely to increase in the future as vessel traffic increases and ships become larger and faster. A growing body of information also calls into question the widely held assumption that only whales, and not smaller cetaceans, are affected.

Except for a few areas and populations, mainly in the North Atlantic, the scarcity of documented records impedes any accurate assessment of the true prevalence of collision: under-or non-reporting of ship strikes is a global norm. To counter this, the IWC's Conservation Committee has established a working group, which has developed a global ship strike database and is working to mitigate ship strikes in the most critical areas.

Freshwater dolphins are also victims of the development of inland water transport, especially in China, India and the Mekong countries. As a result, many dolphins living in today's busy rivers are wounded or die because of ship strikes.

3.5. MARINE DEBRIS, ACOUSTIC AND CHEMICAL POLLUTION

There is widespread recognition of the threat that environmental contaminants pose to marine mammals. Cetaceans, particularly odontocetes, are at high risk from toxic contamination, because they are at the top of the food chain and therefore accumulate toxins from their environment and food. In addition, many chemical compounds concentrate in fatty tissues such as whale blubber. High concentrations of toxic compounds in the tissues of these animals has been associated with organ anomalies, impaired reproduction and immune function, and as a consequence of the latter, with the occurrence of large die-offs among cetacean species.

In general, the concept of pollution incorporates many substances to which marine mammals are exposed and which might adversely affect their health. These include chemical compounds, oil, marine debris, sewage-related pathogens, and excessive amounts of nutrients causing environmental changes in cetacean habitats.

Pollution is also a significant issue for freshwater cetaceans. The water quality of many river basins has been badly degraded. Industrial effluents, rapid urban development, human sewage, mining waste and agriculture runoff contaminate watercourses, impair water quality and adversely affect river dolphins. The Ganges river dolphin has been found to have high residues of polychlorinated biphenyl (PCB) and dichlorodiphenyltrichloroethane (DDT) in its blubber. Freshwater cetaceans could be at greater risk of contamination than marine cetaceans because pollution discharge sites are often located in their preferred habitat. Large amounts of pesticides and fertilizers used in agriculture are having a negative impact on freshwater ecosystems in river basins such as the Indus and Ganges. In South America, large amounts of mercury are released into water systems from gold mining, which is posing a potential threat to dolphin species that inhabit those rivers.

Noise pollution or disturbance is also of particular concern because many freshwater and marine cetacean species rely heavily on sound for finding their prey, communication and navigation. Activities producing loud noise-related disturbances include shipping, military manoeuvres, seismic testing, oil and gas drilling, and in some cases tourism (including whale watching). Most data on cetacean disturbance by noise concerns short-

term behavioural reactions that generally include cessation of resting, feeding, or social interactions; changes in surfacing, respiration, or diving cycles; and avoidance behaviour. It is difficult to monitor and assess the consequences of such disruption in natural activities. Long-term effects of noise disturbance are poorly documented but known effects include auditory damages – sometimes leading to death; long-term displacement; loss of energy and stress.

The threat posed to cetaceans by the growing quantities of plastic and other marine debris is not well understood but there are growing concerns for deep-diving whales which may feed in areas where submerged debris is concentrated.

3.6. DESTRUCTION/DEGRADATION OF HABITAT

Possibly the most significant threat to the habitat of freshwater dolphins is the construction of large water development structures, most notably dams, barrages and levees. Water development projects in Asia and, to a lesser degree, South America have fragmented freshwater cetacean populations, and in some cases actually eliminated habitat. Additional problems occur as a result of upstream diversion of water out of the river systems inhabited by cetaceans. Dams and barrages change the flow regime and the quality and quantity of the river water, altering or eliminating the special hydrological conditions which are necessary for the survival of freshwater cetaceans and other species that contribute to biodiversity. The river water volume must be sufficient year round to allow the movement of dolphins between deep pools, to maintain suitable temperature regimes and to dilute the large quantity of pollutants discharged into rivers. Dams also disrupt migration patterns of fish, resulting in less available prey for river dolphins.

Degradation of habitat can also directly impact marine species, especially when it occurs in critical feeding, breeding, calving or nursery grounds. Topical examples include the impact of oil and gas development on the feeding ground of western gray whales (*Eschrichtius robustus*) off Sakhalin Island, Russia, and the impact of infrastructure development on nursery habitat of humpback whales (*Megaptera novaengliae*) in Malaga Bay, Colombia.

Direct loss of habitat through land reclamation, aquaculture and the construction of harbours is increasingly reducing the available space for some coastal cetacean species, with potential impacts on their health. For example, reclamation is a serious threat to the Indo-Pacific humpback dolphin (*Sousa chinensis*), which inhabits mangrove and estuarine habitats, in mainland China, Hong Kong, Taiwan and the Arabian region.

3.7. CLIMATE CHANGE

There is now unequivocal evidence that climate change is happening and that human activities are contributing to it. The Intergovernmental Panel on Climate Change (IPCC) concluded that 20-30% of plant and animals species assessed so far are likely to be at increased risk of extinction if global temperatures rise by more than 1.5-2.5°C.

A number of factors, including the complexity of marine food webs, affect our ability to accurately predict changes in the oceans. However, it is clear that the impacts of climate change will include shifts in temperature, sea levels, sea-ice extent, nutrient inputs/primary productivity, water acidity and salinity, stratification and circulations, precipitation patterns, storm frequency, wind speed, wave conditions and climate patterns.

While climate change is expected to affect cetaceans primarily via loss of habitat and changes in prey availability, additional consequences may result from climate-driven shifts in human behaviours and economic activities. For example, increases

in shipping, oil and gas exploration and fishing in the Arctic due to the loss of sea ice are likely to increase acoustic disturbance, ship strikes, bycatch and prey depletion for Arctic cetaceans. In the tropics, climate change may result in increased hunting pressure on near-shore dolphins and whales off Asia, Latin America, Africa and elsewhere as the availability of other marine resources diminishes.

However, predicting the consequences of global environmental change on biodiversity is a complex task, as the effects encompass multiple and complex dynamic processes that rarely have single and clear-cut actions. For instance, trying to predict the precise consequences of climate change for cetacean species is extremely difficult. As described in more detail in section 5, very little is known about many cetaceans; basic status information is lacking in many cases, and knowledge regarding specific habitat preferences and adaptive capacity is virtually nonexistent. Predicting the effects of climate change for cetaceans that we know so little about is therefore extremely problematic. Nonetheless it has been estimated that climate change is likely to modify the range of all the cetacean species listed as threatened by the IUCN for which predictions can be made. Over their evolutionary history, many marine mammal species have adapted their behaviours and distributions in response to changing environmental conditions. However, it is unclear to what extent cetaceans will be able to adapt to the unprecedented rates of climate change currently occurring and predicted in the near future.

AS TEMPERATURES INCREASE, THERE ARE LIKELY TO BE SIGNIFICANT LOSSES OF POLAR "SPECIALIST" SPECIES (SUCH AS NARWHALS AND BELUGAS)

The impacts of global climate change are already proving to be far more pronounced in the polar regions, so climate change is likely to be of greatest significance for cetacean species that rely on polar habitats. As temperatures increase, there are likely to be significant losses of polar "specialist" species (such as narwhals and belugas) and a general shift of more temperate species toward the poles, either due to animals searching out preferred temperature conditions or due to changes in the distribution and abundance of prey species. For polar-adapted species, this is likely to be particularly problematic, as there will be a limited amount of colder habitats to move into.

Climate change is also very likely to exacerbate existing pressures and threats facing river dolphins. For example, less precipitation combined with high demand for water for agriculture may result in increased water abstraction from rivers and construction of more storage dams or irrigation canals, further altering river flows and fragmenting river systems. Increased demand for low-carbon electricity may result in construction of more hydropower dams, while inland water transport may be intensified to increase fuel efficiency for bulk transport. Increases in extreme weather events may lead to further construction of hard infrastructure for flood prevention. For instance, a recent study shows that the Brahmaputra and Indus basins are likely to be affected substantially by climate change and may experience reductions of flow. This would not only potentially affect freshwater dolphins but it is also a serious threat to the food security of an estimated 60 million people. Flooding, for example, may destroy crops and put extra pressure on fishing activities.

Cetaceans are already facing numerous non-climate-related threats, as noted above. Climate change-induced impacts are likely to compound and exacerbate these threats by reducing resilience and adaptive capacity because of conservation resource deployment to competing needs. In addition, climate change will directly increase several direct threats to cetaceans, such as prey depletion, habitat degradation and destruction, and water shortage.

Nonetheless, there are climate change adaptation measures that can be implemented to reduce non-climate stressors, and to develop spatial management schemes that protect key feeding, breeding and migration areas based on plausible future as well as current conditions.

3.8. POORLY MANAGED WHALE AND DOLPHIN WATCHING

Whale and dolphin watching, if not conducted responsibly, can harm cetacean populations. The impacts of whale watching are due both to the presence of the vessels (which can turn the cetaceans' attention away from activities like foraging, feeding, socializing and breeding, and even result in collisions) and to the noise the vessels produce (reducing the ability of cetaceans to detect their prey, communicate and navigate). Repeated harassment by numerous boats could lead to cetaceans abandoning critical habitat areas such as feeding and breeding grounds. This means that in some areas with intense, poorly managed whale-watching enterprises, whale watching switches from being a conservation solution to a threat to cetaceans and the ecosystems in which they live.

WWF supports the sustainable, non-lethal use of whales, and promotes the implementation of responsible whale-watching guidelines, such as those of the IWC.

Fisherman with plataniste or Ganges river dolphin, Bangladesh

Project team members fitting a satellite radio transmitter to the back of a captured narwhal (*Monodon monoceros*) in Tremblay Sound, Nunavut, Canada

4. THE WWF APPROACH TO SPECIES ACTION PLANS

Species action plans (SAPs) are the blueprint for WWF's major conservation programmes to conserve our flagship species across their range.

SAPs comprise a full suite of activities designed to ensure the long-term, sustainable conservation of the entire extent of habitat necessary to support viable populations of the species and to mitigate the threats to their survival. As WWF flagship species are generally long-lived, complex animals which require diverse habitats on a large scale, SAPs by definition address broad ecosystem conservation. A key point to note about SAPs is that they are not intended to reflect all theconservation actions required to save a species or species group – they reflect the specific interventions which WWF intends to take, in collaboration with its broad range of public and private partners. Building on the 2005 WWF Cetacean SAP and using the best available knowledge, the present SAP is designed to:

- Provide a framework for WWF's cetacean conservation efforts through a cohesive global strategy focused on the most critical species threats for cetaceans;
- Take advantage of lessons learnt and expertise gained at national, regional and international levels, and apply successful strategies more broadly throughout the network;
- Initiate new efforts that address strategic priorities and capitalize on existing or planned work;
- Integrate cetacean conservation action with other WWF initiatives and multiply the impact of our conservation efforts.

4.1. IMPLEMENTATION AND COORDINATION OF THE SPECIES ACTION PLAN

WWF offices and associate offices in North America, Europe, Latin America, Asia, Africa and Oceania will implement this SAP. The work will be coordinated by the Species Programme at WWF International, in collaboration with the WWF International Marine and Freshwater programmes. This arrangement will also secure the necessary links between the work of WWF offices in the field with global/regional-level policy activities.

This SAP is an overarching framework, which overlaps with other WWF priority programmes such as place-based Global Initiatives (GIs) (e.g. Coral Triangle, Living Amazon and Arctic), thematic GIs (e.g. Smart Fishing for threats such as cetacean bycatch) and Ecoregion Action Programmes (EAPs) (e.g. West African Marine Ecoregion). It builds on these programmes (and their own respective strategies and action plans), pulling together aspects relevant to cetaceans into a global vision and strategy for WWF's cetacean work.

This SAP is not a collection of activities that are already under way. It is a visionary blueprint for the actions considered to be the highest priority for furthering cetacean conservation at regional and global levels. Thus there are several parts which at the time of writing are not funded, but are considered critical to achieve the SAP's vision. Securing significant additional funds will be necessary to ensure full implementation of the SAP.

A major part of making this SAP a success will be effective coordination across the wide variety of its projects, ensuring that project leaders are able to learn from the successes and failures of similar initiatives undertaken elsewhere, and that capacity building on best practices for cetacean conservation is increased. These functions should be conducted by the cetacean SAP coordinator. Finally, and most importantly, the vision of this SAP and its goals and objectives are impossible for WWF to achieve alone. Establishing effective partnerships with governments, private sector, communities, scientists, non-governmental organizations (NGOs),

THE VISION OF THIS SAP AND ITS GOALS AND OBJECTIVES ARE IMPOSSIBLE FOR WWF TO ACHIEVE ALONE. WE NEED YOU!

intergovernmental organizations (IGOs) and civil society will be a critical and core component of the work undertaken through this SAP. The success of these partnerships will determine our ability to achieve our vision. Successful cetacean conservation will call on the ability of people and organizations to work together, requiring long-term commitments and synergy of knowledge, skills and resources to implement the diverse and complementary range of activities needed.

4.2. MULTIPLICATION BY DESIGN

In order to have the most significant conservation impact through all species action plans, WWF aims to create a transformational effect that multiplies the impact of our conservation efforts through effective engagement with key stakeholders.

At the policy level, we will continue developing partnerships with national and international authorities to develop and implement effective legislation for the conservation of freshwater and marine cetaceans. We support the protection of cetaceans through regional agreements such as the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS); Agreement on the Conservation of Small Cetaceans of the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS); the Cartagena Convention and the Specially Protected Areas and Wildlife (SPAW) Protocol; and the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). At the international level, we will continue promoting a conservation agenda that delivers concrete results through the IWC, Convention for Migratory Species (CMS), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and Convention on Biological Diversity (CBD), among others.

We will continue efforts to inform and engage coastal communities, the public and private sector, as well the media and the general public in the conservation of cetaceans through environmental education, public awareness, and social and mass media. We will support efforts to build the organizational and institutional capacity of local communities, enabling them to develop and lead financially sustainable cetacean conservation initiatives that benefit local livelihoods.

WWF will also continue partnering with other environmental organizations and academic and scientific institutions, to share lessons learnt and cross-cutting information, and use the tools available to expand our outreach. By developing external partnerships, we can clearly determine synergies to build upon each other's efforts. As a global network, we can place WWF's priority species issues on shared agendas and make a difference for cetaceans where they most need it.

4.3. THE SOCIAL DIMENSION

This SAP is aligned with WWF's four guiding social policies:

- *Indigenous peoples*: we respect indigenous and traditional peoples' human and development rights and recognizes the importance of conserving their cultures.
- *Poverty and conservation*: we find equitable solutions for people and the environment, making special efforts to enable local people to play a key part in crafting solutions for sustainable development.
- *Human rights*: we respect human rights and promote them within the scope of our conservation initiatives.
- *Gender*: we are committed to equity and integrating a gender perspective in our policies, programmes and projects, as well as in our own institutional structure.

5. STRATEGIC FRAMEWORK FOR THE SPECIES ACTION PLAN

A challenge in defining the priorities for this SAP was the crippling lack of data for many cetaceans. Of the 87 known species of cetaceans, 44 are listed as data deficient by IUCN, meaning that there is not enough information to even determine whether or not they are threatened.

This lack of data also means that for many species, critical habitats (feeding, breeding, nursing and calving grounds) and migratory routes are not clearly identified, and that the most important threats to their survival are not clearly defined. Where possible, WWF will support and contribute to filling these critical information gaps.

Prioritizing where WWF's limited resources should be spent with maximum conservation benefit is no easy task. But it is essential to build our conservation efforts together in a strategic way to ensure a secure and sustainable future for this important group of animals.

This SAP comprises two distinct sections, one on marine cetaceans and one on freshwater cetaceans. These two groups of species have been separated as they occupy two very different ecological systems – terrestrial/freshwater and coastal/marine – meaning that the threats they face are different, and that the people involved in their conservation come from different backgrounds and teams. However, the same strategic framework was used for both species groups.

5.1. PRIORITIZING EVOLUTIONARY DISTINCTIVENESS OF CETACEANS

The IUCN uses several criteria (e.g. trends in population size, distribution, fragmentation and rate of decline) to establish the level of imperilment of a species. This information is traditionally used to prioritize conservation efforts in many animal groups, including cetaceans. However, more recent conservation efforts are increasingly combining IUCN imperilment levels with the evolutionary history of species and lineages to identify conservation priorities. The reason for this is that species differ in the amount of unique evolutionary history they represent. Therefore, the loss of evolutionarily unique species with no close relatives represents a greater loss of biodiversity. The most evolutionarily unique cetaceans are the freshwater species, which are faring relatively poorly and thus are top conservation priorities. Other evolutionarily distinct cetaceans include the sperm whale, beluga, narwhal, and many species of beaked whales. Although the vaquita is not at the top of most evolutionarily distinct cetacean species, it is a top conservation priority because of its high levels of imperilment. Clearly, there is an urgent need to focus conservation effort on freshwater species. However, it is important to keep an eye on other phylogenetic (evolutionary distinct) conservation priority species, whose levels of imperilment are unknown but whose loss would hack whole branches off the tree of life of cetaceans.

5.2. MARINE PRIORITY SPECIES

Marine cetaceans cover a huge taxonomic breadth and geographic scope. While there is certainly a lack of data for many cetacean species, the information that is available highlights a number of highly threatened species and populations which require urgent conservation action if extinction is to be prevented. This SAP focuses on six of the most threatened cetacean species/populations in the world; their habitats are not necessarily included in WWF global priority places, but WWF is best placed to have a positive and long-term impact on their conservation.

Priority species table

Species	Scientific name	IUCN Status	Population trend	CITES	Description	Threats
Humpback whale (Arabia)	*Megaptera novaeangliae*	EN	Unknown	Appendix 1	The Arabian Sea humpback whale is recognized as an isolated resident subpopulation of humpbacks off the coast of Oman with an estimated 82 animals. Observations of severe entanglement scarring, large number of strandings, fast ferry routes through known humpback habitats and the potential for growth of unregulated whale watching in the region are cause for concern.	Bycatch, ship strikes, unregulated whale watching, habitat degradation
Harbour porpoise (Baltic Sea)	*Phocoena phocoena*	CR	Decreasing	Appendix 1	Current information on this subpopulation of harbour porpoise indicates a population of fewer than 250 mature animals in the Baltic Sea. The continued decline of the Baltic harbour porpoise can be attributed to current bycatch rates.	Bycatch
Franciscana	*Pontoporia blainvillea*	VU	Decreasing	Appendix 1	Native to the Southwest Atlantic (Argentina, Uruguay and Brazil), the Franciscana has suffered a decline of more than 30% over three generations (36 years; Taylor et al. 2007) according to projections based on actual and potential levels of bycatch. This rate is probably underestimated and the threat of bycatch is likely increasing because of fishery expansion, which can also reduce prey availability.	Bycatch
North Atlantic right whale	*Eubalaena glacialis*	EN	Unknown	Appendix 1	The North Atlantic right whale is one of the most endangered whales in the world, numbering no more than 400 animals (with 300-350 individuals off the east coast of North America). This species has become a major flagship for the threats of ship strikes and bycatch, with these two human-induced factors currently preventing population recovery.	Bycatch, ship strikes
Vaquita	*Phocoena sinus*	CR	Decreasing	Appendix 1	The vaquita is the smallest porpoise in the world and the only cetacean species endemic to North America, inhabiting only the Gulf of California in Mexico. However, this unique species is in imminent danger of extinction. Current estimates indicate as few as 245 surviving individuals (Gerrodette et al., in press.) which are critically threatened by entanglement in gillnets.	Bycatch
Western gray whale	*Eschrichtius robustus*	CR	Increasing very slightly	Appendix 1	The Western gray whale is ranked as one of the most critically endangered whale populations in the world, with just 125-130 individuals remaining, and only 25 breeding females. It has also become a flagship for the impact of oil and gas activities on the marine environment, with major international scientific, industry and public attention focused on how oil and gas exploration and development off Sakhalin Island in Russia is affecting the main feeding ground of this population.	Bycatch, noise, ship strikes, habitat degradation

5.3. MARINE PRIORITY SITES

The lack of data on most cetacean species, and the fact that marine cetaceans occur in almost the entire world's oceans and seas, meant that prioritizing those places where WWF's efforts should be focussed was a challenge. This SAP took as a starting point WWF's 15 marine priority places (Fig.1). These had already been defined in the WWF Global Programme Framework (GPF) as priorities either because they are home to irreplaceable and threatened biodiversity, or because they represent an opportunity to conserve the largest and most intact representative of their ecosystem.

The WWF marine priority places were then reviewed according to two criteria:

i) Whether the priority place is of high ecological importance for marine cetaceans;

ii) Whether there is existing institutional capacity on cetacean conservation and management within the WWF programme in that priority place.

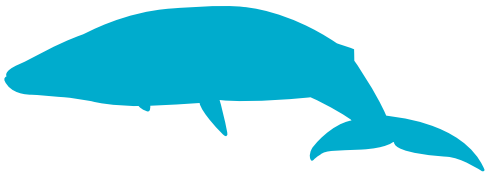
The following priority places came out of the analysis as the 10 target sites for the marine cetacean SAP: Arctic Seas, Coastal East Africa & Madagascar, Coral Triangle, Mediterranean & Black Sea, Southern Chile, Southern Ocean, South West Pacific, and West Africa Marine Ecoregion.

The 10 top priority places comprise many critical habitats for cetaceans, including critically endangered, endangered and threatened species. Critical habitats are those parts of a cetacean's range that are essential for survival, such as areas that are regularly used for feeding, breeding (all aspects of courtship) and raising calves, as well as migration routes. The Arctic and Antarctic (Southern Ocean) are critical feeding grounds for many great whale species, which travel to those areas each year from their breeding grounds in warmer waters. Arctic waters are home year round to the bowhead whale, beluga whale and narwhal. The Southern Ocean is a feeding ground for many endangered species such as blue whales, fin whales and southern right whales. In the Southern Ocean waters, specifically off the coast of New Zealand, are the endemic Hector's and Maui's dolphins. The latest population estimate of Maui's dolphins found only 55 animals over 1 year of age, making this subspecies of Hector's dolphin critically endangered, while it continues to face the threat of bycatch in gillnets and inshore trawls.

THE SOUTHERN OCEAN IS A FEEDING GROUND FOR MANY ENDANGERED SPECIES SUCH AS BLUE WHALES, FIN WHALES AND SOUTHERN RIGHT WHALES

Critical whale and dolphin feeding, breeding, calving and nursery areas occur in Southern Chile (e.g. blue whale, southern right whale, and Chilean dolphin), South West Pacific (e.g. Australian snubfin dolphin), West Africa Marine Ecoregion (e.g. Atlantic humpbacked dolphin) and the Coral Triangle (e.g. Indo-Pacific finless porpoise, Indo-Pacific humpback dolphin).

The Mediterranean and Black Seas are home to geographically and in some cases genetically distinct populations, such as the Mediterranean sperm whale and short-beaked common dolphin. At least 25 species of cetaceans are known to occur in Coastal East Africa and Madagascar, including 6 baleen whales, 10 toothed whales and 9 dolphins.



Priority sites table

Species	Scientific name	IUCN Status	Population trend	CITES	Description
Bowhead (Barents Sea)	*Balaena mysticetus*	CR	Increasing	Appendix 1	This predominantly Arctic species has suffered from severe over-exploitation that has seen its range shrink considerably since the 17th century.
Beluga	*Delphin-apterus leucas*	NT	Decreasing	Appendix 11	As of 2008, the beluga is listed as "near threatened" by the IUCN, due to uncertainty about the number of belugas over parts of its range (especially the Russian Arctic), and the expectation that if current conservation efforts cease, especially hunting management, the beluga population is likely to qualify for "threatened" status within five years.
Narwhal	*Monodon monoceros*	NT	Decreasing	Appendix 11	Narwhals are famous for the long ivory tusk that spirals forward clockwise from their head. They are considered one of the Arctic marine mammals most vulnerable to climate change.
Sperm whale (Mediterranean)	*Physeter macrocephalus*	EN	Decreasing	Appendix 11	The sperm whale is the largest of the toothed whales. The Mediterranean subpopulation is genetically distinct and contains fewer than 2,500 mature individuals.
Short-beaked common dolphin (Mediterranean)	*Delphinus delphis*	EN	Decreasing	Appendix 11	The data available on this subpopulation is insufficient, but enough to infer a reduction in population size of more than 50% over a three-generation period. Habitat degradation due to human impact and climate change are presumed contributors to the decline of this population.
Atlantic humpbacked dolphin	*Sousa teuszii*	VU	Decreasing	Appendix 1	The Atlantic humpback dolphin is endemic to West Africa, where threats include bycatch and direct takes for food by local people (Van Waerebeek et al. 2004).
Indo-Pacific finless porpoise	*Neophocaena phocaenoides*	VU	Decreasing	Appendix 1	Finless porpoises are small and lack a dorsal fin. Partly because of their small size porpoises are exceptionally vulnerable to bycatch in gillnets.
Indo-Pacific humpback dolphin (Chinese white dolphin)	*Sousa chinensis*	NT	Decreasing	Appendix I	Some Indo-Pacific humpback dolphins, particularly in the northwest Indian Ocean, have been hunted for human consumption and oil. Bycatch and entanglement pose a threat throughout their range. Mangrove degradation due to coastal development may also pose a threat as mangroves are an important part of their habitat.
Australian snubfin dolphin	*Orcaella heinsohni*	NT	Unknown	Appendix I	This recently discovered subspecies is found off the Australian coast, which poses fewer threats than other areas. This means conservation efforts can have an especially positive impact.

Continued

Priority sites table *continued*

Scientific name	Scientific name	IUCN Status	Population trend	CITES	Description
Hector 's dolphin (Maui's)	*Cephalor-hynchus hectori ssp. Maui*	CR	Decreasing	Appendix II	The critically endangered Maui's dolphin is a subspecies of Hector's dolphin. These endemic dolphins are only found in waters off the west coast of the North Island of New Zealand. With numbers estimated at just 55 adults, they are at serious risk of extinction. The Maui's dolphin is the smallest and rarest of any of the world's marine dolphin species. Research has clearly identified that the most serious threat to these dolphins is entanglement in gillnets and trawl fisheries.
Fin whale	*Balaenoptera physalus*	EN	Decreasing	Appendix I	Their speed and their preference for the vastness of the open sea gave them almost complete protection from the early whalers. With modern whaling methods, however, fin whales were easy victims until the IWC placed them under full protection in 1966. But fin whales continue to endure some commercial catches by island and small "aboriginal subsistence" catches off Greenland. Fin whales are also commonly reported in ship strikes and are occasionally caught in fishing gear as bycatch.
Southern right whale (Chile-Peru)	*Eubalaena australis*	CR	Unknown	Appendix I	Very little is known about this subpopulation except that it was once numerous off Chile. Although no current estimate of abundance exists for right whales in the waters off Chile and Peru, the paucity of sightings over the past 50 years makes it very probable that the mature population size is below 50 individuals.
Blue whale	*Balaenoptera musculus*	EN	Decreasing	Appendix I	The biggest animal in the world has been protected from whaling by the IWC for almost 50 years, but now faces the threat of climate change. The melting of glaciers allows a large amount of fresh water to flow into the oceans, which could cause a disruption to blue whales' migratory patterns, which are highly dependent on ocean temperature.
Chilean dolphin	*Cephalor-hynchus eutropia*	NT	Decreasing	Appendix I	Chilean dolphins are caught as bait for long-line swordfishing and crab fisheries. They have also been caught for human consumption. Hunting Chilean dolphins is now illegal; however, fishers continue to use this species for bait as their remote locations make it difficult to enforce the law. Chilean dolphins are also at risk of becoming bycatch, particularly in the northern range of their habitat where gillnet fisheries are present.

Threats for species in priority sites

Species	Arctic	Mediterranean & Black Sea	WAMER, CEA & Madagascar	Coral Triangle & South West Pacific	Southern Chile & Southern Ocean
Bowhead (Barents Sea)	Climate change, noise, habitat degradation				
Beluga	direct takes, climate change, noise & habitat degradation				
Narwhal	direct takes, climate change, noise & habitat degradation				
Sperm whale (Mediterranean)		Bycatch, ship strikes, habitat degradation			
Short-beaked common dolphin (Mediterranean)		Bycatch, habitat degradation			
Atlantic humpbacked dolphin			Bycatch, direct takes		
Indo-Pacific finless porpoise				Bycatch, habitat degradation, direct takes	
Indo-Pacific humpback dolphin (Chinese white dolphin)			Bycatch, direct takes	Noise, habitat degradation, ship strikes	
Australian snubfin dolphin				Bycatch, noise, habitat degradation	
Hector's dolphin (Maui's)					Bycatch
Fin whale					Bycatch, ship strikes, direct takes, habitat degradation
Southern right whale (Chile-Peru)					Bycatch, ship strikes, noise, unregulated WW, climate change, habitat degradation
Blue whale					Bycatch, ship strikes, noise, unregulated WW, climate change, habitat degradation
Chilean dolphin					Bycatch, direct takes, noise, habitat degradation

5.4. FRESHWATER PRIORITY SITES

The freshwater section has built upon the WWF River Dolphin Initiative Strategy and Action Plan, which previously set the foundation for a strategic framework for freshwater cetacean conservation. In addition, information has been gleaned from the 2010 WWF report River Dolphins & People: Shared Rivers, Shared Future.

Compared to their marine relatives, all populations of freshwater dolphins and porpoises are considered threatened (i.e. listed by the IUCN Red List as vulnerable, endangered or critically endangered), with population trends decreasing; exceptions are the species inhabiting the Amazon and Orinoco river basins (boto, tucuxi, Bolivian Amazon river dolphin), which are still considered by IUCN as data deficient and for which population trends are unknown. WWF works on all river dolphin and porpoise species; however, this SAP prioritizes those populations or subpopulations that are most threatened, such as the endangered finless porpoise in the lower and mid Yangtze and the critically endangered subpopulations of Irrawaddy dolphin in the Mekong and Mahakam river basin, where WWF has the greatest capacity and ability to make a difference. Nevertheless, it should be noted that there are other critically endangered populations of both freshwater and marine cetaceans where WWF currently does not have adequate capacity to engage.

Irrawaddy dolphins (*Orcaella brevirostris*) at Koh Kon Sat, Mekong River, Cambodia. A 2007 survey estimated a population abundance of only 71 individuals left in this section of the river

Freshwater priorities table

Species	Scientific name	IUCN Status	Population trend	CITES	Description	River	Threats
Yangtze finless porpoise	*N. a. Asiaeorientalis*	EN	Decreasing	Appendix I	There is evidence of a rapid decline in recent decades in the Yangtze River and adjoining lake systems of China (Zhao et al. 2008, Wang 2009); the subspecies is currently being reassessed to determine whether it should be uplisted to Critically Endangered.	Yangtze	Bycatch, ship strikes, habitat degradation
Boto	*Inia geoffrensis*	DD	Decreasing	Appendix I	Large numbers of dolphins have been killed and their skins used for leather; their fat for cooking. In addition, several hundred have been captured live for display in aquariums. But the biggest threat today are direct takes to use as bait for the "piracatinga" or "mota" fisheries, followed by the construction of numerous dams that would disrupt water flow, prey migration, and divide dolphin groups, limiting their genetic pool.	Amazon, Bolivia & Orinoco	Bycatch, bushmeat, ship strikes, unregulated whale watching, noise, habitat degradation
Irrawaddy (Mekong & Mahakam sub-populations)	*Orcaella brevirostris*	CR	Decreasing	Appendix I	Irrawaddy dolphins are more susceptible to human conflict than most other dolphins who live further out in the ocean. Drowning in gillnets is the main threat to them throughout their range.The majority of reported dolphin deaths in all subpopulations is due to bycatch.Though most fishers are sympathetic to the dolphins' plight, it is difficult for them to abandon their traditional livelihood.	Mekong & Mahakam	Bycatch, unregulated whale watching, habitat degradation
Tucuxi	*Sotalia fluviatilis*	DD	Decreasing	Appendix I	The Tucuxi can be considered the world's only exclusively freshwater delphinid. This endemism jeopardizes its persistence because its restricted habitat is shared with increasing human populations. Tucuxis are vulnerable to threats such as bycatch, habitat deterioration and fragmentation of populations by dam construction (Reeves at al. 2003). Pollution, in particular mercury poisoning of water due to gold mining, is a particular concern for this species.	Amazon	Bycatch, noise, habitat degradation
Ganges river dolphin	*Platanista gangetica ssp. Gangetica*	EN	Decreasing	Appendix I	The construction of at least 50 dams has dramatically affected this dolphin's habitat. Reason why this subspecies is a metapopulation, with numerous isolated subpoplations that are further threatened by toxic contaminants due to industrial pollution, direct takes by tribal people and fishers for oil and bate, as well as bycatch.	Ganges	Bycatch, bushmeat & habitat degradation
Indus river dolphin	*Platanista minor*	EN	Decreasing	Appendix I	The Indus river dolphin has been very adversely affected by human use of the river systems. Entanglement in fishing nets can cause significant damage to local population numbers. Some individuals are still taken each year and their oil and meat used as a liniment, as an aphrodisiac and as bait for catfish. Irrigation has lowered water levels throughout their ranges.	Indus	Bycatch, bushmeat, habitat degradation

6. DEVELOPING THE OBJECTIVES OF THE SAP

Conceptual models were developed for marine cetaceans (Annex I) and freshwater cetaceans (Annex II). These identified the direct threats and contributing factors to the survival of each species group, using information from WWF's field programmes, the scientific literature and IUCN Red List, and following the WWF Standards of Project and Programme Design.

Climate change was not considered as a discrete threat in the conceptual models, as it is a contributing factor, or exacerbating factor, to many if not all other threats. Because of this, and because of the significant changes in marine and freshwater ecosystems that the predicted impacts of climate change are likely to induce, we must consider climate change in conservation planning. This SAP therefore includes specific strategies on climate change in both the Southern Ocean and Arctic objectives, as these are the areas where the impacts of climate change are likely to be most severe, although we also need to be vigilant elsewhere. A specific strategy has also been added in both the Amazon and Yangtze river basins, where highly precautionary and adaptive conservation and management actions are needed to mitigate the threats posed by climate change to freshwater dolphins and porpoises and to increase their resilience. Based on lessons learnt, similar strategies should be developed in other marine priority places and river basins in the near future.

6.1. RANKING THREATS

Direct threats were ranked for their importance against each of ten WWF priority places for marine cetaceans and against eight river basins for freshwater species. This threat prioritization was conducted using information from WWF's field programmes, the IUCN Red List and the scientific literature. Threats were prioritized according to their scope, severity and urgency, and given an overall score, which ranked each threat as 'high', 'medium' or 'low' priority.

It is often hard to estimate with any precision the scope, severity and urgency of some threats such as bycatch and direct takes, especially in developing countries where data are often lacking. For other threats, including chemical and acoustic pollution or degradation of habitat, evaluating the effects on individual species is logistically difficult, especially in the long term. While a threat-based approach works well for individual threats considered in isolation, it is fairly inadequate for situations in which several threats operate cumulatively or synergistically. The results of the threat prioritization exercise can therefore be misleading when complex interactions are involved. However, with limited resources available, the process of ranking threats does provide a basic framework for prioritizing conservation activities.

WWF PRIORITY PLACES

1 African Rift Lakes Region
2 Altai-Sayan Montane Forests
3 Amazon Guianas
4 Amur-Heilong
5 Arctic Seas & Associated Boreal/Tundra
6 Atlantic Forests
7 Borneo
8 Cerrado-Pantanal
9 Chihuahuan Deserts & Freshwater
10 Choco-Darien
11 Coastal East Africa
12 Congo Basin
13 Coral Triangle
14 Eastern Himalayas
15 Fynbos
16 Galapagos
17 Greater Black Sea basin
18 Lake Baikal
19 Madagascar
20 Mediterranean
21 Mekong Complex
22 Miombo Woodlands
23 Nammib-Karoo-Kaokoveld
24 New Guinea & Offshore Islands
25 Northern Great Plains
26 Orinoco River & Flooded Forests
27 Southern Rivers & Streams
28 Southern Chile
29 Miombo Woodlands
30 Southwest Australia
31 Southwest Pacific
32 Sumatra
33 Wast African Marine
34 Western Ghats
35 Yangtze Basin

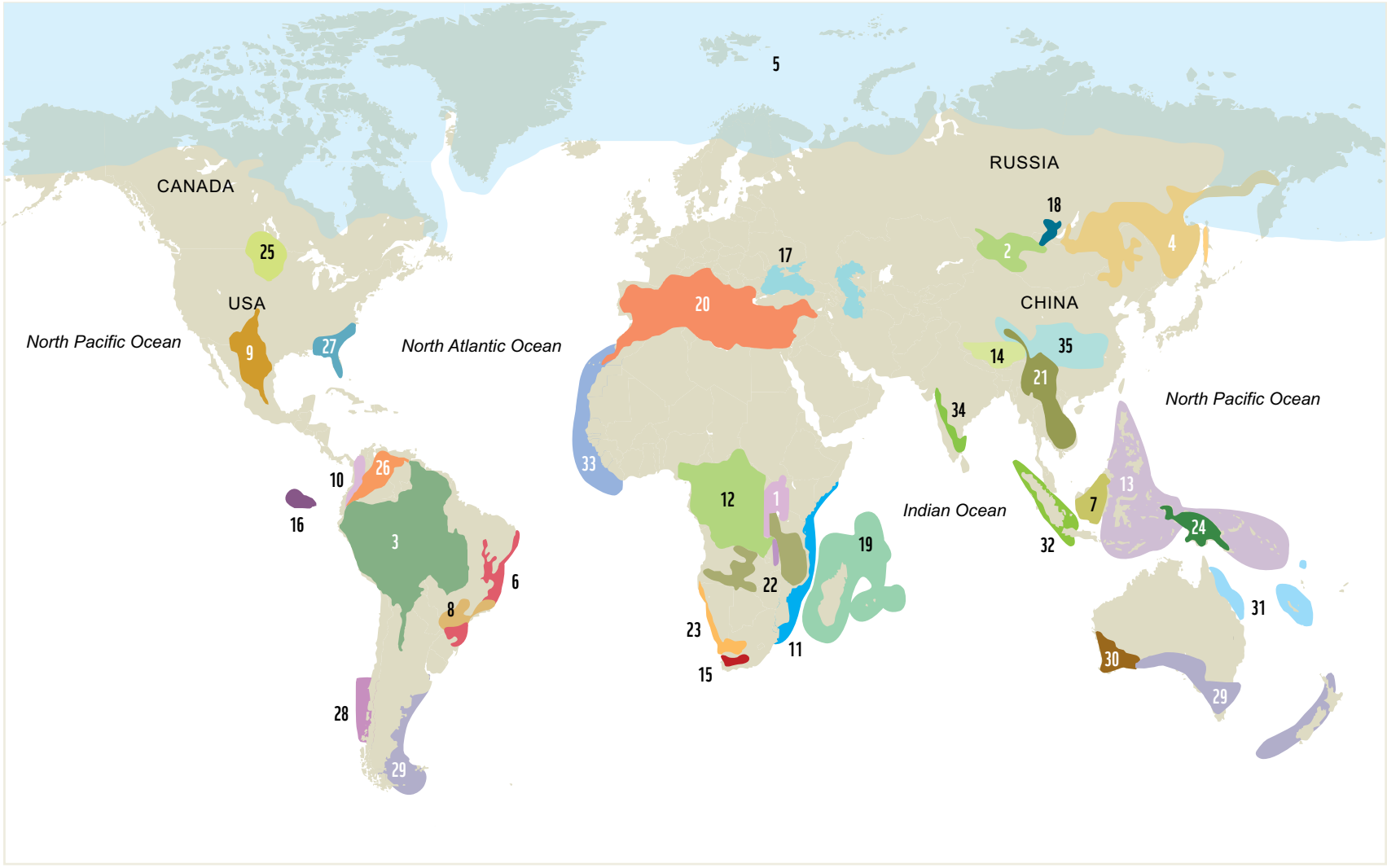


Fig.1. Map showing WWF priority places. Marine global priority places are nos. 5, 11, 13, 20, 28, 29, 31, 33. Regional marine priority places, i.e. Gulf of California, Baltic Sea, Yellow Sea and Mesoamerican Reef, are not shown on this map. WWF global freshwater priority places include the Amazon River Basin (n°3), Orinoco River (n°26), Mekong Complex (n°21) and Yangtze Basin (n°35), whereas Indus Delta is a regional priority place (not shown on this map).

7. VISION, GOAL, OBJECTIVES AND INDICATORS FOR MARINE CETACEANS

VISION – By 2050, viable populations of all marine cetacean species exist in the wild, fulfilling their ecological role and benefitting the livelihoods of coastal communities.

GOAL – By 2020, highly threatened marine cetacean populations are protected, managed and restored.

OBJECTIVE 1

By 2020, bycatch and entanglement of at least 10 highly threatened cetacean populations is eliminated or reduced through improved and effectively implemented protection policies.

Target priority species	Arabian humpback whale, Baltic harbour porpoise, Franciscana, North Atlantic right whale, vaquita
Target priority sites	Coastal East Africa & Madagascar, Coral Triangle, Mediterranean & Black Sea, Southern Chile, Southern Ocean, South West Pacific, West Africa Marine Ecoregion

- *Indicator 1.1:* Number of reported bycaught or entangled individuals of priority or highlighted species
- *Indicator 1.2:* Percentage of observer coverage in key cetacean habitats where there is a demonstrated incidence of bycatch of target species
- *Indicator 1.3:* Number of key cetacean habitats where bycatch reducing policies are implemented and enforced (e.g. no-take zones, banning problematic fishing gear and implementation of alternative "cetacean-friendly" gear)

OBJECTIVE 2

By 2020, the IWC has a strong outcome-oriented cetacean conservation agenda and all types of commercial whaling are under IWC control, while direct takes of small cetaceans adhere to a precautionary and conservation-based enforced management system in at least five key cetacean habitats.

Target priority sites	Arctic Seas, Coastal East Africa & Madagascar, Coral Triangle, Western Africa Marine Ecoregion

- *Indicator 2.1:* Number of whales killed outside the IWC's control (e.g. scientific and under objection whaling)
- *Indicator 2.2:* Number of direct takes of small cetaceans under conservation-based enforced management systems
- *Indicator 2.3:* Number of IWC recommendations transformed into regulations or conservation measures implemented at a national and regional level

OBJECTIVE 3

By 2020, incidence of ship strikes is eliminated or reduced in at least five key cetacean habitats through the adoption of ship-strike mitigation measures by the shipping industry, enforced through national and international regulation.

Target priority species	Arabian humpback whale, Franciscana, North Atlantic right whale, vaquita, Western gray whale
Target priority sites	Mediterranean & Black Sea, Southern Chile

- *Indicator 3.1:* Number of shipping companies adopting ship-strike mitigation measures (e.g. lane changes or speed reduction in key cetacean habitats)
- *Indicator 3.2:* Number of countries implementing regulation to reduce ship strikes
- *Indicator 3.3:* Number of regulations implemented by International Maritime Organization (IMO) to reduce ship strikes

OBJECTIVE 4

By 2020, the impact of acoustic and chemical pollution is eliminated or reduced in at least five key cetacean habitats through the extractive industry's adoption of best management practices (BMPs), enforced through national and international regulation.

Target priority species	Western gray whale
Target priority sites	Arctic Seas, Coral Triangle, Mediterranean & Black Sea, Southern Chile, South West Pacific

- *Indicator 4.1:* Number of industries (e.g. oil and gas) effectively implementing acoustic and chemical BMPs
- *Indicator 4.2:* Number of countries requiring the adoption of chemical and acoustic BMPs
- Indicator 4.3: Number of key cetacean habitats protected from further oil and gas development

OBJECTIVE 5

By 2020, at least five key cetacean habitats are identified and protected from destruction/degradation (e.g. marine debris) through marine protected areas or effectively implemented conservation management systems.

Target priority species	Arabian humpback whale, Western gray whale
Target priority sites	Arctic Seas, Coral Triangle, Mediterranean & Black Sea, Southern Chile, Southern Ocean, South West Pacific

- *Indicator 5.1:* Number of key cetacean habitats identified
- *Indicator 5.2:* Number of marine protected areas created for cetaceans
- *Indicator 5.3:* Amount of management systems being developed and enforced
- *Indicator 5.4:* Results from monitoring to determine the effectiveness of protected areas and management systems

OBJECTIVE 6

By 2020, climate change vulnerability assessments and resulting mitigation strategies that preserve key feeding, breeding, and migration areas are developed and implemented through national and international regulations, at least in the polar priority sites.

Target priority sites	Arctic Seas, Southern Ocean

- *Indicator 6.1*: Number of vulnerability assessments conducted in key cetacean habitats
- *Indicator 6.2*: Extent of climate change mitigation strategies developed and applied in international and national legislations
- *Indicator 6.3*: Number of cetacean populations or key habitats benefiting from the effective implementation of climate change adaptation measures

OBJECTIVE 7

By 2020, whale-watching activities in at least five key cetacean habitats implement regulations under international guidelines (e.g. IWC whale-watching guidelines).

Target priority species	Arabian humpback whale
Target priority sites	Coastal East Africa, Mediterranean & Black Sea, Southern Chile, South West Pacific, West Africa Marine Ecoregion

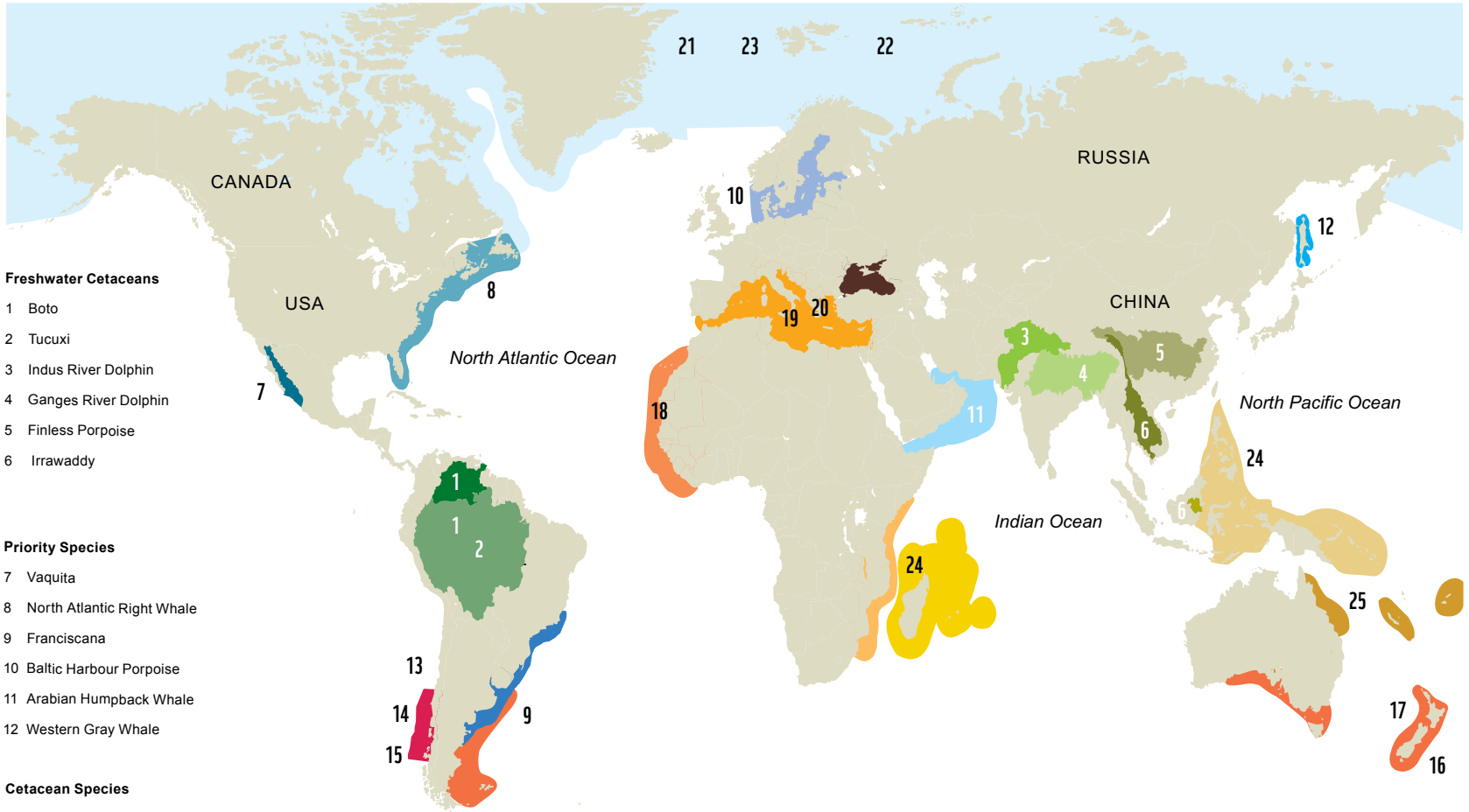
- *Indicator 7.1:* Number of key cetacean habitats where whale-watching regulations are developed and implemented under international guidelines
- *Indicator 7.2:* Number of whale-watching operators trained to implement whale-watching best practices
- *Indicator 7.3:* Results from monitoring to determine the compliance with whale-watching guidelines and regulations

OBJECTIVE 8

By 2020, the scientific understanding of cetacean population health, trends, threats and the impact of conservation measures is improved for all targeted species and sites.

- *Indicator 8.1:* Number of studies revealing population health and trends of targeted species and sites or data deficient species under IUCN's Red List
- *Indicator 8.2:* Number of studies on threats, such as the impact of climate change, oil and gas development, whale-watching tourism etc., in key cetacean habitats
- *Indicator 8.3:* Number of studies on the impact of conservation measures, such as bycatch reduction efforts, the IWC conservation outcomes, management systems, ship strike regulations, industry BMPs, MPAs and climate change mitigation strategies

PRIORITY SPECIES AND SITES



River Basins

- Orinoco
- Amazon
- Indus
- Ganges-Brahmaputra
- Mekong
- Yangtze
- Mahakam

Marine Sites

- Gulf of California
- North West Atlantic
- South West Atlantic
- Baltic Sea
- North Arabian Sea
- Sakhalin Island

Priority Sites

- Southern Chile
- Southern Ocean
- West Africa Marine
- Mediterranean
- Black Sea
- Arctic Seas & Associated Boreal/Tundra
- Coastal East Africa
- Madagascar
- Coral Triangle
- Southwest Pacific

Freshwater Cetaceans

1 Boto
2 Tucuxi
3 Indus River Dolphin
4 Ganges River Dolphin
5 Finless Porpoise
6 Irrawaddy

Priority Species

7 Vaquita
8 North Atlantic Right Whale
9 Franciscana
10 Baltic Harbour Porpoise
11 Arabian Humpback Whale
12 Western Gray Whale

Cetacean Species

13 Southern Right Whale
14 Blue Whale
15 Chilean Dolphin
16 Hector's Dolphin
17 Maui's Dolphin
18 Atlantic Humpbacked Dolphin
19 Sperm Whale
20 Short-beaked Dolphin
21 Beluga
22 Bowhead
23 Narwhal
24 Indo-Pacific Humpback Dolphin
25 Australian Snubfin Dolphin

Fig 2. Map showing WWF priority species and sites. The priority sites are where WWF works although in many cases, these areas do not cover the full range of the priority species.

8. VISION, GOAL, OBJECTIVES AND INDICATORS FOR FRESHWATER CETACEANS

VISION – By 2050, freshwater cetaceans and humans live in harmony and mutually benefit from fully functioning and healthy freshwater systems.

GOAL – By 2020, highly threatened freshwater dolphin and porpoise populations are protected, managed and restored.

OBJECTIVE 1

By 2020, bycatch and direct takes of freshwater cetaceans is eliminated or reduced through effective legislation, alternative fisheries and the creation of alternative livelihoods.

- *Indicator 1.1:* Number of known freshwater cetacean deaths caused by bycatch or direct takes
- *Indicator 1.2:* Number of fishers that change to sustainable fishing or alternative livelihoods
- *Indicator 1.3:* Number of monitored protected critical freshwater cetacean habitats

OBJECTIVE 2

By 2020, habitat destruction/degradation is prevented by the implementation of effective regulations that protect priority sites and secure environmental flows for freshwater cetaceans from threats (e.g. dams).

- *Indicator 2.1:* Number of sites protected by government regulations that ensure planning and construction of river infrastructure minimize impact on freshwater cetaceans and their food base
- *Indicator 2.2:* Proportion of sites in which dams and other infrastructure implement BMPs that minimize impacts on the natural flow regime and ecosystem connectivity
- *Indicator 2.3:* Number of protected areas, high-quality habitats and/or management plans that secure the protection of critical habitats and freshwater cetacean health
- *Indicator 2.4:* Number of sites with guidelines regulating boat traffic and speed of vessels in freshwater cetacean habitats

OBJECTIVE 3

By 2020, chemical and acoustic pollution is eliminated or reduced through the extractive industry's adoption of best management practices, enforced through national regulation.

- *Indicator 3.1*: Number of sites with guidelines to mitigate chemical and acoustic pollution in freshwater cetacean habitats
- *Indicator 3.2*: Number of assessments of the impact of existing and planned sources of pollution and mining projects
- *Indicator 3.3*: Proportion of mining industries and farming communities adopting BMPs in and around priority sites
- *Indicator 3.4*: Pollutant levels (chemical and acoustic) in freshwater cetacean priority sites

"River dolphins evoke wonder in many of us, but also tell us about the lifeblood of our environment — rivers. Conserving river dolphins means keeping water-ways healthy for biodiversity and people,"

Gerard E. Ryan, WWF Cambodia

OBJECTIVE 4

By 2020, dolphin watching in priority sites is carried out under international guidelines that both benefit local communities and protect dolphins from adverse impacts.

- *Indicator 4.1:* Freshwater dolphin-watching guidelines are developed by national and international regulators (e.g. the IWC)
- *Indicator 4.2:* Proportion of freshwater dolphin-watching sites assessed that respect the carrying capacity of tourism activity
- *Indicator 4.3:* Proportion of sites where dolphin-watching guidelines are legally binding and effectively implemented

OBJECTIVE 5

By 2020, climate change mitigation strategies for freshwater cetaceans are developed and implemented in priority sites.

- *Indicator 5.1:* Number of vulnerability studies of the effects of climate change on freshwater ecosystems affecting cetaceans and local communities
- *Indicator 5.2:* Number of mitigation strategies for freshwater dolphins included in national and international regulation
- *Indicator 5.3:* Number of priority sites implementing mitigation measures

OBJECTIVE 6

By 2020, scientific understanding of freshwater cetacean population trends, health, threats, and impact of conservation measures is improved.

- *Indicator 6.1:* Number of studies revealing freshwater cetacean population abundance, range and trends
- *Indicator 6.2:* Number of studies on threats, such as the impact of bycatch, direct takes, acoustic and chemical pollution, river infrastructure, dolphin watching, and climate change
- *Indicator 6.3:* Number of studies on the impact of conservation measures, such as bycatch reduction, management systems, industry BMPs, dolphin-watching regulations, and climate change mitigation strategies

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Useful websites:

Australian Government Biodiversity Species Profile and Threats Database: www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

Cetacean Bycatch Resource Centre: www.cetaceanbycatch.org

Cetacean Habitat Resource site: www.cetaceanhabitat.org

Convention on International Trade in Endangered Species of Wild Fauna and Flora: www.cites.org

Convention on Migratory Species (CMS) Small Cetacean Species Guide: www.cms.int/reports/small_cetaceans/contents_english.htm

International Union for Conservation of Nature (IUCN) Red List: www.iucnredlist.org

International Whaling Commission – Whale Watching: www.iwcoffice.org/whalewatching

Forage fish: the most important fish in the sea: www.conservefish.org

Society for Marine Mammalogy: www.marinemammalscience.org

Sea Around Us Project, Fisheries, Ecosystem and Biodiversity: www.seaaroundus.org

UN Atlas of the Oceans: www.oceansatlas.org

WDCS Cetacean Species Guide: www.wdcs.org/species

ENDNOTES

[i] Cetacean taxonomy is an ever-changing and complex issue. Here we take as a reference the Ad-Hoc Committee on Taxonomy of the Society of Marine Mammalogy, which has produced the first official list of marine mammal species and subspecies. However, consensus has still not been reached on some issues www.marinemammalscience.org

[ii] Culik, B.M. 2011. *Odontocetes – The Toothed Whales*. UNEP/CMS/ASCOBANS Secretariat, Bonn, Germany

[iii] www.iucn-csg.org/index.php/baiji

[iv] Borobia *et al.*, 1991

[v] This section has been adapted from Estes, J.A. 2009. Ecological Effects of Marine Mammals. In: Perrin, W.F., Würsig, B. and J.G.M. Thewissen (eds.). *Encyclopedia of Marine Mammals*, 2nd Ed. Academic Press, Amsterdam, pp.357-361

[vi] Ibid

[vii] CIESM. 2004. Investigating the roles of cetaceans in marine ecosystems. CIESM Workshop Monograph no. 25, pp. 144, Monaco

[viii] Smith, C.R. and Baco, A.R. 2003: Ecology of whale falls at the deep-sea floor. In: Gibson, R.N. and Atkinson, R.J.A. (eds). *Oceanography and Marine Biology: an Annual Review* 41: 311-354

[ix] This section has been adapted from Jensen et al. 2009. Inuit and Marine Mammals (pp. 628-637) and Forestell, P.H. 2009. Popular Culture and Literature (pp. 898-912). In: Perrin, W.F., Würsig, B. and J.G.M. Thewissen (eds.). *Encyclopedia of Marine Mammals*, 2nd Ed. Academic Press, Amsterdam

[x] O'Connor, S., Campbell, R., Cortez, H. and T. Knowles. 2009. Whale Watching Worldwide: Tourism numbers, expenditures and expanding economic benefits. A special report from the International Fund for Animal Welfare, Yarmouth MA, USA, prepared by Economists at Large

[xi] This section has been adapted from Northridge, S. 2009. Bycatch. In: Perrin, W.F., Würsig, B. and J.G.M. Thewissen (eds.). *Encyclopedia of Marine Mammals*, 2nd Ed. Academic Press, Amsterdam, pp. 167-169

[xii] www.cetaceanbycatch.org

[xiii] Reeves et al. 2003. *Dolphins, Whales and Porpoises: 2002-2010 Conservation Action Plan for the World's Cetaceans*. IUCN/SSC Cetacean Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK; Lewison et al. 2004. Understanding the impacts of fisheries bycatch on marine megafauna. Trend. Ecol. Evol. 19: 598-604

[xiv] This section has been adapted from Clapham, P.J. and Baker, C.S. 2009. Modern Whaling. In: Perrin, W.F., Würsig, B. and J.G.M. Thewissen (eds.). *Encyclopedia of Marine Mammals*, 2nd Ed. Academic Press, Amsterdam, pp. 1239-1243

[xv] In recent years, new data released upon the break-up of the former Soviet Union revealed widespread illegal catches after World War II, showing that the extent of the overexploitation was even greater than originally thought (Ivashchenko et al. 2008)

[xvi] Branch, T. 2007. Abundance of Antarctic blue whales south of 60°S from three complete circumpolar sets of surveys. *J. Cetacean Res. Manage* 9(3): 253–262

[xvii] This report is available online at: www.worldwildlife.org/who/media/press/2009/WWFBinaryitem12794.pdf

[xviii] Robards, M.D. and Reeves, R.R. 2011. The global extent and character of marine mammal consumption by humans: 1970–2009. *Biological Conservation* 144 (12): 2770-2786, ISSN 0006-3207, 10.1016/j.biocon.2011.07.034

[xix] Reeves *et al.* 2003

[xx] Silveira, R. and Viana, J.P. 2003. Amazonian crocodilians: a keystone species for ecology and management... or simple bait? IUCN Crocodile Specialist Group Newsletter 22 (1): 15-19; Trujillo *et al.* 2010. The Action Plan for South American River Dolphins 2010-2020. WWF, Fundación Omacha, WDS, WDCS, Solamac, Bogotá, D.C., Colombia

[xxi] Trujillo *et al.* 2010

[xxii] This section has been adapted from Van Waerebeek *et al.* 2007. Vessel collisions with small cetaceans worldwide and with large whales in the Southern Hemisphere, an initial assessment. LAJAM 6(1): 43-69

[xxiii] More information on the IWC ship strikes database: iwcoffice.org/ship-strikes

[xxiv] This section has been adapted from Reijnders *et al.* Pollution and Marine Mammals. In: Perrin, W.F., Würsig, B. and J.G.M. Thewissen (eds.). *Encyclopedia of Marine Mammals*, 2nd Ed. Academic Press, Amsterdam, pp. 890-898

[xxv] The term "die-off event" refers to an unusually large number of animals which become stranded one at a time (although often many per day), often dead or dying, over a fairly defined geographic area and over a period of days, weeks, or even months in severe cases (Brown *et al.* 1998)

[xxvi] Kannan *et al.* 1997. Sources and accumulation of butyltin compounds in Ganges River Dolphin, *Platanista gangetica*. Applied Organometallic Chemistry 11: 223-230

[xxvii] Frantzis was one of the first to show the correlation between cetacean mass strandings and acoustic testing of Low Frequency Active Sonar (LFAS) by NATO that caused die-off of beaked whales in Greece in 1998 (Frantzis, A. 1998. Does acoustic testing strand whales? *Nature* 392: 29)

[xxviii] Simmonds, M.P. In press. Cetaceans and marine debris. *Journal of Marine Biology*

[xxix] Smith, B.D. and Reeves, R.R. 1997. Report on the Workshop on the Effects of Water Development and the River Cetaceans, 26-28 February 1997, Rajendrapur, Bangladesh. In: Reeves, R.R., Smith, B.D. and T. Kasuya (eds). Biology and Conservation of Freshwater Cetaceans in Asia. IUCN Species Survival Commission Occ. Pap., pp. 15-22

[xxx] Reeves *et al.* 2003

[xxxi] Reeves *et al.* 2003

[xxxii] Jefferson, T.A. and Hung, S.K. 2004. A Review of the Status of the Indo-Pacific Humpback Dolphin (*Sousa chinensis*) in Chinese waters. *Aquatic Mammals* 30(1): 149-158; Baldwin et al. 2004. The Indo-Pacific Humpback Dolphin of the Arabian Region: A Status Review. Aquatic Mammals 30(1): 111-124

[xxxiii] This section has been adapted from *Simmonds*, M. and Elliott, W. 2009. Climate change and cetaceans: concerns and recent developments. *J. Mar. Biol.* Assoc. UK. 89(1): 203-210

[xxxiv] IPCC. 2007b. Summary for Policymakers. In: Parry, M.L., Canziani, O.F., Palutikof, J.P., van der Linden, P.J. and C.E. Hanson (eds.) *Climate Change 2007*: *Impacts, Adaption and Vulnerability*. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change Cambridge University Press, Cambridge, UK, pp. 7-22

[xxxv] Alter *et al.* 2010. Forecasting the consequences of climate-driven shifts in human behaviour on cetaceans. *Marine Policy* 34 (5): 943-954

[xxxvi] Acevedo-Whitehouse, K. and Duffus, A.L.J. 2009. Effects of environmental change on wildlife health *Phil. Trans. R. Soc.* 364: 3429-3438

[xxxvii] Sommerkorn, C. P. 2012. RaCeR: Rapid assessment of Circum-arctic ecosystem Resilience, 2nd ed. WWF Global Arctic Programme, Ottawa, Canada, pp. 72. Available online at: www.panda.org/arctic/racer

[xxxviii] Immerzeel *et al.* 2010. Climate change will affect the Asian water towers. Science 328: 1382-1384

[xxxix] WWF has produced a report outlining the predicted impacts of climate change on cetaceans (Elliott and Simmonds, 2007) and modelled the impacts of a 2°C global temperature increase on the whales of the Antarctic (Tynan and Russell, 2008). These two reports are available online at: panda.org/what_we_do/endangered_species/cetaceans/threats/climate_change

[xl] Hoffman, J.R., Fonseca, A. and C. Drews (eds). 2009. Cetaceans and Other Marine Biodiversity of the Eastern Tropical Pacific: Options for Adapting to Climate Change

[xli] Christiansen, F., Lusseau, D., Stensland, E. and P. Berggren. 2010. Effects of tourist boats on the behaviour of Indo-Pacific bottlenose dolphins off the south coast of Zanzibar. *Endangered Species Research* 11(1): 91–99

[xlii] iwcoffice.org/wwguidelines

[xliii] Available on the WWF intranet (externally available upon request) at: https://intranet.panda.org/documents/documents.cfm?uFolderId=1715&uDocId=107984

[xliv] May-Collado, L.J., Agnarsson, I. 2011. Phylogenetic Analysis of Conservation Priorities for Aquatic Mammals and Their Terrestrial Relatives, with a Comparison of Methods. PLoS ONE 6(7): e22562.

[xlv] Available on the WWF intranet (externally available upon request) at: https://intranet.panda.org/documents/documents.cfm?uFolderId=80702&uDocId=123420

[xlvi] Hamner *et al.* 2012. Estimating the abundance and effective population size of Maui's dolphins using microsatellite genotypes in 2010–11, with retrospective matching to 2001–07. Department of Conservation, Auckland, NZ

[xlvii] de Lestang, 1993; La Hausse de la Louviere, 1991

[xlviii] Available on the WWF intranet (externally available upon request) at: https://intranet.panda.org/documents/documents.cfm?uFolderId=58500&uDocId=100195

[xlvix] www.worldwildlife.org/species/finder/cetaceans/WWFBinaryitem17960.pdf

[l] At a national level several countries categorize these species as endangered – Ecuador (Tirira, 2011) – and vulnerable: Venezuela (Rodriguez & Rojas-Suarez, 2008), Colombia (Trujillo et al., 2006) and Bolivia (Aliaga-Rossel, 2009)

[li] Available on the WWF intranet (externally available upon request) at: https://intranet.panda.org/documents/documents.cfm?uFolderID=60993&uDocID=66541

[lii] 'Resilience' here refers to the ability of a system/species/population to recover from a disturbance. Increasing the resilience of cetacean populations to the impacts of climate change could include anything which increases the ability of that cetacean population to cope with the climate-related changes in its environment. There are many things that can be done to increase the resilience of cetaceans to climate change, such as protecting adequate and appropriately located habitat taking into account climate change-driven shifts in range, or reducing non-climate based threats such as overharvest or pollution.

[liii] A detailed threat ranking analysis is available on the WWF intranet (externally available upon request) at: https://intranet.panda.org/documents/documents.cfm?uFolderId=118842&uDocId=172220

[liv] Hoffman, J.R., Fonseca, A., and C. Drews (Eds). 2009. Cetaceans and Other Marine Biodiversity of the Eastern Tropical Pacific: Options for Adapting to Climate Change. Report from a workshop held 9-11 February 2009

[lv] iwcoffice.org/whalewatching

[lvi] Per the IWC64 Report of the Sub-Committee on Whale watching (Annex M of the Scientific Report)

Cetaceans SAP in numbers

6

WWF is trying to save six freshwater cetacean species

21

WWF is focusing its efforts to protect twenty one endangered marine cetacean species and populations

10

WWF works in ten global marine priority sites

87

the total of identified cetacean species in the world

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