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A REVIEW TO SUPPORT THE DEVELOPMENT OF A SECOND CMS CETACEAN PROGRAMME OF WORK (2024-2035)

(Prepared by OceanCare upon request from the Secretariat)

Summary:

Decision 13.81 a) requested the Aquatic Mammals Working Group (AMWG) to undertake a review of the implementation of the Cetacean POW to date, prepare a gap analysis and identify priorities to be addressed, leading to a revision of the Cetacean POW. In order to facilitate this task, CMS partner organization OceanCare was contracted to prepare, in partnership with relevant COP-Appointed Councillors as well as some experts most directly involved with the development of the original Cetacean POW, the review found in this document.

This review forms the groundwork for the cetacean-related draft Resolution and draft Decisions found in Doc.27.5.1.

A Review to Support the Development of a Second CMS Cetacean Programme of Work (2024-2035)

Margi Prideaux, Nicola Hodgins, Giuseppe Notarbartolo di Sciara, and Mark Simmonds

2023

Dedicated to Dr. William Perrin
(CMS COP-Appointed Councillor for Aquatic Mammals, between 1991 and 2014) for his inspiration and tireless effort, over the span of more than two decades, to bring the work of CMS to the aid of Earth's aquatic species.
He is missed.

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The views expressed here are those of the authors and may not necessarily reflect those of any bodies that they are, or have been, associated with. The authors welcome further dialogue on any of the issues raised in this report.

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Margi Prideaux acknowledges the spiritual relationship of the Ngarrindjeri, Narungga, and Kaurna Nations to the island of Karta on which the core research and writing for this review was completed. The authors pay our respects to First Nations Elders and First Nations Leaders across the world—past, present, and future.

Preamble

The review authors stress that despite ongoing government-level resolve through many Resolutions stretching as far back as COP7 (2002), the commitment to conserve cetaceans is, to a large extent, still insufficiently applied. The problem is not just laws that need to be written and enforced; it is mostly a transformational change in human use of the environment that is required – change that conserves the wider planetary complex of ecosystems, without which strenuous isolated efforts to conserve marine mammals are futile. Efforts to conserve cetaceans should not stop at halting their decline from a single threat or issue, or to simply accept their status quo. Instead, there is urgent need to restore populations and habitats toward presumed pristine conditions, and toward the full recovery of the animals' former numbers and ranges. Conservation can only be considered successful when each species has a thriving, healthy ecologically connected habitat and is free from all anthropogenic harm.

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Glossary

CMS related acronyms, such as ACCOBAMS, ASCOBANS, the Western African Aquatic Mammals MOU, and the Pacific Cetaceans MOU are assumed to be known and not reflected in long form within the text.

App	Appendix
App I	Appendix I
App II	Appendix II
ASEAN	Association of Southeast Asian Nations
ASOEN	ASEAN State Officials for Environment
ASW	Aboriginal Subsistence Whaling
CC	Climate Change
CITES	Convention on International Trade in Endangered Species
CME	Coastal and Marine Environment
COP	Conference of the Parties
CSG	Cetacean Specialist Group
CTI	Coral Triangle Initiative
EEZ	Exclusive Economic Zone
FADs	fisheries aggregation devices
IMMAs	International Marine Mammal Areas
IUCN	International Union for the Conservation of Nature
IUU	illegal, unreported and unregulated
IWC	International Whaling Commission
IWC SC	International Whaling Commission Scientific Committee
MEAs	Multilateral Environmental Agreements
MPAs	marine protected areas
NCB	ASEAN Working Groups on National Conservation and Biodiversity
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PEMSEA	Partnerships in Environmental Management for the Seas of East Asia
RFMOs	Regional Fisheries Management Organizations
UNEP	United Nations Environment Programme
UNICPOLOS	United Nations Informal Consultation on Protection of the Oceans and the Law of the Sea
WCPA	World Commission on Protected Areas

A note about language

The language used in this document seeks to support, feed into, and inform the formal documentation of CMS, but is intended to be easy to read and reflects the views of the authors. It is not presented as 'COP language'. The language of the recommendations considered by CMS COP14 (in the COP document and Resolution) may differ, reflecting the wishes of the CMS Parties.

Executive Summary

Despite decades of international negotiation and discussion, fishing, vessel traffic, hunting, ocean acidification, marine pollution, the breakdown of ecological networks, military exercises and, most sadly, even active combats still take place within key cetacean habitats. Environmental changes, including climate disruption, are altering ecosystems and availability of prey. Some cetaceans have responded to these changes by shifting their feeding, breeding, and migratory behaviours and ranges, sometimes at a cost to their energy budgets. In some regions, environmental changes have left cetaceans susceptible to infectious diseases.

Of a total 130 extant species, the status of almost one third of marine mammals (38 species) is assessed in a threatened category ('Critically Endangered', 'Endangered' or 'Vulnerable') in International Union for the Conservation of Nature's (IUCN) Red List of Threatened Species. With 10 percent of the total still listed as 'Data Deficient' the number of threatened species might be much higher. Cetaceans appear prominently within this list.

The most acute examples include species especially affected by human presence because they inhabit riverine, estuarine, or coastal ecosystems. Cetaceans endemic to large rivers are subjected to extreme levels of human encroachment with dire effects on their conservation status, and are likely to be among the first cetacean species that will disappear from Earth, following the fate of the Yangtze River dolphin (*Lipotes vexillifer*, not listed), which is believed to be extinct. The Yangtze River porpoise (*Neophocaena asiaeorientalis*, App II) is also reaching critically endangered status, as are subpopulations of the Irrawaddy dolphin (*Orcaella brevirostris*, App I and II), Ganges River dolphin (*Platanista gangetica*, App I and II), Indus River dolphin (*Platanista minor*)[1], Amazon River dolphin (*Inia geoffrensis*, App II) and the tucuxi (*Sotalia fluviatilis*, App II).

Many other cetaceans confined to marine coastal habitats are faring just as poorly as their riverine equivalents. Despite huge efforts invested by conservation communities, only a handful of individuals of the critically endangered vaquita (*Phocoena sinus*, not listed) survive. Other coastal odontocetes teetering on the edge of the abyss include the Atlantic humpback dolphin (*Sousa teuszii*, App I and II), Maui dolphin (*Cephalorhynchus hectori maui*, not listed), Taiwanese humpback dolphin (*Sousa chinensis taiwanensis*, App II), the harbour porpoise (*Phocoena phocoena*, App II) in the Baltic and the narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*, App II). These riverine and coastal species are not the only ones threatened with extinction, however. Northern Hemisphere right whales— the North Atlantic right whale (*Eubalaena glacialis,* App I) and the North Pacific right whale (*Eubalaena japonica,* App I)—and probably also the recently described Rice's whale (*Balaenoptera ricei*, not listed) are all struggling in increasingly hostile habitats to recover from the effects of whaling which ceased decades ago.

Conscious of the alarming downward trajectory for many listed cetaceans and the growing evidence of threats, the first CMS Global Programme of Work for Cetaceans was drafted in the lead up to CMS COP10 to intentionally span three COP cycles, as a project led by Dr. William Perrin, the then COP Appointed Counsellor for Aquatic Mammals.

This Review supports a new, second Programme of Work that is presented as a separate document to the 14th CMS Conference of the Parties (COP). It both looks back at the first programme of work and casts forward to inform the second. Presuming the second programme of work will span three COP cycles, the recommendations are purposely appropriate for that timeline. It is overseen by Perrin's successor, Prof. Giuseppe Notarbartolo di Sciara, offering a renewed opportunity to harness the input of cetacean experts. It consciously grows from the first Programme of Work adopted in 2011. The format has been streamlined, and the support information summarised with links to deeper research provided. A consolidation of species, threats and regions remains, but in a format more accessible for Range States, partners and funders alike. The information seeks to make relative priorities for action, either within Resolutions or Decisions, clear and available.

Particularly, this Review serves as an early warning of issues that are unfolding and are already posing a considerable risk to cetaceans. And, it offers hope. Arguably, without the first Programme of Work, CMS would not be leading the world in animal culture, ocean noise and aquatic wild meat. Important Marine Mammal Areas (IMMAs) may have struggled for recognition without CMS' early embrace of their value but are now seen as one of the most important tools at our disposal to address the importance of a huge variety of marine areas for marine mammals.

As he passes the baton to a third Appointed Counsellor, Prof. Notarbartolo di Sciara does so with equal concern about a world in an even worse state than ten and twenty years ago, and a plea that efforts to conserve cetaceans, and other aquatic mammals or indeed any other species, should not stop at halting their decline and simply preserving their status quo.

We must not forget the baselines of the past—a past where humans and nature healthily co-existed, largely under local, traditional and indigenous governance—and steadfastly refuse to accept new baselines that reflect the decline of an ever-diminished natural Earth.

Looking Back and Projecting Forward

Looking back at the first Global Programme of Work for Cetaceans

The first Global Programme of Work for Cetaceans was drafted in the lead up to CMS Conference of the Parties (COP)10 to intentionally span three COP cycles, as a project led by Dr. William Perrin, the then COP Appointed Counsellor for Aquatic Mammals. Triggered by Resolution 8.22: *Adverse Human Induced Impacts on Cetaceans*, and negotiated as Resolution 10.15: *Global Programme of Work for Cetaceans*, the work was supported by a comprehensive document (Inf 10.31) that was developed between 2008 and 2010. The first Programme of Work sought to draw together the many individual Resolution commitments negotiated over the previous years as well as requests from CMS Range States for agreement (Memorandum of Understanding) on development in the Pacific Islands and Western African regions, and focused collaboration with regional process in South and East Asian Seas and the Caribbean.

The supporting review responded to the direction of Resolution 8.22, examining the progress and intent of CMS and its agreements to date, and offering advice on how the CMS family could be more effective through strong collaboration with specific Multilateral Environmental Agreements (MEAs) including the International Maritime Organization (IMO), the International Whaling Commission (IWC) and its Scientific Committee (IWC SC) and Conservation Committee (IWC CC), the Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR), the United Nations Informal Consultation on Protection of the Oceans and the Law of the Sea (UNICPOLOS), the Cartagena Convention, European Union Habitats and Species Directive, the Bern Convention and the United Nations Environment Programme (UNEP) Regional Seas Programme. Its premise was the importance of ensuring synergy and compatibility between international instruments to reduce the burden on States that may result from duplication of reporting and compliance effort. The document also responded to changing processes within the International Union for the Conservation of Nature (IUCN) Cetacean Specialist Group and delays in the production of that body's cyclical Action Plan.

Against this backdrop, Perrin's intent with the Programme of Work was threefold. The first goal was to develop an identifiable work programme generated through the Scientific Council for the Secretariat, Scientific Council, and Parties that would span a number of COP cycles. He hoped for a process that could clearly identify funding priorities and break away from the triennial rush that leads into each COP cycle. Finally, given the considerable growth of the marine mammal work programme and that Perrin held long-standing work relationships within a number of regions, he sought a regionally specific focus to assist Parties to better understand which Resolution commitments were most pressing in their respective regions while also providing greater clarity with National Reporting priorities. An important driver behind this work was the emerging need to establish clarity between the changing IWC policy work programme and CMS' growing mandate (Resolution 8.22).

An objective analysis of the Global Programme of Work for Cetaceans performance reveals some of these areas were highly successful, while other intents have been lost to document history.

An identifiable work programme

The document that supported Resolution 10.15, *Towards a Global Programme of Work for Cetaceans*, was a genuine global assessment of need communicated from the scientific community into the policy community. The authors sought extensive input across the wider scientific community, working through the IUCN Cetacean Specialist Group, as well as directly with experts across both the CMS listed cetacean species and the threats they faced. The 'regionalization' of this work represented considerable input from the cetacean scientific community. This consultation process had the unexpected benefit of raising awareness about the value and potential of CMS across this community, and facilitated the growth of the Scientific Council's Aquatic Mammals Working Group membership.

By considering all listed species as a taxonomic group, rather than as multiple individual species listings (at that point there were 15 Appendix I and 43 Appendix II listed cetaceans) remotely bound by Range States for these species should issue specific resolutions, the first Programme of Work provided a focus for Range States and CMS daughter agreements that had not been apparent before. It also facilitated emergent discussions about work areas that have branched off as independent work areas. These include the extensive and ground-breaking, conservation-driven work on Animal Culture; the growing and previously unacknowledged issue of aquatic wild meat harvesting; the detailed focus on the impact of noise-generating activities in the marine environment and the development and endorsement of the *CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities*; and the policy recognition of the science and process behind *Important Marine Mammal Areas* (IMMAs). The first Programme of Work also facilitated active engagement between the IWC Scientific Committee and the CMS Scientific Council on a number of issues (ocean noise and aquatic wild meat, specifically), such that a collaborative culture has been established between the two bodies that will live beyond the Programme of Work.

Regionally specific focus

By prioritization of threat and species focus by region, the first Programme of Work enabled finer grained consideration of the relative scale of threat across different oceans than is usually provided in Resolutions of the COP. This meant that exploring the emergent science of cetacean social complexity and culture could be identified as a global issue: noise pollution was highlighted as specifically important for the Mediterranean while bycatch and aquatic wild meat were highlighted as particularly urgent issues in the Indian Ocean (work on aquatic wild meat was then extended on the request of the Parties to the tropics and sub-tropics across the world). The information provided regions a solid opportunity to pick up critical issues as their capacity allowed, without having to raise each issue individually through the Scientific Council. Marine noise was successfully pursued by both daughter agreements and Range States a number of times during the life of the Programme of Work.

Identifiable funding priorities

The first Programme of Work provided ample opportunities for internal and external funding to be generated. It also gave focus to partner organizations to collaborate with CMS in tangible and practical ways. Much of the work that transpired took place with external funding without drawing on the core resources of CMS including the work on Animal Culture; the specific focus on aquatic wild meat harvesting in Western Africa; the development and endorsement of the *CMS Family Guidelines on Environmental Impact Assessment for Marine Noise-generating Activities;* and the considerable work in the development of IMMAs.

Projecting forward

Lessons learned

As the first of its kind, the first Programme of Work presented a volume of information and format previously unseen within the CMS policy space. Despite the length of the consultation process and the lead time of document availability, there was some criticism about its scale and scope as the COP approached. Parties also needed space to be able to negotiate sensitives around the historical management of cetacean species. However, consensus was reached once the full context of the work was understood.

Objectively, for the co-authors of this document at least, it is not clear how this criticism might have been avoided. The first Programme of Work sought to establish something not seen in the CMS aquatic species space before, while arguably commonplace in the avian work of the convention. This required a body of work be established to give confidence that the extent of issues and implications was understood by the cetacean science community. Moving forward, a new Programme of Work can stand on the shoulders of these efforts without duplicating the volume of its predecessor and can streamline the presentation to make it easier for Parties to consider and ultimately implement.

Regrettably, the first Programme of Work was not captured well within the CMS Secretariat programme of work, largely because of its format and the structural changes to Resolutions and Decisions. Early discussion with the Secretariat in the development of the new Programme of Work relating to the scope, regionalization, and format (presented as a separate document to the 14th CMS COP) has alleviated some of this mismatch, however it is anticipated that over time, greater guidance may be forthcoming about how best to present volumes of work over extended periods.

Similarly, the directive from Resolution 8.22: *Adverse Human Induced Impacts on Cetaceans* to marry CMS' work with other MEAs was only executed in limited cases, and mostly where the Secretariat carried focus between one MEA and the other. No matter the reason, the provision of these cross-institutional linkages was an artefact largely driven by IWC Stakeholders in the negotiation of Resolution 8.22, and the fact it has not been carried forward into subsequent Resolutions and Decisions suggests directing collaboration around cetaceans specifically is no longer considered relevant.

The attempt at prioritization according to a timeline was also essentially overlooked. This appears to be a symptom of the Resolution fading from Party view for all but the Scientific Council and the Aquatic Mammals Working Group. Areas were taken up, organically, as and when there was a champion to lead the work.

Opportunities to harness

The Review grows from the first Programme of Work. The format proposed for the second Programme of Work and reflected in the recommendations that follow is streamlined, and the support information summarized with links provided to more detailed research. The consolidation of species, threats and regions remains, but in a format more accessible for Range States, partners and funders alike. The information seeks to make relative priorities for action, either within Resolution or as Decisions, clear and available.

A new Programme of Work once again spanning three COP cycles, overseen by Perrin's successor, Prof. Giuseppe Notarbartolo di Sciara, offers a renewed opportunity to harness the input of cetacean experts to the baton being handed on to the next COP Appointed Councillor who follows in Perrin's and Notarbartolo di Sciara's footsteps.

Particularly, this Review serves as an early warning of issues that are unfolding and are already posing a considerable risk to cetaceans. As previously stated, without the first Programme of Work, CMS would not be leading the world in animal culture, ocean noise and aquatic wild meat. IMMAs may have struggled for recognition without CMS' early embrace of their value but are now seen as one of the most important tools at our disposal to address the importance of a huge variety of marine areas for marine mammals.

Resolutions in force

Finally, this Review also outlines the Resolution commitments currently in force as they relate to the threats faced by the Appendix I and II cetaceans. This is offered to inform Parties of both solid precedents for taking the steps the second draft Cetacean Programme of Work will propose, and that the hard discussions have already taken place.

All that remains is a commitment to implement.

Current Status of CMS-listed Cetaceans

Between the adoption of the First Programme of Work for Cetaceans and the drafting of this review for the second, the status of cetaceans in almost all oceans has worsened. Of the 51 Appendix-listed cetaceans, 27 are in the IUCN Red List as either Critically Endangered (CE), Endangered (E) or Vulnerable (V). Near threatened (NT) and Least Concern (LC) are also indicated. Three species remain listed as Data Deficient (DD). More details pertaining to each species and their Red List status appear in Annex 3.

Species Name	**IUCN Red List**						**CMS App.**	
	CE	**E**	**V**	**NT**	**LC**	**DD**	**I**	**II**
Bowhead whale (*Balaena mysticetus*)		X - Greenland-Svalbard-Barents Sea and Okhotsk Sea sub-pops.			X		X	
North Atlantic right whale (*Eubalaena glacialis*)	X						X	
North Pacific right whale (*Eubalaena japonica*)	X – northeast Pacific sub-pop.	X					X	
Southern right whale (*Eubalaena australis*)	X – south-east Pacific sub-pop.				X			
Sei whale (*Balaenoptera borealis*)		X					X	X
Fin whale (*Balaenoptera physalus*)		X – Mediterranean sub-pop.	X				X	X
Blue whale (*Balaenoptera musculus*)	X – Antarctic subspecies (*B. m. intermedia*)	X					X	
Humpback whale (*Megaptera novaenangliae*)		X – Arabian Sea and Oceania sub-pops.			X		X	
Common dolphin – North and Baltic Seas, Mediterranean Sea, Black Sea and Eastern Tropical Pacific populations (*Delphinus delphis*)	X – Gulf of Corinth sub-pop.	X – Mediterranean sub-pop.	X – Black Sea subspecies (*D. d. ponticus*)		X		X – Med sub-pop & Black Sea ssp.	X
Irrawaddy dolphin (*Orcaella brevirostris*)	X – All six recognized sub-pops.	X					X	X
Black Sea bottlenose dolphin (*Tursiops truncatus*	X						X	X

Species Name	IUCN Red List						CMS App.	
ponticus)								
Atlantic humpback dolphin (*Sousa teuszii*)	X						X	X
Sperm whale (*Physeter microcephalus*)		X – Mediterranean sub-pop.	X				X	X
South Asian River dolphin (*Platanista gangetica gangetica*)		X					X	X
Franciscana (*Pontoporia blainvillei*)			X				X	X
Cuvier's beaked whale – Mediterranean subpopulation (*Ziphius cavirostris*)			X				X	
Antarctic minke whale (*Balaenoptera bonaerensis*)				X				X
Bryde's whale (*Balaenoptera edeni*)	X – Gulf of Mexico sub-pop. (Now recognized as Rice's whale, *B. ricei*)				X			X
Omura's whale (*Balaenoptera omurai*)						X		X
Pygmy right whale (*Carperea marginata*)					X			X
Indo-Pacific humpback dolphin (*Sousa chinensis*)	X – Taiwanese subspecies (*S. c. taiwanensis*)		X					X
Tucuxi (*Sotalia fluviatalis*)		X						X
Guiana dolphin (*Sotalia guianensis*)				X				X
White-beaked dolphin – North and Baltic Seas populations (*Lagenorhynchus albirostris*)					X			X
Dusky dolphin (*Lagenorhynchus obscurus*)					X			X
Peale's dolphin (*Lagenorhynchus australis*)					X			X

Species Name	IUCN Red List						CMS App.	
Risso's dolphin – North and Baltic Seas populations (*Grampus griseus*)					X			X
Indo-Pacific bottlenose dolphin – Arafura/Timor Seas populations (*Tursiops aduncus*)				X				X
Common bottlenose dolphin – North, Baltic, Mediterranean and Black Sea populations (*Tursiops truncatus*) **T.t.ponticus is on App. I*					X			X
Pantropical spotted dolphin – Eastern Tropical Pacific and Southeast Asian populations (*Stenella attenuata*)					X			X
Spinner dolphin – Eastern Tropical Pacific and Southeast Asian populations (*Stenella longirostris*)			X - the eastern spinner dolphin (*S. l. orientalis*)		X			X
Striped dolphin – Eastern Tropical Pacific and Mediterranean populations (*Stenella coeruleoalba*)					X			X
Clymene dolphin (*Stenella clymene*)					X			X
Fraser's dolphin – South East Asian populations (*Lagenodelphis hosei*)					X			X
Australian snubfin dolphin (*Orcaella*			X					X

Species Name	IUCN Red List						CMS App.	
heinsohni)								
Commerson's dolphin – South American population (*Cephalorhynchus commersonii*)					X			X
Chilean dolphin (*Cephalorhynchus eutropia*)				X				X
Heaviside's dolphin (*Cephalorhynchus heavisidii*)				X				X
Orca (*Orcinus orca*)	X – Strait of Gibraltar sub-pop.					X		X
Long-finned pilot whale – North and Baltic Seas populations (*Globicephala melas*)						X		X
Beluga (*Delphinapterus leucas*)	X – Cook Inlet sub-pop.				X			X
Narwhal (*Monodon monocerus*)					X			X
Harbour porpoise – North and Baltic Seas, western North Atlantic, Black Sea and north-west African populations (*Phocoena phoconena*)	X – Baltic Sea sub-pop.	X – Black Sea harbour porpoise (*P. p. relicta*)			X			X
Burmeister's porpoise (*Phocoena spinipinnis*)				X				X
Spectacled porpoise (*Phocoena dioptrica*)					X			X
Indo-Pacific finless porpoise (*Neophocaena phocaenoides*)			X					X
Narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*)		X						X
Dall's porpoise (*Phocoenoides dalli*)					X			X

Species Name	IUCN Red List						CMS App.	
Amazon River dolphin (*Inia geoffrensis*)		X						X
Baird's beaked whale (*Berardius bairdii*)					X			X
Northern bottlenose whale (*Hyperoodon ampullatus*)				X				X

Current Threats to CMS-listed Cetaceans

In the period between the adoption of the first Cetacean Programme of Work and the groundwork for this review, all the global indicators of ocean health have significantly worsened. The insidious impact of ocean acidification is being revealed, while ocean noise, levels of bycatch, chemical pollution and marine debris have all increased, and the status of most cetacean species and populations continue to decline. It is a grim picture that, when merged with the unfolding scale of climate driven disaster now also impacting marine and estuarine areas, feels like the fate of cetaceans is genuinely at two minutes to midnight. The scale of damage is no longer projected into the future. It is being catalogued in the present.

The negative impacts of human society on Earth's environment have escalated species extinctions at a rate two to three orders of magnitude greater than natural cycles. Species and populations everywhere live in a degraded world. Across the world's oceans, every cetacean species now experiences multiple and cumulative impacts every day, and their habitat is in continuous decline. In 2021, a new species of whale was recognized, Rice's whale (*Balaenoptera ricei*), and immediately listed as Critically Endangered. Other reviews of species and population status undertaken by the IUCN Cetacean Specialist group (CSG) saw more and more populations being listed in a threatened category. The industrialized human presence on the planet is having dire consequences for Earth's biodiversity, none more so than for the world's whales, dolphins and porpoise.

Meanwhile, an increasingly desperate science community has busily sought ever clearer ways to describe the fate of the Earth's precious aquatic environments. Of particular importance to CMS is the development of the IMMA declarations. IMMAs are an important advisory, expert-based classification applied to the world's oceans, coastal waters and shorelines, and relevant inland water bodies, consisting of discrete portions of habitat, important to marine mammal species, that have the potential to be delineated and managed for conservation. CMS has recognized the value of IMMAs as useful in defining critical habitats for CMS-listed pinnipeds, sirenians, otters, polar bears and cetaceans, extending from the tropics to the poles, from shallow estuarine, riverine and coastal areas to the high seas (marine areas beyond the limits of national jurisdiction). This review highlights a few examples of IMMAs where specific threats are significantly affecting cetaceans.

In the pages that follow, concise introductions to two emergent issues are provided—'Out of habitat' cetaceans and climate migrants, and deep sea mining. Also provided are concise summaries of the nine threat areas of CMS's traditional focus:

- entanglement, bycatch, and prey depletion;
- hunting;
- climate change;
- pollution (marine debris, chemical, and noise);
- vessel strikes;
- live captures;
- disturbance and harassment;
- disease; and
- habitat degradation.

Each subsection includes a concise narrative, followed by a brief summary of relevant operatives contained in each related Resolution currently in force outlining the pre-existing commitments of Parties (noting that the specific text of each Resolution remains the ultimate reference). Recommendations from the science community for inclusion in the second Cetacean Programme of Work follow. Key resources for Parties and others to draw from are outlined, including CMS' own documents, relevant IMMAs, and a recent selection of published materials.

Greater details about each of the related Resolutions appear in Annex 1. The threats for each large ocean region have been presented as a prioritized list with an accompanying species list in Annex 2.

Intersections with fisheries: entanglement, bycatch, and prey depletion

Bycatch, the accidental fatal capture of a non-target species in fisheries, and entanglement where parts of cetaceans become entangled in foreign materials such as nets, ropes and fishing line are both common and universal phenomenons. Bycatch and entanglement remains the largest immediate threat to cetaceans globally, with an estimate of at least 300,000 cetaceans killed each year, however this is widely considered to be an underestimate. Trawls, seine nets, hooks and lines, set-gillnets and driftnets and even lines of pots and creels take their toll on marine mammals, seabirds, turtles and sharks. For cetaceans specifically, bycatch can be caused by entanglement in fishing gear, or direct capture by hooks or in trawl nets, fish traps, creels, and pots. While much of this bycatch is happening within the jurisdiction of national management, or regional fisheries organizations, there is also bycatch within illegal, unreported and unregulated (IUU) fishing activities.

For many populations and species, and in particular small cetaceans, bycatch is the primary driver in their decline and sustained incidental capture, and when coupled with certain cetacean life history traits (e.g., long lifespans, slow growth, late maturity, and low fecundity), increase the potential for bycatch to significantly impact cetacean populations.

Nearly all gear types pose risks to cetaceans to some degree, though gillnets are considered the riskiest gear type. Coastal gillnets represent the single largest threat, particularly for dolphins and porpoises, leading to the decline of most of the threatened small cetaceans around the world. Bycatch is the main threat to 11 of the critically endangered cetacean species. Entanglement in gillnets contributed to the extinction of the Yangtze River or Baiji dolphin (*Lipotes vexillifer*, not listed) and is responsible for the imminent extinction of the vaquita (*Phocoena sinus*).

For some species, like the vaquita (*Phocoena sinus*, not listed), extinction looms; for other species the extent of bycatch has yet to be ascertained, and no remedial actions are being taken.

Several populations of odontocete cetaceans, from at least 19 species, have modified their behaviour and started foraging behind trawlers, which offers a facilitated access to prey. This opportunistic foraging tactic exposes the animals to potential harm and mortality in trawl gear and is a growing issue that needs to be addressed.

Also, non-target wildlife can become entangled in drifting fisheries aggregation devices (FADs) which are actively deployed and being tracked by fishers, or in those which have been lost and which are considered marine debris. The full scale of this is unknown, and entanglement in drifting FADs tends to go unobserved by fishers because much of it takes place in the submerged sections of the FAD.

There are concerning levels of bycatch and entanglement in almost every ocean, and despite the mitigation measures documented in *Review of Methods Used to Reduce Risks of Cetacean Bycatch and Entanglements* (CMS Technical Series No.38) or the Guidelines for the Safe and Humane Handling and Release of Bycaught Small Cetaceans from Fishing Gear (CMS Technical Series No.43) progress remains limited. A number of regions need focused attention and examples are given below.

- Bycatch (in addition to aquatic wild meat harvests) of the Critically Endangered Atlantic humpback dolphins (*Sousa teuszii*, App I and II) are documented in a number of West African countries, and in particular in the Gulf Guinea.
- Expanding trawl fisheries have devastated Commerson's dolphin (*Cephalorhynchus commersonii*, App II) populations in Argentina. Franciscana dolphin (*Pontoporia blainvillei*, App I and II) populations are impacted heavily in gillnet fisheries across their range (Brazil, Uruguay and Argentina).
- While bottlenose dolphin (*Tursiops truncatus*)[1], and Atlantic spotted dolphin (*Stenella frontalis*) are bycaught in trawl fisheries in the Gulf of Mexico. The Burmeister's porpoise (*Phocoena spinipinnis*, App II) is one of three cetaceans

often bycaught in Peru and Chile. The vaquita (*Phocoena sinus*, not listed), critically endangered and endemic to the upper Gulf of California, Mexico, is killed in gillnets used in the illegal capture of the endangered totoaba (*Totoaba macdonaldi*), a local croaker fish.

- Irrawaddy dolphin (*Orcaella brevirostris*, App I and II) populations have been severely impacted by lift nets and crab gear and are listed as critically endangered in the Mekong River in East and mainland Southeast Asia, the Mahakam River in Indonesia, Malampaya Sound in the Philippines and Songkhla Lake in Thailand. In the Philippines, round-haul nets and tuna driftnet fisheries have a substantial impact on the populations of spinner dolphins (*Stenella longirostris,* App II – Southeast Asian population) and Fraser's dolphins (*Lagenodelphis hosei*, App II – Southeast Asian population). The Yangtze River or Baiji dolphin (*Lipotes vexillifer*, not listed) is the most endangered cetacean and is only found in the Yangtze River, China; it is nowadays presumed extinct. The Yangtze River finless porpoise (*Neophocaena phocaenoides asiaeorientalis*, App II) also lives in the Yangtze River and is subject to entanglement in gillnets. The Taiwanese humpback dolphin (*Sousa chinensis taiwanensis*, App II as *Sousa chinensis*) faces a serious risk of extinction through bycatch, habitat loss, pollution, reduced freshwater input to maintain the dolphins' estuarine habitat and anthropogenic noise.
- Hector's dolphin (*Cephalorhynchus hectori*, not listed) and Maui's dolphin (*Cephalorhynchus hectori maui*, not listed), are often caught in set nets and pair trawlers in New Zealand waters.
- Drift and bottom-set gillnets are the biggest conservation threat to Indo-Pacific humpback dolphin (*Sousa chinensis*, App II)[2], Indian Ocean humpback dolphin (*Sousa plumbea*), and Indo-Pacific bottlenose dolphin (*Tursiops aduncus*, App II) in the Indian Ocean. With Risso's dolphin (*Grampus griseus*, App II)[3], dwarf sperm whale (*Kogia sima*, not listed), Longman's beaked whale (*Indopacetus pacificus*, not listed), and Cuvier's beaked whale (*Ziphius cavirostris,* App I) all reported as being entangled in both surface and subsurface gillnets in the north-western Indian Ocean. Historically, the byctach rates have been as much as 100,000 animals per year.
- Static nets (gillnets and beach seines) pose a serious threat to harbour porpoises (*Phocoena phocoena*, App II)[4] as they are extremely susceptible to entanglement across their European range, especially within the Black and Baltic Seas, where a distinct population is endangered.
- In the Mediterranean, the demographically isolated populations of common dolphin (*Delphinus delphis*, App I)[5], striped dolphin (*Stenella coeruleoalba*, App II) and sperm whale (*Physeter macrocephalus*, App I and II) are bycaught in a range of fisheries, including pelagic trawl. Measures to reduce bycatch have been limited and not always directed at the most problematic fisheries. In the Bay of Biscay, every year, thousands of common dolphins are accidentally captured by trawlers and gillnets.
- A number of species of baleen whale are regularly entangled in static fishing gear, particularly buoy lines for creels/pots/traps. These include humpback whale (*Megaptera novaeangliae*, App I), North Atlantic right whale (*Eubalaena glacialis*, App I) and minke whale (*Balaenoptera acutorostrata*) in the north Pacific, north Atlantic and minke and humpback whales in the Arabian Sea.

In 2016, the IWC created the Bycatch Mitigation Initiative, in recognition of the significance of bycatch to cetacean populations. Through its work plans it aims to develop, assess and promote effective bycatch prevention and mitigation measures world-wide.[6]

For any species, there is a balance between the energy expended in acquiring food, the energy provided by that food and its subsequent expenditure to maintain body processes, such as thermoregulation, growth and reproduction. Most cetacean species feed on a variety of fish and cephalopod species. The diet of a particular species can vary with season and age

in terms of prey size and selection, with the prey type differing in terms of quality and energy provided. While high dietary variability is often interpreted as indicating an opportunistic foraging strategy, some cetacean species are also known to select prey according to prey quality rather than simply availability. Fisheries is the primary driver of prey depletion for cetaceans, but there are other factors influencing prey abundance including pollution, disturbance and climate change.

Beyond issues of population and species viability, declines in marine megafauna as a result of bycatch and entanglement, and their loss of prey, lead to major changes in ecosystem function and process. This loss of megafauna, referred to as trophic downgrading, has reverberating effects on biotic interactions, disturbance regimes, species invasions, and nutrient cycling. There is also an urgent need for the development and adoption of participatory and adaptive approaches to promote sustainable fisheries practices and effective marine megafauna bycatch mitigation, to ultimately protect the health and function of marine ecosystems.

[1] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of both the Mediterranean and Black Sea populations of *T. truncatus*. The Mediterranean population should be changed to reflect subpopulation status, whilst the Black Sea population should be listed as a sub-species, *T. t. ponticus*, as designated by IUCN.
[2] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of *S. chinensis*. *S. chinensis* in the Western Indian Ocean should be listed separately as *S. plumbea* according to mainstream science. The documentation was prepared for this ahead of CMS COP13, but was beset by a failure of political progress at the time. In mainstream science today *S. chinensis* extends from Gulf of Bengal to Taiwan.
[3] It is important to note that CMS Appendices do not align with Daughter Agreement ASCOBANS Appendices in terms of range included.
[4] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of the Black Sea population of *P. phocoena* as opposed to the sub-species *P. p. relicta*, as designated by the IUCN.
[5] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of both the Mediterranean and Black Sea populations of *D. delphis*. The Mediterranean population should be changed to reflect subpopulation status, whilst the Black Sea population should be listed as a sub-species, *D. d. ponticus*, as designated by the IUCN.
[6] Details are available at: https://iwc.int/management-and-conservation/bycatch

Current CMS Resolutions in force

- Resolution 12.22: Bycatch
  A summary of this Resolution appears in Annex 1.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to the intersections with fisheries are that:

1. Parties should:
   a) work consciously through FAO and relevant Regional Fisheries Management Organizations (RFMOs) to mitigate the impact of modified cetacean behaviour and adapt fishing activities around foraging strategies in association with trawlers;
   b) further build collaboration with IWC on bycatch mitigation and support the IWC's programme of research;
   c) support the development and implementation of alternative gear; and
   d) prioritise combatting IUU fishing activities through the application of appropriate monitoring, enforcement and sanctions.
2. CMS Party Range States for these following species should prioritize bycatch mitigation:

a) Atlantic humpback dolphin (*Sousa teuszii*, App I and II) throughout its range, but especially in the Gulf of Guinea;
b) harbour porpoise (*Phocoena phocoena*, App II, including the distinctive Baltic Sea and Iberian populations), common dolphin (*Delphinus delphis*, App I and II) and bottlenose dolphin (*Tursiops truncatus*, App II), striped dolphin (*Stenella coeruleoalba*, App II) and sperm whale (*Physeter macrocephalus*, App I) in European and surrounding waters;
c) Commerson's dolphin (*Cephalorhynchus commersonii*, App II), Franciscana dolphin (*Pontoporia blainvillei*, App I and II) in the Western South Atlantic;
d) bottlenose dolphin (*Tursiops truncatus*, App II), and Atlantic spotted dolphin (*Stenella frontalis*, not listed) in the Gulf of Mexico;
e) Burmeister's porpoise (*Phocoena spinipinnis*, App II) in the Eastern South Pacific;
f) Irrawaddy dolphin (*Orcaella brevirostris*, App I and II) throughout East and Southeast Asia, as well as spinner dolphin (*Stenella longirostris*, App II) and Fraser's dolphin (*Lagenodelphis hosei*, App II) in the Philippines, Yangtze River finless porpoise (*Neophocaena asiaeorientalis*, App II) in the Yangtze River and the Taiwanese humpback dolphin (*Sousa chinensis taiwanensis,* App II);
g) Hector's dolphin (C*ephalorhynchus hectori*, not listed) and Maui's dolphin (*Cephalorhynchus hectori maui*, not listed) in New Zealand waters;
h) Indo-Pacific humpback dolphin (*Sousa chinensis*, App II), Indian Ocean humpback dolphin (*Sousa plumbea*, not listed), and Indo-Pacific bottlenose dolphin (*Tursiops aduncus*, App II) in the Indian Ocean and South China Sea and Risso's dolphin (*Grampus griseus*, App II) in the northwest Indian Ocean.

3. CMS Party Range States for the following species should prioritize entanglement mitigation:
   a) humpback whale (*Megaptera novaeangliae*, App I), North Atlantic right whale (*Eubalaena glacialis,* App I), and minke whales (*Balaenoptera acutorostrata*, not listed) in the North Atlantic, North Pacific, and Arabian Sea.
4. Scientific Council should:
   a) review whether the taxonomic reference for *S. chinensis, P. phocoena, D. delphis*, and the Mediterranean and Black Sea populations of *T. truncatus,* should be updated, coupled with a list of all changes that occurred with respect to listed species, and make recommendations to Parties; and
   b) develop a report to quantify the contribution of bycatch and fisheries-related mortalities of air-breathing CMS-listed species to trophic downgrading and the health and function of marine ecosystems, and make recommendations to Parties.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- Technical Mitigation to Reduce Marine Mammals Bycatch and Entanglement in Commercial Fishing Gear: Lessons Learnt and Future Directions
- Review of Methods Used to Reduce Risks of Cetacean Bycatch and Entanglements
- Guidelines for the Safe and Humane Handling and Release of Bycaught Small Cetaceans from Fishing Gear - CMS Technical Series No.43

Examples of IMMAs where the entanglement and bycatch threat is significantly affecting cetaceans

- Sea of Azov (Black Sea, Turkish Straits System, and Caspian Sea)
- Balearic Islands Shelf and Slope IMMA (Mediterranean)
- Continental shelf of the Northern Humboldt Current IMMA (South East Tropical and Temperate Pacific Ocean)

- Upper Gulf of California IMMA (South East Tropical and Temperate Pacific Ocean
- Iloilo and Guimaras Straits IMMA (Northeast Indian Ocean and Southeast Asian Seas)
- Indus Estuary and Creeks IMMA (Western Indian Ocean and Arabian Seas)

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Hunting

Hunting of cetaceans for either commercial purposes (whaling) and/or subsistence consumption (aquatic wild meat) is a widespread activity across the world.

Nearly three million great whales (baleen whales and sperm whales) were killed in the twentieth century, with several populations reduced to tiny fractions of their original size. In 1982, the IWC decided that there should be a ban on commercial whaling on all whale species and populations from the 1985/1986 season onwards. This ban, often referred to as the commercial whaling moratorium, relates to all international and national waters and it remains in place today.

Despite the moratorium, Norway has continued to take common minke whale (*Balaenoptera acutorostrata*) in the Northeast Atlantic and Iceland, and in recent years has taken both common minke whale and also North Atlantic fin whale (*Balaenoptera physalus*, App I and II). Japan left the IWC in 2019 and continues to catch common minke whale, Bryde's whale (*Balaenoptera brydei*) and sei whale (*Balaenoptera borealis*, App I and II) within its Exclusive Economic Zone.

The IWC also manages the take of some cetacean populations outside of the moratorium under the category of Aboriginal Subsistence Whaling ASW. The relevant species, populations and quotas are detailed on the IWC website. Importantly, a number of cetacean populations are also subject to hunting outside IWC jurisdiction, as the IWC is not recognized by them as the competent authority to manage/monitor or regulate the hunting of small cetaceans.

Many different cetaceans are hunted all around the world. The better known hunts occur in Canada, the Faroe Islands, Peru, Greenland, Iceland, Japan, Solomon Islands, St Vincent and the Grenadines, Norway and the Russian Federation but there are also less well documented takes elsewhere. The largest number of individuals and the greatest diversity of species is taken in Japan. For some of these hunts there is no internationally accepted management, including a quota, the exceptions being the ASW hunts managed by the IWC.

The capture, killing and trade of cetaceans and their products is illegal in most Latin American countries. Despite this, use for food and other purposes (e.g., fish bait) occurs in many countries, although the drivers and magnitude of the exploitation vary markedly between regions. In some countries (e.g., Argentina), uses are rare events and are almost exclusively opportunistic, while in others (e.g., Peru and Ecuador), there is continued use of cetaceans in spite of existing legislation, especially as bait in a number of fisheries. There are marked differences in the target species, the reasons for their capture and the methods used to capture them, both between and within countries. For example, botos (*Inia geoffrensis,* App II) and tucuxis (*Sotalia fluviatilis,* App II) are illegally harvested for use as bait for catfish (*Calophysus macropterus*) in Brazil, Peru, Colombia, and Venezuela. Common bottlenose dolphins (*Tursiops truncatus,* App II) and the pantropical spotted dolphin (*Stenella attenuata*, App II)[1] have been hunted for bait by local long-line fishers in the northern Colombian Pacific. The largest exploitation of small cetaceans traditionally occurred in Peru, where they have been caught (intentionally and otherwise) for decades in artisanal gillnets and by harpooning and sold in local markets or transported to the capital Lima. The use of dolphins as bait has spread to all coastal areas, with annual catches increasing since the early 2000s including dusky (*Lagenorhynchus obscurus*, App II), common (*Delphinus delphis*, App II), and bottlenose dolphins (*T. truncatus*, App II), as well as Burmeister's porpoise (*Phocoena spinipinnis*, App II) (e.g., in longline and gillnet shark fisheries in coastal Peru) which appears prolific and has now largely replaced use for human consumption.

Captures of several species of cetaceans have been documented throughout the Caribbean including in the Dominican Republic, St Vincent and the Grenadines, Trinidad and Tobago, St Lucia, and Dominica including Fraser's (*Lagenorhynchus hosei*, App II), spinner (*Stenella longirostris*, App II), common (*Delphinus delphis*, App I and II), and clymene dolphins (*Stenella clymene,* App II), orcas (*Orcinus orca*, App II), and humpback whales (*Megaptera novaeangliae*, App I). In 2019, reports presented to the IWC Scientific Committee raised concerns as it was estimated that the current level of hunting of short-

finned pilot whales (*Globicephala macrorhynchus*, App II) and orcas in the waters of St Vincent and the Grenadines were unsustainable.

There is evidence of the use of cetaceans in most countries in tropical Africa, with meat and other body parts used for human consumption, shark bait, traditional medicine and other purposes. Dolphins are both intentionally hunted and landed as bycatch in artisanal gillnets, drift gillnets, beach seines and other fishing gear. The available data from West and Central Africa are limited, but recent records indicate Atlantic humpback dolphin (*Sousa teuszii*, App I and II) and common bottlenose dolphin (*Tursiops truncatus*, App II), pilot whale (*Globicephala macrorhynchus*, App II), humpback whale (*Megaptera novaeangliae*, App I) and melon-headed whale (*Peponocephala electra*, not listed) have been targeted. In some countries, including Ghana, as demand increased for dolphin meat for human consumption or shark bait, bycatch gradually transformed into targeted harvesting. Ghanaian artisanal fishers, operating in Togolese coastal waters, are thought to promote trade and consumption of cetacean meat. In Eastern Africa, there are a number of records of opportunistic take, bycatch and intentional harvests of dolphins whilst in Mozambique, there is concern that increasing intentional harvest has evolved from commercial use of bycaught animals. Direct exploitation of small cetaceans is regularly reported from the western coast of Madagascar, mostly Indian Ocean humpback dolphin (*Sousa plumbea*, not listed), bottlenose dolphin (likely *Tursiops truncatus*, App II), and spinner dolphin (*Stenella longirostris*, App II).

The use of marine mammals for food, and likely for other purposes, within some East and Southeast Asian cultural groups is higher than ever before. This region's extensive coastline and large riverine systems are densely populated and communities rely heavily on aquatic resources. Most species are used for human consumption, but some for bait in fisheries. Species include finless porpoise (*Neophocaena phocaenoides* and *Neophocaena asiaeorientalis*, App II), sperm whale (*Physeter macrocephalus*, App I and II), orca (*Orcinus orca*, App II), short-finned pilot whale (*Globicephala macrorhynchus*, App II), and Irrawaddy dolphin (*Orcaella brevirostris*, App I and II).

Throughout many parts of South Asia, recent data suggest cetacean meat is exploited commercially for human consumption, particularly west India, especially the Indo-Pacific finless porpoise (*Neophocaena phocaenoides*, App II) and Indo-Pacific bottlenose (*Tursiops aduncus*, App II). A few species, notably the Indo-Pacific finless porpoise, are hunted for a niche market along the west coast of India. In the town of Malpe alone, an estimated 2,000 cetaceans are caught for human consumption every year. In India and Bangladesh, Ganges River dolphins (*Platanista gangetica*, App I and II)[2] that become entangled in nylon gill-nets are sometimes killed by fishers to extract oil to be used as a fish attractant. In Pakistan, the meat of Indian Ocean humpback dolphin (*Sousa plumbea*, not listed), Indo-Pacific bottlenose (*Tursiops aduncus*, App II), spinner dolphin (*Stenella longirostris*, App II), and finless porpoise (*Neophocaena asiaeorientalis*, App II) is used for shark bait, human food and traditional remedies. Along the south coast of Sri Lanka, small cetaceans are hunted using hand-held harpoons and this practice has spread to western areas driven by the increasing demand for dolphin meat from inland and urban people. There is also a less well documented offshore fishery for dolphins for uses as shark bait. Most of the trade occurs at sea between local fishermen and the sharks fisheries.

For Western Asia (Arabian region) there was consumption in Oman of dwarf sperm whale (*Kogia sima*, not listed), common dolphin (*Delphinus delphis*, App I and II), Indo-Pacific humpback dolphin (*Sousa plumbea*, not listed), spinner dolphin (*Stenella longirostris*, App II), and bottlenose dolphin (*Tursiops aduncus*, App II) and in the United Arab Emirates consumption of common dolphin (*Delphinus delphis*, App I and II) which is known to have taken place between 1970 and 2009. Little is known from this region on the extent of current cetacean use or its sustainability.

Although illegal throughout Europe, there is increasing concern that small cetaceans are being consumed in larger numbers than first considered, with increasing numbers of common dolphins (*Delphinus delphis*, App I and II) stranding along the west coast of France reported as having been butchered. Several species of small cetacean are also taken in several

hunts throughout the North Atlantic and North America, for example beluga (*D. leucas*, App II), narwhal, (*M. monocerus,* App II), long-finned pilot whale (*G. melas*, App II) and harbour porpoise (*P. phocoena*, App II).

Contemporary use of cetaceans is reported across Polynesia, Melanesia and Micronesia, however, although details of the species being taken are limited. Species identification is available for the Solomon Islands, where Risso's dolphin (*Grampus griseus*, App II), Fraser's dolphin also known as the Sarawak dolphin (*Lagenodelphis hosei*, App II), pantropical spotted dolphin (*Stenella attenuata*, App II), spinner dolphin (*Stenella longirostris*, App II), and Cuvier's beaked whale (*Ziphius cavirostris*, App I) are utilized. It is also considered that the local population of melon-headed whale (*Peponocephala electra*, not listed) have been extirpated as a direct result of hunting. The Gilbert Islands of Kiribati have a long history of marine mammal hunting, and data suggest that some species of Ramari's beaked whale (*Mesoplodon eueu*, not listed) and Cuvier's beaked whale (*Ziphius cavirostris*, App I) are still targeted for human consumption.

Typically, cetacean hunting is judged through the lens of whether it is believed to be sustainable and humane. Both judgements are often hotly debated where the science in inadequate, in particular where there are no appropriate population assessments or inadequate knowledge of population structure. However, hunting cetaceans also raises highly significant welfare concerns. These range from whether the method used is adequate to produce an appropriately swift death, noting that large animals are difficult to kill and that cetaceans present challenges in terms of determining if they are dead or insensible, to the effects on other members of the social group. For example, calves may be left without a mother or a social group may lose its lead animal.

[1] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of the Eastern Tropical Pacific population of *S. attenuata*. The listing should be changed to reflect sub-species status, *S. a. graffmani*, as designated by IUCN.
[2] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of the Ganges River dolphin as *P. g. gangetica*. The listing should be changed to reflect the recognition of two species, *P. gangetica* and *P. minor*, as designated by the IUCN.

Current CMS Resolutions in force

- Resolution 12.15: Aquatic Wild Meat
  A summary of this Resolution appears in Annex 1.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to hunting are that:

1. Parties should:
   a) transparently assess the hunting takes of all Appendix II listed cetaceans, overlaid with the other threats faced by these species, and assess measures for reducing the takes to ensure the survival of populations; and
   b) regularly review CMS Appendix I and II species listings, and identify and propose for listing those threatened species of migratory small cetaceans that warrant CMS protection on Appendix I. This should include those species already listed on Appendix II (e.g., botos).
2. Range States should:
   a) implement measures to cease the hunting of all Appendix I listed species, except where those hunts are genuinely 'to accommodate the needs of traditional subsistence users of such species' and where taking does 'not operate to the disadvantage of the species'. (CMS Art. III);
   b) support the ongoing development of the Gulf of Guinea Action Plan to Reduce

Aquatic Wild Meat hunting and consumption in West Africa; and

c) agree to pursue the development of Action Plans to Reduce Aquatic Wild Meat hunting and consumption in:
   - East, South East, and South Asia;
   - Latin America; and
   - Pacific Islands Region.

3. Scientific Council should:
   a) quantify the contemporary whaling and aquatic wild meat takes of all CMS Appendix I-listed cetaceans, in all regions and make recommendations to Parties.

Resources

Examples of IMMAs where the hunting threat could be significantly affecting cetaceans

- Sindhudurg-Karwar IMMA (Western Indian Ocean and Arabian Seas)
- Main Solomon Islands IMMA (Pacific Islands)

Current science

Ingram, D.J., Prideaux, M., Hodgins, N.K., Frisch-Nwakanma, H., Avila, I.C., Collins, T., Cosentino, M., Keith-Diagne, L.W., Marsh, H., Shirley, M.H. and Van Waerebeek, K., (2022). Widespread use of migratory megafauna for aquatic wild meat in the tropics and subtropics. Frontiers in Marine Science, 112.

Nunny, L., and Simmonds, M. P. (2022). Hunting, fishing, and whaling. In Routledge Handbook of Animal Welfare (pp. 203-219). Routledge.

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Altherr, S. and Hodgins, N. (2018). Small Cetaceans, Big Problems: A global review of the impacts of hunting on small whales, dolphins and porpoises. Edited by Sue Fisher, Kate O'Connell and D.J. Schubert. A Report by AWI, Pro-Wildlife and Whale and Dolphin Conservation. 70pp.

Climate change

The rise in sea surface temperature, with associated ocean acidification, decreased prey availability and loss of habitat can have severe consequences for cetacean survival. Climate-driven factors include changes in water temperature which can cause physiological stress, whilst indirect effects include changes in prey availability leading to changes in distribution, abundance and migration patterns, presence of competitors and/or predators, community structure, timing of breeding, reproductive success and survival.

Rising sea surface temperatures, reducing sea ice extent and other climate-driven factors are already causing a variety of impacts on the distribution, habitat and migrations of cetaceans and more impacts are predicted to occur over the next century. Many populations have already demonstrated a poleward shift, following their preferred sea surface temperatures to higher latitudes, and some have altered the timing of their migrations. Some species in some localities seem to be exhibiting an ability to adapt, at least to some extent in the short-term, whilst others, such as the bowhead whale (*Balaena mysticetus,* App I), may have only a limited ability to find alternative habitat.

Climate-driven changes act synergistically with other stressors and threats putting further pressure on individual cetacean welfare and the conservation status of populations. Threats may increase in some regions as humans change their behaviour in response to climate change, for example through increased shipping in areas that were previously inaccessible due to sea ice cover.

Increased meltwater and increased rainfall events and flooding will lead to higher rates of land-based runoff in downstream coastal areas. This will have two effects, firstly it may

dilute the salinity of core inshore habitat areas with associated health implications for cetaceans, and secondly it may increase contaminant loadings. Persistent organic contaminants can bioaccumulate in marine mammals, with potentially severe consequences for their health and reproduction. Other potential outcomes of climate change could be even more dramatic, such as an increase in harmful algal blooms and epizootics, both potentially leading to local population crashes, followed by longer term problems.

Baleen whales and their prey (e.g., krill and copepods) are already being impacted in the Southern Ocean. Models predict concerning declines under climate change, even local extinctions by 2100, for Pacific populations of blue whales (*Balaenoptera musculus,* App I), southern right whales (*Eubalaena australis*, App I), and populations of Atlantic/Indian fin (*Balaenoptera physalus*, App I and II) and humpback whales (*Megaptera novaeangliae*, App I).

Similar impacts are predicted for Arctic species such as bowhead whales (*Balaena mysticetus,* App I), belugas (*Delphinapterus leucas*, App II), and narwhals (*Monodon monoceros*, App II). Three subarctic baleen whale species—humpback whales (*Megaptera novaeangliae*, App I), fin whales (*Balaenoptera physalus*, App I and II) and common minke whales (*Balaenoptera acutorostrata*, not listed)—have displayed a northward range shift. Northern hemisphere sperm whales (*Physeter macrocephalus*, App I and II) and orca (*Orcinus orca*, App II) have also shifted their range. Other baleen whale species are migrating earlier and extending their stay in the higher latitudes.

In mid-latitudes similar range shifts appear to be occurring, with northward extensions of the range of striped dolphins (*Stenella coeruleoalba*, App II), common dolphins (*Delphinus delphis*, App I and II), and Cuvier's beaked whales (*Ziphius cavirostris*, App I), and possible range contractions of for white-beaked dolphins (*Lagenorhynchus albirostris*, App II), harbour porpoises (*Phocoena phocoena*, App II), northern bottlenose whales (*Hyperoodon ampullatus*, App II), and Pacific white-sided dolphins (*Lagenorhynchus obliquidens*, not listed). In some cases, e.g., in semi-enclosed seas such as the Mediterranean and Black Seas, such latitudinal range shifts are obstructed by the presence of land masses and could prevent the movement of the animals to a cooler environment.

In low latitudes where sea temperatures are highest, some species (e.g., bottlenose dolphins, baleen whales, and manatees) have experienced occasional mass die-offs linked to the presence of algal toxins.

Sea surface temperature and associated disease outbreaks may now also be affecting other marine mammal species in mid-latitudes.

Consideration should be given to a CMS position around the welfare and conservation of climate migrants, and adaptive measures that can minimize anthropogenic impact on critical ecosystems faced with an influx of novel climate refugees.

Recent research is helping to illuminate the role of cetaceans in climate mitigation through both the sequestration of carbon in their bodies and also their contribution to the promotion of ocean productivity. Attention is mainly focused on the role of the larger whales because of the quantities of carbon they contain in their huge bodies, including when they die and fall to the seabed. Cetaceans have also been described as ecosystem engineers because they move key nutrients around in marine ecosystems and can promote productivity in localized areas. These important contributions are being further researched, including through modelling techniques, and such research should be encouraged along with a wider recognition of the positive contributions living cetaceans make to mitigating climate control.

Current CMS Resolutions in force

- Resolution 12.21: Climate Change and Migratory Species
- Resolution 11.28: Future CMS Activities related to Invasive Alien Species

A summary of these Resolutions appear in Annex 2.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to climate change are that:

1. Parties should take into account the positive role of cetaceans in climate mitigation in their conservation strategies, including encouraging appropriate research.
2. CMS Party Range States for these species should develop adaptive conservation efforts for:
   - 2a. Antarctic populations of blue whales (*Balaenoptera musculus,* App I), southern right whales (*Eubalaena australis*, App I), Atlantic/Indian Ocean fin (*Balaenoptera physalus*, App I and II), and humpback whales (*Megaptera novaeangliae*, App I);
   - 2b. bowhead whales (*Balaena mysticetus,* App I), belugas (*Delphinapterus leucas*, App II), and narwhals (*Monodon monoceros*, App II) in the Arctic;
   - 2c. Subarctic humpback whales (*Megaptera novaeangliae*, App I), fin whales (*Balaenoptera physalus*, App I and II) and common minke whales (*Balaenoptera acutorostrata*, not listed), northern hemisphere sperm whales (*Physeter macrocephalus*, App I and II) and orca (*Orcinus orca*, App I), including other baleen whale species that are migrating earlier and extending their stay in the higher latitudes; and
   - 2d. Mid-latitude striped dolphins (*Stenella coeruleoalba*, App II), common dolphins (*Delphinus delphis*, App I and II), Cuvier's beaked whales (*Ziphius cavirostris*, App I), white-beaked dolphins (*Lagenorhynchus albirostris*, App II), harbour porpoises (*Phocoena phocoena*, App II), northern bottlenose whales (*Hyperoodon ampullatus*, App II), Pacific white-sided dolphins (*Lagenorhynchus obliquidens*).
3. Scientific Council should:
   - 3a. investigate the linkages and impacts of mass die-offs linked to the presence of algal toxins, and make recommendations to Parties;
   - 3b. develop a report about the welfare and conservation of climate migrants, and make recommendations to Parties; and
   - 3c. develop a report about 'climate-proofing' protected areas dedicated to marine mammals, and make recommendations to Parties.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- Fact Sheet on Migratory Species and Climate Change
- Fact Sheet on Blue Whales and Climate Change
- Fact Sheet on Narwhals and Climate Change

Examples of IMMAs where the climate change threat could be significantly affecting cetaceans

- Ross Sea Ecosystem IMMA (Extended Southern Ocean)
- Western Antarctic Peninsula and Islands IMMA (Extended Southern Ocean)
- North West Mediterranean Sea, Slope and Canyon System IMMA (Mediterranean)

Current science

Agrelo, M., Daura-Jorge, F.D., Rowntree, V.J., Sironi, M., Hammond, P.S., Ingram, S.N., Marón, C.F., Vilches, F.O., Seger, J., Payne, R., and Simões-Lopes, P.C. (2021). Ocean warming threatens southern right whale population recovery. Science Advances 7

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map for marine megafauna and the people who depend on them. Frontiers in Marine Science 7; 547.

Gulland, F.M., Baker, J.D., Howe, M., LaBrecque, E., Leach, L., Moore, S.E., Reeves, R.R. and Thomas, P.O., (2022). A review of climate change effects on marine mammals in United States waters: Past predictions, observed impacts, current research and conservation imperatives. Climate Change Ecology, 3, p.100054.

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Evans, P., and Waggitt, J. (2020). Impacts of climate change on Marine Mammals, relevant to the coastal and marine environment around the UK.

Simmonds, M.P. (2016) Impacts and effects of ocean warming on marine mammals. In: Laffoley, D. and Baxter, J.M. (eds). Explaining ocean warming: Causes, scale, effects and consequences. Full report. Gland, Switzerland: IUCN

Pollution

Chemical and physical pollution of the marine environment is now widespread, impacting every marine region across the world. Similarly, noise now impacts every ocean and sea.

Marine debris

Marine debris (also known as marine litter) is a pollution problem affecting thousands of marine species in all the world's seas and oceans. Marine debris, especially plastic and ghost (old, inactive) fishing gear, has negative impacts on marine wildlife, primarily through its ingestion and entanglement of animals. Among debris, plastic is by far the most pervasive due to the materials' persistence in the environment, its action as a vehicle of noxious compounds, and because of the tendency of some plastic to break up into micro- and nano-particles, thereby easily assumed into living organisms. Overcoming the failure of global governance in addressing plastic pollution is of vital importance. Ingested debris can cause obstruction of the alimentary canal or perforate it and, despite the challenges of such investigations, has shown to be responsible for the deaths of some cetaceans. Recently published studies suggest that about 68 percent of cetacean species are negatively affected by marine debris, with an increase in the number of species involved over the past decades.

Large filter-feeders like humpback (*Megaptera novaeangliae*, App I) and fin whales (*Balaenoptera physalus*, App I and II) are particularly prone to microplastic ingestion and likely contamination by plastic-associated toxins due to the large volumes of water they process during feeding, as well as trophic transfer. Microplastics have also been found in non-filter feeding species like belugas (*Delphinapterus leucas*, App II), common dolphins (*Delphinus delphis*, App I and II) and harbour porpoise (*Phocoena phocoena*, App II). Ingestion of macroplastics (large plastic items that can block gastrointestinal passages or fill stomach cavities) remains the most commonly identified cause of death related to plastic pollution. Sperm whales appear to be particularly susceptible to gastric impaction from marine debris ingestion, with hundreds of kilograms of mixed debris reported in stomachs of stranded sperm whales.

The role of FADs in generating significant marine debris has been recognized. Drifting FADs which remain in the environment and are re-used may also become marine debris and can sink or drift onto beaches, coral reefs or mangroves. The deeper the tail of the drifting FAD extends, the higher the probability of it touching the seabed and grounding.

Entanglement in marine plastic affects both mysticetes and odontocetes, with most records involving fishery related items. The individual-level effects of interactions with

marine debris include drowning, starvation, malnutrition, physical injury, reduced mobility, and physiological stress, reduced energy acquisition and assimilation, compromised health and reproductive impairment.

Furthermore, ingestion of microplastics has the potential to impact all parts of the marine food web, including cetacean prey species, increasing the bioavailability of toxic substances.

It is crucial that cetacean (and other marine apex predators) health and welfare is considered within the development of the international plastics treaty within the framework of the United Nations Environment Assembly.

Current CMS Resolutions in force

- Resolution 12.20: Management of Marine Debris
  A summary of this Resolution appears in Annex 1.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to marine debris are that:

1. Parties should:
   - 1a. improve fisheries management practices and advocate for solutions to reduce loss or prevent dumping, as well as the full recovery, of fishing gear, FADs, and other debris from all fisheries activities;
   - 1b. enable the removal of marine debris where it poses a threat, utilising 'Best Available Techniques' and 'Best Environmental Practice' to avoid removal of biomass or exacerbate harm to the marine environment;
   - 1c. apply the Voluntary Guidelines for the Marking of Fishing Gear developed by FAO;
   - 1d. support the conclusion of an international legally binding instrument on plastics to end plastic pollution targeting both land- and sea-based sources of plastic pollution, including all types of microplastics, covering the whole life cycle of plastics by the end of 2024; and
   - 1e. develop, implement and update national action plans to prevent, reduce and eliminate plastic pollution, and support regional and international cooperation
2. Scientific Council should:
   - 2a. develop a report about incidences and physiological impact of marine debris pollution on CMS listed cetaceans, and make recommendations to Parties.
3. Secretariat should:
   - 3a. support CMS Parties to present the case for cetacean (and other marine apex predators) health and welfare to be considered within the development of the international plastics treaty within the framework of the United Nations Environment Assembly.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- Fact Sheet on Two CMS Reports on Plastic Pollution and Migratory Species
- Risk Assessment of Plastic Pollution to Migratory Species in the Mekong and Ganga River Basins
- Impacts of Plastic Pollution on Freshwater Aquatic, Terrestrial and Avian Migratory Species in the Asia and Pacific Region
- Migratory Species, Marine Debris and its Management
- Marine Debris and Commercial Marine Vessel Best Practice
- Marine Debris: Public Awareness and Education Campaigns

Current science

Baini, M., Martellini, T., Cincinelli, A., Campani, T., Minutoli, R., Panti, C., Finoia, M.G., and Fossi, M.C., (2017). First detection of seven phthalate esters (PAEs) as plastic tracers insuperficial neustonic/planktonic samples and cetacean blubber. Anal. Methods1512–1520.

Battaglia, F. M., Beckingham, B. A., and McFee, W. E. (2020). First report from North America of microplastics in the gastrointestinal tract of stranded bottlenose dolphins (Tursiops truncatus). Marine Pollution Bulletin, 160, 111677.

Barnes, D.K.A., Galgani, F., Thompson, R.C., and Barlaz, M., (2009). Accumulation and fragmentation of plastic debris in global environments. Philos. Trans. R. Soc. B. Sci 364,1985–1998.

Baulch, S., and Perry, C. (2014). Evaluating the impacts of marine debris on cetaceans. Marine pollution bulletin, 80(1-2), 210-221.

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Jacobsen, J. K., Massey, L., and Gulland, F. (2010). Fatal ingestion of floating net debris by two sperm whales (Physeter macrocephalus). Marine Pollution Bulletin, 60(5), 765-767.

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Nelms, S. E., Galloway, T. S., Godley, B. J., Jarvis, D. S., & Lindeque, P. K. (2018). Investigating microplastic trophic transfer in marine top predators. Environmental pollution, 238, 999-1007

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Sanganyado, E., and Liu, W. (2022). Cetacean health: global environmental threats. In Life Below Water (pp. 107-120). Cham: Springer International Publishing.

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Also:

Zudaire, I., Tolotti, M.T., Murua, J., et al. (2020). Testing designs and identify options to mitigate impacts of drifting fads on the ecosystem. Second Interim Report. European Commission. Specific Contract No. 7 EASME/EMFF/2017/1.3.2.6 under Framework Contract No. EASME/EMFF/2016/008. 193 pp.

Chemical pollution

Since the industrial revolution, human activities have introduced over 200,000 synthetic chemicals into the marine environment. Many of these chemicals are strongly persistent and not easily degradable and therefore, have deleterious impacts on various ecosystems and species, including cetaceans. Organisms absorb toxic chemicals through contaminated food, water, and/or air. The gastrointestinal tract concentrates stable and hydrophobic (low affinity to water) chemicals and when stored in fatty body tissues, they bioaccumulate inside the organism.

Marine mammals accumulate high levels of toxic POPs (persistent organic pollutants) and trace elements in their tissues (blubber, liver, hair) because of their unique biological

and ecological features. They have extensive fat stores in which lipophilic contaminants (easily dissolved in fat) accumulate, are at the top (or close to the top) of marine food webs, are homeothermic (warm-blooded) animals, eating large quantities of food containing pollutants and have a long lifespan. Together, these factors mean that pollutants accumulate in these animals over time.

A well-studied case of contamination effects comes from the St. Lawrence River Estuary beluga whale (*Delphinapterus leucas*, App II) population, Canada. The St. Lawrence River Estuary receives water from one of the world's most industrialized regions. The belugas are heavily contaminated by trace elements, PCB (Polychlorinated biphenyls), DDT (Dichlorodiphenyltrichloroethane) and PAHs (polycyclic aromatic hydrocarbons). Exposure to highly toxic discharges from local aluminium smelters led to elevated contaminant levels in the tissue of the belugas and had toxicological effects. From studies conducted between 1983 and 2006, 16 percent of the 175 stranded animals had at least one terminal cancerous tumour. Some of the cancer types found in belugas are related to the presence of PAHs, suggesting that these compounds may trigger cancer-causing cell mutations in the St. Lawrence River Estuary belugas. Other studies have measured high levels of mercury (Hg) and a recent report predicted that the global orca (*Orcinus orca,* App II) population may collapse due to PCB pollution, while other research highlights the severe impact of Polybrominated diphenyl ethers (PBDEs) on orca populations.

Chemical pollutants can have direct and indirect effects at multiple levels; cellular, tissue, individual and population. Some contaminants, particularly organochlorines, cause immunosuppression, and a subsequent increase in vulnerability to infectious disease, reproductive impairment, and developmental abnormalities. Some compounds may have mutagenic (causing a mutation), genotoxic (damaging to DNA) cancerogenic (cancer-causing substance or agent) and even teratogenic (causing congenital disorders in a developing embryo or fetus) impacts that can directly affect cetaceans or, indirectly, their prey and their predators. Subsequently, any risk analysis that relates to cetaceans should always include the assessment of contaminants in their environment, as well as considering other activities likely to impact them, so that cumulative and synergistic effects can be evaluated.

Current Resolutions in force

- Resolution 07.03: Oil Pollution and Migratory Species
  A summary of this Resolution appears in Annex 1.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to chamical pollution are that:

1. Parties should:
   1a. recognize the cumulative and synergistic effects of multiple stressors;
   1b. include the impact of chemical pollution on cetacean health in risk analyses; and
   1c. include in their risk assessments consideration of all marine-based activities likely to affect cetaceans.
2. Scientific Council should:
   2a. work with the CoP-Appointed councillor for Marine Pollution to develop a report about incidences of chemical pollution on CMS listed cetaceans, and make recommendations to Parties; and
   2b. work with the Aquatic Wild Meat Working Group to develop a report on the impact of chemical pollution in cetaceans on human health, and make recommendations to Parties.

Key resources

Current science

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Marine noise

The ocean environment is filled with natural sound from animals and physical processes. Species living in this environment are adapted to these sounds, however, over the past century, many anthropogenic marine activities have vastly increased marine noise,ing, degrading the marine environment. Anthropogenic noise has the potential to cause physical, physiological and behavioural impacts on marine mammals, reptiles, fish, and invertebrates. Cetaceans are particularly sensitive to sound.

Levels of anthropogenic marine noise have doubled in some areas of the world, every decade, for the past 60 years. Marine wildlife relies on sound for vital life functions, including communication, prey and predator detection, orientation and for sensing surroundings. Animals exposed to anthropogenic noise can suffer direct injury and temporary or permanent auditory impairment. Noise can mask important natural sounds, such as the call of a mate, or the sound made by prey or a predator and can displace animals

from important habitats.

The sources of anthropogenic noise are diverse and include military and civil high-powered sonar, shipping, geophysical surveys, pile driving, aggregate extraction, construction works, offshore oil and gas platforms, playback and sound exposure experiments, acoustic deterrent devices (pingers), acoustic data transmission, and wind, tidal and wave turbines. These activities are usually divided into 'non-impulsive' (or continuous) noise—the constant drone caused, for example, by shipping or oil and gas installations—and 'impulsive' noise—intense, short pulses, repeated over a period of time (e.g., airguns from seismic surveys, military sonar, pile driving, and explosions).

Behavioural responses can include reduction in both occurrence and efficiency, or even cessation, of foraging behaviour. Masking, or the obscuring of communication and other biologically important acoustic signals, can limit mating, threatening the health of the population. Spatial displacement can cause the loss of access to important habitat, such as prime feeding grounds, forcing individuals to exploit suboptimal foraging areas. This effect is especially concerning if foraging behaviour is seasonal. Similarly, displacement can reduce breeding opportunities if it occurs during the mating season. Therefore, foraging habitat and breeding seasons or areas are particularly sensitive components to noise impact.

The occurrence of upwelling and eddies, often associated with oceanographic fronts or seafloor topographic structures (canyons and seamounts), are known to favour ecosystem richness and consequently, cetacean occurrence. Therefore, areas where such phenomena are known to occur should be taken into special consideration when assessing impact to offshore odontocetes, even if limited knowledge of cetacean occurrence is available. Appropriate scheduling of noise-generating activities at periods with the lowest presence of cetaceans should be prioritised. Feeding can be concentrated within habitat specific features such as river mouths or canyons. These spatial particularities of habitat should also be considered and their disturbance minimised.

CMS is currently focusing on reducing noise at source, by using quieting technologies or operational measures, such as slowing shipping speed, protecting still quiet areas as acoustic refuges, and managing noise within marine protected areas (MPAs).

Current CMS Resolutions in force

- Resolution 07.05 (Rev. COP12): Wind Turbines and Migratory Species
- Resolution 11.27 (Rev.COP13): Renewable Energy and Migratory Species
- Resolution 12.14: Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species (+Annex) and the 'CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities'
  A summary of these Resolutions appear in Annex 2.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to marine noise are that:

1. Parties should:
   a) transparently conduct Environmental Impact Assessments for all marine noise-generating activities that overlap with CMS-listed cetaceans, taking particular care to investigate impacts within key habitat areas such as MPAs and IMMAs, or relevant national-level areas, identified for species known to be vulnerable to noise, by applying the CMS Noise Environmental Impact Assessment Guidelines;
   b) ensure that measures to avoid, reduce and mitigate underwater noise pollution is part of marine spatial planning procedures;
   c) promote the usage of technologies and apply practises with the least acoustic impact;
   d) avoid or minimise the effects of introducing potentially harmful impulsive noise, such as noise produced by airguns, sparkers, active sonars, within areas of

importance for cetaceans, such as MPAs and IMMAs or relevant national-level areas;

e) promote the application of vessel speed reductions (e.g., slow steaming) within the IMO as an operational measure that results into multi-environmental benefits, including the reduction of underwater noise and greenhouse gases emissions, as well as of the risk of ships strikes; and

f) within the framework of the development and implementation of the future BBNJ instrument, support the development robust, modern and uniform Environmental Impact Assessments provisions, including Annex I and II marine species, for all marine noise-generating activities with potential impacts in areas within and beyond national jurisdictions.

2. Scientific Council should:
   a) undertake a review of loud noise sources in the marine environment, to include suggestions for mitigation, and make recommendations to Parties.
3. Secretariat should:
   a) seek to work with the secretariats of other appropriate international conventions on the alleviation of marine noise pollution.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities
- Technical support to the CMS family guidelines on environmental impact assessment for marine noise-generating activities

Examples of IMMAs where the marine noise threat could be significantly affecting cetaceans

- Marlborough Sounds and Cook Strait IMMA (Australia, New Zealand and Southeast Indian Ocean)
- Main Hawaiian Archipelago IMMA (Pacific Islands)
- Hellenic Trench IMMA (Mediterranean)
- Western Ligurian Sea and Genoa Canyon IMMA (Mediterranean)

Current science

André, M., Solé, M., Lenoir, M., Durfort, M., Quero, C., Mas, A., Lombarte, A., Van Der Schaar, M., López-Bejar, M., Morell, M. and Zaugg, S., (2011). Low-frequency sounds induce acoustic trauma in cephalopods. Frontiers in Ecology and the Environment, 9(9), 489-493.

Chou, E., Southall, B. L., Robards, M., and Rosenbaum, H. C. (2021). International policy, recommendations, actions and mitigation efforts of anthropogenic underwater noise. Ocean & Coastal Management, 202, 105427.

Ellison, W. T., Southall, B. L., Clark, C. W., and Frankel, A. S. (2012). A new context-based approach to assess marine mammal behavioral responses to anthropogenic sounds. Conservation Biology, 26(1), 21-28.

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Moore, S. E., Reeves, R. R., Southall, B. L., Ragen, T. J., Suydam, R. S., and Clark, C. W. (2012). A new framework for assessing the effects of anthropogenic sound on marine mammals in a rapidly changing Arctic. BioScience, 62(3), 289-295.

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Prideaux, G. (2016). Technical Support to the CMS family guidelines on environmental impact assessment for marine noise-generating activities. Convention on Migratory Species, Bonn, Germany.

Simmonds, M. P., Dolman, S. J., Jasny, M., Parsons, E. C. M., Weilgart, L., Wright, A. J., and Leaper, R. (2014). Marine noise pollution-increasing recognition but need for more practical action.

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Southall, B.L., Nowacek, D.P., Bowles, A.E., Senigaglia, V., Bejder, L., and Tyack, P.L. (2021). Marine

mammal noise exposure criteria: assessing the severity of marine mammal behavioral responses to human noise. Aquatic Mammals 47(5):421-464.

Also:

European Maritime Transport Environmental Report 2021 (European Maritime Safety Agency, EMSA and European Environment Agency, EEA, September 2021).

Weilgart, L., (2023). Best Available Technology (BAT) and Best Environmental Practise (BET) for Mitigating Three Noise Sources: Shipping, Seismic Airgun Surveys, and Pile Driving, CMS Report, in press

Vessel strikes

The number of reported cetacean vessel strikes has increased in recent decades and is expected to continue to do so given the current upward trend in shipping intensity, vessel speed and engine power.

Although long considered anecdotal, vessel strikes are now recognized as a major threat to cetaceans. Any vessel type may be involved, including tankers, cargo or cruise ships, ferry boats, whale watching vessels, and sailing vessels. Most scientific publications on this topic have focused on the collisions between large vessels and large whales. However, a review found that at least 75 marine species are affected, including smaller whales, dolphins, porpoises, dugongs, manatees, sharks (mostly whale sharks), seals, sea otters, sea turtles, penguins, and fish.

Several hotspots have been identified across the world where vessel strikes seriously threaten the conservation status of whale populations—northern right whales (*Eubalaena glacialis*, App I) in the Western North Atlantic, blue whale (*Balaenoptera musculus,* App I) around Sri Lanka and fin (*Balaenoptera physalus*, App I and II) and sperm whale (Physeter macrocephalus, App I and II) in the Mediterranean Sea. Humpback whales (*Megaptera novaeangliae*, App I) are also frequently struck in various regions of the Pacific Ocean.

The only demonstrably effective actions are vessel speed limits and keeping ships and whales apart, which are often difficult to implement. Worldwide, it is recognized that a maximum vessel speed of 10 knots significantly limits the risk of fatal strikes between ships and cetaceans.

The IMO developed guidelines for reducing the risk of ship strikes with cetaceans in 2009. The IWC hosts a database on collisions with large whales and has developed a Strategic Plan to Mitigate the Impacts of Ship Strikes to assess and share solutions, with the aim of permanently reducing vessel strikes. The CMS daughter agreements, ACCOBAMS and ASCOBANS, already work closely with IWC on this issue.

CMS could usefully advocate for either avoidance of key habitats (spatial closures) or the establishment of mandatory vessel speed restrictions within key habitats, supporting IMOs measures including the designation of Particularly Sensitive Sea Areas (PSSA) with effective Associated Protective Measures or Traffic Separation Schemes (TSS) which keep ships away from important whale habitat, protecting large whales while importantly creating a level playing field for all shipping companies.

Additionally, there is now an established correlation between vessel speed and its greenhouse gas emission and level of underwater noise plus the risk of cetacean strike. Thus, all of these issues can be mitigated by reducing ship speeds and this should be recognized in future conservation work.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to vessel strikes are that:

1. Parties should:
    a) give due attention to the effects of vessel strikes on cetacean populations and review/implement speed reductions as a necessary mitigation measure;
    b) engage within the IMO by promoting solutions through the modification of ship

lanes by e.g., IMO approved routing measures, and/or the adoption of speed limits in areas and seasons where cetaceans are known to aggregate in densities likely to increase the risk of collisions, and encourage the shipping sector likewise; and

c) explore the opportunity of involving the concerned nations in supporting the declaration by the IMO of PSSAs in areas of special importance for cetaceans potentially affected by high levels of maritime traffic.

2. Scientific Council should
   a) identify areas with high risk of vessel strike for all CMS-listed cetaceans, including by mapping shipping lanes with IMMAs, develop a report about appropriate routing measures, including area avoidance, and/or the establishment of vessel speed restrictions for key cetacean habitats, and make recommendations to Parties.
3. Secretariat should:
   a) approach the IMO to address the convenience of adopting mandatory vessel speed reduction measures that would effectively protect large whales while creating a level playing field for all shipping companies, at least in certain key areas for cetaceans

Resources

Examples of IMMAs where the vessel strike threat could be significantly affecting cetaceans

- Alborán Corridor IMMA (Mediterranean)
- Hellenic Trench IMMA (Mediterranean)
- NW Mediterranean Sea, Slope and Canyon System IMMA (Mediterranean)
- Tīkapa Moana – Te Moanaui-ā-ToiHauraki IMMA (Australia, New Zealand and Southeast Indian Ocean)
- South West to Eastern Sri Lanka IMMA (Northeast Indian Ocean and Southeast Asian Seas)
- Gulf of Panama IMMA (South East Tropical and Temperate Pacific Ocean)

Current science

Cates, K., DeMaster, D.P., Brownell Jr, R.L., Silber, G., Gende, S., Leaper, R., Ritter, F. and Panigada, S., (2017). Strategic Plan to Mitigate the Impacts of Ship Strikes on Cetacean Populations: 2017-2020, IWC Strategic Plan to Mitigate Ship Strikes. Impington: IWC

Frantzis, A., Leaper, R., Alexiadou, P., Prospathopoulos, A., & Lekkas, D. (2019). Shipping routes through core habitat of endangered sperm whales along the Hellenic Trench, Greece: Can we reduce collision risks?. PloS one, 14(2), e0212016.

International Whaling Commission. (2011). Report of the Joint IWC-ACCOBAMS Workshop on Reducing Risk of Collisions between Vessels and Cetaceans. Agenda item 4.1: IWC/63/CC8, Discussed at the 63rd International Meeting Commission.

Laist, D. W., Knowlton, A. R., Mead, J. G., Collet, A. S., and Podesta, M. (2001). Collisions between ships and Whales. Mar. Mammal Sci. 17, 35–75

Leaper, R. (2019). The Role of Slower Vessel Speeds in Reducing Greenhouse Gas Emissions, Underwater Noise and Collision Risk to Whales. Front. Mar. Sci. 6:505

Panigada, S., Pesante, G., Zanardelli, M., Capoulade, F., Gannier, A., & Weinrich, M. T. (2006). Mediterranean fin whales at risk from fatal ship strikes. Marine Pollution Bulletin, 52(10), 1287-1298.

Ransome, N., Loneragan, N.R., Medrano-González, L., Félix, F., and Smith, J.N. (2021). Vessel strikes of large whales in the Eastern Tropical Pacific: a case study of regional underreporting. Frontiers in Marine Science

Redfern, J.V., Moore, T.J., Becker, E.A., Calambokidis, J., Hastings, S.P., Irvine, L.M., Mate, B.R., and Palacios, D.M. (2019). Evaluating stakeholder-derived strategies to reduce the risk of ships striking whales. Diversity and Distributions 2019;1-11.

Ritter, F. (2012). Collisions of sailing vessels with cetaceans worldwide: first insights into a seemingly growing problem. J. Cetacean. Res. Manage. 12, 119–127

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Tort Castro, B., Prieto Gonzalez, R., O'Callaghan, S.A., Dominguez Rein-Loring, P. and Degollada Bastos, E., (2022). Ship Strike Risk for Fin Whales (Balaenoptera physalus) Off the Garraf coast, Northwest Mediterranean

Sea. Frontiers in Marine Science, 9, p.492.
Vanderlaan, A.S.M., and Taggart, C.T. (2006). Vessel collisions with whales: the probability of lethal injury based on vessel speed. Marine Mammal Science 23(1):144-156.

Also:
Designation of a particular sensitive sea area in the North-Western Mediterranean Sea to protect cetaceans from international shipping". Submitted by France, Italy, Monaco and Spain to IMO MEPC, approval in principle at MEPC79

Live captures

There is a growing trade in live small cetaceans for the captive industry and private zoos. While the primary purpose of keeping captive cetaceans is for entertainment or 'edu-tainment', live cetaceans are also used for research and in military operations. The demand for these cetaceans is being driven by a new wave of aquaria and dolphin display facilities, in the Middle East, Asia and the Caribbean. There are increasingly popular programmes that offer physical contact with cetaceans, including the opportunity to feed, pet, and swim with them, and there is a proliferation of facilities that offer 'dolphin assisted therapy' to treat human illness or debility.

A significant number of individuals, from several different species continue to be wild caught for these commercial purposes. Rigorous assessment of source populations is often lacking, and in some instances live capture is adding to the pressure on populations already at risk from hunting, fishery bycatch, habitat degradation, and pollution. Some of the most recent cetacean captures are thought to have impacted populations which may already be critically endangered as a direct result of anthropogenic threats. Many, but not all, of these captures are taking place in countries that are not a Party to CMS.

The Black Sea bottlenose dolphin (*Tursiops truncatus ponticus,* App I and II) is listed on CMS Appendix I and Convention on International Trade in Endangered Species (CITES) Appendix II. The zero quota for trade in wild-caught individuals for commercial purposes remains a threat to the already threatened Black Sea bottlenose dolphin population, despite its protection under the ACCOBAMS agreement. Parties to ACCOBAMS have noted that live removals in the Agreement area have continued, as have trade activities. It is also noted that dolphins in trade are often classified as 'captive-bred' when they are indeed wild-caught individuals. These claims regarding the origin of individuals s hard to verify without proper husbandry records, breeding logs or even a DNA-coding system.

Yangtze finless porpoise (*Neophocaena asiaeorientalis*, App II) are classified by the IUCN as critically endangered. Recent live captures removed individuals from protected natural areas to commercial captive facilities within China. There are also thought to be over 200 belugas (*Delphinapterus leucas,* App II) in captivity in China, the vast majority wild-caught in Russian waters. The largest rate of live captures of small cetaceans is in Japanese waters.

Captive breeding Endangered or Critically Endangered small cetaceans raises a number of concerns about individual animals' welfare, including mental and physical health. Conditions in captivity are unlikely to meet an individual's biological needs, and restricted space, limited social environment, artificial surroundings and behavioural restrictions will contribute to stress and, possibly, premature mortality.

Current CMS Resolutions in force

- Resolution 11.22 (Rev.COP12): Live Capture of Cetaceans from the Wild for Commercial Purposes (+Annex: 'Best Practice Guidelines Relating to the Live Capture of Cetaceans from the Wild for Commercial Purposes')
  A summary of this Resolution appears in Annex 1.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to live captures are that:

1. Parties should:
   a) develop and implement national legislation, as appropriate, prohibiting the live capture of cetaceans from the wild for commercial purposes ;
   b) consider taking stricter measures in line with CITES Article XIV with regard to the import and international transit of live cetaceans for commercial purposes that have been captured in the wild;
2. Scientific Council should:
   a) develop report to quantify the extent of live capture operations on CMS-listed species addressing both the welfare and conservation of targeted individuals, populations and species, and make recommendations to Parties.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- Best Practice Guidelines Relating to the Live Capture of Cetaceans from the Wild for Commercial Purposes

Examples of IMMAs where the live capture threat could be significantly affecting cetaceans

- Main Solomon Islands IMMA (Pacific Islands)

Current science

Clegg, I. L. (2021). What Does the Future Hold for the Public Display of Cetaceans?. Journal of Applied Animal Ethics Research, 3(2), 240-278.

orkeron, P. (2022). Marine Mammal Captivity, an Evolving Issue. Ethology and behavioral ecology of marine mammals: the evolving human factor. Springer Nature, Cham, Switzerland, 193-217.

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Harfoot, M., Glaser, S. A., Tittensor, D. P., Britten, G. L., McLardy, C., Malsch, K., and Burgess, N. D. (2018). Unveiling the patterns and trends in 40 years of global trade in CITES-listed wildlife. Biological Conservation, 223, 47-57.

Lewis, J., Rahman, M., Milne, S., and Galib, A. J. (2016). Current Conservation Issues Affecting Dolphins in the Tropics. Tropical Conservation: Perspectives on Local and Global Priorities, 166.

Lott, R., and Williamson, C. (2017). Cetaceans in captivity. In Marine mammal welfare (pp. 161-181). Springer, Cham.

Reeves, R. R. (2022). Cetacean Conservation and Management Strategies. Ethology and behavioral ecology of marine mammals: the evolving human factor. Springer Nature, Cham Switzerland, 1-29.

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Weir, C. R., and Pierce, G. J. (2013). A review of the human activities impacting cetaceans in the eastern tropical Atlantic. Mammal Review, 43(4), 258-274.

Also:

Van Waerebeek, K., Ofori-Danson, P. K., Debrah, J., Collins, T., Djiba, A., and Samba Ould Bilal, A. (2016). On the status of the common bottlenose dolphin Tursiops truncatus in western Africa, with emphasis on fisheries interactions, 1947-2015. Document SC/66b/SM19 presented to the Scientific Committee of the International Whaling Commission, Bled, Slovenia.

Disturbance and harassment

Wildlife watching activities in coastal and marine environments are growing fast, and the management of boat-based wildlife watching presents additional challenges to those in the terrestrial environment.

Human interactions with wildlife can have both lethal (consumptive) and non-lethal (non-consumptive) effects on populations. Traditionally, it has been assumed that non-lethal impacts will have minor effects on population viability. H. However, a growing number of

studies have shown that non-lethal effects can have similar, or even larger, influence on populations than direct mortality.

Disturbance caused by excessive exposure to wildlife watching boats may lead to changes in the target species' behaviour and as a result, to negative consequences, such as emigration, reduced feeding and in some cases on reproduction, or reductions of the population.

Recreational in-water interaction with aquatic mammals, a fast-growing tourism and recreational activity, may cause disturbance in many different situations and habitats, with potentially serious conservation consequences. Aquatic mammal species, including cetaceans, can be sensitive to the disturbances and harassment caused by in-water interactions. These interactions which usually involve transport by motorized boats carry a risk of direct physical impacts, that can lead to injuries and even death, and put not only the animals at risk, but can also compromise the safety of human participants.

The global growth of the in-water interaction phenomenon has outpaced the conduct of sufficiently long-term research studies and the development of appropriate site-specific risk assessments and management guidelines. In many cases, effects may only be detected once they have already reached biologically significant levels, hence can only provide information to decision-makers when the impact has already manifested.

Current CMS Resolutions in force

- Resolution 11.29 (Rev.COP12): Sustainable Boat-based Marine Wildlife Watching (+Annex: 'Species-specific Guidelines for Boat-based Wildlife Watching')
- Resolution 12.16: Recreational In-Water Interaction with Aquatic Mammals
- Resolution 12.23: Sustainable Tourism and Migratory Species
  A summary of these Resolutions appear in Annex 2.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to disturbance and harassment are that:

1. Parties should:
   a) adopt appropriate measures, such as national guidelines, codes of conduct, and if possible, national legislation with binding regulations or other regulatory tools such as permit systems to control the size of the boat-based wildlife watching fleet and to address the consequences of, and carefully regulate, all boat-based and in-water activities that interact with cetaceans; and
   b) ensure that these activities do not have negative effects on the long-term survival of populations and habitats and have minimal impact on the behaviour of the exposed animals, especially where vessel-based and in-water activities occur concurrently, to ensure the safety of marine wildlife and human participants.
2. Scientific Council should:
   a) develop a report to assess the long-term effects and biological significance of disturbances from boat-based and in-water interactions for all CMS-listed cetaceans, and make recommendations to Parties; and
   b) propose where no in water and limited boat-based tourism (from an increased distance) should be implemented for endangered species and populations, and make recommendations to Parties.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- Species-specific Guidelines for Boat-Based Wildlife Watching
- IWC/CMS Online Whale Watching Handbook
- ACCOBAMS Guidelines for Potential adverse impact of WW activities on individuals or cetacean populations

Examples of IMMAs where the harassment threat could be significantly affecting cetaceans

- North West Mediterranean Sea, Slope and Canyon System IMMA (Mediterranean)
- Main Hawaiian Archipelago IMMA (Pacific Islands)
- Pacific Coast of Baja California Peninsula IMMA (South East Tropical and Temperate Pacific Ocean)
- Galápagos Archipelago IMMA (South East Tropical and Temperate Pacific Ocean)
- Menai Bay IMMA (Western Indian Ocean and Arabian Seas)

Current science

Christiansen, F., and Lusseau, D. (2014). Understanding the ecological effects of whale-watching on cetaceans. Whale-watching, sustainable tourism and ecological management. Cambridge University Press, Cambridge, UK, 177-192.

Currie, J. J., McCordic, J. A., Olson, G. L., Machernis, A. F., and Stack, S. H. (2021). The impact of vessels on humpback whale behavior: the benefit of added whale watching guidelines. Frontiers in Marine Science, 8, 601433.

Hoarau, L., Dalleau, M., Delaspre, S., Barra, T., and Landes, A. E. (2020). Assessing and mitigating humpback whale (Megaptera novaeangliae) disturbance of whale-watching activities in Reunion Island. Tourism in Marine Environments, 15(3-4), 173-189.

Parsons, E. C. M. (2012). The negative impacts of whale-watching. Journal of Marine Biology, 2012.

Sprogis, K. R., Bejder, L., Hanf, D., & Christiansen, F. (2020). Behavioural responses of migrating humpback whales to swim-with-whale activities in the Ningaloo Marine Park, Western Australia. Journal of Experimental Marine Biology and Ecology, 522, 151254.

Pagel, C. D. (2021). The relevance of skilled in-water guides in swim-with wildlife tours. Tourism in Marine Environments, 16(4), 195-204.

Also:

Fiori, L., Martinez, E., Orams, M. B., & Bollard, B. (2019). Assessing the effects of humpback whale-based tourism in Vava'u, Kingdom of Tonga: Behavioral responses of whales to vessels and in-water tourism activities. Unpublished work.

Disease

The overall health of an individual animal is the result of complex interactions mediated by the physiology of the animal and its interactions with its environment, including exposure to novel and other pathogens and pollutants. Cetaceans host diverse groups of pathogenic microorganisms such as bacteria and viruses and a wide variety of parasites. The main transmission routes for pathogens are dietary intake, dermal entry via skin injuries, and inhalation.

Viruses belonging to nine families have been detected in cetaceans. *Morbilliviruses, papillomaviruses, Toxoplasma gondii, and Brucella sp*. have been linked to mass mortalities, reduced reproduction, and increased virulence of other diseases. Severe cases of *lobomycosis* and *lobomycosis*-like disease may have contributed to mortality in some instances.

Cetacean *morbillivirus* (family *Paramyxoviridae*) induces a serious disease with a high mortality rate and persists in several populations. It may have long-term effects on the dynamics of cetacean populations either as enzootic infection or recurrent epizootic. The latter presumably has the more profound impact due to removal of sexually mature individuals.

Poxviridae infect several species of odontocetes, resulting in ring and tattoo skin lesions.

Although poxviruses apparently do not induce significant mortality, circumstantial evidence suggests these viruses may be lethal in young animals that lack comprehensive immunity.

Papillomaviruses cause genital warts in at least 3 species of cetaceans. In 10 percent of male Burmeister's porpoises (*Phocoena spinipinnis*, App II) from Peru, lesions were sufficiently severe to at least hamper, if not impede, copulation.

The indirect effects of climate change on animal health in regions such as the Arctic may include changes in pathogen transmission (for example when populations that did not previously meet come into contact with each other) and impact body condition due to changes in prey, toxicant exposures and other anthropogenic-stressors.

Inshore and estuarine cetaceans incur a higher risk of disease than pelagic cetaceans as these habitats are often severely degraded by anthropogenic factors, such as chemical and biological contamination.

Most research investigating the human health impacts of consuming wildlife deal with terrestrial wild meat, but some apply to aquatic wild meat. Health risks associated with wild meat consumption are context-specific, and include zoonotic pathogens and excessive consumption of heavy metals and pollutants.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to disease are that:

1. Parties should:
   a) prepare for and investigate mortality events in marine mammal populations and use standard protocols as identified by expert bodies; and
   b) support functional and fully funded stranding networks in their countries to respond to stranding events and obtain standardised and harmonised data which can be used for conservation purposes.
2. Scientific Council should:
   a) give consideration to the identification of standard protocols that may be used to investigate disease-driven and other mortality events, and advocate for a global database to record such incidences, and make recommendations to Parties.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- ASCOBANS Best Practice on Cetacean Post-mortem Investigation and Tissue Sampling
- ACCOBAMS Guidelines for a coordinated cetacean stranding response during mortality events caused by infectious agents and harmful algal blooms

Examples of IMMAs where the disease threat could be significantly affecting cetaceans

- Gulf of Ambracia IMMA (Mediterranean)
- Western Black Sea IMMA (Black Sea, Turkish Straits System, and Caspian Sea)

Current science

Ingram, D.J., Prideaux, M., Hodgins, N.K., Frisch-Nwakanma, H., Avila, I.C., Collins, T., Cosentino, M., Keith-Diagne, L.W., Marsh, H., Shirley, M.H. and Van Waerebeek, K., (2022). Widespread use of migratory megafauna for aquatic wild meat in the tropics and subtropics. Frontiers in Marine Science, 112.

Simmonds, M. P., and Eliott, W. J. (2009). Climate change and cetaceans: concerns and recent developments. Journal of the Marine biological Association of the United Kingdom, 89(1), 203-210.

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Van Bressem, M.F., Raga, J.A., Di Guardo, G., Jepson, P.D., Duignan, P.J., Siebert, U., Barrett, T., de Oliveira Santos, M.C., Moreno, I.B., Siciliano, S. and Aguilar, A., (2009). Emerging infectious diseases in cetaceans

worldwide and the possible role of environmental stressors. Diseases of aquatic organisms, 86(2), 143-157.

Emergent issues for cetaceans

Deep-sea mining

Deep-sea mining is focused on three resources found in different settings with distinct ecosystems—polymetallic nodules (also known as manganese nodules) on the abyssal seafloor, cobalt-rich ferromanganese crusts and polymetallic sulphides (also known as seafloor massive sulphides).). For all types of deep-sea mining, the projected intensities and methodologies, as well as spatial scales, would cause significant environmental impacts, such as direct removal and destruction of seafloor habitats along with their unique fauna. Sediment plumes created from seafloor disturbance and the return of sediment-laden wastewater extend the impacts of deep-sea mining horizontally and vertically for tens to hundreds of kilometres. Additionally, there will be contaminant release, changes to water properties, and increases in noise, light and ship traffic. Further, scientific misconceptions and a lack of baseline and applied scientific knowledge may lead to miscalculations of the environmental impacts of these activities, underestimating mining footprints and the impact on the dynamics of ocean ecosystems.

Cetaceans are known to inhabit all regions where mining is proposed and impacts are highly likely. All inhabiting species are at risk but a number of Appendix I and II deep diving cetacean species given their deep-water and mid-water foraging activities, physical seafloor interactions and sensitivity to noise, are likely to be particularly at risk. CMS should recommend that the transition to the exploitation of mineral resources be paused until sufficient and robust scientific information has been obtained to make informed decisions as to whether deep-sea mining can be undertaken without significant damage to the marine environment and migratory species, and if so, under what conditions. Additionally, CMS should develop an advisory position about the necessity to include Appendix I and II species in all EIAs prior to approvals for deep-sea exploitation of minerals being given.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to deep-sea mining are that:

1. Parties should:
   a) support investigations, pause transition to exploitation, prioritise research to investigate impacts of deep-sea mining.
2. Scientific Council should:
   a) develop report on state of knowledge, identify gaps that need to be addressed before exploitation should be considered, including the need for robust scientific information to be obtained to support informed decisions as to whether deep-sea mining can be undertaken without significant damage to the marine environment and migratory species, and make recommendations to Parties; and
   b) develop a report about the necessity to include deep-water Appendix I and II species in all Environmental Impact Assessments prior to granting deep-water mining approvals, and make recommendations to Parties.

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Out of habitat cetaceans and climate migrants

Dispersal over wide areas, particularly in the juvenile phase of the life history of a species, is a natural part of its biology as it creates opportunities to explore new environments in a changing world. However, if those changes occur unnaturally rapidly, that species may not be able to respond quickly enough to adapt, and populations risk local extirpation or even species extinction may follow. Those with restricted habitat or that are highly sedentary are particularly vulnerable to human pressures and climate change. Examples are the Yangtze River or Baiji dolphin (*Lipotes vexillifer*, not listed), now presumed extinct, the vaquita (*Phocoena sinus*, not listed) perilously close to extinction, and the North Atlantic right whale (*Eubalaena glacialis*, App I), which has shifted its range bringing it into growing conflict with shipping and fisheries through vessel strike and incidental entanglement respectively.

A great deal of recent climate changed-focused research has been dedicated to the limited ability of many species to respond to the current and future effects of climate change. Marine predators and in particular cetaceans have also been recognized as important 'ecosystem and/or climate sentinels'. We now also better understand how climate change can directly impact the foraging opportunities of cetaceans, leads to habitat loss, and may force cetaceans to move to other feeding grounds. The rise in ocean temperature, associated changes in currents, decrease in prey availability and degradation and loss of core habitat can all have severe consequences for cetacean survival, particularly, as noted, those populations and species that are already threatened or possess a limited habitat range with no ability to move away from unfavourable changes. Marine predators moving into novel areas where they have not held a historical role have the potential to significantly impact these ecological communities. This impact can be exacerbated by the ecological community itself experiencing other changing climate dynamics. Appendix I and II listed marine mammals are potentially moving because either they must or because they are presented with novel opportunities they are biologically adapted to explore.

Climate change related impacts are also likely to be largely responsible for observed shifts in population distributions and the increasing number of marine mammals seen

outside what is thought of as their typical or normal range. Such individuals include bowhead whale (*Balaena mysticetus,* App I), narwhals (*Monodon monoceros*, App II), and beluga whales (*Delphinapterus leucas*, App II), which have all been recently found far from the Arctic waters where they usually live. Finding such cetaceans in unusual circumstances may bring them into novel conflict with human activities and lead to calls for action to remove or repatriate them. The term 'Out of Habitat' has been used to describe such individuals, and even single large or small cetaceans far from their normal habitat (or at least interpreted as such), can present significant challenges to national authorities in terms of their management and welfare. This can include urgent and compelling calls from the public to address their situation.

Human pressures tend to be concentrated at mid- to high latitudes, where industrialization is greatest. When warm water species are increasingly observed beyond tropical and subtropical regions, they too become increasingly exposed to these pressures. Similarly, those species whose ranges typically encompass polar regions may find themselves unable to respond to climate warming as their favoured habitat and associated prey on which they depend become increasingly threatened. In their attempts to escape unfavourable conditions, they may range into mid-latitudes and in their attempts to locate familiar habitat or adequate prey, end up getting into difficulties. The full implications remain to be determined, but these distributional changes and the growing phenomenon of Out of Habitat cetaceans need to be carefully monitored and consideration given as to how to best respond to them.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our recommendations related to out of habitat cetaceans and climate migrants are that:

1. Scientific Council should:
    a) develop a report about the monitoring, welfare, and conservation of climate migrants and Out of Habitat Cetaceans, provide advice on appropriate responses to them, and make recommendations to Parties.

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Encompassing all CMS-listed aquatic mammals

The first Global Programme of Work for Cetaceans contained a task to expand this work to include all CMS-listed aquatic mammals.

While critical, this has not been completed for this Review because the skill set and knowledge would need to involve a wider set of authors, but it remains vital and should be a priority early in the next triennium. The species include:

- Amazonian Manatee (*Trichechus inunguis*), App II, currently listed on the Red List index as **Vulnerable**;
- Caspian Seal (*Pusa caspica*), App I and II, currently listed on the Red List index as **Endangered**;
- Common Seal (*Phoca vitulina*), App II, currently listed on the Red List index as Least Concern;
- Dugong (*Dugong dugon*), App II, currently listed on the Red List index as **Vulnerable**;
- Grey Seal (*Halichoerus grypus*), App II, currently listed on the Red List index as Least Concern;
- Manatee (*Trichechus manatus*), App I and II, currently listed on the Red List index as **Vulnerable**;
- Marine Otter (*Lontra felina*), App I, currently listed on the Red List index as **Endangered**;
- Mediterranean Monk Seal (*Monachus monachus*), App I and II, currently listed on the Red List index as **Endangered**;
- Polar Bear (*Ursus maritimus*), App II, currently listed on the Red List index as **Vulnerable**;
- South American Fur Seal (*Arctocephalus australis*), App II, currently listed on the Red List index as Least Concern;
- South American Sea Lion (*Otaria flavescens*), App II, currently listed on the Red List index as Least Concern;
- Southern River Otter (*Lontra provocax*), App I, currently listed on the Red List index as **Endangered**;
- West African Manatee (*Trichechus senegalensis)*, App I and II, currently listed on the Red List index as **Vulnerable**.

At a minimum the Vulnerable and Endangered species not currently on Appendix I should be proposed for inclusion on Appendix I as a matter of priority. Programmes of work should also be developed for Sireneans, Pinnipeds, and Lontra, and a shared programme of work for

Polar Bear (*Ursus maritimus,* App II) between CMS and the Arctic Council (Conservation of Arctic Flora and Fauna) and the Polar Bear Agreement.

Recommendations

Based on our understanding of the extent of this issue faced by other CMS-listed aqautic mammals, our recommendations are that:

2. Parties should:
   a) list the following species on Appendix I:
      - Amazonian Manatee (*Trichechus inunguis*)
      - Caspian Seal (*Pusa caspica*)
      - Dugong (*Dugong dugon*)
      - Polar Bear (*Ursus maritimus*)
3. Scientific Council should:
   a) develop draft three new programmes of work for Sirenians, Pinnipeds, and Lontra, and make recommendations to Parties.
4. Secretariat should:
   a) to begin the development of a shared programme of work for Polar Bear (*Ursus maritimus*) between CMS and the Arctic Council (Conservation of Arctic Flora and Fauna) and the Polar Bear Agreement.

Beyond habitat degradation: realigning conservation

Traditionally this subsection would be titled habitat degradation and the text following would catalogue the heavily impacted areas of the world where cetacean populations are struggling to survive. Yet, we face unprecedented times and the previous subsections have all already outlined the true state of cetacean habitat.

Fishing, vessel traffic, hunting, ocean acidification, marine pollution, the breakdown of ecological networks, military exercises and, most sadly, even active combats are all taking place within key cetacean habitats. Environmental changes, including climate disruption, are altering ecosystems and availability of prey. Some cetaceans have responded to these changes by shifting their feeding, breeding, and migratory behaviours and ranges, sometimes at a cost to their energy budgets. In some regions, environmental changes have left cetaceans susceptible to infectious diseases.

The previous subsections have also catalogued the existing CMS Resolutions containing commitments, that if implemented, would dramatically reverse this situation.

The current level of fragmented and convenient conservation attention is not enough. By focusing conservation action on the trigger of CMS Appendix or Red listing, and not taking obvious precautionary steps, we are always playing catch-up. It is time to shift conservation efforts towards behaviour, based on a simple moral value—having the least possible impact on Earth's biota. Inherent in this is a recognition that all of life needs to be appreciated, honoured and protected. Better stewardship is not just a moral force, it is a practical one as well. Humans, like other species, need the oceans to be healthier.

The moral knowledge that calls for this step already sits behind almost every decision made in international conservation fora, yet a sense of failure is hard to avoid once humankind genuinely opens our eyes to the dismal status of species and populations, including cetaceans, and their downhill trajectories during the past few decades. Of a total 130 extant species, the status of almost one third of marine mammals (38 species) is assessed in a threatened category ('Critically Endangered', 'Endangered' or 'Vulnerable') in IUCN's Red List of Threatened Species. With 10 percent of the total still listed as 'Data Deficient' the number of threatened species might be much higher.

The most acute examples include species especially affected by human presence because

they inhabit riverine, estuarine, or coastal ecosystems. Cetaceans endemic to large rivers are subjected to extreme levels of human encroachment with dire effects on their conservation status, and are likely to be among the first cetacean species that will disappear from Earth, following the fate of the Yangtze River dolphin (*Lipotes vexillifer*, not listed), which is believed to be extinct. The Yangtze River porpoise (*Neophocaena asiaeorientalis*, App II) is also reaching critically endangered status, as are subpopulations of the Irrawaddy dolphin (*Orcaella brevirostris*, App I and II), Ganges River dolphin (*Platanista gangetica,* App I and II), Indus River dolphin (*Platanista minor*, not listed)[1], Amazon River dolphin (*Inia geoffrensis,* App II) and the tucuxi (*Sotalia fluviatilis*, App II).

Many other cetaceans confined to marine coastal habitats are faring just as poorly as their riverine equivalents. Despite huge efforts invested by conservation communities, only a handful of individuals of the critically endangered vaquita (*Phocoena sinus*, not listed) survive. Other coastal odontocetes teetering on the cliff's edge include the Atlantic humpback dolphin (*Sousa teuszii*, App I and II), Maui dolphin (*Cephalorhynchus hectori maui*, not listed), Taiwanese humpback dolphin (*Sousa chinensis taiwanensis*, App II), the harbour porpoise (*Phocoena phocoena*, App II) in the Baltic and the narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*, App II). These riverine and coastal species are not the only ones threatened with extinction, however. Northern Hemisphere right whales— the North Atlantic right whale (*Eubalaena glacialis,* App I) and the North Pacific right whale (*Eubalaena japonica,* App I)—and probably also the recently described Rice's whale (*Balaenoptera ricei*, not listed) are all struggling in increasingly hostile habitats to recover from the effects of whaling which ceased decades ago.

It is understood that species with narrower niches are often more vulnerable to disturbances. This is especially of concern when species and populations face prey depletion. When food webs are 'fished down', top predators are often the first to be affected—either because fisheries target them directly or take them as bycatch, or because overfishing depletes their prey resources. In such situations, there may be little evidence of an impact on predators, such as debilitated, wounded, or dead cetaceans, but science is clear in its message that foraging in impoverished areas requires more time and effort, leading to less successful reproduction and poorer recruitment if the cetaceans are not willing or able to move away. If the cetaceans do shift their ranges, they likely face risks and challenges associated with relocating into distant and unfamiliar areas, including the need to compete with the populations that already reside there. They may also trigger impacts on the ecosystems of the habitats they relocate to.

All of these factors are in play for each of the other CMS-listed aquatic mammals, all of whom are equally deserving of similar attention.

There is a moral road that we all know is right. Morally, it is not good enough that animals survive; they need to have healthy environments and day-to-day ways of living free of harassment and threat, so that individuals and populations can flourish.

> '*What is the point of marine mammals reaching a status where their population is maintained, if survival means for them needing to constantly struggle to avoid drowning in a net, being chopped up by the propeller of a vessel, being deafened by air guns, pile-driving or military sonar, or sickened for having ingested toxic chemicals or microplastics? Conservation efforts should strive not just to allow cetacean populations to survive but to flourish in an environment where marine food webs are revived, and ocean health and richness are restored as much as possible to pre-industrial times.*' (Notarbartolo di Sciara and Würsig, 2022)

To allow only the most opportunistic and resilient species to persist, often by merely attempting to mitigate direct mortality (e.g. from bycatch in fishing gear or from vessel strikes in busy shipping lanes), should not pass for actual cetacean conservation. Conservation can only be considered successful when each species has a thriving, healthy ecologically connected habitat and is free from all anthropogenic harm.

Across the world the conservation community (government and nongovernment) is,

collectively, a long way from the goal of successful conservation, and we risk being blinded by continuing to look at conservation in silos of information. CMS has knowledge that habitat destruction and fragmentation are among the primary threats to migratory species, and that the identification and conservation of habitats of appropriate quality, extent, distribution and connectivity are of paramount importance for the conservation of CMS-listed species. But it is telling that nowhere in the CMS archives is there an assessment of habitat viability for each of the CMS-listed cetaceans, nor for the other CMS-listed aquatic mammals. Crucial information is scattered across documents, issue-specific resolutions, and listing proposals in the archives, but there is no definitive assessment of the habitat state for each of these species or populations. This oversight needs urgent attention. Efforts to conserve cetaceans should not stop at halting their decline from a single threat or issue, or to simply accept their status quo. Instead, there is urgent need to restore populations and habitats toward presumed pristine conditions, and toward the full recovery of the animals' former numbers and ranges.

We recognize that this full recovery also means an embrace of new solutions and new ways of conceiving our work. Substantial increases in the pace, scale, and effectiveness of conservation action will be required to abate the ongoing loss of global biodiversity and simultaneous ecological degradation. Extreme climatic events are increasing in frequency and magnitude, and rates of ocean acidification are climbing, with severe consequences for both nature and human societies. Clearly, we need to adapt ecological management and nature conservation actions to actively accommodate the scale of environmental change now beyond our control. This means a dramatic rework of the ways we approach conservation, and expanding our boundaries of what is considered key guidance to also include local, traditional and indigenous knowledge.

Both the strengthening of First Nations-led governance and respecting the continuity of coastal local, traditional and indigenous cultures and knowledge—thousands of years of observation and culturally transmitted learning, and the complex conservation strategies in order to better steward marine resources—is wholly in line with established international obligations such as the those of the Convention on Biological Diversity and the United Nations Declaration on the Rights of Indigenous Peoples. Local, traditional and indigenous practices, passed down generationally by means of oral stories, ceremonies, art and dance, taboos, and other cultural elements, constitute part of the knowledge, practice, and belief complex of local, traditional and indigenous peoples that should be recognized alongside science.

Research, the world over, has demonstrated strong support for spatial protection measures in local, traditional and indigenous communities who retain their connections to the sea, allowing for the continued practice and adaptation of these established traditional cultures.

At the same time, CMS' own Expert Group on Animal Culture is deepening our understanding of both taxonomic and crosscutting issues relating to social learning and animal culture, for a broad range of vertebrate taxa, including cetaceans. At the time of writing, the most recent *Workshop on Conservation Implications of Animal Culture and Social Complexity* is yet to complete its work. The purpose of the workshop is to identify priority species and populations on the CMS Appendices, and to provide advice to Parties on rapid assessment techniques and how to augment existing conservation efforts using insights on aspects of sociality. The full report of the workshop and recommendations from the various subgroups within the culture group, such as the rapid assessment and human-wildlife interactions subgroups, will be provided, and relevant findings should be considered for incorporation into this next Cetaceans Programme of Work, as well as across the entire conservation community.

International agreements such as CMS, CITES, the Conventional on Biological Diversity and the United Nations General Assembly already state the obvious—conservation must happen—demonstrating a government-level resolve. Yet the commitment is, to a large extent, still insufficiently applied in the real world by the individual contracting parties. The problem is not just laws that need to be written and enforced; it is mostly a transformational

change in human use of the environment that is required—change that conserves the wider planetary complex of ecosystems, without which strenuous isolated efforts to conserve marine mammals are futile.

Dr William Perrin, the first Appointed Counsellor for Aquatic Mammals, began this process of a detailed CMS Programme of Work for Cetaceans because of the inexorable decline he witnessed. The second Appointed Counsellor for Aquatic Mammals, one of the authors of this document (Prof. Giuseppe Notarbartolo di Sciara) has carried this forward, drawing in critical information about important marine mammal areas and deepening CMS' knowledge of the escalating threats cetaceans face.

As he passes the baton to a third Appointed Counsellor, he does so with equal concern about a world in an even worse state than ten and twenty years ago, and a plea that efforts to conserve cetaceans, and other aquatic mammals or indeed any other species, should not stop at halting their decline and simply preserving their status quo. We share his plea for the conservation community to evolve and realign conservation to restore populations and ecologically connected habitats toward known or presumed pristine conditions, and climate-adapted ones where change has become permanent, and towards the full recovery of the animals' former numbers and ranges.

We must not forget the baselines of the past—a past where humans and nature healthily co-existed, largely under local, traditional and indigenous governance—and steadfastly refuse to accept new baselines that reflect the decline of an ever-diminished natural Earth.

[1] It is important to note that the taxonomic reference CMS uses for marine mammals does not yet reflect current scientific consensus with its referencing of *Platanista gangetica gangetica*. The listings should be changed to reflect the acceptance of *P. gangetica* and *P. minor*, as separate species as designated by the IUCN.

Current CMS Resolutions in force

- Resolution 07.16 (Rev.COP12): Regional Coordination for Small Cetaceans and Sirenians of Central and West Africa
- Resolution 07.17 (Rev.COP12): Regional Coordination for Small Cetaceans and Dugongs of Southeast Asia and Adjacent Waters
- Resolution 09.09 (Rev.COP12): Marine Migratory Species
- Resolution 10.15 (Rev.COP12): Global Programme of Work for Cetaceans
- Resolution 11.10 (Rev.COP13): Synergies and Partnerships
- Resolution 11.23 (Rev.COP12): Conservation Implications of Animal Culture and Social Complexity
- Resolution 12.07 (Rev.COP13): The Role of Ecological Networks in the Conservation of Migratory Species
- Resolution 12.13: Important Marine Mammal Areas (IMMAs)
- Resolution 12.17: Conservation and Management of Whales and their Habitats in the South Atlantic Region
- Resolution 12.24: Promoting Marine Protected Area Networks in the ASEAN Region
- Resolution 12.25: Promoting Conservation of Critical Intertidal and Other Coastal Habitats for Migratory Species
- Resolution 12.26 (Rev.COP13): Improving Ways of Addressing Connectivity in the Conservation of Migratory Species

A summary of these Resolutions appears in Annex 2.

Recommendations

Based on our understanding of the extent of this issue faced by cetaceans, our overarching recommendations are that:

1. Parties should:
   a) establish processes for genuine local, traditional and indigenous involvement

with CMS activities and decisions, as well as within national jurisdictions;
b) protect and restore areas to address the needs of CMS-listed cetaceans as far as possible throughout their life cycles and migratory ranges, with network-scale objectives that include the restoration of fragmented and degraded habitats and removal of barriers to migration;
c) utilise the Important Marine Mammal Areas database as a primary resource for considering habitats of critical importance for CMS-listed cetaceans;
d) when identifying areas of importance to cetaceans, to take into account and make explicit by description, schematic maps or conceptual models the relationship between those areas and other areas which may be ecologically linked to them, in physical terms, for example as connecting corridors, or in other ecological terms, for example as breeding areas related to non-breeding areas, stopover sites, feeding and resting places;
e) respond to the work of the CMS Expert Group on Animal Culture that identifies any priority CMS-listed cetacean species and populations; and
f) adopt the advice of the CMS Expert Group on Animal Culture on rapid assessment techniques and how to augment existing conservation efforts using insights on aspects of sociality.

2. Scientific Council should:
a) conduct an assessment of habitat viability for each of the CMS-listed aquatic mammals, incorporating the advice of the CMS Expert Group on Animal Culture on how to augment existing conservation efforts using insights on aspects of sociality, and make recommendations to Parties; and
b) develop a draft programme of work for other CMS-listed aquatic mammals for consideration by CMS COP15, incorporating the advice of the CMS Expert Group on Animal Culture on how to augment existing conservation efforts using insights on aspects of sociality, and make recommendations to Parties.

3. Secretariat should be directed to:
a) work with Parties, the Scientific Council, and other international and regional organisations, including the Convention on Biological Diversity, to organise regional and sub-regional workshops to progress the conservation and management of critical sites and ecological networks for CMS-listed cetaceans; and
b) implement Party directions for establishing processes for local, traditional and indigenous involvement with CMS activities and decisions.

Resources

CMS Technical Reports/Fact Sheets/Guidelines

- Strategic Review on Ecological Networks

Current science

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Sanganyado, E., and Liu, W. (2021). Cetacean Health: Global Environmental Threats.

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Annexes

Annex 1: Current Resolutions in Force

Entanglement, bycatch, and prey depletion

Resolution 12.22: Bycatch urges Parties should:

- assess the risk of entanglement and bycatch arising from the fisheries within their management orbit;
- strengthen mitigation measures;
- report incidences of injuries or death;
- cooperate with other Range States for these species should reduce bycatch;
- highlight serious problems with entanglement and bycatch within regional; fisheries management organisations and to work within these bodies towards mitigation solutions; and
- conduct strategic mitigation research, collect and share data to evaluate welfare implications of bycatch and to improve mitigation measures.

Hunting

Resolution 12.15: Aquatic Wild Meat urges Parties should:

- increase collaboration and information sharing among CMS Parties should understand better and monitor aquatic wild meat harvests;
- increase scientific knowledge and understanding of the impacts of subsistence use of CMS-listed species as aquatic wild meat;
- provide adequate financial, technical and capacity support to ensure that the harvest of CMS-listed species of aquatic wild meat for subsistence purposes is legal and sustainable; and
- recognize the important role they can play in providing capacity-building assistance, especially to Range State Parties, in managing the impact of aquatic wild meat harvests.

Climate change

Resolution 12.21: Climate Change and Migratory Species urges Parties should:

- implement the Climate Change Programme of Work, detailing specific climate related conservation measures Parties are urged to take for Appendix I and II listed species.
- avoid delaying their decision-making and action on climate change
- conduct vulnerability assessments
- roll impacts to species into their domestic adaptation and planning measures
- assess the steps needed to help species cope with climate change
- take clear management steps that facilitate species adaptation and resilience
- invest in research and monitoring
- cooperate and share capacity and knowledge with other Range States

Resolution 11.28: Future CMS Activities related to Invasive Alien Species urges Parties should:

- take into account the risk of migratory species to become invasive themselves if

translocated and/or introduced outside their natural range, by undertaking dedicated risk assessments incorporating future climate change scenarios for any movement of animals, including measures related to conservation actions targeting endangered species

Marine debris

Resolution 12.20: Management of Marine Debris urges Parties should:

- identify coastal and oceanic locations where marine debris aggregates to identify any potential areas of concern;
- work collaboratively with regional neighbours and other states to identify and address the sources and impacts of marine debris on migratory species;
- provide information on the amounts, impacts and sources of marine debris in waters within their jurisdiction on marine species listed on Appendix I and II of the Convention in their National Reports;
- conduct monitoring programmes that give particular regard to:
    - the prevalence of all the types of debris that may, or are known to, have impacts on migratory species;
    - sources and pathways of these types of debris;
    - geographic distribution of these types of debris and identification of hot spot areas;
    - impacts on migratory species, within and between regions;
    - identification of the most threatened species or most vulnerable populations in view of densities and seasonal distribution of marine debris;
    - the presence and effects of micro- and nanoscale plastics, including sub-lethal effects; and
    - population level effects on and welfare of migratory species as appropriate to national circumstances;
- address the issue of abandoned, lost or otherwise discarded fishing gear, by following the strategies set out under the Food and Agriculture Organisation's *Code of Conduct for Responsible Fisheries*,
- work towards achieving Goal B of the *Global Framework for Prevention and Management of Marine Debris*, agreed as part of the Honolulu Strategy
- promote measures such as the *Clean Shipping Index* and marine environmental awareness courses among shipping operators;
- require of their shipping operator's adherence to national obligations also when in areas beyond national jurisdiction;
- note the examples of successful campaigns provided in UNEP/CMS/ScC18/10.4.3 when considering campaigns to address the most pressing needs in their area of jurisdiction cooperate with organisations currently campaigning on marine debris
- implement already existing regulatory frameworks, plans and policies to fight marine litter;
- establish and implement policies, regulatory frameworks and measures consistent with the waste hierarchy and the circular economy concept;
- cooperate regionally and globally on clean-up actions of hotspots of marine debris
- develop and implement national plans of action;
- build capacity in and support the efforts of Parties with limited resources in the development and implementation of their national plans of action for marine debris;
- incorporate where possible quantitative targets of relevance to marine debris reduction when developing marine debris management strategies;
- consider implementing market-based instruments or other measures making use of incentives for the prevention of debris, such as:
    - levies or bans on single-use carrier bags and other single-use plastics;

    - deposit refund systems for beverage containers;
    - extended producer responsibility;
    - establishment of new business models based on reusable products and packaging;
    - obligations for the use of reusable items at events as appropriate to national circumstances;
    - phasing-out of disposable plastics;
    - phasing out of primary microplastics in products such as personal care products, industrial abrasives, printing products, and their replacement with organic or mineral non-hazardous compounds;
    - facilitating of technical solutions to prevent the entering of synthetic laundry fibres into the waste water;
    - promoting technical material innovations to halt microplastics from tyre abrasions entering the environment, taking into account ongoing studies;
    - subjecting fishing gear to mandatory deposit-and-refund schemes;
    - promoting waste delivery in ports through an indirect fee and deposit-refund system; and
    - phasing out of the most hazardous, toxic plastics;
- report on measures taken and their relative success;
- join other relevant Conventions such as MARPOL Annex V and the London Protocol, to join Protocols to Regional Seas Conventions on Pollution from Land Based Sources, and to include the prevention and management of marine debris in relevant national legislation; and
- engage, as appropriate, with other global marine initiatives.

Chemical pollution

Resolution 07.03: Oil Pollution and Migratory Species urges Parties should:

- implement a monitoring process in order to assess the cumulative environmental impacts of oil pollution on migratory species;
- strengthen comprehensive environmental protection legislation, including legislation at sea;
- implement measures of preparedness to respond to oil spills;
- seek appropriate partnerships with industry to address oil pollution, taking the 'polluter pays principle' fully into account; and
- take full account of the precautionary principle in the location of oil installations.

Marine noise

Resolution 07.05 (Rev. COP12): Wind Turbines and Migratory Species urges Parties should:

- implement the voluntary Guidelines;
- apply appropriate Strategic Environment Assessment and Environmental Impact Assessmentet procedures, including an appropriate ecological assessment if migratory species are likely to be affected;
- prioritise the establishment of renewable energies in areas where power lines already exist;
- undertake appropriate surveying and monitoring both before and after deployment of renewable energy technologies;
- require data sharing and enhance availability of biodiversity data, survey results and pre- and post-construction monitoring;
- enact appropriate legislation, licensing and permitting procedures;
- apply appropriate cumulative impact studies to describe and understand impacts on a larger scale, such as at population level or along entire migration routes;

- promote continued dialogue and cooperation between all stakeholders;
- undertake science-based strategic planning and monitoring for the safe siting and management of renewable energy development projects;
- avoid protected areas and respect important areas for biodiversity identified at the national level;
- give attention to possible impacts on migratory species of injury, increased noise and electromagnetic field disturbance especially during construction work in coastal habitats;
- undertake measures to reduce or mitigate known serious impacts on the upstream and downstream movements of migratory aquatic species;
- avoid habitat loss, disturbance and barrier effects in order to continue to keep the overall environmental impacts at their current low level; and
- develop national or regional level multi-stakeholder forums and networks to promote energy-migratory species discourse as a way of accelerating sharing of evidence-based best practices, experience and uptake of guidelines adopted for safeguarding migratory species.

Resolution 11.27 (Rev.COP13): Renewable Energy and Migratory Species urges Parties should:

- identify areas where migratory species are vulnerable to wind turbines and where wind turbines should be evaluated to protect migratory species; and
- take full account of the precautionary principle in the development of wind turbine plants, and to develop wind energy parks taking account of environmental impact data and monitoring information as it emerges.

Resolution 12.14: Adverse Impacts of Anthropogenic Noise on Cetaceans and Other Migratory Species (+Annex) endorses the 'CMS Family Guidelines on Environmental Impact Assessments for Marine Noise-generating Activities' and urges Parties should:

- control the impact of anthropogenic marine noise pollution in habitats of vulnerable species and in areas where marine species that are vulnerable to the impact of anthropogenic marine noise may be concentrated;
- undertake relevant environmental assessments on the introduction of activities that may lead to noise associated risks CMS-listed marine species and their prey;
- prevent adverse effects on CMS-listed marine species and their prey by restricting the emission of underwater noise;
- adopt mitigation measures on the use of high intensity active naval sonars until a transparent assessment of their environmental impact on marine mammals, fish and other marine life has been completed;
- ensure that Environmental Impact Assessments take full account of the effects of activities on CMS-listed marine species and their prey and consider a more holistic ecological approach at a strategic planning stage;
- apply 'Best Available Techniques' and 'Best Environmental Practice' including, where appropriate, clean technology, in their efforts to reduce or mitigate marine noise pollution;
- use, as appropriate, noise reduction techniques for offshore activities such as: air-filled coffer dams, bubble curtains or hydro-sound dampers, or different foundation types (such as floating platforms, gravity foundations or pile drilling instead of pile driving);
- integrate the issue of anthropogenic noise into the management plans of marine protected areas;
- facilitate regular collaborative and coordinated temporal and geographic monitoring and assessment of local ambient noise (both of anthropogenic and biological origin);
- further understanding of the potential for sources of noise to interfere with long-

range movements and migration;
- the compilation of a reference signature database, to be made publicly available, to assist in identifying the source of potentially damaging sounds;
- characterization of sources of anthropogenic noise and sound propagation to enable an assessment of the potential acoustic risk for individual species in consideration of their auditory sensitivities;
- studies on the extent and potential impact on the marine environment of high-intensity active naval sonars and seismic surveys in the marine environment; and the extent of noise inputs into the marine environment from shipping and to provide an assessment, on the basis of information to be provided by the Parties, of the impact of current practices;
- studies reviewing the potential benefits of 'noise protection areas', where the emission of underwater noise can be controlled and minimized for the protection of cetaceans and other biota;
- establish national noise registries to collect and display data on noise-generating activities in the marine area;
- develop provisions for the effective management of anthropogenic marine noise in CMS daughter agreements and other relevant bodies and Conventions; and
- strive, wherever possible, to ensure that their activities falling within the scope of this Resolution avoid harm to CMS-listed marine species and their prey.

Live captures

Resolution 11.22 (Rev.COP12): Live Capture of Cetaceans from the Wild for Commercial Purposes (+Annex) endorses the 'Best Practice Guidelines Relating the Live Capture of Cetaceans from the Wild for Commercial Purposes' and urges Parties should:
- develop and implement national legislation, as appropriate, prohibiting the live capture of cetaceans from the wild for commercial purposes;
- consider taking stricter measures in line with CITES Article XIV with regard to the import and international transit of live cetaceans for commercial purposes that have been captured in the wild;
- contribute to cooperation and collaboration with CITES and IWC on small cetacean species targeted by live captures from the wild;
- actively discourage new live captures from the wild for commercial purposes; and
- share data and information on live captures with the IWC and other appropriate fora.

Disturbance and harassment

Resolution 11.29 (Rev.COP12): Sustainable Boat-based Marine Wildlife Watching (+Annex) endorses the 'Species-specific Guidelines for Boat-based Wildlife Watching' and urges Range States of jurisdictions with commercial operations involving marine boat-based wildlife watching to:
- adopt appropriate measures, such as national guidelines, codes of conduct, and if necessary, national legislation, binding regulations or other regulatory tools, to promote ecologically sustainable wildlife watching;
- take into account the following guiding principles based on which the boat-based wildlife watching activities should be conducted:
  - the activities should not have negative effects on the long-term survival of populations and habitats;
  - the activities should have minimal impact on the behaviour of watched and associated animals;
- consider the measures as appropriate and depending on the target species in particular with respect to the need for provisions concerning:
  - licensing or permitting of operators, including training, reporting and

compliance requirements;
    - level of activity, including the possible setting of daily, seasonal and/or geographical exclusion areas and limitations on the number of vessels;
    - method of approach, including provisions on distance to be maintained and direction and speed of vessels, as well as careful and sensitive navigation in the vicinity of animals; and
    - interaction, including prohibition of operators' behaviours that disturb animals or provoke interactions, unless there is good scientific evidence that this will not have negative consequences, or negatively impact the habitat;
- also cover opportunistic wildlife watching during other commercial and private boat-based activities;
- when vessel-based and in-water activities, such as swimming or diving with the animals, occur concurrently, specific measures be included to ensure the safety of marine wildlife and human participants;
- provide that the measures take into account the size and status of any wildlife watching programme and the specific needs of all affected species; and
- review these measures periodically to enable any impacts detected through research and monitoring of the populations to be taken into account.

Resolution 12.16: Recreational In-Water Interaction with Aquatic Mammals urges Range States of jurisdictions with commercial operations involving recreational in-water interactions with aquatic mammals to:

- adopt appropriate measures, such as national guidelines, codes of conduct, and if necessary, national legislation, binding regulations or other regulatory tools, to address the consequences of, and carefully regulate, all such activities, including opportunistic in-water encounters with aquatic mammals;
- ensure that these activities do not have negative effects on the longterm survival of populations and habitats and have minimal impact on the behaviour of the exposed animals;
- adopt measures for when vessel-based and in-water activities occur concurrently, to ensure the safety of marine wildlife and human participants;
- facilitate research allowing an assessment of the long-term effects and biological significance of disturbances; and
- review any measures periodically to enable any impacts detected to be taken into account as necessary.

Resolution 12.23: Sustainable Tourism and Migratory Species urges Range States of jurisdictions with commercial operations involving marine boat-based wildlife watching to:

- adopt measures such as national action plans, regulations and codes of conduct, binding protocols or additional legal frameworks and legislation, aiming to ensure tourism activities do not negatively affect species anywhere within their migratory range;
- in promoting tourism or recreational activities involving wildlife interaction, take into account the following basic philosophies:
    - tourism activities should not inhibit the natural behaviour and activity of migratory species nor adversely affect their associated habitat;
    - the activities should not have significant negative impact on the long-term survival of species populations;
    - tourism activities should create sustainable social and economic benefits within local communities;
    - revenues generated from the activity should be able to provide resources for the conservation of the species or group of species subject to tourism, including the protection of their habitat, and sustaining best practices; and
    - take into account the safety of observers and wildlife as well as risk to human

health;
- develop appropriate measures and guidelines dependent on the target species, including, but not limited to:
  - accreditation of operators, provisions of training and a clear code of conduct;
  - allowable types of interactions;
  - level of activity, including aspects such as maximum interaction hours per day, maximum observation time per interaction, or number of individuals/vehicles within designated interaction zones or distances;
  - appropriate equipment or technologies to be used with limits on any that could cause undue disturbance to target species;
  - consider seasonal or life stage-specific regulations or exclusions (e.g., during the mating season);
  - monitoring of implementation through the relevant agencies and authorities, with suitable engagements with operators to facilitate compliance;
  - monitoring potential impacts of tourism activities to target species; and
  - make the same measures applicable to non-dedicated or opportunistic interactions;
- apply the Precautionary Principle where there is a lack of information concerning the effects of interactions brought about by tourism on a species;
- perform regular appraisals of enacted measures to account for any new research or relevant information, and adapt regulations;
- provide adequate resources to support thorough ecotourism planning process, and the development of protocols and standards applicable for target species or species groups; and
- collaborate closely with relevant stakeholders in planning for tourism involving wildlife.

Beyond habitat degradation

Resolution 07.16 (Rev.COP12): Regional Coordination for Small Cetaceans and Sirenians of Central and West Africa urges Parties should:
- the promotion of conservation of small cetaceans and sirenians with the actors of civil society including those outside the area, such as oil companies, fish and aquaculture industries, and tourist operators.

Resolution 07.17 (Rev.COP12): Regional Coordination for Small Cetaceans and Dugongs of Southeast Asia and Adjacent Waters urges Range States should:
- consider the establishment of an appropriate instrument of cooperation for the conservation of these species, which would consider the particular characteristics of inland and marine waters;
- ensure the participation of all stakeholders, including government agencies responsible for the conservation and management of small cetaceans and sirenians, as well as non-governmental organizations and the international scientific community;
- promote the conservation of these species with various sectors of society including oil companies, fish and aquaculture industries, and tourist operators; and
- designate as soon as possible a coordinator for the preparatory phase of the appropriate instrument.

Resolution 09.09 (Rev.COP12): Marine Migratory Species urges Parties should:
- identify priority issues, species and habitats in the marine sphere requiring intervention by CMS in the next decade.

Resolution 10.15 (Rev.COP12): Global Programme of Work for Cetaceans (+Annex) adopts the 'Global Programme of Work for Cetaceans' and urges Parties should:

- cooperate as appropriate with relevant international organisations;
- promote the integration of cetacean conservation into all relevant sectors by coordinating their national positions among various conventions, agreements and other international fora;
- encourages the participation of all relevant stakeholders in the work of cetacean-related agreements of CMS; and
- facilitate the implementation of the Global Programme of Work for Cetaceans with voluntary contributions and in-kind support.

Resolution 11.10 (Rev.COP13): Synergies and Partnerships urges Parties should:

- strengthen engagement with indigenous peoples, youth groups and local communities across the CMS Family.

Resolution 11.10 also notes the recommendations contained in UNEP/CMS/COP13/Doc.18/Annex.3 aimed at enhancing the relationship between the CMS Family and Civil Society both at international and national levels. Further, it recognizes that formal partnerships with biodiversity-related NGOs have the potential to significantly increase the delivery of the Convention's objectives and may deserve of a formal recognition.

Resolution 11.23 (Rev.COP12): Conservation Implications of Animal Culture and Social Complexity urges Parties should:

- consider culturally transmitted behaviours when determining conservation measures;
- assess anthropogenic threats to socially complex mammalian species on the basis of evidence of interactions of those threats with social structure and culture;
- apply a precautionary approach to the management of populations for which there is evidence that influence of culture and social complexity may be a conservation issue; and
- gather and publish pertinent data for advancing the conservation management of these populations and discrete social groups.

Resolution 12.07 (Rev.COP13): The Role of Ecological Networks in the Conservation of Migratory Species (+Annex) endorses the recommendations made in the strategic review on ecological networks and urges Parties should:

- consider the network approach and ecological connectivity in the implementation of existing CMS instruments and initiatives;
- take into account and make explicit by description, schematic maps or conceptual models the relationship between areas of importance to migratory terrestrial, avian and aquatic species and other areas which may be ecologically linked to them, in physical terms or in other ecological terms;
- collaborate to identify, designate and effectively maintain comprehensive and coherent ecological networks of protected sites and other adequately managed sites of international and national importance;
- make full use of all existing complementary tools and mechanisms for the identification and designation of critical sites and site networks for migratory species;
- when implementing systems of protected areas, and other relevant site- and area-based conservation measures, to:
  - select areas in such a way as to address the needs of migratory species as far as possible throughout their life cycles and migratory ranges;
  - set network-scale objectives for the conservation of these species within such systems, including by restoration of fragmented and degraded habitats and removal of barriers to migration; and
  - cooperate regionally and internationally for the achievement of such objectives;
- enhance the quality, monitoring, management, extent, distribution and

connectivity of terrestrial and aquatic protected areas, including marine areas, in accordance with international law including UNCLOS;
- explore the applicability of ecological networks to marine migratory species, especially those that are under pressure from human activities such as over exploitation, oil and gas exploration/exploitation, fisheries and coastal development;
- apply the concept of Transfrontier Conservation Areas, meaning an area or component of a large ecological region that straddles the boundaries of two or more countries and is within their national jurisdiction, which may encompass one or more protected areas, as well as multiple resource use areas, in their transboundary conservation efforts;
- identify transboundary habitats of CMS-listed species, which could be considered as transfrontier conservation areas, for cooperation and possible bi- or multilateral agreements between neighbouring Range States, to improve the conservation of the habitats and species concerned;
- promote ecological networks and connectivity through, for example, the development of further site networks within the CMS Family or other fora and processes, that use scientifically robust criteria to describe and identify important sites for migratory species and promote their internationally coordinated conservation and management, with support from the CMS Scientific Council, as appropriate;
- address immediate threats to national sites important for migratory species within ecological networks, making use, where appropriate, of international lists of threatened sites;
- monitor adequately ecological networks to allow early detection of any deterioration in quality of sites, rapid identification of threats and timely action to maintain network integrity, making use where appropriate of existing monitoring methods
- adopt and implement those guidelines developed within CMS and other relevant processes, which aim to promote connectivity and halt its loss;
- apply the IUCN WCPA Best Practice Guideline on Transboundary Conservation, the IUCN WCPA / SSC Joint Taskforce on Protected Areas and Biodiversity's Key Biodiversity Areas standard and the criteria for identifying Important Marine Mammal Areas developed by the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force once adopted by IUCN;
- use tools such as Movebank, ICARUS and other tools to better understand the movements of CMS-listed species, including the selection of those endangered species, whose conservation status would most benefit from a better understanding of their movement ecology, while avoiding actions which may enable the unauthorized tracking of individual animals and facilitate poaching;
- engage in the ongoing work taking place within the Convention on Biological Diversity to develop EBSA descriptions, noting that CBD COP decision XI/17 states that the description of areas meeting the EBSA scientific criteria is an evolving process to allow for updates;
- collaborate with and participate actively in the EBSA process and mobilize all available data and information related to migratory marine species, to ensure that the EBSA process has access to the best available science in relation to marine migratory species;
- consider the results of the initial GOBI review (UNEP/CMS/COP11/Inf.23) with respect to EBSAs and marine migratory species;
- provide adequate, predictable and timely financial resources and in-kind support to assist in implementing the recommendations within this Resolution;
- provide financial resources and in-kind support to underpin and strengthen existing ecological network initiatives within the CMS Family of instruments;
- work closely with relevant organizations such as the European Space Agency and

its Focal Points to support new technology developments such as the ICARUS experiment to track the movement and fate of migratory animals globally;
- bring this resolution and the experience of CMS relevant to identifying pathways for marine migratory species, critical habitats and key threats, and promoting coordinated conservation and management measures across a migratory range in marine areas to the attention of the United Nations General Assembly Ad Hoc Open-ended Informal Working Group to Study Issues Relating to the Conservation and Sustainable Use of Marine Biological Diversity Beyond Areas of National Jurisdiction; and
- address outstanding emerging, or recurring actions.

Resolution 12.13: Important Marine Mammal Areas (IMMAs) acknowledges the IMMAs criteria and identification process described in the IMMA Guidance Document posted on the website of the IUCN Joint Specieis Survival Commission (SSC)/World Commission on Protected Areas (WCPA) Marine Mammal Protected Areas Task Force (www.marinemammalhabitat.org) for CMS-listed pinnipeds, sirenians, otters, polar bears and cetaceans and urges Parties should:
- identify specific areas where the identification of IMMAs could be particularly beneficial, for example through stimulating protected area network design and connectivity, or addressing threats to aquatic mammals more comprehensively;
- ensure that such work to identify specific areas engages the authorities of Parties in the spirit of transparency at an early stage;
- request the support of the IUCN Joint SSC/WCPA Marine Mammal Protected Areas Task Force to advance these approaches; and
- invites the Convention on Biological Diversity, the International Maritime Organization and the International Union for the Conservation of Nature to consider IMMAs as useful contributions for the determination of Ecologically or Biologically Significant Areas, Particularly Sensitive Sea Areas, Key Biodiversity Areas.

Resolution 12.17: Conservation and Management of Whales and their Habitats in the South Atlantic Region (+ Annex) urges Parties should:
- strengthen existing measures under CMS and other relevant multilateral environmental agreements to address threats and promote the conservation of Appendix I and II-listed great whale species in the South Atlantic area;
- redouble their efforts to increase public awareness of, and support for, great whales' conservation along migratory routes in the South Atlantic; and
- strengthen national and local capacity for cetacean conservation and the implementation of the Action Plan.

Resolution 12.24: Promoting Marine Protected Area Networks in the ASEAN Region urges Range States should:
- continue development of transboundary area-based conservation measures including marine protected areas, particularly in the Association of Southeast Asian Nations (ASEAN) Region;
- participate in promoting marine protected area networks and connectivity that will improve the identification and governance of important sites for migratory species and support internationally coordinated conservation and management;
- in line with Targets 10, 11 and 12 of the CBD Strategic Plan for Biodiversity 2011-2020 and the related Targets 7, 8 and 10 of the Strategic Plan for Migratory Species 2015 – 2023) to expedite efforts in increasing the number and coverage of protected areas, and addressing continued losses in biodiversity, particularly to coastal and marine ecosystems;
- collaborate with existing region-wide networks which includes the Partnerships in Environmental Management for the Seas of East Asia (PEMSEA), the Coral

Triangle Initiative (CTI), the ASEAN Working Groups on National Conservation and Biodiversity (NCB), Coastal and Marine Environment (CME), Climate Change (CC) and mechanisms associated with ASEAN State Officials for Environment (ASOEN) and various other national and regional programs that promote the establishment of marine protected area networks; and

- support government implementation of marine biodiversity conservation actions at the regional, national and local levels and scale-up the coverage and effectiveness of marine conservation areas and threatened species protection in South-east and East Asia in support of the implementation of regional strategies and plans of action that address issues relating to the governance of coasts and oceans including but not limited to the ASEAN Heritage Parks Programme, the Coral Triangle Initiative on Coral Reefs Fisheries and Food Security Regional Plan of Action and the Sustainable Development Strategy for the Seas of East Asia.

Resolution 12.25: Promoting Conservation of Critical Intertidal and Other Coastal Habitats for Migratory Species urges Parties should:

- as a matter of urgency, to enhance significantly their efforts to conserve and promote the sustainable use of intertidal wetlands and other coastal habitats of importance for migratory species worldwide;
- support and engage in the establishment, under the Coastal Forum, of a "Caring for Coasts" initiative to promote restoration of coastal wetlands and other relevant habitats;
- in line with Target 10 of the Strategic Plan for Migratory Species 2015- 2023, to give urgent protection to remaining intertidal wetlands and associated coastal habitats of international importance, especially but not exclusively, in coastal regions that are suffering high rates of intertidal wetland loss, notably in Asia, paying particular attention to those sites that form part of the critical site networks of migratory species, such as the East Asian-Australasian Flyway Partnership Site Network and the Western Hemisphere Shorebird Reserve Network;
- consider appropriately qualifying intertidal sites for nomination as World Heritage Sites as well as Ramsar Sites, including as serial transboundary sites as appropriate, and thus for waterbirds and other migratory species potentially forming ecological site networks with other key sites;
- ensure that intertidal protected area boundaries include the entire ecosystem of importance to migratory waterbirds and other dependent migratory species;
- recognize fully the international importance of their intertidal wetlands for migratory species and ecosystem services halting further approval of intertidal flat conversion (land claim);
- in line with Target 4 of the Strategic Plan for Migratory Species 2015- 2023, to withdraw or modify any perverse incentives to convert intertidal or other coastal wetland habitats, and additionally, to implement sustainable coastal engineered measures for climate adaptation, coastal defence and risk reduction;
- develop pilot schemes to demonstrate flyway-scale Net Positive Impact of critically important areas including offsetting approaches that involve corporations and governments;
- ensure that coastal sediment needs from riverine inputs are maintained through the appropriate regulation of outflows from dams or other water regulation structures through the implementation of the Ramsar Convention's guidance on environmental flows (Resolutions VIII.1 and X.19);
- development of programmes and initiatives including, for example, festivals associated with the arrival of migratory species; and
- report progress in implementing this Resolution, including assessments of the efficacy of measures taken, to each meeting of the Conference of the Parties including through their National Reports.

Resolution 12.26 (Rev.COP13): Improving Ways of Addressing Connectivity in the Conservation of Migratory Species urges Parties should:

- give special attention to the issues highlighted in this Resolution when planning, implementing and evaluating actions designed to support the conservation and management of migratory species, both at national level and in the context of regional and international cooperation, including in particular when:
  - devising strategic conservation objectives, so that these may more often be expressed in terms of whole migration systems, and in terms of the requirements for the functioning of the migration process itself, as opposed to merely the status of populations or habitats;
  - identifying, prioritizing, developing and managing protected areas and other effective area-based conservation measures, both within and beyond areas of national jurisdiction, taking account inter alia of the best available science, the need for connectivity to be a key factor in the definition of appropriate conservation management units, including at the landscape or seascape scale, and the need for actions to be addressed to the connections between places as well as to the places themselves;
  - strengthening and expanding, based on the best available science, ecological networks to conserve migratory species worldwide and enhancing their design and functionality in accordance with Resolution 12.7 (Rev.COP13) The Role of Ecological Networks in the Conservation of Migratory Species
  - evaluating the sufficiency and coherence of ecological networks in functional and qualitative terms as well as in terms of extent and distribution, having regard to Resolution 12.7 (Rev.COP13) and to the desirability of sharing experiences and best practices on this issue; and
  - monitoring and assessing the effectiveness of the protection and management of the areas and networks referred to in the present paragraph;
- make use of existing guidelines including those prepared by the International Union for Conservation of Nature (IUCN);
- working with all relevant stakeholders in government authorities, local communities, the private and other sectors, to intensify efforts to address threats to the conservation status of migratory species; and
- assess the continued relevance and where appropriate update the content and provide support for the long-term maintenance and enhancement of large-scale databases on migratory species distributions, movements and abundance.

Annex 2: Regional priorities

New priority issues that were not highlighted in the first Programme of Work are indicated as **bold**. Priorities that have not featured as prominently in the recommendations for the second programme of work are indicated as ~~strike through~~. Hunting features across many regions, because this review includes directed takes (lethal and live capture), whereas the first programme of work did not include whaling or live captures.

While there are some areas of sub-regional progress (ie shipping speed restrictions, or bycatch reduction in one or another fishery), in general, none of the priority issues have been solved. To fully reflect that levels of national and sub-regional progress would require a thorough assessment of the national reports which was beyond the scope of this review.

North Atlantic, Baltic, Mediterranean and Black Sea

Priority issues

- Intersections with fisheries: entanglement, bycatch, and prey depletion
- **Hunting**
- Habitat degradation
- Climate change
- Marine noise
- Marine debris
- Chemical pollution
- Vessel strikes
- **Live captures**
- **Disturbance and harassment**
- **Disease**

CMS instruments

ACCOBAMS
ASCOBANS
Western African Aquatic Mammals MOU

CMS listed species and populations

- Atlantic white-sided dolphin (*Lagenorhynchus acutus*), App II
- Blue whale (*Balaenoptera musculus*), App I
- Bryde's whale (Balaenoptera edeni), App II
- Common bottlenose dolphin (*Tursiops truncatus*), App II
- Common dolphin (*Delphinus delphis*), App II
- Fin whale (*Balaenoptera physalus*), App I/II
- Harbour porpoise (*Phocoena phocoena*), App II
- Humpback whale (*Megaptera novaeangliae*), App I
- Long-finned pilot whale (*Globicephala melas*), App II
- North Atlantic right whale (*Eubalaena glacialis*), App I
- Northern bottlenose whale (*Hyperoodon ampullatus*), App II
- Orca (*Orcinus orca*), App II
- Risso's dolphin (*Grampus griseus*), App II
- Sei whale (*Balaenoptera borealis*), App I/II
- Sperm whale (*Physeter macrocephalus*), App I/II
- Striped dolphin (*Stenella coeruleoalba*), App II
- White-beaked dolphin (*Lagenorhynchus albirostris*), App II

Central and South Atlantic

Priority issues

- Intersections with fisheries: entanglement, bycatch, and prey depletion
- Hunting
- Habitat degradation
- Climate change
- Marine debris
- Chemical pollution
- Marine noise
- Vessel strikes
- **Disturbance and harassment**
- **Disease**

CMS instruments

Western African Aquatic Mammals MOU
MOU
Atlantic Humpback Dolphin SSAP

CMS listed species and populations

- Amazon river dolphin / Boto (Inia geoffrensis), App II
- Atlantic humpback dolphin (*Sousa teuszii*), App I/II
- Blue whale (*Balaenopter amusculus*), App I
- Bryde's whale (*Balaenoptera edeni*), App II
- Burmeister's porpoise (Phocoena spinipinnis), App II
- Clymene dolphin (*Stenella clymene*), App II
- Commerson's dolphin (Cephalorhynchus commersonii), App II
- Dusky dolphin (Lagenorhynchus obscurus), App II
- Fin whale (*Balaenoptera physalus*), App I/II
- Franciscana (*Pontoporia blainvillei*), App I/II
- Guianadolphin (Sotalia guianensis), App II
- Harbour porpoise (*Phocoena phocoena*), App II
- Humpback whale (*Megaptera novaeangliae*), App I
- Orca (*Orcinus orca*), App II
- Peale's dolphin (Lagenorhynchus australis), App II
- Sei whale (*Balaenoptera borealis*), App I/II
- Southern right whale (Eubalaena australis), App I
- Spectacled porpoise (Phocoena dioptrica), App II
- Sperm whale (*Physeter macrocephalus*), App I/II
- Tucuxi (Sotalia fluviatilis), App II

North Pacific and South China Seas

Priority issues

- Intersections with fisheries: entanglement, bycatch, and prey depletion
- Hunting
- Habitat degradation
- Climate change
- Marine debris
- Marine noise
- Chemical pollution
- Vessel strikes
- **Live captures**
- **Disturbance and harassment**
- **Disease**

CMS instruments

None relevant to cetaceans

CMS listed species and populations

- Australian snubfin dolphin (*Orcaella heinsohni*), App II
- Baird's beaked whale (*Berardius bairdii*), App II
- Blue whale (*Balaenoptera musculus*), App I
- Bryde's whale (*Balaenoptera edeni*), App II
- Dall's porpoise (*Phocoenoides dalli*), App II
- Fin whale (*Balaenoptera physalus*), App I/II
- Finless porpoise (*Neophocaena phocaenoides*), App II
- Fraser's dolphin (*Lagenodelphis hosei*), App II
- Humpback whale (*Megaptera novaeangliae*), App I
- Indo-Pacific bottlenose dolphin (*Tursiops aduncus*), App II
- Indo-Pacific humpback dolphin (Sousa chinensis), App II
- Irrawaddy dolphin (*Orcaella brevirostris*), App I/II
- North Pacific right whale (*Eubalaena japonica*), App I
- Omura's whale (*Balaenoptera omurai*), App II
- Orca (*Orcinus orca*), App II
- Pantropical spotted dolphin (*Stenella attenuata*), App II
- Sei whale (*Balaenoptera borealis*), App I/II
- Short-beaked common dolphin (*Delphinus delphis*), App II
- Sperm whale (*Physeter macrocephalus*), App I/II
- Spinner dolphin (*Stenella longirostris*), App II
- Spinner dolphin (*Stenella longirostris*), App II
- Striped dolphin (*Stenella coeruleoalba*), App II

Pacific Islands and Southwest Pacific

Priority issues

- Intersections with fisheries: entanglement, bycatch, and prey depletion
- Hunting
- Climate change
- Marine debris
- Chemical pollution
- Marine noise
- **Habitat degradation**
- **Live captures**
- **Disturbance and harassment**
- **Disease**
- ~~Vessel strikes~~

CMS instruments

Pacific Islands Cetaceans MOU

CMS listed species and populations

- Australian snubfin dolphin (*Orcaella heinsohni*), App II
- Blue whale (*Balaenoptera musculus*), App I
- Bryde's whale (*Balaenoptera edeni*), App II
- Burmeister's porpoise (P*hocoena spinipinnis*), App II
- Chilean dolphin (*Cephalorhynchus eutropia*), App II
- Dusky dolphin (*Lagenorhynchus obscurus*), App II
- Fin whale (*Balaenoptera physalus*), App I/II
- Heaviside's dolphin (*Cephalorhynchus heavisidii*), App II
- Humpback whale (*Megaptera novaeangliae*), App I
- Indo-Pacific humpback dolphin (*Sousa chinensis*), App II
- Omura's whale (*Balaenoptera omurai*), App II
- Orca (*Orcinus orca*), App II
- Pantropical spotted dolphin (*Stenella attenuata*), App II
- Peale's dolphin (*Lagenorhynchus australis*), App II
- Sei whale (*Balaenoptera borealis*), App I/II
- Southern right whale (*Eubalaena australis*), App I
- Sperm whale (*Physeter macrocephalus*), App I/II

Indian Ocean and Timor Sea

Priority issues

- Intersections with fisheries: entanglement, bycatch, and prey depletion
- Hunting
- Climate change
- **Chemical pollution**
- Habitat degradation
- **Marine debris**
- Marine noise
- Vessel strikes
- **Disease**

CMS instruments

None relevant to cetaceans

CMS listed species and populations

- Blue whale (*Balaenoptera musculus*), App I
- Bryde's whale (*Balaenoptera edeni*), App II
- Dusky dolphin (*Lagenorhynchus obscurus*), App II
- Fin whale (*Balaenoptera physalus*), App I/II
- Finless porpoise (*Neophocaena phocaenoides*), App II
- Ganges River dolphin (*Platanista gangetica gangetica*), App I/II
- Humpback whale (*Megaptera novaeangliae*), App I
- Indo-Pacific humpback dolphin (*Sousa chinensis*), App II
- Irrawaddy dolphin (O*rcaella brevirostris*), App I/II
- Orca (*Orcinus orca*), App II
- Omura's whale (*Balaenoptera omurai*), App II
- Sei whale (*Balaenoptera borealis*), App I/II
- Southern right whale (*Eubalaena australis*), App I
- Sperm whale (*Physeter macrocephalus*), App I/II

Arctic

Priority issues

- Climate change
- Habitat degradation
- **Hunting**
- Chemical pollution
- Marine debris
- Marine noise
- Live captures
- **Disease**
- ~~Intersections with fisheries: entanglement, bycatch, and prey depletion~~

CMS instruments

None relevant to cetaceans

• ~~Vessel strikes~~	

CMS listed species and populations

- Beluga (*Delphinapterus leucas*), App II
- Bowhead whale (*Balaena mysticetus*), App I
- Orca (*Orcinus orca*), App II
- Narwhal (*Monodon monoceros*), App
- Northern bottlenose whale (*Hyperoodon ampullatus*), App II

Southern Ocean

Priority issues	CMS instruments
• Climate change • Habitat degradation • **Hunting** • Marine debris • Chemical pollution • Marine noise • Disease • ..... ntersections with fisheries: entanglement, bycatch, and prey depletion	None relevant to cetaceans

CMS listed species and populations

- Antarctic minke whale (*Balaenoptera bonaerensis*), App II
- Blue whale (*Balaenoptera musculus*), App I
- Humpback whale (*Megaptera novaeangliae*), App I
- Orca (*Orcinus orca*), App II
- Pygmy right whale (*Caperea marginata*), App II
- Sei whale (*Balaenoptera borealis*), App I/II
- Southern right whale (*Eubalaena australis*), App I
- Spectacled porpoise (*Phocoena dioptrica*), App II
- Sperm whale (*Physeter macrocephalus*), App I/II

Annex 3: Status of cetaceans on CMS Appendix I/Appendix II

CMS Appendix I

Bowhead whale (*Balaena mysticetus*)
Globally, there are four identified subpopulations of bowhead whale, two of which (Okhotsk Sea and East Greenland-Svalbard-Barents Sea) have separate IUCN Red List assessments, but with a global population size of over 25,000 individuals, the species is listed as of **Least Concern** by the IUCN (Cooke and Reeves, 2018a). The population size of the Greenland-Svalbard-Barents Sea subpopulation is unknown but thought to comprise less than 250 mature individuals and is listed as **Endangered** by the IUCN (Cooke and Reeves, 2018b), and with likely fewer than 250 mature individuals, the Okhotsk Sea subpopulation is also listed as **Endangered** (Cooke *et al.,* 2018a).

North Atlantic right whale (*Eubalaena glacialis*)
With the estimated number of North Atlantic right whales alive totalling 409 individuals, of which fewer than 250 were mature (Pettis *et al.,* 2020), the species is listed as **Critically Endangered** by the IUCN (Cooke, 2020).

North Pacific right whale (*Eubalaena japonica*)
The current range-wide population size of North Pacific right whale is unknown but it is considered that the number of mature individuals is around 250 individuals and the species is listed as **Endangered** by the IUCN (Cooke and Clapham, 2018a). With the likelihood that the number of mature individuals is below 50 and concern over the paucity of sightings of calves, the northeast Pacific subpopulation is listed separately as **Critically Endangered** (Cooke and Clapham, 2018b).

Southern right whale (*Eubalaena australis*)
With an estimated total population size of 13,600 individuals in 2009 (IWC, 2013) and the 5-10 fold increase in the population since the 1970s, the southern right whale is not considered under threat at the hemispheric level and as such is listed as of **Least Concern** by the IUCN (Cooke and Zerbini, 2018). Some breeding subpopulations have shown strong recoveries however some are still very small and one of these, the south-east Pacific subpopulation off Chile/Peru with the number of mature individuals very likely less than 50, has been assessed separately and is listed as **Critically Endangered** (Cooke, 2018f).

Sei whale (*Balaenoptera borealis*) – App I and II
Sei whale are listed as **Endangered** by the IUCN and are considered to number around 50,000 individuals however projections of the population size indicate that the global population of mature animals may be recovering (Cooke, 2018a).

Fin whale (*Balaenoptera physalus*) – App I and II
Fin whale are listed as **Vulnerable** by the IUCN with available global estimates suggesting a total population size of 145,000 individuals (North Atlantic: 70,000 whales in 2015; North Pacific: 50,000 whales in 2011; Southern Hemisphere: 25,000 whales in 2008) (Cooke, 2018c).The Mediterranean subpopulation is considered to comprise 3,282 (CV=30.85%) individuals with less than 1,720 mature individuals and is listed as **Endangered** by the IUCN (Panigada *et al.,* 2021).

Blue whale (*Balaenoptera musculus*)
Recognised as comprising five sub-species and listed as **Endangered** by the IUCN, the current global mature population size of blue whales is uncertain but considered to be in the range of 5,000 -15,000 individuals, corresponding to a reduction from their pre-whaling

estimate of 89%-97% (Cooke, 2018d). With an estimated population size of 3,000 mature (or 6,500 total) individuals in 2018, the Antarctic subspecies (*B. m. intermedia*) is listed as **Critically Endangered** (Cooke, 2018e).

Humpback whale (*Megaptera novaenangliae*)
The recent global population estimate for all three recognized subspecies of humpback whale is approximately 84,000 mature individuals out of a total of 135,000 whales, and the species is listed as of **Least Concern** by the IUCN (Cooke, 2018g). With less than 100 individuals thought to remain (Minton *et al.,* 2011; Collins *et al.,* 2018), the Arabian Sea subpopulation has been assessed separately and is listed as **Endangered** (Minton *et al.,* 2008) and has been proposed as **Critical Endangered** (Pomilla *et al*., 2014), whilst the Oceania subpopulation with less than 11,000 individuals, is also listed as **Endangered** (Childerhouse *et al.,* 2008).

Common dolphin (*Delphinus delphis*) Mediterranean population - App I and II
The Mediterranean subpopulation was previously listed as Endangered by the IUCN (Bearzi, 2003). With the number of mature individuals believed to be less than 2,500 and the estimated rate of decline likely between 5 and 10% annually, a reassessment in 2021 resulted in the newly named Inner Mediterranean subpopulation retaining the listing of **Endangered** (Bearzi *et al.,* 2021). Less than ten individuals are thought to remain in the semi-enclosed Gulf of Corinth, Greece, and the subpopulation is listed as **Critically Endangered** by the IUCN (Bearzi *et al.,* 2020).

Irrawaddy dolphin (*Orcaella brevirostris*) – App I and II
The current range-wide population size of Irrawaddy dolphin is unknown and abundance estimates are only available for a few portions of their range, where they exist in very small local subpopulations, and the species is listed as **Endangered** by the IUCN (Minton *et al.,* 2017). Best estimates of reproductively mature individuals in all six recognized subpopulations is estimated to be <50 dolphins and as such all six are listed as **Critically Endangered** (Smith, 2004; Smith and Beasley, 2004a/b/c; Dolar *et al.,* 2018; Minton *et al.,* 2017).

Black Sea bottlenose dolphin (*Tursiops truncatus ponticus*) – App I and II
There is no estimate of total population size but available data suggests that there are at least several 1,000 Black Sea bottlenose dolphins (*T. t. ponticus*) and the subspecies is listed as **Endangered** by the IUCN (Birkun, 2012).

Atlantic humpback dolphin (*Sousa teuszii*) – App I and II
A lack of information is available on the abundance of Atlantic humpback dolphins however a collation of what is known suggests that the species' total abundance is <3,000 individuals (Collins, 2015) and the number of mature animals is likely <1,500 individuals, hence the species is listed as Critically Endangered (Collins *et al.,* 2017).

Sperm whale (*Physeter macrocephalus*) – App I and II
The sperm whale has a global population size in the 100,000's (Whitehead, 2002) and is listed as **Vulnerable** by the IUCN (Taylor *et al.,* 2019). The Mediterranean subpopulation of sperm whales has been separately assessed and given the total size of the subpopulation is thought to be between 500 - 5,000 individuals with the number of mature whales likely <2,500, they are listed as **Endangered** (Pirotta *et al.,* 2021).

Ganges river dolphin (*Platanista gangetica*) – App I and II
No definitive abundance estimate exists for the Ganges River dolphin but surveys infer that there is likely a minimum of 1,200–1,800 individuals, although the true number could be several times as high, and the subspecies is listed as **Endangered**. It was also suggested that the Karnaphuli-Sangu subpopulation should be considered separately as it may fit the

criteria to be listed as Critically Endangered (Smith *et al.,* 2012).

La Plata dolphin (*Pontoporia blainvillei*) – App I and II
Four provisional management units, all with extensive subpopulation structure, are recognized for Franciscana and although there is no range-wide abundance estimate for the species, estimates have been calculated for a portion of their range and they are listed as **Vulnerable** by the IUCN (Zerbini *et al.,* 2017).

Cuvier's beaked whale (*Ziphius cavirostris*) Mediterranean subpopulation
The Mediterranean subpopulation is genetically distinct, contains <10,000 mature individuals and is listed as **Vulnerable** (Cañadas and Notarbartolo di Sciara, 2018).

CMS Appendix II

Antarctic minke whale (*Balaenoptera bonaerensis*)
The Antarctic minke whale is listed as **Near Threatened** by the IUCN (Cooke *et al.,* 2018b) and based on surveys conducted during 1993-2004 a circumpolar population estimate of about 500,000 individuals is considered (IWC 2013).

Bryde's whale (*Balaenoptera edeni*)
Bryde's whale are listed as of **Least Concern** by the IUCN and two subspecies are recognized; *B. e. edeni* and *B. e. brydei*. There is no comprehensive global population estimate however estimates for offshore areas of the North Pacific and Southern Hemisphere total nearly 80,000 whales and can be assumed to consist primarily of *B. e. brydei.* (Cooke and Brownell, 2018). Formerly known as the Gulf of Mexico sub-population, and listed as **Critically Endangered** by the IUCN with fewer than 50 mature individuals remaining (Corkeron *et al.,* 2017), Rice's whale (*Balaenoptera ricei*) was identified as a separate species in 2021 (Rosel *et al.,* 2021).

Omura's whale (*Balaenoptera omurai*)
Omura's whale are listed as **Data Deficient** by the IUCN and the global population size is unknown (Cooke and Brownell, 2019).

Pygmy right whale (*Carperea marginata*)
Despite being poorly known and rarely sighted, there is no estimate of global population size for the pygmy right whale and it is listed as of **Least Concern** by the IUCN (Cooke, 2018b).

Indo-Pacific humpbacked dolphin (*Sousa chinensis*)
The species is thought to be made up of many different 'population units' and the sum of available abundance estimates currently available is 5,056 individuals, however a declining population can be inferred throughout their range due to intensive threats and the Indo-Pacific humpback dolphin is listed as **Vulnerable** by the IUCN (Jefferson *et al.,* 2017). The Taiwanese humpback dolphin *(Sousa chinensis ssp. Taiwanensis)* has a declining population of 37 mature individuals and is listed as **Critically Endangered** (Wang *et al.,* 2017)

Tucuxi (*Sotalia fluviatilis*)
Tucuxi is listed as **Endangered** by the IUCN and although there are no estimates of total population size the population trend is considered to be declining (da Silva *et al.,* 2020).

Guiana dolphin (*Sotalia guianensis*)
The Guiana dolphin is listed as **Near Threatened** by the IUCN (Secchi *et al.,* 2018). For conservation and management purposes, eight highly differentiated management units (MUs) of Guiana Dolphins are recognized (Solé-Cava *et al.,* 2010) however abundance estimates are not available for any of the proposed MUs or for the species as a whole.

White-beaked dolphin (*Lagenorhynchus albirostris*) North and Baltic Seas populations
White-beaked dolphin are listed by the IUCN as of **Least Concern** (Kiszka and Braulik, 2018a) and aerial and vessel-based surveys of the North Sea and adjacent Atlantic European waters in 2016 produced an estimate of 36,287 individuals (CV=0.29) (Hammond *et al.,* 2017). No information is available for white-beaked dolphins in the Baltic Sea and they are not thought to use these waters.

Atlantic white-sided dolphin (*Lagenorhynchus acutus*) North and Baltic seas populations
Although the species is listed by the IUCN as of Least Concern (Braulik, 2019a) current data support recognition of at least four potential Atlantic white-sided dolphin populations (Calderan, 2021). As part of SCANS III, aerial and vessel-based surveys of cetaceans in waters of the European Union – which included the North Sea – in 2016 produced an estimate of 15,510 individuals (CV=0.717) (Hammond *et al.* 2017). No information is available for Atlantic white-sided dolphins in the Baltic Sea and they are not thought to use these waters.

Dusky dolphin (*Lagenorhynchus obscurus*)
Although the species is listed by the IUCN as of **Least Concern**, four subspecies of dusky dolphin are currently recognized by the Society for Marine Mammalogy's Committee on Taxonomy and further subspecies are suggested (Alafaro-Shiguieto *et al.,* 2019). No abundance estimate exists for the Peruvian/Chilean sub-species yet it is thought to be in serious decline and was recently uplisted to Vulnerable (Mangel and Alfaro-Shigueto, 2019) whilst the sub-species in Argentinian waters, Fitzroy's dusky dolphin, are thought to number around 20,000 individuals (Alafaro-Shiguieto et al., 2019). Although no population estimate exists for the African subspecies it is has been estimated that the total number of mature individuals exceeds 10,000 individuals (Elwen et al. 2016). The only available estimate for the subspecies in New Zealand waters is 12,626 (Markowitz, 2004). No information is available for the abundance of dusky dolphins known to reside around oceanic islands in the South Atlantic and Indian Oceans.

Peale's dolphin (*Lagenorhynchus australis*)
Peale's dolphin is listed as of **Least Concern** by the IUCN (Heinrich and Dellabianca, 2019) despite few available estimates of abundance. An estimated 19,924 individuals (coefficient of variation (CV) =0.2) are thought to occur over the Patagonian shelf (Dellabianca et al., 2016), and studies in inshore waters of the Falkland Islands propose 1,896 individuals (CV=0.33) (Costa et al., 2018). There are no abundance estimates for the species in the South Pacific.

Risso's dolphin (*Grampus griseus*) North and Baltic Seas populations
As part of SCANS III, aerial and vessel-based surveys of cetaceans in waters of the European Union – which included the North Sea – in 2016 produced an estimate of 13,504 (CV = 0.44) Risso's dolphins however no sightings were made in the North Sea (Hammond *et al.,* 2017). Furthermore, no information is available for the species in the Baltic Sea and they are not thought to use these waters. The Risso's dolphin is listed as of **Least Concern** by the IUCN (Kiszka and Braulik, 2018c).

Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) Arafura/Timor Seas populations
There are no estimates of abundance for populations of Indo-Pacific bottlenose dolphins from the Arafura and Timor Seas populations and the species is listed as **Near Threatened** by the IUCN (Braulik *et al.,* 2019).

Common bottlenose dolphin (*Tursiops truncatus*) North, Baltic, Mediterranean and Black Sea populations

As a species, the bottlenose dolphin is listed by the IUCN as of **Least Concern** (Wells *et al.,* 2019) however at least one subspecies and several populations and sub-populations are known to exist. As part of SCANS III, aerial and vessel-based surveys of cetaceans in waters of the European Union produced an estimate of 2,222 bottlenose dolphins in the North Sea (Hammond *et al.,* 2018). No information is available for the species in the Baltic Sea and they are not thought to use these waters. The Mediterranean subpopulation is listed as of Least Concern by the IUCN (Natoli *et al.,* 2021) and the first basin-wide abundance estimate suggests a population of approximately 60,000 individuals (95%CI=45,000-79,000) (ACCOBAMS, 2021). There is no estimate of total population size but available data suggests that there are several 1,000 Black Sea bottlenose dolphins (*T. t. ponticus*) and the subspecies is listed as **Endangered** by the IUCN (Birkun, 2012). An isolated population living within Greece's Gulf of Ambracia was listed as **Critically Endangered** by the IUCN (Gonzalvo and Notarbartolo di Sciara, 2021)

Pantropical spotted dolphin (*Stenella attenuata*) Eastern Tropical Pacific and Southeast Asian populations
Although the species is listed as of **Least Concern** by the IUCN (Kiszka and Braulik, 2018b), two subspecies are currently recognized: - (1) the offshore pantropical spotted dolphin, *S. a. attenuata* in oceanic tropical waters worldwide, and (2) the coastal pantropical dolphin, *S. a. graffmani* in the coastal waters of the eastern tropical Pacific (ETP); both of which are considered to contain several populations and sub-populations (Escorza-Treviño *et al.,* 2005, Leslie and Morin 2016, Perrin 2018). In the ETP, the coastal subspecies was estimated as 278,155 (CV =59%) (Gerrodette and Forcada, 2002) while the combined abundance of the offshore subspecies was estimated at around 1,297,092 (NE CV=23%; W/S CV=29%) (Gerrodette *et al.,* 2008). Little is known about south-east Asian pantropical spotted dolphin populations although an estimated 438,000 individuals were considered inhabiting Japanese waters in the early 1990s (Miyashita 1993), and an estimated 14,930 (CV=41%) were suggested for the eastern Sulu Sea and 640 (CV=27%) for the Tañon Strait between the islands of Negros and Cebu (Dolar *et al.,* 2006).

Spinner dolphin (*Stenella longirostris*) Eastern Tropical Pacific and Southeast Asian populations
There is no global abundance estimate for this widely distributed species and the spinner dolphin is listed as of **Least Concern** by the IUCN (Braulik and Reeves, 2018). Two sub-species of spinner dolphin are known from the eastern tropical Pacific (ETP): - (1) the eastern spinner dolphin (*Stenella longirostris ssp. orientalis*) is listed as Vulnerable by the IUCN (Hammond *et al.,* 2012) and the most recent estimate of abundance is around 613,000 individuals (CV = 22%) (Gerrodette *et al.,* 2005); and (2) the Central American spinner dolphin, (*S. longirostris ssp. centroamericana)* for which no abundance estimate is available. An intermediate form between the Gray's spinner and the eastern spinner is also recognized (Andrews *et al.,* 2013) and there were an estimated 801,000 (CV =37%) white-bellied spinner dolphins in the ETP in 2000 (Gerrodette *et al.*, 2005). Little is known about south-east Asian spinner dolphin populations (Braulik and Reeves, 2018) although estimated abundance in the southern part of the Sulu Sea and north-eastern Malaysian waters was 4,000 (Dolar *et al.,* 1997), and about 31,000 (CV=27%) in the south-eastern Sulu Sea, (Dolar *et al.,* 2006).

Striped dolphin (*Stenella coeruleoalba*) Eastern Tropical Pacific and Mediterranean populations
The IUCN list the striped dolphin as of **Least Concern** (Braulik, 2019b). In the eastern tropical Pacific (ETP) a 2003 survey estimated there to be 1,470,854 individual striped dolphins (CV = 15%) (Gerrodette *et al.,* 2005). The striped dolphin is considered the most abundant cetacean in the Mediterranean Sea despite no available estimate for the eastern Mediterranean Sea (Braulik, 2019b). In the western Mediterranean, excluding the Tyrrhenian Sea, the abundance of striped dolphin was estimated at 117,880 individuals (95%

confidence interval (CI) = 68,379-214,800) (Forcada *et al.,* 1994) whilst surveys in the north west Mediterranean in summer 2008 and summer and winter 2009 estimated striped dolphin population size as 13,232 (CV = 35.5% (Lauriano *et al.,* 2009),19,462 in winter (95% CI = 12,939–29,273) and 38,488 in summer (95% CI = 27,447–53,968) (Panigada *et al.,* 2011). An isolated population within Greece's Gulf of Corinth is listed as Endangered by IUCN (Bearzi et al., 2022)

Clymene dolphin (*Stenella clymene*) West Africa population
As a species, the Clymene dolphin is listed as of **Least Concern** by the IUCN yet there are no estimates of abundance from the eastern part of their range (Jefferson and Braulik, 2018b). Although considered widespread in West African pelagic waters (Weir *et al.,* 2014) they are also the most commonly bycaught cetacean species in pelagic fisheries (Debrah *et al.,* 2010)

Common dolphin (*Delphinus delphis*) North and Baltic Seas, Mediterranean Sea, Black Sea and Eastern Tropical Pacific populations
Common dolphins are considered the most widespread and abundant of all cetaceans and are listed as of **Least Concern** by the IUCN (Braulik *et al.,* 2021). As part of SCANS III in 2016, aerial and vessel-based surveys of cetaceans in waters of the European Union – which included the North Sea but did not include the Mediterranean and Black seas –produced an estimate of 467,673 (CV=0.26) common dolphins; the majority of sightings however were in the Bay of Biscay and coastal waters of France and Spain and none were made in the North Sea (Hammond *et al.,* 2017). The Mediterranean subpopulation was previously listed as **Endangered** by the IUCN (Bearzi, 2003). With the number of mature individuals believed to be less than 2,500 and the estimated rate of decline likely between 5 and 10% annually, a reassessment in 2021 resulted in the newly named Inner Mediterranean subpopulation retaining the listing of **Endangered** (Bearzi *et al.,* 2021). Less than ten individuals are thought to remain in the semi-enclosed Gulf of Corinth, Greece, and the subpopulation is listed as **Critically Endangered** by the IUCN (Bearzi *et al.,* 2020). The population size of the Black Sea common dolphin subspecies (*D. d. ponticus*) is unknown but results from a few small-scale surveys suggest that there are several 10,000 individuals and they are listed as **Vulnerable** by the IUCN (Birkun, 2008). During surveys in 2006, common dolphins were found to be the most abundant cetaceans in the eastern tropical Pacific and were estimated at 3,127,203 (CV=26%) individuals (Gerrodette *et al.,* 2008).

Fraser's dolphin (*Lagenodelphis hosei*) South East Asian population
Fraser's dolphins are listed as of **Least Concern** despite being thought to occur at relatively low densities in most parts of their range (Kiszka and Braulik, 2018d). Surveys in the Sulu Sea of the Philippines in 1994-9 provided an estimated total abundance of 13,518 (CV=27%) (Dolar *et al.,* 2006).

Australian snubfin dolphin (*Orcaella heinsohni*)
Although there is no range-wide estimate of the abundance of Australian snubfin dolphins, as they occur in small, decreasing, isolated subpopulations with limited gene flow, and are thought to number < 10,000 mature individuals across the range, they are listed as **Vulnerable** by the IUCN (Parra *et al.,* 2017).

Commerson's dolphin (*Cephalorhynchus commersonii*) South American population)
Listed as of **Least Concern** by the IUCN, much of the Commerson's dolphin range has not been surveyed and there are only a few estimates of abundance (Crespo *et al.,* 2017). Surveys in Argentine waters provided an estimate of 40,000 individuals (Pedraza 2008), and surveys over the Patagonian shelf provided an overall abundance of 21,933 individuals (CV = 74%, 95% CI = 6,013–80,012) (Dellabianca *et al.,* 2016), as a result, the south American sub-species (*C. c. commersonii*) is considered widespread, abundant, and not in decline in major portions of its range (Crespo *et al.,* 2017).

Chilean dolphin (*Cephalorhynchus eutropia*)
With a restricted range, at least two genetically distinct subpopulations (Pérez-Alvarez *et al.,* 2015) and available information indicating that the total population size is in the low thousands, the Chilean dolphin is listed as **Near Threatened** by the IUCN (Heinrich and Reeves, 2017).

Heaviside's dolphin (*Cephalorhynchus heavisidii*)
No range-wide survey has been conducted for Heaviside's dolphins although recent research indicates a relatively large population of 6,345 individuals (95% CI 3,573–11,267) at the southern limit of the species range (Elwen *et al.,* 2009) yet the possibility that there are <10,000 mature individuals cannot be ruled out and the species is listed as **Near Threatened** by the IUCN (Elwen and Gopal, 2018).

Orca (*Orcinus orca*)
Despite extensive and growing evidence of multiple forms with morphological, genetic, ecological, and behavioural differences that merit subspecies if not also species designations, orca are currently treated as a single species and listed by the IUCN as **Data Deficient** and abundance estimates for sampled areas provides a minimum worldwide abundance estimate of about 50,000 orca of all types (Reeves *et al.,* 2017). One sub-population however, is considered separately and with <50 mature individuals, orca in the Strait of Gibraltar are listed by the IUCN as **Critically Endangered** (Esteban and Foote, 2019

Long-finned pilot whale (*Globicephala melas*) North and Baltic seas populations
As a species, long-finned pilot whale is listed as **Data Deficient** by the IUCN (IUCN SSC CSG, 2007). Surveys undertaken in July 2016 in the European Atlantic as part of SCANSIII survey programme provide an estimate of 25,777 (CV = 0.345, CI = 13,350 - 49,772) long-finned pilot whales however no sightings were made in the North Sea and the Kattegat and Belt Seas, and surveys were not undertaken within the Baltic Sea (Hammond *et al.,* 2017). Two populations in the Mediterranean are now listed by IUCN, respectively, **Critically Endangered** and **Endangered** (Verborgh and Gauffier, 2021).

Beluga whale (*Delphinapterus leucas*)
The global beluga population consists of multiple subpopulations with varying degrees of genetic differentiation and abundance however the species is treated as a single species and is listed as of **Least Concern** with an estimated global abundance of 136,000 mature individuals (Lowry *et al.,* 2017a). The Cook Inlet subpopulation is listed as **Critically Endangered** with a mature population in 2016 of 231 belugas (CI = 194 - 273) with an 82% probability that there are fewer than 250 reproductive adults (Lowry *et al*., 2019).

Narwhal (*Monodon monoceros*)
The global narwhal population consists of about 12 subpopulations with varying degrees of genetic differentiation and geographical isolation however the species is treated as a single species and is listed as of **Least Concern** with a minimum of 122,925 mature individuals (Lowry *et al.,* 2017b). Importantly however, an ad hoc Working Group of the NAMMCO Scientific Committee on East Greenland narwhals stated unequivocally that unless hunting pressure ceased, the population of narwhals at Ittoqqortoormiit will very likely go extinct before the end of the decade (NAMMCO, 2021).

Harbour porpoise (*Phocoena phocoena*) North and Baltic seas, western North Atlantic, Black Sea and north west African populations
Although the species is listed as of **Least Concern** by the IUCN (Braulik *et al.,* 2020) the Black Sea harbour porpoise (*Phocoena phocoena ssp. relicta*), also found in parts of the Mediterranean, is listed as **Endangered** (Birkun and Frantzis, 2008) and the Baltic Sea sub-population is listed as **Critically Endangered** (Hammond et al., 2016). Surveys

undertaken in July 2016 in the European Atlantic as part of SCANSIII survey programme provide an estimate of 466,569 (CV=0.154, CI=345,306-630,417) harbour porpoise in the North Sea and adjacent waters (Hammond *et al.,* 2017). Acoustic surveys for Baltic proper porpoise between 2011- 2013 estimated an abundance of 497 individuals (95% CI=80-1091) (Scheidat et al., 2008), and 71–1105 individuals (95% CI, point estimate 491) (Amundin *et al.,* 2022). Aerial surveys conducted during different seasons between 2002 to 2006 estimates abundance in the southwestern Baltic ranging from 457 (CV=0.97) in March 2003 to a high of 4,610 (CV=0.35) in May 2005 (Scheidat *et al.* 2008). Aerial line transect surveys of the Atlantic coast of Canada in 2016 generated an abundance estimate of harbour porpoise of 256,355 (CV=0.40) (Lawson & Gosselin, 2018). In the early 2000's, the entire Black Sea harbour porpoise subspecies was thought to number only about 10,000 individuals (Reeves and Notarbartolo Di Sciara, 2006). No up-to-date population estimate currently exists. No abundance estimates are available for harbour porpoise off Northwest Africa.

Burmeister's porpoise (*Phocoena spinipinnis*)
Burmeister's porpoise are listed as **Near Threatened** by the IUCN (Felix *et al.,* 2018). To date, no systematic abundance surveys have been undertaken anywhere throughout their range and no comprehensive information on abundance or population trends is available.

Spectacled porpoise (*Phocoena dioptrica*)
Although the spectacled porpoise is listed by the IUCN as of **Least Concern** (Dellabianca *et al.,* 2018), there are no estimates of abundance from anywhere in their range.

Indo-Pacific finless porpoise (*Neophocaena phocaenoides*)
The Indo-Pacific finless porpoise is listed by the IUCN as **Vulnerable** (Wang and Reeves, 2017a) and the current population trend is considered to be decreasing. To date, estimates of abundance have been made for only a few areas, for example; Hong Kong and adjacent waters 217 individuals (CV 21-150%) (Jefferson *et al.,* 2002a); Kuching Bay, Sarawak, Malaysia 135 individuals (CV 31%, 95% confidence interval 74-246) (Minton *et al.,* 2013); coastal waters of Bangladesh 1,382 individuals (CV 55%) (Smith *et al.,* 2008).

Narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*)
The narrow-ridged finless porpoise is listed by the IUCN as **Endangered** and thought to exist in severely fragmented populations which are steadily decreasing (Wang and Reeves, 2017b). Estimates of abundance have been made for only a few areas (IWC 2006) and the current population trend is considered to be decreasing.

Dall's porpoise (*Phocoenoides dalli*)
Dall's porpoise are listed by the IUCN as of **Least Concern** however there is a recognized on-going decline in mature individuals (Jefferson and Braulik(a), 2018). The IWC recognizes 11 stocks of this species (IWC, 2002) and total abundance is considered to be over 1.2 million individuals (Buckland *et al.,* 1993).

Amazon river dolphin (*Inia geoffrensis*)
Although there is no range-wide estimate of abundance or information trends in abundance for the species, with an overall decline of at least 50% in the total population beginning around 2000, the Amazon River dolphin is listed as **Endangered** by the IUCN (DaSilva *et al.,* 2018).

Berardius (*Berardius bairdii*)
Despite limited global information on abundance and none on trends in abundance, Baird's beaked whale are listed as of **Least Concern** by the IUCN (Taylor and Brownell, 2020). Kasuya (2017), estimated abundance in Japanese waters at about 7,100 individuals. In the eastern Pacific, all surveys conducted off the U.S. west coast between 1991 and 2014 provided an estimate of abundance of 2,697 (CV=0.60) whales (Moore and Barlow, 2017) whilst

estimated abundance in the California Current was 5,394 (CV=0.83) in 2008 and 7,960 (CV=0.93) whales in 2014 (Barlow, 2016).

Northern bottlenose whale (*Hyperoodon ampullatus*)
The northern bottlenose whale is listed as **Near Threatened** by the IUCN (Whitehead *et al.,* 2021). Apart from an estimated 143 individuals (95% confidence interval 129–156) in the Scotian Shelf population (O'Brien and Whitehead 2013) and a minimum estimate of 128 individuals on the north-eastern edge of the Grand Banks (Stewart 2018), there are no published abundance estimates for any other areas of the western North Atlantic. No reliable estimates exist for the north-eastern Atlantic.

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