

A large school of fish, possibly sardines, swimming in the ocean. The fish are densely packed and move in a coordinated pattern, creating a swirling motion. The water is a deep blue, and the fish are silvery with dark fins. The perspective is from above, looking down at the school.

Review on global, commercial, wild-capture fisheries intentionally harassing or killing marine mammals

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July 2019

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intentionally harassing or killing marine mammals**

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July 2019

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Acronyms, Abbreviations and Glossary Terms

ACCOBAMS	Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area
ADD	Acoustic Deterrent Devices
AHD	Acoustic Harassment Devices
AIDCP	Agreement on the International Dolphin Conservation Program
ASCOBANS	Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas
BYCELS	By-catch, Entanglements and Live Strandings (NAMMCO)
CBD	Convention on Biological Diversity
CCAMLR	Commission for the Conservation of Antarctic Marine Living Resources
CCBSP	Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea
CCRF	Code of Conduct for Responsible Fisheries (FAO)
CCSBT	Commission for the Conservation of Southern Bluefin Tuna
CE	Critically Endangered
CEAF	Fisheries Committee for the Eastern Central Atlantic
CITES	Convention on International Trade in Endangered Species
CMM	Conservation and Management Measure
CMS	Convention of Migratory Species
COFI	Committee on Fisheries (FAO)
CPC	Contracting Party, Entity, or Fishing Entity
DDD	Dolphin Dissuasive Devices
DLMs	Dolphin Mortality Limits
EEC	European Economic Community
EEZ	Exclusive Economic Zone
EN	Endangered
ERA	Ecological Risk Assessment
ERS	Electronic Reporting System
ETP	Endangered, Threatened and Protected
EU	European Union
FAD	Fish-Aggregating (or Aggregation) Device
FAO	Food and Agriculture Organization
GFCM	General Fisheries Commission for the Mediterranean
HELCOM	Baltic Marine Environment Protection Commission
IATTC	Inter-American-Tropical-Tuna-Commission
ICCAT	International Commission for the Conservation of Atlantic Tunas
IMO	International Maritime Organization
IOTC	India Ocean Tuna Commission
IUCN	International Union for Conservation of Nature
IUU	Illegal, Unreported and Unregulated
IWC	International Whaling Commission

IWC SC	International Whaling Commission Steering Committee
JBWG	Joint Bycatch Working Group
JNCC	Joint Nature Conservation Committee
MEA	Multilateral Environmental Agreements
MMPA	Marine Mammal Protection Act
MVP	Minimum Viable Population size
NAFO	Northwest Atlantic Fisheries Organisation
NAMMCO	North Atlantic Marine Mammal Commission
NASCO	North Atlantic Salmon Conservation Organization
NDF	Non-Detriment Finding
NEAFC	North-East Atlantic Fisheries Commission
NFMS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
PBR	Potential Biological Removal
RFMO	Regional Fisheries Management Organisation
SEAFO	South-East Atlantic Fisheries Organisation
SIOFA	South Indian Ocean Fisheries Agreement
SNH	Scottish Natural Heritage
SPRFMO	South Pacific Regional Fisheries Management Organisation
STECF	Scientific, Technical and Economic Committee for Fisheries
TSS	Traffic Separation Schemes
UNCLOS	United Nations Convention on the Law of the Sea
VESS	Vanuatu Environmental Science Society
VU	Vulnerable
WCPFC	Western and Central Pacific Fisheries Commission
WECAFC	Western Central Atlantic Fisheries Commission
WGBYC	Working Group on Bycatch of Protected Species (ICES)

Executive summary

The MSC is carrying out its Fisheries Standard review (2019-2021). In this context, MSC is reviewing the best science and management practice on how to mitigate disturbance on marine mammals to determine whether changes should be made to criteria and ETP species Performance Indicators. Some of the considerations in this report have been made under the assumption that the MSC Fisheries Certification Process is also a tool to disseminate into the fishery world more rigorous best practices for a “sustainable fishing”, particularly on “*Minimising environmental impact*” and “*Effective fisheries management*”.

This report fits in the context of this review process and attempts to provide elements on:

- Identify fisheries intentionally harassing or killing of marine mammals (Table 1 and Box 1 in Section 2).
- How the issue of “intentionality” during fishery operations is handled by international legislation, by Regional Fishery Management Organisations (RFMO) and in relation to the U.S. Marine Mammal Protection Act (MMPA) (Section 3).
- How other industries (e.g. aquaculture, wildlife tourism, hydrocarbon exploitation, renewable energies, shipping, recreational boating, etc.) handle the issue of “intentional harassment” during their activities (Section 4).

A sample of RFMOs, global fisheries organisations (i.e. COFI) and Multilateral Environmental Agreements (MEA) were selected based on their relevance to fisheries more likely to have an impact on marine mammals (Table 2 in Section 3) and relevance to marine mammal management (i.e. IWC, CMS and its relevant regional agreements, NAMMCO).

A number of fisheries that either intentionally harass or kill marine mammals were identified, including tuna fisheries, shark fisheries, crab and lobster fisheries, catfish fisheries, and EU fisheries deploying AHDs/DDDs (Box 1 in Section 2). Potential regional patterns in occurrence of fisheries intentionally harassing or killing mammals, which are likely based on traditions and economic drivers, were considered.

This report contains an analysis of elements that are relevant for the MSC ongoing revision process:

- Aspects needing a careful consideration by RFMOs, relevant MEAs and Fisheries certification organisations were identified (Box 2 in Section 3).
- Potentially problematic aspects of existing *modus operandi* by RFMOs and MEAs on the issue of marine mammals-fishery interaction (Box 3 in Section 3.22).
- Potential assets to support and disseminate principles and actions necessary for an effective sustainability of fisheries (Box 3 in Section 3.22).
- Important common elements in Codes of conduct and Guidelines when discussing potential new criteria for fisheries certification processes and on mitigation measures by RFMOs (Section 4.4).

In particular, while considering management and conservation measures by RFMOs and relevant MEAs, four common denominators were identified:

- The existence of a serious engagement by RFMOs on the implementation of Ecosystem Management Approach, in this case, in minimising the impact of fisheries on the ecosystem.
- The lack of efficiency and consistency, within and between RFMOs, in management of mitigation measures for marine mammals, compared to other ETPs species.

- An urgent need for coordinated work by environment and fisheries authorities (international and national) to improve efficiency of their policy and management actions.
- RFMOs and fisheries certification bodies can play a huge role in promoting the best practices of sustainable fisheries and implementing effective mitigation measures for marine mammals.

Finally, in terms of measures by other industries to mitigate disturbance to marine mammals, common traits were: exclusion zones; restrictions on number of platforms around animals at any given time; limitation on exposure, in terms of both time and sound; distance from the animals; speed of the platform operating around animals; movements/positioning around animals; and soft-start/ramp-up of noisy activities. Almost all guidelines include the notion of data collection (before, during and after), to assess the impact of any activity on populations and species.

1. Introduction

1.1. Marine Stewardship Council and the Fisheries Standard Review

The Marine Stewardship Council (MSC) is recognised as the largest global organisation for the certification of wild capture fisheries (FAO 2008, Gilman 2011). MSC Fisheries Standard¹ is based on three core Principles:

‘Principle 1: Sustainable target fish stocks

A fishery must be conducted in a manner that does not lead to over-fishing or depletion of the exploited populations and, for those populations that are depleted, the fishery must be conducted in a manner that demonstrably leads to their recovery.

Principle 2: Environmental impact of fishing

Fishing operations should allow for the maintenance of the structure, productivity, function and diversity of the ecosystem (including habitat and associated dependent and ecologically related species) on which the fishery depends.

Principle 3: Effective management

The fishery is subject to an effective management system that respects local, national and international laws and standards and incorporates institutional and operational frameworks that require use of the resource to be responsible and sustainable’.

The MSC certification system aims to guarantee that (a) fishing is carried out “*at a level that ensures it can continue indefinitely and the fish population can remain productive and healthy*”, (b) fishing activities are “*managed carefully so that other species and habitats within the ecosystem remain healthy*”, and (c) fisheries “*comply with relevant laws*” and are “*able to adapt to changing environmental circumstances*”.

In the Fisheries Certification Process v2.1, fisheries with mammals as the target species are clearly not eligible for MSC certification and fisheries impacts on marine mammals are scored under secondary or ETP species. MSC includes a suite of Performance Indicators (2.3.1-2.3.3), including criteria assessing whether fisheries are avoiding and minimizing injury and mortality of Endangered, Threatened and Protected (ETP) species and stocks and whether they meet national or international requirements for ETP species protection and rebuilding (Marine Stewardship Council 2018a). In particular, in accordance to Principle 2 above, MSC evaluates whether fisheries put in place ‘*a comprehensive strategy to manage impacts, minimize mortality and injury of ETP species, and evaluate with a high degree of certainty whether a strategy is achieving its objectives*’ (Marine Stewardship Council 2018a). For ETP species (‘*out of scope species*’) the general intent is to ‘*provide a high probability of persistence of the species over time*’. This can be measured ‘*as minimum viable population size (MVP), Potential Biological Removal (PBR) or other metrics which help determine the sustainability of a population*’ (Marine Stewardship Council 2018a). The MSC Fisheries Certification Process specifies that if ‘*the impact of the fishery in assessment on ETP species*’ cannot be ‘*analytically determined*’ a Risk-Based Framework can be triggered (Marine Stewardship Council 2018b).

The MSC Fisheries Certification Process includes principles and criteria that are in line with international laws (see Section 3 for more details). Concerning legal requirements, MSC assessment process focuses on whether species are covered by national ETP species legislation, listed in binding international agreements (i.e. CITES and CMS

¹ <https://www.msc.org/for-business/certification-bodies/fisheries-standard-program-documents>

agreements) or listed in the IUCN Redlist as vulnerable (VU), endangered (EN) or critically endangered (CE) (Marine Stewardship Council 2018a).

At present, the MSC is carrying out the MSC Fisheries Standard review (2019-2021). MSC is reviewing the best science and management practice on how to mitigate disturbance on marine mammals to determine whether changes should be made to criteria and ETP species Performance Indicators. In particular, the MSC is considering whether it should implement specific ETP species requirements to evaluate or prohibit fisheries for which intentional harassment or killing of marine mammals take place in the course of fishing activities.

This report fits in the context of this review process. It attempts to provide elements on how the issue of “intentionality” during fishery operations is handled by international legislation, by Regional Fishery Management Organisations (RFMO) and in relation to the U.S. Marine Mammal Protection Act (MMPA). It also provides some elements on how other industries (e.g. aquaculture, wildlife tourism, hydrocarbon exploitation, renewable energies, shipping, recreational boating, etc.) handle the issue of “intentional harassment” during their activities.

1.2. U.S. Marine Mammal Protection Act

In 1972, the U.S. Congress passed Marine Mammal Protection Act in response to increasing concerns among scientists and the public that significant declines in some species of marine mammals were caused by human activities. The MMPA established part of the national policy to prevent marine mammal species and population stocks from declining beyond the point where they cease to be significant functioning elements of the ecosystems of which they are a part. This was the first legislation to mandate an ecosystem-based approach to marine resource management.

Three federal entities share responsibility for implementing the MMPA:

- **National Oceanic and Atmospheric Administration (NOAA) Fisheries**, responsible for the protection of whales, dolphins, porpoises, seals, and sea lions.
- **U.S. Fish and Wildlife Service**, responsible for the protection of walrus, manatees, sea otters, and polar bears.
- **Marine Mammal Commission**, which provides an independent, science-based oversight of domestic and international policies and actions of federal agencies addressing human impacts on marine mammals and their ecosystems.
-

1.2.1 MMPA terminology and rules

“Take” is defined under the MMPA as any action/mean “to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal” (16 U.S.C. 1362). The Act does not make any distinction between ‘intentional’ and ‘unintentional’ take. Instead, the MMPA makes a distinction in terms of level of harassment (i.e. Level A and Level B). However, there is a tendency, while interpreting the Act, to consider an ‘incidental take’ like an unintentional, but not unexpected, taking. As for several other international legislations (e.g. EU Habitats Directive and fishery Regulations; see Section 4), a “take” includes “[t]he collection of dead animals, or parts thereof” and “[t]he restraint or detention of a marine mammal, no matter how temporary”.

Finally, the Act does not include “injuries” in the definition of “take”, but they are considered in the definition of “harassment”. All relevant excerpts of the MMPA² and some definition provided by the NOAA Fisheries³ are presented in Appendix 1.

Concerning commercial fishing, since 1997 the MMPA has included a provision on studies on intentional encirclement to be conducted in consultation with the Inter-American Tropical Tuna Commission (IATC).

1.2.2 Fish and Fish Product Import Provisions of the Marine Mammal Protection Act (The 1 January 2017 amendment)

On 1 January 2017, NOAA Fisheries enacted a new rule requiring countries exporting seafood to the United States to demonstrate that their fisheries management are “comparable in effectiveness” with those of the U.S. MMPA. Seafood can only be imported to the U.S. if the harvesting nation has applied for and received a comparability finding from the National Marine Fisheries Service (NMFS). To determine whether a comparability finding is required, or an exemption may be permitted, fisheries are classified in a ‘List of Foreign Fisheries’ as exempt or export based on the following definitions (exact text found in excerpts below).

Exempt fisheries have a remote likelihood of or no known marine mammal bycatch, including the following:

- 10% or less of any marine mammal stock’s bycatch limit;
- Hand-lines, hook and line, dip nets, cast nets, diving;
- No regulatory program requirement.
- Exempt fisheries are required to: (a) prohibit the intentional mortality or serious injury of marine mammals in the course of commercial fishing operations; and (b) reapply for comparability finding every 4 years.

Export fisheries have more than a remote likelihood of marine mammal bycatch:

- Insufficient information
- Gillnets, longline, trawl, purse seines
- Would be required to develop a regulatory program comparable in effectiveness to the US regulatory program.
- Export fisheries are required: (a) to prohibit the intentional mortality or serious injury of marine mammals in the course of commercial fishing operations; (b) provide scientifically valid data to measure marine mammal bycatch; (c) have marine mammal bycatch mitigation measures in place; and (d) reapply for comparability finding every 4 years.

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1.3. Materials and methods

A full bibliographic search on most popular academic and generic search engines (i.e., www.sciencedirect.com, www.google.com, www.academia.com; www.researchgate.net) has been made for “marine mammal & fishery/ies” combined with the following set of keywords: “bait”, “deliberate harassment”, “intentional harassment”, “culling” (and its variations), “encircling” (and its variations), “retaliation/retaliate”. In terms of time-window, whenever possible, this report attempts to restrict its review on the most recent data (i.e. last 10 years).

² <https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act>

³ <https://www.fisheries.noaa.gov/insight/glossary-marine-mammal-protection-act-definitions>

A sample of RFMOs, global fisheries organisations (i.e. COFI) and Multilateral Environmental Agreements (MEA) were selected based on their relevance to fisheries more likely to have an impact on marine mammals (see Table 2 in Section 3) and relevance to marine mammal management (i.e. IWC, CMS and its relevant regional agreements, NAMMCO). Particular attention was given to organisations that already took some form of action for mitigating the effect of fishery-related activities on marine mammals or ETP species.

In order to identify potential criteria or guidelines that could inform the ongoing MSC discussions around the review of the MSC Fisheries Standard 2019-2021, including aspects of the scoring performance indicators for Endangered, Threatened or Protected (ETP) species, a number of other industries were considered regarding their approaches to minimise their impacts on marine mammals and assess the sustainability of their activities. In particular, the following industries were considered:

- Aquaculture
- Wild-life tourism
- Hydrocarbon industry
- Renewable energy industry
- Shipping and recreational boating

2. Analysis of global fisheries that intentionally harass or kill marine mammals

This Section presents an analysis of global, commercial, wild-capture fisheries that intentionally harass or kill marine mammals (e.g. intentional encirclement of dolphins or other marine mammals, intentional lethal take of any pinnipeds, shooting at marine mammals etc.). Here, the term “intentional” is used to differentiate from bycatch. However, in some instances in terms of “intentionality” there is a grey area. In fact, as it has been described in various studies, in some region “unintentional catches” of marine mammals, including dugongs, become intentional as alive bycaught animals are not released and they become baits for fisheries (particularly for sharks; see Section 2.1) or food for personal or local consumption (e.g. IWC 2011; Muir & Kizska 2012; Mintzer et al 2018). IWC Scientific Committee (2011) found that *‘there is increasing evidence of directed takes of small cetaceans for human use within local small-scale fisheries in some areas of Africa, Asia and South America. Some of these takes are related to decreases in fishing incomes, suggesting that cetaceans are serving as some type of substitute for other resources that are becoming scarcer in relation to demands for human consumption (so-called ‘marine bushmeat’), bait for fisheries or income generation (including the sale of stranded or bycaught animals)’*. Given the status of global fisheries, the IWC SC (2011) *‘considered that an integrated view was warranted. It is reasonable to suspect a relationship between dwindling fish stocks (whether as a result of overfishing, habitat degradation or climate change) and the increased incidence of directed hunts of cetaceans’*.

This Section helps identifying types of fisheries that are prone to harassing or killing marine mammals and geographical “hotspots” of such practices.

As part of existing information on fisheries and geographic areas where marine mammals are targeted in fishery-related operations, Table 1 summaries the available information on marine mammal species utilised as bait or fish attractant for fisheries. This table also includes operations that do not necessarily target marine mammals, but deliberately keep/kill bycaught animals instead of releasing them to use/sell them as bait or as food. In order to give more attention on ongoing activities of such kind, Table 1 mainly restricts

its focus to relatively recent cases and studies (last 10 years). Exceptions are made with “suspected ongoing activities” for which no new studies have been conducted.

In addition to Table 1, the following Sections summarise all known cases of fishing operations that are more prone to actively harass or kill marine mammals.

2.1 Fisheries targeting pelagic fish species

2.1.1 Surrounding nets^{4,5}

Surrounding nets are used worldwide. These are large netting walls set for surrounding aggregated fish from both sides and underneath. The netting wall is framed by lines: a float-line on top and lead-line at the bottom.

In the Eastern Tropical Pacific Ocean, the purse-seine - a type of surrounding net targeting tunas - was set around dolphin schools as they were cue for fish aggregations. This practice produced an unsustainable level of bycatch (e.g. Gerrodette 2009). After an extensive mobilisation in the 90s (the “Dolphin Safe Tuna” campaign for an ecolabelling), purse-seiners developed a mitigation technique known as the “backdown” procedure used with the Medina panel, which it is said to ensure that encircled dolphins are mostly released alive (FAO 2018)⁶. The Backdown Procedure alters the hauling process to facilitate the escape of dolphins before they become caught and killed in the net. To be effective the backdown procedure must be used together with a dense-meshed panel in one portion of the seine (Medina panel) and support teams that from small outboard boats corral dolphins in the direction of this panel. There are safety/operational concerns (i.e. some mortality of fishermen has been reported). It is believed that the Backdown Procedure significantly reduced bycatch of several dolphin species. This tuna purse seine fishery in the Eastern Pacific Ocean is still carried out by vessels of nations that are party to an Agreement on the International Dolphin Conservation Program (AIDCP), with a total annual allowed bycatch of 5000 dolphins. See Section 3.13.1 for full details on the management objectives and mitigation measures implemented by this programme.

The “Dolphin Safe Tune” label prohibits intentional chasing, netting and encirclement of dolphins and the use of drift gillnets to catch tuna. It is also prohibited to mix dolphin safe and ‘ordinary’ tuna on board the vessels and observers must be present in certain fisheries. By purchasing tuna with this label, consumers support tuna fisheries, where adverse impacts on dolphins are minimised (Thrane et al. 2009).

It was believed that outside the eastern tropical Pacific Ocean, fishermen do not intentionally encircle dolphins with purse seine nets to capture tuna. However, marine mammal bycatch were observed also in the Indian Ocean (i.e. outboard and pirogue encircling gillnets targeting Mackerels in Seychelles, beach seines in Comoros and reef seines in Mayotte; Kiszka et al 2008a). Escalle and colleagues (2015) analysed on-board observer data collected between 1995 and 2011 - 9.2% of total vessel ‘activities’ in the Atlantic Ocean and 7.8% in the Indian Ocean - to look at interactions between cetaceans and tuna purse seine fisheries in these basins. They have found as areas of relatively high co-occurrence are east of the Seychelles (Dec-Mar), the Mozambique Channel (Apr-May) and the offshore waters of Gabon (Apr-Sept). Numbers found were reassuring: “[t]he percentage of cetacean-associated fishing sets was around 3% in both oceans and

⁴ <http://www.fao.org/fishery/geartype/101/en>

⁵ <https://www.msc.org/what-we-are-doing/our-approach/fishing-methods-and-gear-types/purse-seine>

⁶ <https://www.iattc.org/DolphinSafeENG.htm>

*datasets whereas 0.6% of sets had cetaceans encircled. Of the 194 cetaceans encircled in a purse seine net (122 baleen whales, 72 delphinids), immediate apparent survival rates were high (Atlantic: 92%, Indian: 100%). Among recorded mortalities, 8 involved pantropical spotted dolphins *Stenella attenuata* and 3 involved humpback whales *Megaptera novaeangliae*". However, in this dataset, 'activities' also included fishing activities (fishing sets and searches for tuna schools), transit between fishing areas, and FAD-related operations (i.e. deployment or recovery). This may translate in an irrelevant number of observed fishing effort, and a following underestimation of the issue.*

Table 1 - Species of marine mammals utilised as bait in marine and freshwater wild fisheries

Table 1. Species of marine mammals utilized as bait in marine and freshwater fisheries						
North Atlantic region						
Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
Present (P)	Cameroon	Driftnet gillnets, Longlines	Sharks (including blue, mako and hammerhead sharks)	Unspecified Delphinid	Targeted, Non-Targeted/Deliberate kill	Van Waerebeek et al., 2015
Past (C)	Ghana			<i>Manatee</i>	Targeted	Ofori-Danson et al., 2008
1999-2010				<i>All cetaceans</i>	Bycatch	IWC 2011
2010-2014 (P)				<i>Tursiops truncatus</i>	Targeted, Non-Targeted/Deliberate kill	Van Waerebeek et al., 2014, 2015
Present (P)	Guinea			Unspecified Delphinid	Targeted, Non-Targeted/Deliberate kill	Ofori-Danson et al., 2019
Present (P)		Unspecified Delphinid	Targeted, Non-Targeted/Deliberate kill	Van Waerebeek et al., 2015		
2010-2014 (C)		Nigeria	<i>Tursiops truncatus, Sousa teuszii</i>	Targeted, Bycatch	Van Waerebeek et al., 2015, 2016	
2015	Mexico	NA	Shark	<i>Tursiops truncatus</i>	Targeted (harpoon), Bycatch	Delgado Estrella. Pers. Comm., July 3, 2015 as in Minzer et al. 2018
South Atlantic region						
Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
Past (C)	Argentina	Crab trap	<i>Lithodes santolla, Paralomis granulosa</i>	<i>Cephalorhynchus commersonii</i>	Targeted (harpoon, gun), Bycatch	Crespo et al., 2017
2001-2005 (P)	Brazil	Longline and other gears	NA	<i>Kogia sima, Sotalia guianensis</i>	Targeted (harpoon, nets, knives), Bycatch (gillnet)	Meirelles et al., 2009
Ongoing		Longlines and gillnets (known as "esperas")	Shark	Unspecified Delphinid. Unspecified whales	Targeted (harpoon)	Barbosa-Filho et al., 2016, 2018
Past, 2008-2011		Gillnets, Traps/Corral (nets or wood)	<i>Calophysus macropterus</i>	<i>Inia geoffrensis, Sotalia fluviatilis</i>	Targeted (harpoon), Non-Targeted/Deliberate kill, Bycatch (gillnet)	Flores et al 2008, Pinto de Sa Alves et al 2012, Iriarte & Marmontel 2013a,b ; IWC 2018a
Past, Present (C)	Venezuela	Gillnets, Traps/Corral (nets or wood)	<i>Calophysus macropterus</i>	<i>Inia geoffrensis, Sotalia fluviatilis</i>		Flores et al 2008, Bolaños-Jiménez et al 2015
North-Pacific region						
Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
Past (C), present (P)	Japan	Undefined	Shark	<i>Tursiops truncatus</i>	Targeted (drive fishery)	Wells & Scott, 2009

Key: (P): potential occurrence, (C): confirmed occurrence, NA: Not Available.

Table 1 (continued) - Species of marine mammals utilised as bait in marine and freshwater wild fisheries

<i>Indo-Pacific region</i>						
Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
Past, 1997-1999, present (A)	Bangladesh	Hooks, handlines	Catfishes (<i>Eutropiichthys vacha</i> , <i>Clupisoma garua</i>)	<i>Platanista gangetica</i>	Targeted (harpoon), Bycatch, Non-Targeted/Deliberate kill	Smith et al 1998, Sinha 2002
2013	China	NA	NA	Unspecified delphinid	NA	Liu et al., 2016
2004-2005	India	NA	Shark	Unspecified Delphinid	Bycatch, Non-Targeted/Deliberate kill	Yousuf et al., 2009
Past, 1991, 1993-94, 1997-99, present (A)		Hooks, handlines	Catfishes (<i>Eutropiichthys vacha</i> , <i>Clupisoma garua</i>)	<i>Platanista gangetica</i>	Targeted (harpoon), Bycatch, Non-Targeted/Deliberate kill	Mohan and Kunhi 1996, Bairagi 1999, Sinha 2002
2010-2012	Indonesia	Longline	Shark	Small cetaceans, including pilot whales, small baleen whales, and dugongs)	Targeted (harpoon), Bycatch, Non-Targeted/Deliberate kill	CMS 2015
2012		Longline	Shark	<i>Globicephala</i> sp, <i>Stenella longirostris</i>	Targeted (harpoon, homemade explosives)	CMS 2015
1997-2004 (C)	Malaysia	Undefined	Shark	Spinner dolphins, bottlenose dolphins, spotted dolphins, Irrawaddy dolphin, dugongs.	Targeted (harpoon, nets)	Jaaman et al. 2005, 2008
2005-2008 (C), present (P)	Pakistan	Undefined	Shark and other fish	<i>Sousa plumbea</i> , <i>Tursiops aduncus</i> , <i>Neophocaena phocaenoides</i> , unspecified cetaceans	Targeted (harpoon), Bycatch, Non-Targeted/Deliberate kill	Gore et al. 2012, Kiani and Van Waerebeek, 2015
Past, present (P)	Philippines	Trap, Longline	Shark (<i>Galeocerdo cuvieri</i> , <i>Carcharinus springeri</i>), Rays, <i>Nautilus pompilius</i> , Groupers	<i>Lagenodelphis hosei</i>	Targeted (harpoon, spear gun, whale hook), Bycatch	Kiszka & Braulik 2018a
Past (C)		NA	Shark	<i>Stenella longirostris</i>	Targeted (harpoon, spear gun), Bycatch	Braulik & Reeves 2018
Past (C), present (P)		Trap, longline	Shark, <i>Nautilus pompilius</i>	<i>Tursiops truncatus</i>	Targeted (harpoon, spear gun), Bycatch	Wells and Scott, 2009
2016		Longline	Shark	Unspecified Delphinid	Targeted, Bycatch (gillnets)	Porter & Yu Lai 2017
Past (C)	Sri Lanka	Longline	Shark	Unspecified Delphinid	Bycatch	Nanayakkara et al. 2014

2018	Taiwan	NA	Shark	<i>Tursiops aduncus</i>	Targeted (harpoon), Bycatch (gillnet)	http://focustaiwan.tw/news/asoc/201812050011.aspx
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Key: (A): anecdotal, (P): potential occurrence, (C): confirmed occurrence, NA: Not Available.

Table 1 (continued) - Species of marine mammals utilised as bait in marine and freshwater wild fisheries

<i>Indo-Pacific region</i>						
Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
2016-2017	Kenya, Tanzania (Zanzibar**), Madagascar	Drift & set gillnets, longlines, handlines	NA	<i>Unspecified dolphins, Indo-Pacific bottlenose dolphin (Tursiops aduncus)**</i> , <i>unidentified dolphin**</i>	Bycatch	Temple et al 2019
2004-2008	La Mayotte	Longline	NA	<i>Pseudorca crassidens</i> , <i>Stenella longirostris</i>	NA	Kiszka et al 2008b
1995-2003	Tanzania (Zanzibar)	Longline	Shark	<i>Tursiops aduncus</i> , <i>Stenella longirostris</i> , <i>Sousa chinensis</i>	Bycatch	Amir et al 2002; Amir et al. 2005
<i>Eastern Pacific</i>						
Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
Past (over 20 years ago) (C)	Chile	Crab trap, lobster trap	<i>Lithodes antarcticus</i> , <i>Lithodes santolla</i> , <i>Paralomis granulosa</i> , <i>Conger eel (Genypterus spp.)</i> , <i>Lobster</i>	<i>Lagenorhynchus australis</i> , <i>Cephalorhynchus commersonii</i> , <i>Phocoena spinipinnis</i>	Targeted (harpoon, gun), Bycatch	Culik, 2010, Crespo et al. 2017, Felix et al 2018
2005-2006	Colombia	Longline	Smooth-hounds (<i>Mustelus lunulatus</i>)	<i>Tursiops truncatus</i> , <i>Stenella attenuata</i> , <i>Stenella coeruleoalba</i>	Targeted (harpoon)	Avila et al 2011
2009-2016	Ecuador	FAD	Industrial tuna fisheries (purse-seine), mahi mahi (<i>Coryphaena hippurus</i>)	<i>Otaria byronia</i> , <i>Stenella attenuata</i> , <i>Delphinus delphis</i> , <i>Globicephala macrorhynchus</i> .	Targeted Bycatch	Castro et al 2018
2009	Guatemala	Longline	Shark	<i>Stenella spp</i> , <i>Tursiops truncatus</i>	Targeted (harpoon)	Quintana-Rizzo, 2011
Past (A)	Mexico	Undefined coastal fisheries	Unspecified	<i>Delphinus capensis</i>	Targeted (harpoon, firearm)	Culik, 2010

Key: (A): anecdotal, (C): confirmed occurrence, NA: Not Available.

Table 1 (continued) - Species of marine mammals utilised as bait in marine and freshwater wild fisheries

Eastern Pacific Period	Country	Métier	Fishery target	Marine mammal species	How	Reference
2005-2007	Peru	Gillnet (driftnet), longline	Sharks (<i>Sphyrna zygaena</i> , <i>Alopias vulpinus</i> , <i>Prionace glauca</i> , <i>Lamna nasus</i> , <i>Isurus oxyrinchus</i>), Rays (<i>Myliobatis spp.</i>), Angel sharks (<i>Squatina vulpinus</i>), mahi mahi, <i>Bonito</i> (<i>Sarda chilensis</i>)	<i>Delphinus spp.</i> , <i>Lagenorhynchus obscurus</i> , <i>Tursiops truncatus</i> , <i>Phocoena spinipinnis</i>	Targeted (harpoon), Bycatch (gillnet, longline)	Alfaro Shigueto et al 2008, 2010, Mangel et al., 2010, 2013
2007		Pelagic longline	Shark, maki-maki	<i>Grampus griseus</i>	Targeted (harpoon), Bycatch (gillnet, longline)	García-Godos and Cardich, 2010
2013-2015		Longlines	Shark	Unspecified Delphinid	Targeted (harpoon), Non-Targeted/Deliberate kill	https://www.itv.com/news/story/2013-10-17/worlds-largest-dolphin-hunt-captured-on-camera-peru/
Past, 2015		Gillnets, Traps/Corral (nets or wood)	<i>Calophrysus macropterus</i>	<i>Inia geoffrensis</i> , <i>Sotalia fluviatilis</i>		Flores et al 2008, Campbell & Alfaro-Shigueto 2016

2.1.2 Fish-Aggregating Devices⁷

A Fish-Aggregating (or Aggregation) Device (FAD) is a man-made structure used to attract pelagic fish (e.g. marlin, tuna, mahi-mahi/dolphinfish and sharks). They usually consist of buoys or floats that can either be tethered to the ocean floor with concrete blocks (static-FADs) or free to float (Free-floating FADs). FADs are deployed and/or tracked by vessels, including through the use of radio and/or satellite buoys. FADs are used by both industrial and artisanal fisheries. Depending on their design, FADs can be dangerous for ETP species causing entanglements. Restrictions on purse seine sets on dolphins in the eastern Pacific resulted in increased setting on FADs, which increased bycatch of juvenile and undersized tunas, sharks, dolphinfish, sea turtles and marine mammals (Gilman et al. 2012, Dagorn et al. 2013).

Marine mammals can become entangled in any nets, ropes, and lines that are used in the FADs. However, in recent years bycatch is more common because of the practice of encircling FADs. Castro and colleagues (2018) show also an example in Ecuador of marine mammals used as bait for FADs or directly as an improvised FAD.

At present, no mitigation measures are in place for minimizing the impacts of FADs on marine mammals. However, recently some RFMO has raised its concern for the impact that FADs can have on other ETP species, i.e. the International Commission for the Conservation of Atlantic Tunas (ICCAT) and the Inter-American-Tropical-Tuna-Commission (IATTC). In particular, ICCAT Recommendation BYC-10-09 states that CPCs “*shall require that: a) purse seine vessels flagged to that CPC operating in the Convention area avoid encircling sea turtles to the extent practicable, release encircled or entangled sea turtles, including on FADs, when feasible, and report interactions between purse seines and/or FADs and sea turtles to their flag CPC so that this information is included in the CPC reporting requirements [...]*”. IATTC Resolution C-18-05 “on the collection and analyses of data on fish-aggregating devices” recognises that mitigation measures “*need to be expanded and improved upon to ensure that the effects of the use of FADs on highly migratory fish stocks along with non-target, associated and dependent species, are fully understood*”. It also notes that based on science “*the development of improved FAD designs, in particular non-entangling FADs, both drifting and anchored, helps reduce the incidence of entanglement of sharks, sea turtles and other species*”. Finally, this resolution prescribes that “*CPCs shall prohibit their flag vessels from setting [on FADs] a purse-seine net on a school of tuna associated with a live whale shark, if the animal is sighted prior to the commencement of the set*”.

On this bases IATTC has started a systematic data collection that will inform the Commission on potential “*management measures based on those recommendations, including a region-wide FAD management plan, and which may include, inter alia, recommendations regarding FAD deployments and FAD sets, the use of biodegradable materials in new and improved FADs and the gradual phasing out of FAD designs that do not mitigate the entanglement of sharks, sea turtles, and other species*”.

2.1.3 Shark fisheries⁸ and pelagic longlines

Mintzer and colleagues (2018) summarised the extent of shark fisheries hunting marine mammals as bait. Since the 70s, this has been a widespread practice that could be largely unsustainable (Mintzer et al. 2018). This has been described in 33 countries, particularly in Latin America and Asia, with 42 identified species of marine mammals (mostly cetaceans)

⁷ <https://www.fisheries.noaa.gov/national/bycatch/fishing-gear-fish-aggregating-devices>

⁸ <https://news.mongabay.com/2018/06/shark-fisheries-hunting-dolphins-other-marine-mammals-as-bait-study/>

killed as bait. Sharks are fished primarily for their meat, fins, skin, cartilage and liver. The use of marine mammals as shark bait increased when the global price and demand for shark fins increased drastically (late 1990s). In Asia, the study reported that the use of small aquatic marine mammals mostly to attract sharks appeared to be most prevalent in Indonesia, the Philippines and Taiwan. In Latin America, the use of aquatic mammals as bait was found in Argentina, Brazil, Ecuador, Peru, where small cetaceans and South American sea lions are captured to target sharks (in longlines and gillnets; Di Benedetto and Ramos, 2000; Félix and Samaniego 1994; Ott et al. 2002, Mangel et al. 2010).

In addition to the 'bait issue', it is known that shark nets show a high bycatch rate for marine mammals (e.g. in Tanzania and Zanzibar; Kiszka et al. 2008a).

It is worth noting that Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) has listed ten elasmobranchs on Appendix II and seven on Appendix I. While species listed under Appendix I can normally not be traded internationally, except when the purpose of the import is not commercial, species listed under Appendix II can still be internationally traded, but require a certificate that the exported specimens were caught under sustainable conditions, a so-called "Non-Detriment Finding" (NDF). This provides important incentives for shark-exporting nations and RFMOs to develop sustainable management regimes for the listed sharks. This aspect is relevant to the MSC certification process. Shark species listed in Appendix II are: Basking sharks (*Cetorhinus maximus*), Whale sharks (*Rhincodon typus*), Great white sharks (*Carcharodon carcharias*), Porbeagle sharks (*Lamna nasus*), Oceanic whitetip sharks (*Carcharinus longimanus*), Scalloped hammerhead sharks (*Sphyrna lewini*), Great hammerhead sharks (*Sphyrna mokarran*), Smooth hammerhead sharks (*Sphyrna zygaena*), Manta rays (*Manta* spp.), Devil rays (*Mobula* spp), Thresher sharks (*Alopias* spp.) and Silky shark (*Carcharhinus falciformis*).

2.2 Crab and lobster traps and pots⁹

Historically, the use of marine mammal blubber as bait for crabs and lobsters was common in south America up to the 90s (e.g. Argentina and Chile). Nowadays, this practice seems to have disappeared (e.g. Perrin et al. 2009 and relevant IUCN Red list assessments¹⁰).

2.3. Freshwater wild fisheries

There are two well-known cases of dolphins' parts or oil used as bait in freshwater catfish fisheries: the Piracatinga fishery in South America and catfish fisheries in Ganges and Brahmaputra rivers

2.3.1 The Piracatinga fishery (South America)

The fishery on catfish (*Calophysus macropterus*) – known as "piracatinga" (Brazil), "mota" (Colombia), "simi" (Peru), "mapurite" (Venezuela) – has developed in the Amazon and Orinoco basins (South America) mostly replacing another catfish fishery (on *Pimelodus grosskopfii*) due to overfishing. This species is largely consumed and commercially important in Colombia.

Catches have increased over the last 20 years, particularly in Brazil, as trade to Colombia has expanded to as far as the Northeastern, Southeastern and Center-West (including the

⁹ <https://www.msc.org/what-we-are-doing/our-approach/fishing-methods-and-gear-types/pots-and-traps>

¹⁰ <https://www.iucnredlist.org/>

Federal Capital) regions of Brazil. This fishery has been observed in some rivers of Colombia, Peru and Venezuela too.

Unfortunately, the piracatinga fishery uses river dolphins' meat and oil as bait. Thousands of botos (*Inia geoffrensis*) and tucuxi (*Sotalia fluviatilis*), two species of river dolphins used as bait were killed in recent times (IWC 2018a; see Table 1). Although the use of dolphins as bait has been documented in Venezuela, Colombia, Bolivia, and Peru, it is most common in the Brazilian Amazon where botos are frequently harpooned for this purpose. Even though tucuxi are rarely targeted, if they become entangled in fishing gear, their carcasses are used as bait (Iriarte and Marmontel, 2013a,b). All range countries of *Inia* and *Sotalia* have laws in place to protect dolphins and prohibit intentional killing (IWC 2018a). In January 2015, the Brazilian Ministry of the Environment implemented a 5-year moratorium on the selling and trade of piracatinga. Despite the ban, the trade of piracatinga in Brazil seems continuing (IWC 2018a).

2.3.2 The catfish fisheries in Ganges and Brahmaputra rivers (Asia)

Direct killing for use as bait has been one of the principal threats affecting survival of the endangered Ganges river dolphin (*Platanista gangetica*). This long-known practice has been documented by some author (Mohan and Kunhi 1996, Smith et al. 1998, Bairagi 1999; Sinha 2002), which described the use of dolphin blubber oil as catfish (*Eutropiichthys vacha* and *Clupisoma garua*) attractant. This was described in India and Bangladesh, in the Ganges and Brahmaputra rivers. Killing with harpoons have declined since the protection of these species (Indian Wildlife Act 1972). However, "assisted incidental captures" (Sinha, 2002) may still occur (Smith et al 2012). Assisted incidental captures (or 'Non-Targeted-Deliberate kills') are bycatch events in which alive animals are not released from fishing gears, but killed for different uses, including fishery related purposes.

2.4. Fisheries using Acoustic Harassment Devices (AHD)

Acoustic Harassment Devices (AHD), seal scarers, Dolphin Dissuasive Devices (DDD) – which are not Acoustic Deterrent Devices (ADD) or pingers - are deployed by European and other fisheries to deter depredation and mitigate dolphins' bycatch (e.g. Reeves et al. 2001; Buscaino et al. 2009; Maccarrone et al. 2014; ICES 2019). In the context of the implementation of EU Regulation 812/2004, DDDs are used extensively in pelagic trawlers and some static gear (e.g. UK and France; ICES 2019). Given their characteristics and the existing legal definitions, their use should be considered as 'intentional harassment'. There is no doubt that their intent is to cause pain or discomfort to the predator (pinnipeds and cetaceans), preventing the animal from approaching fishing gears (Reeves et al. 2001). In addition, it is worth noting that many international organisations, including the EU and OSPAR commissions, recognise underwater noise as a form of pollution.

AHDs/DDDs use represents a complex case, because they are used as mitigation measure of negative operational interactions between fisheries and marine mammals (i.e. bycatch and depredation). Therefore, they can play an important role in fishery management and marine mammal conservation. However, given their nature (harassment tools) their deployment should be well regulated and managed as other management tools with these characteristics. This does not seem to be the case and their deployment happens with any prior Environmental Impact Assessment. For example, AHD manufacturers are not required to provide (nor they do it voluntarily) data that adequately describe the acoustic output of their devices to allow assessing effects on both target and non-target species (Coram et al. 2014).

2.5 Fishery-related marine mammals culling

2.5.1 Authorised culling programmes: two examples

There are no current examples of authorised marine mammals' culling to protect wild-capture fisheries; however, prior to the implementation of marine mammal protection laws, this has been a widespread practice (e.g. Bearzi et al. 2004). Two relatively recent examples of culling campaigns - seals in Scotland and California sea lions in U.S. (in Oregon, Washington, and Idaho) - are both instances of management measures to protect salmon farming, which are based on two concepts: (a) the existence of rogue animals that are systematically depredating salmon farming facilities; (b) the sustainability of removal for the concerned pinniped population. Although accepted, this practice is controversial (Yodzis 2001).

The Scottish licensing scheme (Coram et al. 2014) has been introduced under the Marine (Scotland) Act 2010. It is worth noting that the Scottish Salmon Growers Association in 1990 adopted the policy that lethal removal should only be used after all reasonable attempts have been made to exclude seals with non-lethal methods. This principle has been adopted in the most recent code of good practice (2010), which states that *"Seals should not be shot during their close seasons (common seals 1 June to 31 Aug; grey seals 1 Sep to 31 Dec) unless all reasonable attempts have been made to apply exclusion measures, these have proved to be ineffective, and there is a significant risk of damage to fish and fish farms"*.

In U.S., a MMPA authorization has been given to lethally remove predatory California sea lions (*Zalophus californianus*), in order to protect salmon farms, in the vicinity of Bonneville Dam for the years 2012 through 2016 (Tidwell et al. 2018).

2.5.2 Illegal culling actions: fishers' retaliation

Fishers in both artisanal and commercial fisheries are known to shoot at a variety of marine mammal species engaging in depredation and to use other destructive means (e.g. explosives) to deter such behaviour (e.g. Yodzis 2001). Despite protection laws, occasionally killing dolphins or seals to avoid loss or damage of target species is seen as a "righteous" action by fishermen in several corners of the world.

2.6. Marine mammals hunts

At least in North Atlantic European and American waters, marine mammals' hunts are strictly regulated. The International Whaling Commission (IWC; see Section 3.20) regulates the Aboriginal whale hunts in Greenland, Alaska, St Vincent and the Grenadines, and in Chukotka (Russian Federation)¹¹. Canada regulates marine mammal hunts domestically, as Greenland for its seals and small cetaceans hunts, Norway and Iceland for their commercial whaling¹² and seal hunts and Faroes Islands for their drive hunt on pilot whales and its sealing¹³. The North Atlantic Marine Mammal Commission (NAMMCO) provides management advice on all marine mammals' hunts in the North Atlantic to Greenland, Faroes Islands, Norway and Iceland (see Section 3.21).

In the Pacific region, Japan has and is still hunting thousands of dolphins per year, including dalli-type Dall's porpoise, truei-type Dall's porpoises, Risso's dolphins, bottlenose dolphins,

¹¹ <https://iwc.int/aboriginal>

¹² <https://iwc.int/commercial>

¹³ <https://www.whaling.fo/>

spotted dolphins, striped dolphins, southern form short-finned pilot whales, false killer whales and Pacific white-sided dolphins (e.g. IWC 2018b). Hunts are managed domestically¹⁴. In June 2019, after withdrawing from the IWC, Japan has also resumed commercial whaling within its Exclusive Economic Zone (EEZ). In Solomon Islands, traditional drive hunting of dolphins (i.e. *Stenella attenuata*, *Stenella longirostris* and *Tursiops truncatus*) is also still conducted to obtain teeth (used as traditional currency, bride price, adornment and, more recently, for cash sale). Meat is also consumed. These hunts are carried out without any management procedure (Oremus et al. 2015). Since 2003, Solomon Islands are also capturing live Indo-Pacific bottlenose dolphins (*Tursiops aduncus*) to sell them to the aquarium industry (Oremus et al. 2015). In Indonesia (Lamalera and Lamakera) whales hunt is permitted as traditional subsistence hunt (Mustika 2006). However, some claims that these hunts are no longer for subsistence but rather for commercial purposes^{15,16}. There are many other Asian countries where, legally or illegally, hunts take place (e.g. see Porter and Lai, 2017).

2.7 Conclusions

A number of fisheries that either intentionally harass or kill marine mammals were identified, including tuna fisheries, shark fisheries, crab and lobster fisheries, catfish fisheries, and EU fisheries deploying AHDs/DDDs (Box 1). Hunts are not included in Box 1, as they are not considered fisheries.

Box 1 - Fisheries either intentionally harassing or killing marine mammals

Who	What	Where	How	Why	Impact / management
Tuna fisheries	Purse seines	P: Worldwide	Setting nets on dolphins or FADs	Targeting tuna, mahi-mahi	High / Yes
	FADs	C: Pacific Ocean P: Indian Ocean			Unknown/ No
Shark fisheries	Longlines	C: Atlantic Ocean (Africa, South America) C: Indian Ocean (Africa, Asia) C: Indo-Pacific region (Asia) C: Pacific Ocean (Asia, South America)	Use mammals as bait or mammal oil as attractant	Targeting sharks	High / Mostly illegal
	FADs	P: Worldwide C: Pacific Ocean (South America)			
	Handline fishing	C: Indian Ocean (Asia)			
	Setnets	C: Atlantic Ocean (Africa, South America) C: Indian Ocean (Africa) C: Pacific Ocean (South America)			
	Traps	P: Worldwide C: Pacific Ocean (Asia)			
Catfish fisheries	Handlines	C: Asia (India, Bangladesh)	Use mammals parts or oil as bait or attractant	Targeting catfish	High / Mostly illegal
	Traps / gillnets	C: Amazonia			
Crab & lobster fisheries**	Traps	C: Atlantic Ocean (South America) C: Pacific Ocean (South America)		Targeting crabs/lobster	Unknown / Mostly illegal
EU fisheries under Reg. 812/2004	Pelagic/mid-water trawlers Static gears	C: European waters	Use AHDs/DDDs	Targeting various pelagic fish	Unknown / Partial

Key: P=potential, C=confirmed. **=confirmed in the past, likely ceased, but confirmation needed.

¹⁴ <http://www.jfa.maff.go.jp/e/whale/index.html>

¹⁵ <https://www.nytimes.com/2017/08/03/world/asia/whaling-lamalera-indonesia.html>

¹⁶ <http://dolphinproject.com/blog/indonesias-illegal-dolphin-slaughter-to-end/>

From Box 1, it appears that there might be a regional pattern in occurrence of fisheries intentionally harassing or killing mammals (i.e. a low occurrence of such activities in European and North American regions as opposed to Asian regions), which is likely based on traditions and economic drivers. South America seems a ‘middle ground’ area where traditions are mixed with merely economic drivers and an evolving nature protection culture.

While reviewing available studies, a number of aspects needing a careful consideration by RFMOs, relevant MEAs and Fisheries certification organisations were identified (Box 2). These should be considered, in conjunction with those identified in Sections 3.22 and 4.4, when discussing potential new criteria for fisheries certification processes and on mitigation measures by RFMOs.

The “Relevance for MSC” part in Box 2 has been filled under the assumptions that the MSC Fisheries Certification Process is also a tool to disseminate into the fishery world more rigorous best practices for a “sustainable fishing”, particularly on “Minimising environmental impact” and “Effective fisheries management”.

Box 2 (part 1/3) - Aspects needing careful consideration on the issue of fisheries intentionally harassing or killing marine mammals

Information / Data			
Issue	Why important	Leading body	Relevance to MSC
Several recent reviews (excluded from this report) pointed out ‘ongoing’ intentional killings , but without recent observations (all based on data 20-30 years old).	Without robust information on which were past practices no longer used, it will not possible to inform prevention and mitigation policies. Rapid assessments to definitely rule out fisheries and regions that are no longer interested by such approaches should be carried out.	Scientific bodies of RFMOs and relevant countries.	Avoid risk of no certifying fisheries based on old data presented as current. Inform Fisheries Certification Standard and Process.
Marine mammals , including pinnipeds, sirenians and cetaceans, are still taken for fishery-related purposes or in fishery activities, but given the sparse and scares nature of the data available, at present it is impossible to even roughly estimate the global proportion of fisheries that harass or kill marine mammals .	Except few exceptions ¹⁷ , there are not systems in place to monitor or record such practices. However, without robust information on the real extent of the ongoing practices, no management action can be implemented. Existing monitoring programmes should be refined and specific pilot projects to collect the appropriate information and understand reasons and scope of such activities should be implemented.	RFMOs and relevant countries.	Avoid risk of certifying fisheries that are illegally using marine mammals (or parts) as bait or fish attractant. Inform Fisheries Certification Standard and Process.
Even though it is not possible to clearly identify “hotspots” of harmful fishery-related practices , because of cultural reasons, Asia and South America seem to have the highest rate of occurrence .	These two continents should be prioritised for further investigations.	Scientific bodies of RFMOs and relevant countries.	Inform Fisheries Certification Standard and Process. In absence of accurate data, the Fisheries Certification Process should include criteria to ascertain the absence of such practice.

¹⁷ See Porter and Lai, 2017.

Box 2 (part 2/3) - Aspects needing careful consideration on the issue of fisheries intentionally harassing or killing marine mammals

Legal aspects			
Issue	Why important	Leading body	Relevance to MSC
<p>Shark fisheries and catfish fisheries are a problem, as they are prone to use marine mammals meat and other parts as bait or fish attractants. The extent of such practice seems greatly underestimated, particularly when considering the recent expansion of these fisheries.</p>	<p>Regulations on prohibition and/or alternative baits, and prohibition and/or alternative fishing practices are part of fishery management. There are several examples of RFMOs recommendations and decisions in this field. There are several international legislations prohibiting the use of even parts of ETP species carcasses (e.g. CITES).</p> <p>CITES Appendix II and the concept of “Non-Detriment Finding” (NDF) could be used to tighten fisheries certification standards</p>	RFMOs	<p>Inform Fisheries Certification Standard and Process.</p> <p>Stricter criteria could help developing more sustainable fisheries. Fisheries using marine mammals as bait should not be certified.</p>
<p>In the context of fisheries using marine mammals parts as bait (or food or money), bycatch events that are originally ‘unintentional’, if alive animals are killed instead of being released, they become ‘non-targeted intentional takes’. The extent of this practice and its conservation implications seem largely underestimated.</p>	<p>Bycatch cannot be considered a separate issue from the use of marine mammals meat, blubber or other parts in fishery operations or for other uses, when there is a profit.</p> <p>Stricter (or clearer) rules should be put in place on the fate of both bycaught animals and other recovered carcasses (e.g. stranded animals).</p>	RFMOs, other relevant MEAs (i.e. CITES) and relevant national Authorities.	<p>Inform Fisheries Certification Standard and Process.</p> <p>Stricter criteria could help developing more sustainable fisheries.</p> <p>Fisheries using marine mammals as bait should not be certified, even when baits come from bycaught or stranded animals, which is consistent with international best practices (e.g. MMPA, CITES, EU HD and fishery regulations, protection laws).</p>
<p>Harassment from fisheries happens in encircling gears targeting tunas.</p> <p>It is unclear why only the Eastern Pacific tuna purse seine is strictly managed and other similar fisheries are exempt from a similar management approach.</p> <p>The level of this harassment and the impact on species and populations should be strictly managed in all similar fisheries.</p> <p>Encircling, including on FADs, should be prohibited in presence of ETP species that are prone to entanglements, unless release practices and a full management approach, similar to that used under the AIDCP, are put in place.</p>	<p>Prohibition of encircling is in line with RFMOs decisions focusing on some ETP species prone to entanglement (i.e. ICCAT Recommendation BYC-10-09, IATTC Resolution C-18-05 and AIDCP with its recommendations and guidelines). This practice causes bycatch and distress in dolphins and is managed to avoid impact on dolphins’ species and populations in the medium-, long-term. In fact, the AIDCP framework combines handling practices to mitigate bycatch to the evaluation of bycatch impact on populations (i.e. PBR).</p> <p>Fisheries not guaranteeing these same standards should not be certified.</p>	RFMOs, Fisheries certification organisations.	<p>Inform Fisheries Certification Standard and Process.</p> <p>Stricter criteria could help developing more sustainable fisheries.</p>

Box 2 (part 2/3) - Aspects needing careful consideration on the issue of fisheries intentionally harassing or killing marine mammals

Legal aspects			
Issue	Why important	Leading body	Relevance to MSC
Harassment from fisheries happens in gears equipped with AHDs and DDDs. This type of equipment is made to harass. Even if AHDs and DDDs are valid mitigation tools, their use should be strictly managed and monitored.	The use of AHDs and DDDs in fisheries should be managed in a similar manner to what is done under the Agreement on the International Dolphin Conservation Program, AIDCP) for the “encircling” practice, which causes bycatch and distress. This seems necessary to guarantee that these tools do not impact marine mammal species and populations in the medium- long-term.	RFMOs, Fisheries certification organisations.	The MSC may want to consider to this aspect for those fisheries where these devices are deployed to avoid bycatch or depredation. These are probably ethical and animal welfare considerations rather than on sustainability. Some lesson could be learned from other industries (e.g. at sea construction works; see Section 4.2.2 and 4.2.4) that use this type of devices.
Retaliation related to fisheries is usually illegal. It happens globally at low rates.	If there are not clear rules prohibiting the use of marine mammals for bait, food or other uses and there is a market, this practice could quickly spread.	RFMOs, Fisheries certification organisations.	The MSC may want to consider introducing some criteria to assess if, in some area, this practice still exist.
In regard to ETP species protection and fishery legislation , the MSC Fisheries Standard there is a reference only to (a) national ETP legislation, (b) CITES, (c) CMS agreements, and (d) IUCN listing (i.e. VU, EN, CE). In this regard, two issues are relevant to this review: (1) it is unclear how national legislation is considered in relation to international legislations, if these are inconsistent; (2) global IUCN listing for ETP species is often different from regional IUCN listing.	On the first issue, clarifying the relative weight of inconsistent legislations would increase transparency in the MSC Fisheries Certification Process and help assessor to put fisheries in the correct context. For example, MSC could consider that national rules can be stricter than the international ones, but never looser. On the second issue, MSC should provide some guidance on what is done in case of inconsistent IUCN listings at global and regional level, possibly in relation to the geographical extension of the fishery under examination.	MSC	Inform Fisheries Certification Standard and Process.

Key: AIDCP=Agreement on the International Dolphin Conservation Program

3. Policy and best practice management review: initiatives to address marine mammal interactions in marine wild-capture fisheries

There are almost 40 years of legal instruments establishing international responsibility for fisheries also to conserve ‘associated and dependent species’ (Gilman et al. 2012). Various international legal instruments explicitly require protection of species and habitat of marine mammals including, for example, the U.S. Marine Mammal Protection Act and the EU Habitats Directive. Other international instruments such as, for example, the International Whaling Commission and the Convention on International Trade in Endangered Species of Wild Fauna and Flora, restrict hunting and commercialising of these species; whereas other RFMO instruments provide provisions to limit and mitigate bycatch. Direct takes/killing of marine mammals is also prohibited in majority of countries worldwide (with the exception of some Asian and African countries; e.g. Porter and Lai 2017). See Annex C, as an example, of legal national status of ETP species (including cetaceans and dugongs) and prohibitions on ‘takes’, in relation to small-scale fisheries of the South Western Indian Ocean (Temple et

al. 2018). However, at the very least, most of world countries have ratified the Convention on Biological Diversity (CBD) whose objectives “*are the conservation of biological diversity, the sustainable use of its components and the fair and equitable sharing of the benefits arising out of the utilization of genetic resources, including by appropriate access to genetic resources and by appropriate transfer of relevant technologies, taking into account all rights over those resources and to technologies, and by appropriate funding*” and/or the United Nations Convention on the Law of the Sea (UNCLOS), whose articles 119 and 192 oblige Parties ‘*to consider the effects of fishing on species associated with or dependent upon commercially exploited species*’, and ‘*to protect and preserve the marine environment*’, respectively.

This general vision was emphasised in the UN ‘FAO Code of Conduct for Responsible Fisheries’ (CCRF), calling for the sustainable use of aquatic ecosystems and requires that fishing be conducted with due regard for the environment (FAO, 1995). In particular, the CCRF Article 6.2 calls for measures that, “*not only ensure the conservation of target species but also of species belonging to the same ecosystem or associated with or dependent upon the target species*”. Article 7.2.2d of the CCRF demands for the conservation of aquatic ecosystem biodiversity and endangered species, by calling for the adoption of measures so that “[...] *catch by lost or abandoned gear, catch of non-target species, both fish and non-fish species, and impacts on associated or dependent species are minimized*” (FAO, 1995). In 2010, the Convention on Biological Diversity adopted a new ten-year strategic plan that includes a target of having by 2020 “*the impacts of fisheries on stocks, species and ecosystems within safe ecological limits*” and having “*no significant adverse impacts on threatened species*” (CBD, 2010). The 2020 deadline is approaching but for marine mammals targets appear still very far.

As Gilman and colleagues (2012) pointed out, these and other instruments and international guidance, broadened the mandate of pre-existing RFMOs. There has been increasing recognition of the need for RFMOs to improve their governance of fisheries and conservation and management of fishery resources, including for older RFMOs by expanding their mandates from a target-species focus to meet broadened expectations of the CCRF for an ecosystem-based management and an application of a precautionary approach. This has included a call for establishing explicit limits of acceptable impact on fish and non-fish bycatch species, including associated or dependent species and threatened species, the ban of highly impacting gears (see Sections 3.1-3.21) and a call for performance reviews of RFMOs effectiveness (Gilman et al 2012). The need for establishing explicit limits of acceptable impact on fish and non-fish bycatch species is now well accepted also at the European level (e.g. see all technical discussions in the context of the EU Marine Strategy Framework Directive and the new EU Common Fishery Policy and Technical Measures).

Zollett & Swimmer (2019) reviewed recent literature on safe handling of sea turtles, cetaceans, seabirds, sharks, and billfish and summarised the most effective measures for improving survivability of these species after interactions with gillnet, pelagic longline, and purse seine gear. They also reviewed the current tuna Regional Fishery Management Organization (tRFMO) measures on safe handling and release to identify gaps in implementation of safe handling practices (Annex A). Finally, they grouped existing strategies that increase post-capture survival of marine species into three primary categories: (a) reducing immediate mortality, (b) minimizing injury that results in delayed mortality, and (c) reducing stress that can lead to death. See Annex A containing a table from Zollett & Swimmer (2019) on general principles for all or multiple taxa to increase post-capture survival of bycatch. This is a very good background material that RFMOs should use for their deliberations. Gilman (2011) also provided a review bycatch problems in tuna fisheries and identified best practice gear technology solutions, involving changes in fishing

gear designs and methods. It also provided a summary of Conservation and management measures to mitigate bycatch adopted by RFMOs (Annex B). In general, fishery management recommendations and best practices can include: (i) assessment of the sustainability of the impact of fishery practices on populations of bycaught species (monitoring and management procedures); (ii) default mitigation measures to reduce bycatch, including gear and fishery practices modifications or ban; (iii) introduction of no-take zones, ban of unsustainable fishing practises and protection of species; (iv) handling procedures to minimise bycatch and maximise post-capture survival (Zollett & Swimmer 2019).

This section of the report contains available information on initiatives to address marine mammal interactions in marine wild-capture fisheries. However, it does not consider ongoing activities carried out by RFMOs on Ecological Risk Assessments (ERA), which are also part of a robust framework to manage the issue of mitigating marine mammals-fisheries interactions. Rules, requirements and legislation that are in place across commercial wild-capture fishing operations with regards to best-practice management on interactions with marine mammals are listed and summarized. The review includes national and regional measures, as well as global best-practice guidelines. A sample of 26 RFMOs and relevant MEAs were considered (Tab. 2).

Table 2 - Reviewed Global and Regional Fishery Management Organisations and relevant MEAs that implemented fishery-related management decisions and/or recommendations on protection and/or mitigation of fishery impacts on marine mammals and/or other Endangered, Threatened or Protected (ETP)

Organisation	Marine mammals	Other ETPs
FAO Committee on Fisheries (COFI)	No	Yes
General Fisheries Commission for the Mediterranean (GFCM)	Yes	Yes
Northwest Atlantic Fisheries Organization (NAFO)	No	Yes
North-East Atlantic Fisheries Commission (NEAFC)	No	Yes
Fisheries Committee for the Eastern Central Atlantic (CECAF)	No	No
Western Central Atlantic Fisheries Commission (WECAFC)	No	No
South-East Atlantic Fisheries Organisation (SEAFO)	No	No
South Indian Ocean Fisheries Agreement (SIOFA)	No	No
Western and Central Pacific Fisheries Commission (WCPFC)	Yes	Yes
South Pacific Regional Fisheries Management Organisation (SPRFMO)	Yes	Yes
Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)	Yes	Yes
Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP)	No	No
International Commission for the Conservation of Atlantic Tunas (ICCAT)	No	Yes
Indian Ocean Tuna Commission (IOTC)	Yes	Yes
Inter-American-Tropical-Tuna-Commission (IATTC)	Yes	Yes
Agreement on the International Dolphin Conservation Program (AIDCP)	Yes	NA
Commission for the Conservation of Southern Bluefin Tuna (CCSBT)	Yes	Yes
North Atlantic Salmon Conservation Organisation (NASCO)	No	No
European Union	Yes	Yes
International Maritime Organization (IMO)	Yes	Yes
International Whaling Commission (IWC)	Yes	No
Convention on Migratory Species (CMS)	Yes	Yes
Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)	Yes	No
Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)	Yes	No
Agreement on the Conservation of Seals in the Wadden Sea	Yes	NA
North Atlantic Marine Mammal Commission (NAMMCO)	Yes	No

Key: NA=not applicable.

Table 3 shows the list of explicit rules, decision, recommendations, guidelines, codes of conduct and mitigation measures on mitigation measures of the impact of fisheries on marine mammals by RFMOs and relevant MEAs.

Table 4 lists of explicit rules, decision, recommendations, guidelines and codes of conduct by RFMOs and relevant MEAs on data collection on impact of fisheries on marine mammals.

Sections from 3.1 to 3.21 summarise the role of the selected RFMOs and MEAs (Table 2) and give some details on the content of their decisions, resolutions and recommendations (Table 3 and 4).

Table 3 – List of explicit rules, decision, recommendations, guidelines, codes of conduct on mitigation measures of the impact of fisheries on marine mammals by RFMOs and relevant MEAs

Title	Year
European Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.	1992
IAATC Agreement on the International Dolphin Conservation Program (AIDCP).	1999
AIDCP A-00-01 Revision of Tuna Tracking System.	2000
ASCOBANS Resolution 3.3 on Incidental Take of Small Cetaceans.	2000
AIDCP A-01-01 Adoption of modified Tuna Tracking System.	2001
AIDCP A-01-02 Procedures for AIDCP Dolphin Safe tuna certification.	2001
AIDCP A-01-03 Amendment of rules for qualified captains.	2001
AIDCP A-01-04 Promotion of compliance with the AIDCP.	2001
AIDCP A-01-06 Fishing by non-party vessels.	2001
AIDCP A-02-01 Vessels of less than 363 mt capacity.	2002
AIDCP A-02-02 Measurement of vessel capacity.	2002
AIDCP A-02-03 Definition of a pattern of infractions.	2002
AIDCP A-02-05 Working Group to promote AIDCP Dolphin Safe tuna certification.	2002
AIDCP A-03-02 Resolution on at-sea reporting.	2003
AIDCP A-03-03 Status for cooperating non-parties.	2003
CCAMLR Conservation Measure 25-03 (2018). Minimisation of the Incidental Mortality of Seabirds and Marine Mammals in the Course of Trawl Fishing in the Convention Area.	2018
ACCOBAMS-MOP2/2004/Res.2.12 Resolution 2.12 Guidelines for the use of Acoustic Deterrent Device, with guidelines for technical measures to minimise cetacean-fishery conflicts in the Mediterranean and Black seas.	2004
ACCOBAMS-MOP2/2004/Res.2.13 Resolution 2.13 Pelagic gillnets.	2004
ACCOBAMS-MOP2/2004/Res.2.21 Resolution 2.21 Assessment and mitigation of adverse impacts of interactions between cetaceans and fishing activities in the ACCOBAMS area.	2004
AIDCP A-04-01 Invalid Dolphin Safe certificates.	2004
AIDCP A-04-02 Night set infractions.	2004
AIDCP A-04-03 Vessel inspections.	2004
AIDCP A-04-04 Qualified captains procedures.	2004
AIDCP A-04-08 Criteria for non-parties.	2004
ASCOBANS Resolution 5.5 Incidental Take of Small Cetaceans.	2006
ACCOBAMS-MOP3/2007/Res.A/3.1 Resolution A/3.1 Amendment of the Annex 2 to the Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic area, related to the use of drift nets.	2007
CCAMLR Conservation Measure 51-02 (2008) Precautionary catch limitation on <i>Euphausia superba</i> in Statistical Division 58.4.1.	2008
CCAMLR Conservation Measure 51-03 (2008) Precautionary catch limitation on <i>Euphausia superba</i> in Statistical Division 58.4.2.	2008
AIDCP A-09-02 Reporting infractions.	2009
ACCOBAMS-MOP4/2010/Res.4.9 Resolution 4.9 Fisheries interactions with cetacean.	2010
CCAMLR Conservation Measure 51-01 (2010) Precautionary catch limitations on <i>Euphausia superba</i> in Statistical Subareas 48.1, 48.2, 48.3 and 48.4.	2010
Recommendation GFCM/35/2011/5 On fisheries measures for the conservation of the Mediterranean monk seal (<i>Monachus monachus</i>) in the GFCM Competence Area.	2011
WCPFC Conservation and Management Measure to address impact of purse seine fishing activity on cetaceans (CMM 2011-03).	2011
Recommendation GFCM/36/2012/2 on mitigation of incidental catches of cetaceans in the GFCM area: 1-3.	2012
Recommendation GFCM/37/2013/2 on the establishment of a set of minimum standards for bottom-set gillnet fisheries for turbot and conservation of cetaceans in the Black Sea.	2013
IOTC Resolution 13/04 On the conservation of Cetaceans.	2013
ACCOBAMS-MOP6/2016/Res.6.2 Resolution 6.16 Interactions between fisheries and cetacean.	2016
ASCOBANS Resolution 8.5 Incidental Take of Small Cetaceans.	2016
CCAMLR Conservation Measure 21-03 (2016) Notifications of intent to participate in a fishery for <i>Euphausia superba</i> .	2016
CCAMLR Conservation Measure 91-05 (2016) Ross Sea region marine protected area.	2016

CCAMLR Conservation Measure 51-04 (2018) General measure for exploratory fisheries for <i>Euphausia superba</i> in the Convention Area in the 2018/19 season.	2018
Recommendation GFCM/42/2018/11 on the regional marking of fishing gear.	2018
CCSBT Resolution to Align CCSBT's Ecologically Related Species measures with those of other tuna RFMOs.	2018
SPRFMO CMM 14a-2019 Conservation and Management Measure for Exploratory Fishing for Toothfish by New Zealand-Flagged Vessels in the SPRFMO Convention Area (Supersedes CMM 4.14).	2019
SPRFMO CMM 14b-2019 Conservation and Management Measure for Exploratory Potting Fishery in the SPRFMO Convention Area (Supersedes CMM 14b-2018).	2019
SPRFMO CMM 14c-2019 Conservation and Management Measure for Exploratory Fishing for Toothfish by EU Vessels in the SPRFMO Convention Area.	2019
European Parliament legislative resolution of 16 April 2019 on the proposal for a regulation [...] on the conservation of fishery resources and the protection of marine ecosystems through technical measures, amending Council Regulations [...] and repealing [...] ¹⁸	2019

Table 4 – List of explicit rules, decision, recommendations, guidelines and codes of conduct by RFMOs and relevant MEAs on data collection on impact of fisheries on marine mammals

Title	Year
AIDCP A-99-01 On-Board Observer Program and captain incentives	1999
AIDCP A-99-02 Dolphin necropsy study and intergovernmental collaboration	1999
ICCAT BYC 2010-11: Recommendation by ICCAT on information collection and harmonization of data on bycatch and discards in ICCAT fisheries.	2011
IOTC Resolution 12/03 On the recording of catch and effort by fishing vessels in the IOTC area of competence. IOTC Resolution 15/01 On the recording of catch and effort data by fishing vessels in the IOTC area of competence.	2012
WCPFC Conservation and Management Measure 2013-05 on Daily Catch and Effort Reporting.	2013
ICCAT GEN 16-14: Recommendation 16-14 by ICCAT to Establish Minimum Standards for Fishing Vessel Scientific Observer Programs.	2016
CCAMLR Conservation Measure 23-04 (2016) 1,2 Monthly fine-scale Catch and Effort Data Reporting System for trawl, longline and pot fisheries.	2016
CCAMLR Conservation Measure 41-08 (2017) Limits on the fishery for <i>Dissostichus eleginoides</i> in Statistical Division 58.5.2 in the 2017/18 and 2018/19 seasons.	2017
Regulation (EU) 2017/1004 of the European Parliament and of the Council of 17 May 2017 on the establishment of a Union framework for the collection, management and use of data in the fisheries sector and support for scientific advice regarding the common fisheries policy and repealing Council Regulation (EC) No 199/2008.	2017
CCAMLR Conservation Measure 42-02 (2018) Limits on the fishery for <i>Champsocephalus gunnari</i> in Statistical Division 58.5.2 in the 2018/19 and 2019/20 seasons	2018
SIOFA Conservation and Management Measure for the Collection, Reporting, Verification and Exchange of Data relating to fishing activities in the Agreement Area (Data Standards), CMM 2018/2.	2018
SPRFMO CMM 02-2018 Conservation and Management Measure on Standards for the Collection, Reporting, Verification and Exchange of Data (Supersedes CMM 02-2017).	2018
SPRFMO CMM 03-2019 Conservation and Management Measure for the Management of Bottom Fishing in the SPRFMO Convention Area (Supersedes CMM 03-2018).	2019
SPRFMO CMM 16-2019 Conservation and Management Measure Establishing the SPRFMO Observer Programme (Supersedes CMM 16-2018).	2019

3.1 Food and Agriculture Organization of the United Nations (FAO)

The FAO Committee on Fisheries (COFI) has addressed bycatch and discards as an emerging illegal, unreported and unregulated (IUU)-related issue (FAO 2009) and in 2011 COFI endorsed the International Guidelines for Bycatch Management and Reduction of

¹⁸ http://www.europarl.europa.eu/doceo/document/TA-8-2019-0381_EN.html#title2

Discards in 2011 (FAO 2011). These overarching guidelines did not consider cetaceans or other marine mammals. Regarding bycatch, including discards, FAO has developed International Plans of Action for seabirds and sharks, and guidelines to mitigate sea turtle interactions and mortality with marine capture fisheries (FAO, 1999a,b, 2010, 2011).

In 2014 the Committee on Fisheries (COFI) reiterated its support for FAO's ongoing work on bycatch management and reduction of discards, and requested FAO to expand its efforts to effectively implement the International Guidelines on Bycatch Management and Reduction of Discards, addressing all fishing gears where bycatch, including, *inter alia*, that of marine mammals, and discards were a problem (FAO 2015). In 2018, FAO convened the '*Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations*' in Rome, Italy. This document, which was welcomed by COFI 33 (2018), contains a useful decision-three that could be adopted by RFMOs to handle the marine mammal bycatch issue. COFI 33 also "*encouraged FAO to continue its work, engaging with Members, relevant experts and organizations, such as the International Whaling Commission and the North Atlantic Marine Mammal Commission, in the development of best practices in the form of technical guidelines*".

3.1.1 General Fisheries Commission for the Mediterranean (GFCM)

The objectives of the General Fisheries Commission for the Mediterranean (GFCM) include: (i) promoting the development, conservation and management of living marine resources; (ii) formulating and recommending conservation measures; and (iii) encouraging training and cooperative projects.

There are four GFCM recommendations on issues related to fishery impacts on marine mammals (Table 3).

The three recommendations (GFCM/35/2011/5, GFCM/36/2012/2 and GFCM/37/2013/2) are "*aiming to reduce cetaceans by-catch in the GFCM Competence Area, thus contributing to improve the conservation status of these animals in line with an ecosystem approach to fisheries management*" they also aim to "*to improve the knowledge about the impact that certain fisheries have on marine mammals*". Mitigation measures include ban of specific gears, mandatory actions to study, monitor, prevent, mitigate and, to the extent possible, eliminate incidental captures.

The fourth recommendation (GFCM/42/2018/11) is relevant in terms of management of bycatch, whale entanglements and ghost nets.

3.2 Northwest Atlantic Fisheries Organization (NAFO)

The Northwest Atlantic Fisheries Organization (NAFO) overall objective is to contribute through consultation and cooperation to the optimum utilization, rational management and conservation of the fishery resources of the Convention Area. The NAFO Convention on Future Multilateral Cooperation in the Northwest Atlantic Fisheries applies to most fishery resources of the Northwest Atlantic except salmon, tunas/marlins, whales, and sedentary species.

NAFO does not have any specific provision or guidelines to address potential "intentional harassment" to marine mammals during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries. NAFO has adopted measures on sharks.

3.3 North-East Atlantic Fisheries Commission (NEAFC)

The North-East Atlantic Fisheries Commission (NEAFC) does not have any specific provision or guidelines to address potential “intentional harassment” to marine mammal species during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries. However, NEAFC has adopted measures on elasmobranchs.

According to Gilman and colleagues (2012) “[u]sing the NEAFC-defined five main managed fisheries [...] the following bycatch problems were identified via non-NEAFC-ecological risk assessments: (i) [...] marine mammals [...] in pelagic trawl fishery for redfish; (ii) [...] marine mammals [...] in pelagic mid-water trawl for Norwegian spring spawning herring, blue whiting, and mackerel; (iii) [...] marine mammals [...] in purse seine fisheries for Norwegian spring spawning herring, blue whiting, and mackerel; [...] (v) [...] marine mammals [...] in fisheries for deep-sea species (combination of multiple gears, including, for example, trawl, longline, gillnet, tangle net), defined as fisheries occurring in depths greater than 400m”. None of these interactions have been addressed in active binding measures since then.

3.4 Fisheries Committee for the Eastern Central Atlantic (CECAF)

The purpose of Fisheries Committee for the Eastern Central Atlantic (CECAF) is to promote the sustainable utilization of the living marine resources within its area of competence by the proper management and development of the fisheries and fishing operations.

The CECAF does not have any specific provision or guidelines to address potential “intentional harassment” to marine mammal species during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries.

3.5 Western Central Atlantic Fisheries Commission (WECAFC)

The general objective of the Western Central Atlantic Fisheries Commission (WECAFC) is to promote the effective conservation, management and development of the living marine resources of the area of competence of the Commission, in accordance with the FAO Code of Conduct for Responsible Fisheries, and address common problems of fisheries management and development faced by members of the Commission.

The WECAFC has not adopted any specific provision or guidelines to address potential “intentional harassment” to marine mammal species during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries.

3.6 South-East Atlantic Fisheries Organisation (SEAFO)

The SEAFO too has not adopted any specific provision or guidelines to address potential “intentional harassment” to marine mammal species during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries.

Within the framework of activities related to Resolution 67/79 on Sustainable Fisheries, SEAFO “[r]equests States and regional fisheries management organizations and arrangements, as appropriate, to strengthen or establish data-collection programmes to obtain reliable species-specific estimates of shark, marine turtle, fin-fish, marine mammal

and sea bird by-catch, and to promote further research on selective fishing gear and practices and on the use of appropriate by-catch mitigation measures”.

3.7 South Indian Ocean Fisheries Agreement (SIOFA)

The objectives of South Indian Ocean Fisheries Agreement (SIOFA) are:

- (a) to ensure the long-term conservation and sustainable use of the fishery resources in the Area through cooperation among the Contracting Parties; and
- (b) to promote the sustainable development of fisheries in the Area, taking into account the needs of developing States bordering the Area that are Contracting Parties to this Agreement, and in particular the least developed among them and small-island developing States.

SIOFA has not adopted any specific provision or guidelines to address potential “intentional harassment” to marine mammal species during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries. However, recognising Article 18(3)(e) of the Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks (UNFSA), it has adopted Conservation and Management Measure for the Collection, Reporting, Verification and Exchange of Data relating to fishing activities in the Agreement Area (Data Standards) (CMM 2018/2). These data standards are introduced to assist the Meeting of the Parties to fulfil its objectives *‘as it relates to assessing the state of the fisheries within SIOFA’s competence, including the status of target and non-target species and the impact of fishing on the marine environment’*. They include data on bycatch of marine mammals and other ETP in their requirements for data collection. In addition, the Conservation and Management Measure for the Interim Management of Bottom Fishing in the Agreement Area (Interim Management of Bottom Fishing; CMM 2018/01) has as objective *“to promote the sustainable management of deep-sea fisheries resources in the Agreement Area, including target fish stocks and non-target species, and to protect the marine ecosystem, including, inter alia, the prevention of significant adverse impacts on vulnerable marine ecosystems”*. This CMM instructed the Scientific Committee to assess at its next meeting *‘whether the proposed activities are compatible with the sustainable management of bottom fisheries, including target fish stocks and non-target species’*.

3.8 Western and Central Pacific Fisheries Commission (WCPFC)

The Western and Central Pacific Fisheries Commission (WCPFC) was established by the Convention for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean (WCPF Convention).

The WCPFC has adopted a specific Conservation and Management Measure (2011-03) to address the impact of purse seine activity on cetaceans, which prohibits intentionally setting a purse seine net around a cetacean. It prescribes that, in the event that a cetacean is unintentionally encircled in a purse seine net, the vessel master shall take all reasonable steps to ensure the safe release of the cetacean. It prescribes data collection and reporting on each event, and safe release of the animals (Table 3).

The WCPFC has also adopted the Conservation and Management measure on daily catch and effort reporting (CMM 2013-05) in which is request the collection of bycatch of cetaceans and other ETP species (Table 4).

In addition, WCPFC has adopted Conservation and Management Measure 2017-04 on marine pollution *‘convinced that certain activities associated with fishing may affect the Western and Central Pacific marine environment and that these activities may play a notable role in WCPFC’s efforts to minimise incidental mortality of non-target species and impacts on marine ecosystems’*.

Finally, Conservation and Management Measure 2018-03 to mitigate the impact of fishing for highly migratory fish stocks on seabirds is based on concepts contained in *‘Article 5 of the Convention, which in giving effect to members duty to cooperate in accordance with the 1982 Convention and the UNFSA, requires members of the Commission under Article 5(e) to adopt measures to minimise, inter alia, catch of non-target species’*.

In essence WCPFC seems consistently engaging in improving its CMs to mitigate impacts of fisheries on ETP species.

3.9 South Pacific Regional Fisheries Management Organisation (SPRFMO)

The South Pacific Regional Fisheries Management Organisation (SPRFMO) is an inter-governmental organisation that is committed to the long-term conservation and sustainable use of the fishery resources of the South Pacific Ocean and in so doing safeguarding the marine ecosystems in which the resources occur. SPRFMO is particularly attentive to issues related to operational interactions between fisheries under its competence and ETP species, including marine mammals. It mostly focus on accurate data collection (Table 4; six Conservation Management Measures), but it also provides some prescription on mitigation measures and release (CMM 14a-2019, CMM 14b-2019, CMM 14c-2019; Table 3). It is interesting to note that CMMs 14a-2019 and 14c-2019 show some inconsistencies for what concerns the text on ETP species. These CMMs both focus on measures for exploratory fishing for Toothfish by vessels from different countries (i.e. NZ and EU) in the SPRFMO Convention Area. They both include specific provisions for mitigation measures and data collection on ETP species. However, the “Marine Mammals, Seabirds, Turtles, and other Species of Concern” section of these two CMMs differ. The CMM 14a-2019, on the information to be collected for marine mammals, seabirds, turtles, and other species of concern, states that *“the observer shall have a target of observing 10% of hooks hauled for marine mammal, seabird and turtle captures, and for comparison with a sample of recorded video observations”* and that *“at least 50% of hooks hauled shall be viewed on recorded video after the voyage”*; whereas CMM 14c-2019 it states *“the observer shall have a target of observing 25% of hooks hauled for marine mammal, seabird and turtle interactions. Where observations take place they will be recorded and stored for analyses and/or reference”*. In addition, CMM 14c-2019 clearly states that *“All marine mammals, seabirds, turtle, sharks, skates and rays shall be released alive where possible”*; that *“any seal or cetacean bycatch will trigger a re-evaluation of fishing strategy”* and, compared to CMM 14a-2019, provides more details on turtle, shark, skate and macrourid bycatch mitigation measures.

It is worth noting that SPRFMO has access to very unique data on marine mammals-fisheries interactions, as for some Parties’ fisheries the observation coverage is 100% (Hansen and Hobsbawn 2015).

Finally, relevant to any future development in the context of evaluating and mitigating the impact of fishing activities on the ecosystem is the newly adopted SPRFMO Observer Programme (CMM 16-2019 Observer Programme; Table 4).

3.10 Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR)

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) has been one of the first RFMOs to adopt a Conservation Measure on the issue of mitigation of interactions between fisheries and marine mammals (Conservation Measure 173/XVIII, 1999). This was expanded and replaced by CM 25-03 (2003) on “*Minimisation of the Incidental Mortality of Seabirds and Marine Mammals in the Course of Trawl Fishing in the Convention Area*” and updated thereafter. The measure prohibits the use of net monitor cables, prohibits discharging offal during shooting and hauling gear, calls for minimizing lighting directed out from the vessel, cleaning nets before shooting, minimizing the time the net remains on the sea surface, and minimizing bird access to parts of the net where they are most vulnerable on trawl vessels operating in the Convention Area, excluding waters adjacent to the Kerguelen and Crozet Islands.

CCAMLR has a number of active CMs also introducing specific mitigation measures for marine mammals. CM 41-08 (2017) prescribes that fishing operations of the trawl fishery on *Dissostichus eleginoides* shall be carried out in accordance with Conservation Measure 25-03, so as to minimise the incidental mortality of seabirds and mammals through the course of fishing. There are a number of CMs prescribing the mandatory use of marine mammal exclusion devices in relation to fisheries exploiting *Euphausia superba* (see Table 3). In addition, Conservation Measure 91-05 (2016) established Ross Sea region marine protected area, which has a focus on marine mammals too.

CCAMLR has three active CMs on marine mammal bycatch data collection (Table 4). Finally, it is worth noting the CCAMLR Scheme of International Scientific Observation that includes recording entanglement and incidental mortality of sea birds and marine mammals.

In line with WCPFC Conservation and Management Measure 2017-04 on marine pollution, CCAMLR has adopted Conservation Measure (26-01; 2018) on ‘*General environmental protection during fishing*’ ‘to minimise possible effects on the marine environment arising from fishing-related activities in the context of mitigating incidental mortality of non-target species and protecting the marine environment in accordance with Article IX of the Convention’. This includes measures on disposal of plastic packaging bands, prohibition of discharge in high-latitude fisheries and translocation of poultry.

3.11 International Commission for the Conservation of Atlantic Tunas (ICCAT)

The International Commission for the Conservation of Atlantic Tunas (ICCAT) does not have any specific provision to address potential “intentional harassment” to marine mammal species during fishing operations nor on mitigating operational interactions between fisheries and marine mammals.

ICCAT has only two specific recommendations regarding marine mammal-fisheries interactions and they only pertain to data collection (Table 4). Nevertheless, ICCAT does have resolutions on reductions of bycatch for sea turtles, sharks and sea birds, which include guidelines to reduce mortality and provisions to minimize the encircling practice. Particularly, Recommendation BYC-10-09 (entered into force in 2011) on prohibition of ‘*encircling sea turtles to the extent practicable*’, ‘*release encircled or entangled sea turtles, including on FADs, when feasible, and report interactions between purse seines and/or FADs and sea turtles*’, is indirectly relevant to marine mammals (see more details in Section 2.1.2).

This lack of management action is notable and not fully consistent with its actions on other ETP species (i.e. BYC-10-09). In fact, one of the premises of his recommendation was to

be “consistent with the call for the minimization of waste, discards, **catch of non-target species (both fish and non-fish species), and impacts on associated or dependent species, in particular endangered species** [emphasis added], in the FAO Code of Conduct for Responsible Fisheries and U.N. Agreement on Straddling Fish Stocks and Highly Migratory Fish Stocks”. Also, the lack of management action by ICCAT is notable considering the huge impact that the Eastern Tropical Pacific Ocean purse-seine fishery had on dolphins for decades (50s-80s) and indications from recent studies on purse seine in Atlantic and Indian oceans (Kiszka et al. 2008a; Escalle et al. 2015). This is based on a rather weak assumption of low mortalities rates (2019 Report of the ICCAT Sub-Committee on Ecosystems meeting):

*“It is **believed** [emphasis added] that the mortality of marine mammals with longline and purse seine fisheries is low, while the mortality with gillnets might be considerable. Future work on interactions should be focused on gillnet fisheries”.*

However, some Contracting Government has raised few times serious concerns around this assumption and proposed to align ICCAT with other RFMOs (by WCPFC, IOTC, and IATTC) approving a new management measure. In 2016, “the United States presented a proposal (PA4-804/16¹⁹) prohibiting the intentional encirclement of cetaceans in purse seine fisheries and increasing monitoring. The proposal was in line with measures already in place in WCPFC, IOTC, and IATTC. Mexico opposed the proposal, stating that it would prevent possibilities to develop innovative fishing approaches. Norway questioned the competency of ICCAT to adopt such a measure as well as the cost and the relative priority of this issue given the SCRS workload. The EU supported the measure and encouraged the SCRS to look at the work of other RFMOs to save costs and prevent duplicative action. As there was no consensus to adopt the measure, the United States withdrew it, indicating an intention to come back to the issue in 2017”²⁰. In 2018, U.S. and others proposed again measures to prohibit intentional encirclement of cetaceans in purse seine fisheries. After the meeting, the U.S. Commissioner to ICCAT commented as follow “Unfortunately, there was no consensus among ICCAT members on these proposals. ICCAT's continued failure to adopt measures that are critical to the sustainable management and sound conservation of ICCAT-managed fisheries and protected living marine resources is of great concern to the United States”.

3.12 Indian Ocean Tuna Commission (IOTC)

The objective of the India Ocean Tuna Commission (IOTC) is “to promote cooperation among the Contracting Parties (Members) and Cooperating Non-Contracting Parties of the IOTC with a view to ensuring, through appropriate management, the conservation and optimum utilisation of stocks covered by the organisation’s establishing Agreement and encouraging sustainable development of fisheries based on such stocks”.

The IOTC has been actively looking into the ETP species bycatch issue since 2008, commissioning at least three reports on this matter (Kiska et al. 2008, IOTC Secretariat 2013; Basir et al. 2013). In addition, in 2013 the IOTC – following and expanding on the example of the Western and Central Pacific Fisheries Commission (see Section 3.8) - approved specific management measures addressing issues related to operational interactions between marine mammal species and fisheries with the Resolution (13/04) on the Conservation of Cetaceans. This Resolution prohibits “intentionally setting a purse seine net around a cetacean in the IOTC area of competence”, it prescribes that “in the event that a cetacean is unintentionally encircled in a purse seine net, the master of the vessels shall

¹⁹ https://www.iccat.int/com2018/ENG/PA4_807_ENG.PDF

²⁰ http://gulfcouncil.org/council_meetings/BriefingMaterials/BB-01-2017/R%20-%205%202016%20ICCAT%20Meeting%20Summary.pdf

[...] *take all reasonable steps to ensure the safe release of the cetacean [...]*"; it lays down the "*best practice guidelines for the safe release and handling of cetaceans developed by the IOTC Scientific Committee*" in regard to the data that needs to be collected and request a safe release. This Resolution also prescribes that for "*other gear types fishing for tuna and tuna-like species associated with cetaceans [CPCs] shall report all interactions with cetaceans to the relevant authority*"; that "*CPCs shall adopt Fish Aggregating Device designs that reduce the incidence of entanglement*" and gives some provision on general data collection on cetacean bycatch.

3.13 Inter-American-Tropical-Tuna-Commission (IATTC)

The IATTC is responsible for the conservation and management of tuna and other marine resources in the eastern Pacific Ocean. In purse seine fisheries, vessels of nations that are contracting parties to an Agreement on the International Dolphin Conservation Program (AIDCP) operating in the Eastern Pacific Ocean receive annual individual vessel Dolphin Mortality Limits (DLMs). The total annual cap is 5000 dolphins in the fishery, as well as annual mortality caps for individual dolphin stocks, established at 0.1% of each stock's minimum estimated abundance (Gilman 2011). Vessels are also required to have an onboard observer, use a Medina dolphin safety panel, complete backdown no later than 30 min after sunset (prohibition on night setting), conduct backdown after dolphins are captured, deploy at least one rescuer during backdown, and carry specified dolphin safety/rescue equipment, and other measures (Gilman 2011).

Thirty-four resolutions²¹ relevant to dolphins have been adopted under the Agreement on the International Dolphin Conservation Program (AIDCP). See section 3.13.1 and Table 4 for more details on resolutions focusing on mitigation and management measures.

In the last two decades, IATTC has been consistent adopting resolutions to mitigate impact of tuna fisheries on non-target species. Four resolutions on non-target species are worth noting:

- IATTC Resolution 04-05 which requires the release of non-target species caught in purse seine fisheries.
- IATTC Resolution C-05-03 on the conservation of sharks caught in association with fisheries in the Eastern Pacific Ocean containing measures to mitigate sharks bycatch.
- IATTC Resolution C-11-08 on scientific observers for longline vessels, recognising the need to collect scientific information on target species as well as comprehensive data on interactions with non-target species, in particular, sea turtles, sharks and seabirds.
- IATTC Resolution C-15-04 which requires CPCs to prohibit retaining on-board, transshipping, landing, storing, selling, or offering for sale any part or whole carcass of Mobulid rays and to release all Mobulid rays alive wherever possible.
-

3.13.1 Agreement on the International Dolphin Conservation Program (AIDCP)²²

The Agreement on the International Dolphin Conservation Program (AIDCP) is legally-binding multilateral agreement, which entered into force in February 1999. This is effectively a management program administered by the Inter-American Tropical Tuna Commission, one of five tuna RFMOs.

²¹ <https://www.iattc.org/ResolutionsAIDCPENG.htm>

²² <https://www.iattc.org/AIDCPdocumentationENG.htm>

The first objective of the Agreement on the International Dolphin Conservation Program (AIDCP) is to reduce incidental dolphin mortalities in the purse-seine fishery in the eastern Pacific Ocean to levels approaching zero. The total mortality of dolphins in the fishery has been reduced from about 132,000 in 1986 to a low of 683 in 2017. The AIDCP framework is the most developed in term of management measures put in place to minimise bycatch and harassment to dolphins, including the label (dolphin-safe) and certificate to document compliance by Eastern Pacific Ocean purse seine vessels with prescribed measures to govern dolphin mortality. The label is applied to tuna caught in sets where no dolphins were injured or killed, and it serves as an incentive to eliminate mortality to add value to the catches.

3.14 Commission for the Conservation of Southern Bluefin Tuna (CCSBT)

CCSBT '*Resolution to Align CCSBT's Ecologically Related Species [ERS] measures with those of other tuna RFMOs*' (2018) by adopting all measures on ERS in force in the Indian Ocean Tuna Commission (IOTC), the Western and Central Pacific Fisheries Commission (WCPFC), the International Commission for the Conservation of Atlantic Tunas (ICCAT). Particularly relevant to marine mammals are WCPFC CMM 2011-03 and IOTC Resolution 13/04.

3.15 Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP)

The Convention on the Conservation and Management of Pollock Resources in the Central Bering Sea (CCBSP) does not have any specific provision or guidelines to address potential "intentional harassment" to marine mammals during fishing operations nor on management measures to mitigate the operational interactions between marine mammals and fisheries.

3.16 North Atlantic Salmon Conservation Organisation (NASCO)

The North Atlantic Salmon Conservation Organization (NASCO), which is charged with conserving and restoring wild Atlantic salmon, it is mostly interested to the depredation issue. NASCO has not adopted any specific provision or guidelines to address potential "intentional harassment" to marine mammal species nor on management measures to mitigate operational interactions between marine mammals and fisheries.

3.16 European Union

Article 12 (*Protection of species*) of the European Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora is of fundamental importance to define the context in which relevant provisions in Fishery Regulations are defined. This article states that "1. Member States shall take the requisite measures to establish a system of strict protection for the animal species listed in Annex IV²³ (a) in their natural range, prohibiting: (a) all forms of deliberate capture or killing of specimens of these species in the wild; (b) deliberate disturbance of these species, particularly during the period of breeding, rearing, hibernation and migration; (c) deliberate destruction or taking of eggs from the wild; (d) deterioration or destruction of breeding sites or resting places. 2. For these species, Member States shall prohibit the keeping, transport and sale or exchange, and

²³ All cetaceans and the monk seal (*Monachus monachus*).

offering for sale or exchange, of specimens taken from the wild, except for those taken legally before this Directive is implemented. 3. The prohibition referred to in paragraph 1 (a) and (b) and paragraph 2 shall apply to all stages of life of the animals to which this Article applies. 4. Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned”.

All EU Fishery Regulation refer to Habitats Directive prohibiting the ‘*deliberate catching, retention on board, transshipment or landing of marine species referred to in Annex IV to Directive 92/43/EEC*’.

The new Common Fisheries Policy (Regulation EU 2017/1004) and the future Technical Measures (Proposal for a regulation of the European Parliament and of the Council on the conservation of fishery resources and the protection of marine ecosystems through technical measure²⁴) contain the legal basis of the policy on mitigation the impact of fishing activities on marine mammals.

3.18 Convention on the Conservation of Migratory Species of Wild Animals (CMS)

The Convention on the Conservation of Migratory Species of Wild Animals, more commonly known as Convention of Migratory Species (CMS) - has adopted a Memorandum of Understanding on the Conservation and Management of Dugongs (*Dugong dugon*) and their Habitats throughout their Range. This implies the adoption of Conservation and Management Plans, which will address, *inter alia*, direct and indirect causes of dugong mortality.

Two CMS sister agreements (ACCOBAMS and ASCOBANS) have recently established the ACCOBAMS/ASCOBANS Joint Bycatch Working Group (JBWG). Its Terms of Reference include providing updates on bycatch mitigation measures and their effectiveness; reviewing information on Illegal, Unreported and Unregulated (IUU) fishing; providing technical support as required to facilitate dialogue with relevant bodies that have certification schemes. In providing its advice, the Working Group will aim to cooperate with other relevant bodies and fora, such as the ICES Working Group on Bycatch of Protected Species, the IWC Bycatch Initiative, HELCOM, OSPAR, NAMMCO, Regional Fisheries Management Organizations, NGOs active in the field, and many more.

3.18.1 Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and contiguous Atlantic area (ACCOBAMS)

ACCOBAMS has been active throughout the years on the issue of operational interactions between cetaceans and fisheries. In this area, it has a strong collaboration with the GFCM (ACCOBAMS 2007), CMS, ASCOBANS and IWC (ACCOBAMS 2016).

ACCOBAMS adopted six resolutions on this matter (Table 3). These focused on issues like increasing cooperation with relevant RFMOs and MEAs, requesting the prohibition of pelagic gillnets, recommending mitigation measures (including Acoustic Deterrent Devices),

²⁴ http://www.europarl.europa.eu/doceo/document/TA-8-2019-0381_EN.html#title2

3.18.2 Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS)

The Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS) has also been active on the issue of interactions between cetaceans and fisheries, mostly on bycatch. The three most relevant resolutions (Table 3) introduce some management objectives, recommends data collection, mitigation measures and cooperation with other bodies (i.e. ICES Working Group on Bycatch of Protected Species (WGBYC), EU Scientific, Technical and Economic Committee for Fisheries (STECF), Regional Coordination Groups, ACCOBAMS, CMS, HELCOM, IWC, NAMMCO and OSPAR).

In terms of management objectives relevant to the issue of bycatch, ASCOBANS established that

“ (a) the general aim should be to minimize (i.e. ultimately to reduce to zero) anthropogenic removals (i.e. mortality), and in the short term, to restore and/or maintain biological or management units to/at 80 per cent or more of the carrying capacity”;

(b) in order to reach this objective, the intermediate precautionary aim is to reduce bycatch to less than 1 per cent of the best available population estimate;

(c) a total anthropogenic removal (e.g. mortality from bycatch and vessel strikes) above 1.7 per cent of the best available estimate of abundance is to be considered unacceptable in the case of the harbour porpoise;

(d) if available evidence suggests that a population is severely reduced, or in the case of species other than the harbour porpoise, or where there is significant uncertainty in parameters such as population size or bycatch levels, then “unacceptable interaction” may involve an anthropogenic removal of much less than 1.7 per cent”.

3.18.3 Agreement on the Conservation of Seals in the Wadden Sea

The aim of the Seal Agreement is to promote close cooperation amongst the parties in order to achieve and maintain a favourable conservation status for the harbour seal population in the Wadden Sea. Parties to this Agreement ‘*shall take appropriate action to suppress illegal hunting and taking of seals*’.

In 2014, a set of principles for a Framework for Sustainable Fisheries²⁵ was adopted. These include the use of regular appropriate assessments, the application of appropriate fishing gear and best practices, closed areas to allow natural processes to proceed in an undisturbed way, monitoring of fishing efforts and control, regular fish stock assessments, knowledge-based management, spreading of best practice knowledge.

3.19 International Maritime Organization (IMO)

Abandoned and lost derelict fishing gears (the so-called ‘ghost nets’), which do affect marine mammals, fall under the remit of the International Maritime Organization. This includes the International Convention for the Prevention of Pollution from Ships (MARPOL, Annex V),

²⁵ https://www.waddensea-secretariat.org/sites/default/files/downloads/Folkert_downloads/annex_5-sustainable_fisheries.docx

which prohibits the disposal into the sea of all plastics, but allowing an exception for, “the accidental loss of fishing nets, providing that all reasonable precautions have been taken to prevent such loss” (IMO, 1978).

3.20 International Whaling Commission (IWC)

The International Whaling Commission (IWC), being in charge of whaling activities, does not prohibit deliberate killing in principle. In terms of addressing issues related to operative interactions between cetaceans and fisheries, the IWC has recently launched the Bycatch Mitigation Initiative (2016). In collaboration with other organisations, national governments and fishing communities, this Initiative aims to develop, assess and promote effective bycatch prevention and mitigation measures world-wide.

3.21 North Atlantic Marine Mammal Commission (NAMMCO)

The North Atlantic Marine Mammal Commission (NAMMCO) being an advisory body has not specific recommendation on avoiding intentional killings. However, in terms of marine mammal/fisheries interactions, it has recently established the NAMMCO Council Working Group on By-catch, Entanglements and Live Strandings (BYCELS), which catalyse discussions among scientists, managers and policy makers in this issue.

3.22 Conclusions

While going through all material available online on management and conservation measures put in place by Regional Fisheries Management Organisations and relevant Multilateral Environmental Agreements, few aspects stand out: some potentially problematic that need fixing, others as potential assets to support and disseminate principles and actions necessary for an effective sustainability of fisheries (Box 3).

In general, four common denominators were identified:

- the existence of a serious engagement by RFMOs on the implementation of Ecosystem Management Approach, in this case, in minimising the impact of fisheries on the ecosystem;
- the lack of efficiency and consistency, within and between RFMOs, in management of mitigation measures for marine mammals, compared to other ETPs species;
- an urgent need for coordinated work by environment and fisheries authorities (international and national) to improve efficiency of their policy and management actions;
- RFMOs and fisheries certification bodies can play a huge role in promoting the best practices of sustainable fisheries and implementing effective mitigation measures for marine mammals.

Box 3 – Potentially problematic aspects of existing *modus operandi* by RFMOs and MEAs on the issue of marine mammals-fishery interactions

Issue	Type
In principle, all RFMOs engage in the implementation of a holistic Ecosystem Management Approach, emphasising the need to mitigate any harmful fishery activity and to apply the Precautionary Approach when necessary.	positive

Except some case (i.e. the tuna purse seine bycatch handling methods and some guidelines to minimise the effect of Acoustic deterrent devices) the handling of intentional harassment or killing of marine mammals is not explicitly considered by RFMOs and MEAs. This is because, in legal terms, these issues are dealt with through environmental laws at international and national level.	neutral	
RFMOs use existing environment and nature protection laws to tune their binding or non-binding regulations. Prohibitions of harmful practices usually derive from those environmental provisions.	neutral	
The Fishery and the Environment worlds seldom acknowledge reciprocal importance in the definition of management measures tackling issue related to interactions between fisheries and ETP species. Examples are resolutions adopted unilaterally by MEAs or RFMOs; although in more recent times, this trend is slowly changing.	problematic	
The lack of an effective cooperative engagement by fisheries and environmental authorities, provoke a fragmented and, sometimes, inconsistent pattern across the fishery sector in approved management actions on fisheries/ETP species interactions. Often this setup induces no real action, especially when MEAs pass resolutions on management and mitigation measures without direct involvement of relevant RFMOs and fishery national focal points.	problematic	
Tuna RFMOs are not consistent in their adoption of Conservation and Management Measures on mitigation of interactions between fisheries and marine mammals (e.g. ICCAT versus all other tRFMOs); however, they consistently adopted CMMs for other taxa, in particular birds, sharks and sea turtles. Perhaps, the marine mammal scientific world is not as effective as that of birds and sea turtle, in providing required advice and participate to the work of RFMOs scientific bodies. In addition, political pressures around marine mammals, particularly cetaceans, might be more divisive compared to that around other taxa and do not facilitate a constructive discourse.	problematic	
All RFMOs are consistent now in terms of recommendations and decisions on data collection on fisheries interactions with ETP species, including marine mammals.	positive	
These provisions on data collection create a potentially enormous amount of data that does not seem to be comprehensively considered in assessments, despite the existence of multiple sources of data and scientific bodies potentially interested.	mixed	
RFMOs can play, and in some case do play, a huge role in promoting and efficient application of mitigation measures and in creating an environment-friendly attitude among stakeholders (from fishermen to fishery policy makers).	positive	
Fisheries certification organisations can play a fundamental role in promoting effective sustainable fisheries and educating all stakeholders to the practicalities of what an “Ecosystem Management Approach” truly is in the everyday life.	positive	
It is worth noting that one of the principle of the ‘FAO Guidelines for the ecolabelling of fish and fishery products from marine capture fisheries, revision 1, 2009’ is that ecolabelling schemes for marine capture fisheries shall “[b]e of a voluntary nature and market-driven”. Nowadays being ‘market driven’ implies also to make a number of ‘ethical’ considerations around the product’s production that are gaining increasing importance for consumers. These considerations span from animal welfare, to fair-trade and food ‘carbon footprint’.	neutral	

4. Policy and best practice management review: initiatives to address marine mammal interactions in other marine industries

In this section provides a sample review of rules, requirements, legislation of guidelines related to mitigation measures used in other marine industries that might affect marine mammals with their activities (Table 5). This section is not meant to be exhaustive, as it aims to highlight some of the representative examples of policy across other fields. In particular, examples of best practice are given for wild-life tourism, various anthropogenic activities generating noise at sea, including geophysical surveys (hydrocarbon industry and

research), offshore constructions and piling, Cetacean-Ship collisions and ship traffic (including noise), aquaculture (Acoustic Deterrent Devices (ADD) and Acoustic Harassment Devices (AHD)).

Table 5 – Sample of best practice on mitigation the impact of anthropogenic activities on marine mammals

Title	Year
Wild-life tourism	
NOAA Fisheries “Marine Life Viewing Guidelines”	NA
Fisheries and Oceans Canada “Watching marine wildlife”	NA
IWC principles on whale watching	1996
Code of Practice for the Sustainable Management of Dugong and Marine Turtle Tourism in Australia	2005
ACCOBAMS Guidelines for commercial cetacean watching in the ACCOBAMS area (ACCOBAMS-MOP4/2010/RESOLUTION 4.7)	2010
SNH Guide to Best Practice for Watching Marine Wildlife	2017
IWC/CMS portal on Whale watching handbook	2018
VESS Best Practice Guidelines for Engaging with Indigenous Traditional Owners in the Planning and Management of Dugong and Turtle Tourism	2018
VESS Code of Conduct for Tourism Operators Interacting with Dugongs	2018
Various anthropogenic activities generating noise	
ACCOBAMS Guidelines for the use of Acoustic Deterrent Devices (ACCOBAMS-MOP2/2004/Res.2.12)	2004
JNCC Guidelines for Minimising Acoustic Disturbance to Marine Mammals whilst using explosives	2008
ACCOBAMS Resolution 4.17 on Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area (ACCOBAMS-MOP4/2010/Res.4.17)	2010
Natural England, the Countryside Council for Wales and JNCC “Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise”	2010
New Zealand Department of Conservation 2013 Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations	2013
Irish Department of Arts, Heritage and the Gaeltacht “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Water”	2014
IMO Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life (MEPC.1/Circ.833; 2014).	2014
JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys	2017
JNCC Guide for the Selection and Deployment of Acoustic Deterrent Devices	2018
Ship Strikes	
Voluntary protection measures to reduce the risk of ship strikes with whales and to minimize impact of noise on beluga whale, Saguenay-St. Lawrence Marine Park (Canada)	2005
Routeing measures other than traffic separation schemes establishment of a new recommendatory seasonal area to be avoided "In The Great South Channel", off the East coast of the United States	2008
IMO Guidance document for Minimizing the Risk of Ship Strikes with Cetaceans (MEPC.1/Circ.674)	2009
Santa Barbara Channel Traffic Separation Scheme, whale advisory zone and voluntary slow speed zone	1975, 2014

4.1 Wild-life tourism

Wildlife watching activities play a significant and growing part in the tourism industry, and create direct and indirect economic benefits for many countries and communities – especially amongst developing countries. As such, in order to be sustainable, it needs to be correctly managed.

The NOAA Fisheries “*Marine Life Viewing Guidelines*”²⁶ and the Fisheries and Oceans Canada “*Watching marine wildlife*”²⁷ are two examples of Government webpages showing

²⁶ <https://www.fisheries.noaa.gov/topic/marine-life-viewing-guidelines>

²⁷ <https://www.dfo-mpo.gc.ca/species-especes/mammals-mammiferes/watching-observation/index-eng.html>

rules on observations in the context of their respective Marine Mammal Protection legislations. These webpages explain that regulations and guidelines, which can vary by state and by species, have been developed with specific provisions for viewing whales, dolphins, porpoises, seals, sea lions, sea turtles, and other marine animals.

4.1.1 Whales and dolphins

There are dozens of guidelines and codes of conduct for whale watching and dolphin watching activities available online. It is worth noting the 1996 IWC principles on whale watching²⁸ as first example of agreed general principles to minimise the risks of adverse impacts of whale watching on cetaceans endorsed by an IGO. The IWC principles were very simple, but they are a still valid framework (extendable to other taxa too) on which local regulations can be built upon:

(1) MANAGE THE DEVELOPMENT OF WHALEWATCHING TO MINIMISE THE RISK OF ADVERSE IMPACTS:

- i. *implement as appropriate measures to regulate platform⁽¹⁾ numbers and size, activity, frequency and length of exposure in encounters with individuals and groups of whales;*
 - *management measures may include closed seasons or areas where required to provide additional protection;*
 - *ideally, undertake an early assessment of the numbers, distribution and other characteristics of the target population/s in an area;*
- ii. *monitor the effectiveness of management provisions and modify them as required to accommodate new information;*
- iii. *where new whalewatching operations are evolving, start cautiously, moderating activity until sufficient information is available on which to base any further development;*
- iv. *implement scientific research and population monitoring and collection of information on operations, target cetaceans and possible impacts, including those on the acoustic environment, as an early and integral component of management;*
- v. *develop training programs for operators and crew on the biology and behaviour of target species, whalewatching operations, and the management provisions in effect;*
- vi. *encourage the provision of accurate and informative material to whalewatchers, to:*
 - *develop an informed and supportive public;*
 - *encourage development of realistic expectations of encounters and avoid disappointment and pressure for increasingly risky behaviour.*

⁽¹⁾Any vessel (with or without engine), aircraft or person in the water.

(2) DESIGN, MAINTAIN AND OPERATE PLATFORMS TO MINIMISE THE RISK OF ADVERSE EFFECTS ON CETACEANS, INCLUDING DISTURBANCE FROM NOISE:

- i. *vessels, engines and other equipment should be designed, maintained, and operated during whalewatching, to reduce as far as practicable adverse impacts on the target species and their environment;*
- ii. *cetacean species may respond differently to low and high frequency sounds, relative sound intensity or rapid changes in sound;*
 - *vessel operators should be aware of the acoustic characteristics of the target species and of their vessel under operating conditions; particularly of the need to reduce as far as possible production of potentially disturbing sound;*
- iii. *vessel design and operation should minimise the risk of injury to cetaceans should contact occur; for example, shrouding of propellers can reduce both noise and risk of injury;*
- iv. *operators should be able to keep track of whales during an encounter.*

²⁸ <https://iwc.int/wwguidelines>

(3) ALLOW THE CETACEANS TO CONTROL THE NATURE AND DURATION OF 'INTERACTIONS':

- i. operators should have a sound understanding of the behaviour of the cetaceans and be aware of behavioural changes which may indicate disturbance;
- ii. in approaching or accompanying cetaceans, maximum platform speed should be determined relative to that of the cetacean, and should not exceed it once on station;
- iii. use appropriate angles and distances of approach; species may react differently, and most existing guidelines preclude head-on approaches;
- iv. friendly whale behaviour should be welcomed, but not cultivated; do not instigate direct contact with a platform;
- v. avoid sudden changes in speed, direction or noise;
- vi. do not alter platform speed or direction to counteract avoidance behaviour by cetaceans;
- vii. do not pursue⁽²⁾, head off, or encircle cetaceans or cause groups to separate;
- viii. approaches to mother/calf pairs and solitary calves and juveniles should be undertaken with special care;
 - there may be an increased risk of disturbance to these animals, or risk of injury if vessels are approached by calves;
 - cetaceans should be able to detect a platform at all times;
 - while quiet operations are desirable, attempts to eliminate all noise may result in cetaceans being startled by a platform which has approached undetected;
 - rough seas may elevate background noise to levels at which vessels are less detectable.

⁽²⁾Chase (as opposed to follow), causing the whale to change its course or speed.

Examples of guidelines adopted by other MEAs are the 2010 ACCOBAMS Guidelines for commercial cetacean watching in the ACCOBAMS area (ACCOBAMS-MOP4/2010/Resolution 4.7).

An extensive repository, by country, can be found on the IWC/CMS portal on Whale watching handbook²⁹.

4.1.2 Pinnipeds

Observations of seals are also regulated in some country. Interesting example of guidelines is the '*Guide to Best Practice for Watching Marine Wildlife*'³⁰ published by the Scottish Natural Heritage (SNH), a government body, which promotes Scottish natural heritage care and improvement, its responsible enjoyment and sustainable use. The guide includes a section defining "disturbance" and sections on specific code of conducts for cetaceans, seals, otters, basking sharks, sea turtles and sea birds. It also includes a section on "reporting and recording".

4.1.3 Sirenians

Concerning guidelines and codes of conduct on sirenians' observations, three examples are worth noting. First, the "*Code of Practice for the Sustainable Management of Dugong and Marine Turtle Tourism in Australia*" (2005)³¹. This document consists of two parts: one addressed to local authorities and managers and tour operators; the second containing the "*Best Practice Guidelines for Engaging with Indigenous Traditional Owners in the Planning*

²⁹ <https://wwhandbook.iwc.int/en/responsible-management>

³⁰ https://s3-eu-west-1.amazonaws.com/wwhandbook/guideline-documents/United-Kingdom_Scottish-Guide-to-best-practice-for-marine-wildlife-watching.pdf

³¹ <http://elibrary.gbrmpa.gov.au/jspui/bitstream/11017/649/1/code-of-practice-for-dugong-and-turtles-2005.pdf>

and Management of Dugong and Turtle Tourism”; and the last containing the Code of Conduct for tours operating in dugong and turtle habitat and for specific interactions with these animals (i.e. aircraft, beach-based, vessel-based, in-water interactions).

The second and third examples are the “Code of Conduct for Tourism Operators Interacting with Dugongs”³² and the “Guidelines for Interacting with Dugongs”³³, both developed by the Vanuatu Environmental Science Society (VESS). The first code of conduct is intended to guide members of the tourism industry with actions to ensure safety for dugongs and spread awareness among visitors. The latter code of conduct is intended to facilitate a friendly environment to interact with dugongs for anyone in and around dugong habitats.

4.2 Anthropogenic activities generating noise at sea

Concerning the issue of impact of anthropogenic noise on marine mammals, in 2010 ACCOBAMS has adopted the “Guidelines to address the impact of anthropogenic noise on cetaceans in the ACCOBAMS area” (ACCOBAMS-MOP4/2010/Res.4.17). These guidelines have a wide prospective, as they cover a series of general principles and of specific guidelines addressing issues related to very specific categories of “at sea” activities (i.e. military sonar and civil high power sonar, seismic surveys and airgun uses, coastal and offshore construction works, offshore platforms, Playback & Sound Exposure Experiments, shipping, touristic boats, whale watching, explosive disposal of residual war weapons, use of explosives for testing or for decommissioning structures, and underwater acoustically active devices).

The “Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Water” of the Irish Department of Arts, Heritage and the Gaeltacht (2014) is a very comprehensive document addressing several key potential sources of anthropogenic sound that may impact detrimentally upon marine mammals in Irish waters, which will be subject to periodic review to allow its efficacy to be reassessed, to consider new scientific findings and incorporate further developments in best practice. Among the other things it discusses risk characterisation and management, including operational requirements for Marine Mammal Observers, and project planning for dredging, drilling, pile driving, geophysical acoustic surveys and blasting.

4.2.1 Geophysical surveys (hydrocarbon industry and research)

Specifically in regard to the hydrocarbon industry, the most widely applied and cited guidelines are those by the JNCC (“JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys”, 2017)³⁴. The mitigation measures outlined in these guidelines are designed to reduce the risk of deliberate injury to marine mammals.

The New Zealand Department of Conservation ‘2013 Code of Conduct for Minimising Acoustic Disturbance to Marine Mammals from Seismic Survey Operations’ includes considerations on visual observations/pre-start observations, delayed starts, soft starts, ongoing MMO observations/stop work procedures, recording and reporting.

³² <https://www.vanuatuconservation.org/wp-content/uploads/2018/09/Code-of-conduct-for-Tourism-Operators-WEB2.pdf>

³³ <https://www.vanuatuconservation.org/wp-content/uploads/2018/09/Tourists-Guide-for-Interacting-with-Dugongs-WEB.pdf>

³⁴ http://jncc.defra.gov.uk/pdf/jncc_guidelines_seismicsurvey_aug2017.pdf

4.2.2 Offshore constructions and piling

On mitigating the risk of injuries to marine mammals in offshore constructions and piling, the “*Statutory nature conservation agency protocol for minimising the risk of injury to marine mammals from piling noise*” (by the Natural England, the Countryside Council for Wales and JNCC, 2010) outlines mitigation measures for potential underwater noise impacts arising from pile driving during offshore wind farm construction. This protocol may also be useful to other industries using pile driving. In addition, there are the *JNCC Guidelines for Minimising Acoustic Disturbance to Marine Mammals whilst using explosives* (2008) in the marine environment, from inshore activities such as harbour construction to offshore operations such as wellhead or oil platform decommissioning, all of which have the potential to impact upon marine mammals.

4.2.3 Noise from commercial shipping

In 2014, IMO published the “*Guidelines for the Reduction of Underwater Noise from Commercial Shipping to Address Adverse Impacts on Marine Life*” (MEPC.1/Circ.833; 2014). These guidelines are intended for any commercial ship (they do not address the introduction of noise from military ships and the deliberate introduction of noise for other purposes, e.g. sonar or seismic activities) and they are intended to provide general advice about reduction of underwater noise to designers, shipbuilders and ship operators. In particular, this document considers a number of topics including predicting underwater noise levels, standards and references, design considerations (propellers, hull design), onboard machinery, additional technologies for existing ships (i.e. design and installation of new state-of-the-art propellers, installation of wake conditioning devices, installation of air injection to propeller), operational and maintenance considerations (i.e. propeller cleaning, underwater hull surface, selection of ship speed).

4.2.4 Acoustic Deterrent Devices (ADD) and Acoustic Harassment Devices (ADD)

Concerning existing guidelines on the selection and use of Acoustic Deterrent Devices (ADD) and Acoustic Harassment Devices (AHD) to minimise the impact on marine mammals, two documents are worth noting: the now dated 2004 ACCOBAMS Guidelines for the use of Acoustic Deterrent Devices (ACCOBAMS-MOP2/2004/Res.2.12) and the “*Guide for the Selection and Deployment of Acoustic Deterrent Devices*” published by the JNCC (McGarry et al. 2018)³⁵.

4.3 Ship Strikes

IMO plays an important active role to regulate shipping to reduce vessel threat to cetaceans, particularly ship strikes; this is usually done through the implementation of Traffic Separation Schemes (TSS) and other rerouting measures. These include exclusion zones and speed reduction zones. Examples of rerouting measures can be Canada³⁶ for whales (strikes) and beluga (noise) and USA³⁷ for the right whale (strikes).

In 2009, IMO has published a Guidance document for Minimizing the Risk of Ship Strikes with Cetaceans (MEPC.1/Circ.674). The purpose of this document is to provide guidance to IMO Member Governments (MG) on reduction and minimisation of the risk of ship strikes of

³⁵ <http://jncc.defra.gov.uk/page-7622>

³⁶ <https://baleinesendirect.org/en/whales-at-risk/actions-for-the-future/working-group-on-marine-traffic-and-potection-of-marine-mammals/>

³⁷ https://puc.overheid.nl/nsi/doc/PUC_2041_14/1/

cetaceans. This document lays down a strategy that IMO MGs can put in place to tackle the issue of collision between cetaceans and ships. It also provides suggestion on Operational Measures that could be applied, which includes routeing and reporting measures or speed restrictions. The document also provides suggestions on possible coordination actions to be taken at international level.

An example of Traffic Separation Scheme (1975) and voluntary slow speed zone (2014) is the one implemented in the Santa Barbara Channel (USA)³⁸. This is a very busy area where commercial ships pass through an area used by blue, fin and humpback whales and this poses a potential risk of collision. The goal of these measures were to help reducing the risk of ship strikes and increase the efficiency of vessel traffic in the study area.

4.4 Conclusions: common elements in codes of conduct and guidelines

The MSC is seeking inspiration to inform its ongoing MSC Fisheries Standard review (2019-2021). By looking at other industries, the MSC is trying to identify aspects of guidelines applied in other sectors that could help revising ETP species criteria.

Common traits of all codes of conduct and guidelines to mitigate the disturbance that anthropogenic activities provoke on marine mammals are the following:

- exclusion zones;
- restrictions on number of platforms around animals at any given time;
- limitation on exposure, in terms of time and in terms of sound;
- distance from the animals;
- speed of the platform operating around animals;
- movements/positioning around animals; and
- soft-start/ramp-up of noisy activities.

Almost all guidelines include the notion of data collection (before, during and after), particularly on sightings (temporal and spatial presence and distribution), to assess the impact of any activity on populations and species.

5. Supporting material

Tables 1-4 as spreadsheets with linked PDFs.

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³⁸ https://channelislands.noaa.gov/management/resource/ship_strikes.html

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Appendix 1 - Marine Mammal Protection Act (MMPA) relevant terminology and rules

Here are reported relevant excerpts of the MMPA (<https://www.fisheries.noaa.gov/topic/laws-policies#marine-mammal-protection-act>) and some definition provided by the NOAA Fisheries (<https://www.fisheries.noaa.gov/insight/glossary-marine-mammal-protection-act-definitions>).

Definition 'take'

Take as defined under the MMPA means "to harass, hunt, capture, or kill, or attempt to harass, hunt, capture, or kill any marine mammal" (16 U.S.C. 1362).

It is further defined by regulation (50 CFR 216.3) as "to harass, hunt, capture, collect, or kill, or attempt to harass, hunt, capture, collect, or kill any marine mammal. This includes, without limitation, any of the following:

- The collection of dead animals, or parts thereof.
- The restraint or detention of a marine mammal, no matter how temporary.
- Tagging a marine mammal.
- The negligent or intentional operation of an aircraft or vessel.
- The doing of any other negligent or intentional act which results in disturbing or molesting a marine mammal.
- Feeding or attempting to feed a marine mammal in the wild."

An **incidental take** is an unintentional, but not unexpected, taking.

Definition of 'harassment'

(A) The term "harassment" means any act of pursuit, torment, or annoyance which:

- (i) has the potential to injure a marine mammal or marine mammal stock in the wild [**Level A harassment**]; or
- (ii) has the potential to disturb a marine mammal or marine mammal stock in the wild by causing disruption of behavioral patterns, including, but not limited to, migration, breathing, nursing, breeding, feeding, or sheltering [**Level B harassment**].

(B) In the case of a military readiness activity [...] or a scientific research activity conducted by or on behalf of the Federal Government [...] the term "harassment" means:

- (i) any act that injures or has the significant potential to injure a marine mammal or marine mammal stock in the wild [**Level A harassment**]; or
- (ii) any act that disturbs or is likely to disturb a marine mammal or marine mammal stock in the wild by causing disruption of natural behavioral patterns, including, but not limited to, migration, surfacing, nursing, breeding, feeding, or sheltering, to a point where such behavioral patterns are abandoned or significantly altered [**Level B harassment**].

Harassment and scientific research

(C) [...] the Secretary shall issue a general authorization and implementing regulations allowing bona fide scientific research that may result only in taking by Level B harassment of a marine mammal. Such authorization shall apply to persons which submit, by 60 days before commencement of such research, a letter of intent via certified mail to the Secretary containing the following:

- (i) The species or stocks of marine mammals which may be harassed.
- (ii) The geographic location of the research.
- (iii) The period of time over which the research will be conducted.
- (iv) The purpose of the research, including a description of how the definition of bona fide research as established under this Act would apply.
- (v) Methods to be used to conduct the research.

[...], the Secretary shall issue a letter to the applicant confirming that the general authorization applies, or, if the proposed research is likely to result in the taking (including Level A harassment) of a marine mammal, shall notify the applicant that subparagraph (A) applies.

Study on intentional encirclement (1997)

(1) [...] The Secretary shall, in consultation with the Marine Mammal Commission and the Inter-American Tropical Tuna Commission, conduct a study of the effect of intentional encirclement (including chase) on dolphins and dolphin stocks incidentally taken in the course of purse seine fishing for yellowfin tuna in the eastern tropical Pacific Ocean. The study [...] shall consist of abundance surveys as described in paragraph (2) and stress studies as described in paragraph (3), and shall address the question of whether such encirclement is having a significant adverse impact on any depleted dolphin stock in the eastern tropical Pacific Ocean.

Harassment by entities other than commercial fishers

(i) Upon request therefore by citizens of the United States who engage in a specified activity (other than commercial fishing) within a specific geographic region, the Secretary shall authorize, for periods of not more than 1 year, subject to such conditions as the Secretary may specify, the incidental, but not intentional, taking by harassment of small numbers of marine mammals of a species or population stock by such citizens while engaging in that activity within that region if the Secretary finds that such harassment during each period concerned:

- (I) will have a negligible impact on such species or stock, and
- (II) will not have an unmitigable adverse impact on the availability of such species or stock for taking for subsistence uses pursuant to subsection (b) of this section, or section 1379 (f) of this title or pursuant to a cooperative agreement under section 1388 of this title.

- (ii) *The authorization for such activity shall prescribe, where applicable:*
- (I) permissible methods of taking by harassment pursuant to such activity, and other means of effecting the least practicable impact on such species or stock and its habitat, paying particular attention to rookeries, mating grounds, and areas of similar significance, and on the availability of such species or stock for taking for subsistence uses pursuant to subsection (b) of this section or section 1379 (f) of this title or pursuant to a cooperative agreement under section 1388 of this title,*
 - (II) the measures that the Secretary determines are necessary to ensure no unmitigable adverse impact on the availability of the species or stock for taking for subsistence uses pursuant to subsection (b) of this section or section 1379 (f) of this title or pursuant to a cooperative agreement under section 1388 of this title, and*
 - (III) requirements pertaining to the monitoring and reporting of such taking by harassment, including requirements for the independent peer review of proposed monitoring plans or other research proposals where the proposed activity may affect the availability of a species or stock for taking for subsistence uses pursuant to subsection (b) of this section or section 1379 (f) of this title or pursuant to a cooperative agreement under section 1388 of this title.*
- (iii) *The Secretary shall publish a proposed authorization not later than 45 days after receiving an application under this subparagraph and request public comment through notice in the Federal Register, newspapers of general circulation, and appropriate electronic media and to all locally affected communities for a period of 30 days after publication. Not later than 45 days after the close of the public comment period, if the Secretary makes the findings set forth in clause (i), the Secretary shall issue an authorization with appropriate conditions to meet the requirements of clause (ii).*
- (iv) *The Secretary shall modify, suspend, or revoke an authorization if the Secretary finds that the provisions of clauses (i) or (ii) are not being met.*
- (v) *A person conducting an activity for which an authorization has been granted under this subparagraph shall not be subject to the penalties of this chapter for taking by harassment that occurs in compliance with such authorization.*
- (vi) *For a military readiness activity [...], a determination of "least practicable adverse impact on such species or stock" under clause (i)(I) shall include consideration of personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity. Before making the required determination, the Secretary shall consult with the Department of Defense regarding personnel safety, practicality of implementation, and impact on the effectiveness of the military readiness activity.*
- (vii) *Notwithstanding clause (iii), for any authorization affecting a military readiness activity [...], the Secretary shall publish the notice required by such clause only in the Federal Register.*

Annex A – Relevant guidelines (Source: Zollett & Swimmer 2019)

Table 1. General principles for all or multiple taxa to increase post-capture survival of bycatch

All taxa
The crew should scan the gear before and/or during hauling (depending on gear type) for bycaught animals. A sighted animal should be approached slowly, and once the animal is alongside the vessel, the engine(s) should be placed in neutral (NMFS SEFSC 2008).
Methods for disentangling or de-hooking should be based on the animal's condition, size, and hook and/or line location.
The crew should not use disentangling devices (e.g. tether, ninja sticks, or de-hooking devices) to control the animal (NOAA 2009).
The crew should remove as much gear as safely possible. For animals hooked on longline gear, de-hooking tools should be used when possible and when appropriate to remove hooks. For animals with deeply ingested (swallowed) hooks, or those where the insertion point of the barb is not visible, the hooks should not be removed from any species. For all species with deeply ingested hooks, the line should be cut as close as possible to the hook (NMFS SEFSC 2008, Parga 2012).
To reduce likelihood of recapture, animals should be released, when possible, away from fishing gear, when the engine is in neutral.
Multiple taxa
For air-breathing species, including cetaceans, sea turtles, and seabirds, crew should attempt to ensure the animal can access the surface to breathe.
Use of circle hooks can lead to shallow hooking of sea turtles, sharks, and billfish, which can make hook removal easier and result in fewer severe injuries.
Small hard-shelled turtles (<1 m) and seabirds with attached fishing gear can be brought on board with a dipnet for gear removal when feasible. Other animals (e.g. cetaceans, large sea turtles, sharks, sawfish, and billfish) should have gear removed in the water with the animal brought gently alongside the vessel.
For animals that can be safely brought on board, the fishing crew should minimize tension and avoid pulling on gear that entangled or hooked on the animal while bringing it on board.
Other fishing vessels operating in the same area should be alerted to the presence of or interactions with cetaceans, sea turtles, or with certain shark species (NOAA 2009, 2017b) to reduce the likelihood of another interaction occurring.

Table 3. Tuna Regional Fishery Management Organizations (trFMO) safe handling and release practices by organization and taxa. ICCAT: International Commission for the Conservation of Atlantic Tunas; IATTC: Inter-American Tropical Tuna Commission; WCPFC: Western and Central Pacific Fisheries Commission; IOTC: Indian Ocean Tuna Commission; CCSBT: Commission for the Conservation of Southern Bluefin Tuna; Rec: Recommendation; Res: Resolution; CMM: Conservation and management measure

Safe handling and release requirements	ICCAT	IATTC	WCPFC	IOTC	CCSBT
Sea turtle	Rec 10-09 (longline and purse seine) Rec 13-11 (longline and purse seine) Res 05-08 (longline only)	Res-C-07-03 (longline and purse seine) Res C-04-05 (longline and purse seine) Res C-04-07 (longline and purse seine) Res C-16-01 (purse seine only)	CMM-2008-03 (longline and purse seine)	Res 12/04 (longline and purse seine)	Rec-11-10 (longline only)
Seabird		Res C-11-02 (longline only)	CMM 2015-03 (longline only)		Rec-11-10 (longline only)
Cetacean			CMM-2011-03 (purse seine only)	Res 13/04 (purse seine only)	
Billfish	Rec 15-05 (marlins)			Res 15/05 (marlins)	
Shark	Rec 04-10 Rec 09-07 (thresher sharks <i>Alopias</i> spp.) Rec 10-06 (shortfin mako sharks <i>Isurus oxyrinchus</i>) Rec 10-07 (oceanic whitetip sharks) Rec 10-08 (hammerhead sharks <i>Sphyrna</i> spp.) Rec 11-08 (silky sharks) Rec 15-06 (porbeagle sharks <i>Lamna nasus</i>) Rec 16-12 (Atlantic blue sharks <i>Prionace glauca</i>) Rec 16-13 Res 03-10 Res 05-08 (longline only)	Res C-16-06 (silky sharks <i>Carcharhinus falciformis</i>) Res C-16-04 Res-C-16-01 (purse seine only) Res C-04-05 Res C-05-03 Res C-11-10 (oceanic whitetip sharks) Res C-15-04 (mobulid rays) Res C-16-05	CMM-2011-04 (oceanic whitetip sharks <i>Carcharhinus longimanus</i> ; longline and purse seine) CMM-2010-07 CMM-2013-08 (silky sharks; longline only) CMM-2012-04 (whale sharks <i>Rhincodon typus</i> ; purse seine only)	Res 12/09 (thresher sharks) Res 13/06 Res 17/05 Res 13-05 (whale sharks; purse seine only)	Rec-11-10 (longline only)

ANNEX B – Summary of ‘Conservation and management measures to mitigate bycatch adopted by Regional Fisheries Management Organisations’ (source: Gilman 2011)

Table 2
Conservation and management measures to mitigate bycatch adopted by the tuna Regional Fisheries Management Organizations.

Measure	Legally binding?	Critique
Seabirds		
CCSBT: in 1997, required bird-scaring (tori) lines south of 30°S [171]; adopted guidelines in 1999 [172]. A 2008 recommendation states that, when fishing in the IOTC and WCPFC areas, CCSBT members and cooperating non-members will comply with IOTC and WCPFC measures on protecting ecologically related species [173].	Y	The 30°S, northern boundary may be problematic: Australia determined seabird bycatch measures are necessary North to 25°S. [174]. ICCAT and IOTC require seabird measures North to 20°S [175] and 25°S [176], respectively. The CCSBT measure lacks performance standards. An estimated 80%, 12%, and 8% of southern bluefin tuna catch comes from the IOTC, WCPFC, and ICCAT areas, respectively [177]. However, CCSBT [173] does not require compliance with ICCAT bycatch measures. As a result, CCSBT vessels fishing in the ICCAT area, if from a nation that is not a member of an ICCAT, are required only to employ a tori line, found to be insufficient as a stand-alone measure at grounds with deep-diving seabirds [178].
IOTC: a 2010 resolution, superseding previous measures, requires, when south of 25°S, use of at least two seabird mitigation methods selected from two lists of nine alternatives [176].	Y	There can be substantial differences in the efficacy of the nine alternative seabird bycatch mitigation measures [10,62,112,113]. For example, a vessel that selects to use weighted branchlines and offal discharge control would very likely have a substantially higher seabird catch rate than a vessel that employs night setting and tori lines. The ‘offal discharge management’ measure, which prohibits offal discharge during setting and discourages discharge during hauling, is inconsistent with WCPFC [179]. There have been mixed findings of the effect on seabird catch rates from intentional ‘strategic’ offal discards [62,180,181]; refraining from discharge may be more effective over the long-term. The measure lacks performance standards.
IATTC: in 2005, recommended: (i) implementation of the FAO International Plan of Action—seabirds; (ii) collection of an information on seabird interactions, including bycatch in fisheries; and (iii) Working Group on Stock Assessment to assess the impact of seabird bycatch in eastern Pacific tuna fisheries [182].	N	There is a need for a legally binding measure requiring best practices to mitigate seabird interactions in pelagic longline fisheries. An IATTC [183] reviewed seabird interactions in Eastern Pacific fisheries, concluding that longline fisheries operating in the IATTC Convention Area may adversely affect some seabird species. There is an evidence of relatively high rates of seabird bycatch in several Eastern Pacific longline fisheries [62,184–187].
ICCAT: in 2007, required pelagic longline vessels to carry and use tori lines when fishing south of 20°S [175]. Longline vessels targeting swordfish using monofilament longline gear that set their gear between nautical dusk and dawn, and using a minimum swivel weight of 60 g within 3 m of the hook, may be an exempt [175].	Y	Seabird bycatch avoidance measures are not required for longline vessels operating in the North Atlantic, where seabird bycatch has been documented [62,168,188–190]. The measure lacks performance standards, including a minimum sink rate for terminal tackle for swordfish vessels claiming the tori line exemption.
WCPFC: in 2007, required longline vessels operating in areas south of 30°S and north of 23°N to employ two seabird avoidance methods selected from two lists of a total of eight alternatives. Exempts vessels < 24 m in areas north of 23°N [179].	Y	As with the IOTC seabird measure, there can be substantial differences in the efficacy of some of the eight seabird bycatch mitigation measures included in the list of alternative measures [10,62,112,113]. Exemption for smaller vessels is problematic: high seabird bycatch rates have been documented by vessels, in this size class, in this area [59–61,111–113]. As with the CCSBT seabird measure, the selection of 30°S as the southern hemisphere northern limit may be problematic [173,175,176]. While seabird bycatch is documented to be an extremely rare event in the tropical Pacific [57,191], the selection of 23°N as the northern hemisphere southern limit is problematic: high seabird catch rates have been documented south of this boundary [113,187]. The ‘management of offal discharge’ measure is inconsistent with an IOTC: the IOTC measure prohibits offal discharge during setting and discourages discharge during hauling [176]; the WCPFC measure allows a vessel to either refrain from all discharges or strategically discharge from the opposite side of the vessel from setting and hauling [179]. Refraining from discharge is possibly more effective over the long-term [62]. The measure lacks performance standards.
Sea turtles		
CCSBT: no specific measure on managing sea turtle bycatch. 2008 Recommendation requires compliance with IOTC and WCPFC measures on protecting ecologically related species when fishing in the IOTC and WCPFC areas [173].	N	A small proportion of southern bluefin tuna longline effort occurs in the ICCAT area [177]. However, CCSBT [173] does not require employment of an ICCAT sea turtle measures.
IOTC: a 2009 resolution requires members to report data on sea turtle interactions and for vessels to follow sea turtles handling and release guidelines and possess and use specified turtle release equipment [192]. Purse seine vessels are required to: (i) avoid encircling sea turtles; (ii) when a turtle is encircled or entangled, take measures to safely release the turtle, including stopping the net roll as soon as the turtle comes out of water, disentangling the turtle before resuming net roll, and to the extent practicable, resuscitating the turtle before returning it to the water; and (iii) release all turtles observed entangled in FADs or other gear. Longline vessels are encouraged to use whole fish bait.	Y	There is a need for a legally binding measure to require the employment of best practices to mitigate sea turtle interactions in pelagic longline fisheries. The current measure requires the possession and use of turtle handling and release equipment, but does not require measures to avoid and minimize turtle captures. Restricting setting on FADs and other tuna aggregating devices; stipulating minimum time periods for monitoring FADs; and recovering FADs when not in use are additional best practice methods to reduce sea turtle bycatch in purse seine fisheries [21]. Measure does not specify what actions vessels must take to avoid encircling turtles. The measure lacks performance standards.
IATTC: a 2004 resolution established a three-year program to: (i) collect and analyze information on sea turtle–fishery interactions in the eastern Pacific Ocean; (ii) review the efficacy and effects on target species catch rates of sea turtle avoidance methods; (iii) educate the industry sector; and (iv) establish a voluntary fund to augment the capacity for sea turtle conservation by coastal developing countries [77]. The program was extended in 2007. Program activities, implemented in collaboration with numerous organizations, have included: (i) the exchange of circle hooks for J hooks, tuna hooks and narrower circle hooks; (ii) distribution of dehookers; (iii) placement of onboard observers to monitor hook trials; and (iv) training in data collection and database management for participants in the hook trials [183]. A 2007 resolution calls for purse seine vessels to: (i) avoid encirclement of sea turtles to the extent practicable; (ii) monitor FADs for entangled turtles; (iii) release turtles observed entangled in FADs; and (iv) conduct research and development of new designs of FADs to reduce turtle entanglement [193]. A previous measure required rescuing turtles sighted in nets before they become entangled, and when turtles are entangled in the net, to stop net roll as soon as the turtle comes out of the water, and not start again until the turtle has been released [194]. The 2007 resolution further calls on longline vessels to: (i) carry and use turtle releasing equipment; and (ii) conduct trials of combinations of circle hooks and bait, depth and other turtle bycatch mitigation measures [193].	Y	There is a need for a legally binding measure requiring best practices to mitigate sea turtle interactions in pelagic longline fisheries. The current measure requires the possession and use of turtle handling and release equipment, but does not require actions to avoid and minimize turtle captures. Restricting setting on FADs and other tuna aggregating devices; stipulating minimum time periods for monitoring FADs; and recovering FADs when not in use are additional best practice methods to reduce sea turtle bycatch in purse seine fisheries, which are not included in the measure [21]. Measure does not specify what actions vessels must take to avoid encircling turtles. The measure lacks performance standards for sea turtle interactions in longline or purse seine fisheries.
ICCAT: a 2003 resolution encourages the: (i) collection and provision of data on sea turtle–fishery interactions and other threats to sea turtles; (ii) live release of caught sea turtles; and (iii) sharing of information on technical measures to reduce turtle catch levels and handling and release practices. The resolution also calls for (iv) the development of data collection and reporting methods for the incidental bycatch of sea turtles in fisheries for tuna and tuna-like species [195]. A 2005 resolution encourages circle hook research and exchange of ideas on improving the handling and release of caught sea turtles [196].	N	There is a need for a legally binding measure to require the employment of best practices to mitigate sea turtle interactions in pelagic longline and purse seine fisheries.
WCPFC: a 2008 measure requires purse seine vessels to: (i) avoid encircling sea turtles; (ii) safely release turtles that are encircled or entangled in FADs or other gear, including, when turtles are entangled in the net, stopping net roll and disentangling the turtle; and (iii) carry and use dip nets to handle turtles [197]. The measure requires shallow-setting, swordfish-targeting longline vessels to employ one or more of the following: (i) use only large circle hooks, defined as, “...generally circular or oval in shape and originally designed and manufactured so that the point is turned perpendicularly back to the shank”, that have an offset $\leq 10^\circ$; (ii) use only whole finfish for bait; and (iii) use any other measure approved by the Commission to be capable of reducing turtle interaction rates. Members are to establish their own definitions of what constitutes a ‘large’ hook, and what constitutes a ‘shallow-set, swordfish targeting’ fishery. Swordfish fisheries determined by the Scientific Committee to have minimal observed turtle interaction rates over a three-year period, and $\geq 10\%$ observer coverage during the three-year period, are exempt from the measure, where ‘minimal’ rates are to be determined by the Scientific Committee. All longline vessels are required to carry specified turtle handling and release equipment [197].	Y	Additional restrictions on setting on FADs and other aggregating devices; stipulating minimum time periods for monitoring FADs; and recovering FADs when not in use are additional best practice methods to reduce sea turtle bycatch in purse seine fisheries [21]. Measure does not specify what actions vessels must take to avoid encircling turtles. The single factor effect of using either a large circle hook with the specified threshold offset, or whole fish bait, on turtle catch rates is less certain than is the use of the combination of the two measures [21,22,67,115–117,119]. The efficacy of the longline measure is compromised by not defining what constitutes a “large” hook, such as a minimum width for the narrowest point of the hook. There is no empirical basis for requiring circle hooks to have an offset $\leq 10^\circ$ [122]. While there is an evidence of order of magnitude higher sea turtle catch rates in shallow-setting, swordfish-targeting longline fleets relative to deeper-setting tuna-targeting fleets, there is a large and growing body of evidence of problematic levels of sea turtle mortality in longline tuna fisheries [21,23,116,119]. The measure lacks performance standards.

Table 2 (continued)

Measure	Legally binding?	Critique
Sharks		
CCSBT: no specific measure on shark bycatch. 2008 recommendation requires compliance with IOTC and WCPFC measures on protecting ecologically related species when fishing in the IOTC and WCPFC areas [173].	N	Measures restricting shark finning practices have limited potential to control shark fishing mortality levels, except in fisheries with limited markets for shark meat and strong resources for surveillance and enforcement [12]. None of the shark measures require employment of longline or purse seine gear technology best practices for shark bycatch mitigation.
IOTC: a 2005 resolution requires: (i) annual reporting of data on shark catches; (ii) keep all parts of retained sharks, excluding head, guts, and skins, to the point of first landing; (iii) have onboard fins that total $\leq 5\%$ of the weight of sharks onboard, up to the first point of landing, or otherwise ensure compliance with the 5% rule through certification, observer monitoring or other method [198]. An IOTC [199] prohibits the retention, transshipment or landing of all species of thresher sharks, intended to address concerns over the status of the bigeye thresher shark (<i>Alopias superciliosus</i>), but applicable to all thresher species due to the difficulty in differentiating between bigeye and other thresher species.	Y	ICCAT has pursued improved collection of species-level shark catch data since 1995, but lack of compliance has impeded effective shark stock assessments [201]. Similarly, IOTC passed a resolution in 2005 calling for shark catch data reporting, and passed a second resolution in 2008 when compliance with the 2005 shark data reporting resolution was poor [198,199]. Measures prohibiting retention of certain at-risk shark species may contribute to reduced fishing mortality of these species.
IATTC: a 2005 measure requires members' vessels to: (i) keep all parts of retained sharks, excluding head, guts, and skins, to the point of first landing; (ii) have onboard fins that total $\leq 5\%$ of the weight of sharks onboard, up to the first point of landing, or otherwise ensure compliance with the 5% rule through certification, observer monitoring or other method [200]. An IATTC has passed resolutions annually since 1999 to evaluate and reduce elasmobranch bycatch [200].	Y	A small proportion of southern bluefin tuna longline effort occurs in the ICCAT area [177]. However, CCSBT [173] does not call for CCSBT members to employ ICCAT measures related to the protection of ecologically related species, including sharks.
ICCAT: a 2004 measure requires vessels to: (i) keep all parts of retained sharks, excluding head, guts, and skins, to the point of first landing; (ii) have onboard fins that total $\leq 5\%$ of the weight of sharks onboard, up to the first point of landing, or otherwise ensure compliance with the 5% rule through certification, observer monitoring or other method [202]. Recommendations adopted in 2006 and 2007 reminded contracting parties of requirements for the provision of shark catch data [203,204]. In 2009, an ICCAT prohibited the retention, transshipment or landing of bigeye thresher sharks, excluding a small-scale Mexican coastal fishery [205].	Y	
WCPFC: a 2009 measure requires members to either: (i) have onboard fins totaling $\leq 5\%$ of the weight of sharks; (ii) land sharks with fins attached to the carcass; or (iii) land fins with the corresponding carcass [206]. The measure calls for the reporting of annual shark catches at the species-level for identified species of concern [206].	Y	
Marine mammals		
IATTC: in purse seine fisheries, vessels operating in the Eastern Pacific Ocean of nations that are contracting parties to an AIDCP receive annual, individual vessel dolphin mortality limits, there is an annual cap of 5000 total dolphin mortalities in the fishery, as well as annual mortality caps for individual dolphin stocks, established at 0.1% of each stock's minimum estimated abundance [51,153,207]. When making dolphin-associated sets, participating vessels allocated individual dolphin mortality limits are also required to have an onboard observer (for vessels with a carrying capacity exceeding 363 metric ton), use a Medina dolphin safety panel, complete backdown no later than 30 min after sunset (prohibition on night setting), conduct backdown after dolphins are captured, deploy at least one rescuer during backdown, and carry specified dolphin safety/rescue equipment, and other measures [153,207].	Y	To determine if mitigation measures are needed in longline fisheries, monitoring is required to determine cetacean interaction levels and identify affected populations [11]. Dolphin mortality was reduced from 133,000 in 1986 to 886 in 2007 in Eastern Pacific purse seine sets on dolphins [208]. Possible indirect adverse effects on dolphin populations require further investigation [79,97,98]. Measure includes specific, quantifiable performance standards.
CCSBT: no specific measure on marine mammal bycatch. 2008 Recommendation requires compliance with IOTC and WCPFC measures on protecting ecologically related species when fishing in the IOTC and WCPFC areas [173]. Neither of these two RFMOs have relevant measures in place.	N	There is a need to assess if problematic cetacean interactions are occurring in pelagic longline fisheries to determine if mitigation measures are needed. Measures prohibiting purse seine sets on whale-associated tuna schools would avoid injury and mortality of whales.
IOTC: no measures on marine mammal bycatch.	N	
ICCAT: no measures on marine mammal bycatch.	N	
WCPFC: no measures on marine mammal bycatch.	N	
Juvenile and small tunas/unmarketable species and/or sizes of fish		
CCSBT: no measure on bycatch of juvenile and small tunas and unmarketable species and/or sizes of other fish species. 2008 Recommendation requires compliance with IOTC and WCPFC measures on protecting ecologically related species when fishing in the IOTC and WCPFC areas [173].	N	While pelagic longlining is the main method for catching southern bluefin tuna, the Australian component of the southern bluefin tuna fishery employs purse seine vessels to supply tuna ranches. The Australian purse seine southern bluefin tuna fishery does not employ FADs [209], suggesting that a CCSBT measure is not likely needed to address purse seine bycatch of juvenile/ small tunas (also noting that the catch of small tunas in this fishery would not constitute bycatch as the catch is destined for ranching grow out). Best practice measures to mitigate longline bycatch of small swordfish should be considered. A small proportion of southern bluefin tuna longline effort occurs in the ICCAT area [177]; however, CCSBT [173] does not call for members to employ ICCAT measures related to the protection of ecologically related species.
IOTC: temporal one-month per year closure to longline and purse seine vessels of an area off Somalia is in effect from 2011 to 2012 [210]. Encourages retention and landing of all purse seine-caught bigeye, skipjack, and yellowfin, and incidental species [211].	Y	Time/area measure may ease pressure on juvenile and small tunas. Restricting purse seine sets on FADs would further reduce catches of juvenile/small bigeye and yellowfin tunas and unmarketable species and sizes of fish. Best practice measures to mitigate longline bycatch of small swordfish should be considered.
IATTC: called for the establishment of a maximum number of purse seine sets on floating objects [212]. Requires retention and landing of all purse seine-caught bigeye, skipjack, and yellowfin [213]. Measures call for continued research on sorting grids, technology to identify species and size composition in schools prior to setting, and real time fleet communication of the locations of juvenile tuna hotspots [194,213]. Temporal closure, of 59, 62, and 73 days duration for 2009–2011, respectively, for large purse seiners, and one-month per year time/area closure to all purse seine tuna vessels in an area off the Galapagos Islands, where relatively high levels of bigeye tuna bycatch occurs [213].	Y	Tuna catch retention measure might provide an economic incentive to refrain from setting when high levels of small target species are present, and for the development and use of techniques to reduce the catch of small tunas, however, performance standards are lacking [213]. Time/area restriction may ease pressure on juvenile/small tunas. Restrictions of purse seine sets on FADs, called for in an IATTC [212], but never directly instituted (the time/area closures are an alternate mechanism to control catch levels), would further reduce catches of juvenile/small bigeye and yellowfin tunas and unmarketable species and sizes of fish. Best practice measures to mitigate longline bycatch of small swordfish should be considered.
ICCAT: measures establish limits on swordfish and bluefin tuna minimum weight and length, percentage of small swordfish and bluefin in landings, and percent of bluefin retained in non-bluefin fisheries [214,215,216]. Measure limits blue and white marlin landings by longline and purse seine vessels [217]. Has time/area closures in the eastern Atlantic and Mediterranean for purse seine, longline, bait boat, troll, trawl and recreational and sport fishing vessels for bluefin tuna [214,218], an annual two-month closed period on the retention of swordfish in the Mediterranean [219], and a prohibition of fishing in western Atlantic bluefin spawning areas [216].	Y	Time/area closures may ease pressure on swordfish and juvenile/small bigeye and yellowfin tunas. The bluefin and swordfish minimum size limits and limits on marlin landings might create incentives to avoid fishing in areas where these are abundant, and might reduce fishing mortality if discards survive. Restricting purse seine sets on FADs would reduce catches of juvenile and small tunas and unmarketable species and sizes of fish. Additional measures to mitigate longline bycatch of small swordfish should be considered, including prescribed employment of circle hooks, deeper setting, and restricting setting at seamounts.
WCPFC: in 2009, adopted a three-month closure on purse seine sets on FADs and other floating objects, and catch retention of all bigeye, skipjack and yellowfin tuna by purse seine vessels, in the area bounded by 20°N and 20°S [220,221]. 2009 measure prohibits purse seine sets on data buoys on the high seas, in part, to reduce mortality of juvenile tunas [163].	Y	2009 measure clarifying the FAD closure and catch retention requirements [221] promises to effectively eliminate purse seine sets on FADs and other floating objects in the designated area and period, and nearly eliminate tuna discards in the designated area. The FAD seasonal restriction will reduce catch of juvenile and small tunas and unmarketable species and/or sizes of fish. The measure does not stipulate performance standards for purse seine catch rates/levels of juvenile and small tunas/unmarketable species and/or sizes of fish. Best practice measures to mitigate longline bycatch of small swordfish should be considered.

ANNEX C – Legal status of ETP species, including cetaceans and dugongs, in relation to small-scale fisheries of the South Western Indian Ocean (source: Temple et al 2017)

Table 4 Legal status and related punishments regarding vulnerable marine megafauna in the small-scale fisheries of the South Western Indian Ocean

Country	Sea Turtle	Cetaceans	Dugong	Chondrichthyans
Comoros	Prohibited— <i>Punishable by imprisonment</i> (Soilihi 2014)	Prohibited	Prohibited	Partial— <i>Thresher shark prohibited</i> (Soilihi 2014)
Kenya	Prohibited— <i>The Wildlife (Conservation and Management) Act of 2013 (revised), The Fisheries Act Cap 378 revised 2012</i>	Prohibited— <i>Kenya Fisheries Act 2012, The Fisheries Management and Development Bill, 2014—1 year imprisonment and/or 100,000 KES fine</i>	Prohibited— <i>Kenya Fisheries Act 2012, The Fisheries Management and Development Bill, 2014—1 year imprisonment and/or 100,000 KES fine</i>	None
Madagascar	Prohibited— <i>Décret no 2006</i>	Prohibited	Prohibited	None
Mauritius	Prohibited— <i>Mauritian Fisheries and Marine Resources Act 2007—100,000 MUR fine</i>	Prohibited— <i>Mauritian Fisheries and Marine Resources Act 2007—100,000 MUR fine</i>	Prohibited— <i>Mauritian Fisheries and Marine Resources Act 2007—100,000 MUR fine</i>	Partial— <i>Fishing licence not granted for targeting sharks</i> (Soondron et al. 2013)
Mayotte	Prohibited— <i>National decree (October 14th 2005)</i>	Prohibited— <i>National decree (July 27th 1995)</i>	Prohibited— <i>National decree (July 27th 1995)</i>	None
Mozambique	Prohibited— <i>Law of Regulation Forests and Wildlife (Decree No. 12/2002)—25,000 MZN fine</i>	Prohibited	Prohibited— <i>Law of Regulation Forests and Wildlife (Decree No. 12/2002)—50,000 MZN fine</i>	None
La Réunion	Prohibited— <i>National decree (October 14th 2005)—5000 EUR or 6 month imprisonment</i>	Prohibited— <i>National decree (July 27th 1995)—5000 EUR or 6 month imprisonment</i>	Prohibited— <i>National decree (July 27th 1995)—5,000 EUR or 6 month imprisonment</i>	Partial— <i>Préfecture de La Réunion, arrêté no 06—2412/SG/DRCTCV 2006—Due to ciguatera poisoning risk, hammerhead sharks (Sphyrna spp.) cannot be commercialised</i>
Seychelles	Prohibited— <i>Fisheries Act 2014 Regulations—green and hawksbill turtles only</i>	Prohibited	Prohibited	Partial— <i>Fisheries Act 2014 Regulations—Baiting and chumming for shark illegal 450,000 SCR fine. Gillnetting for shark prohibited</i>
Tanzania (mainland)	Prohibited— <i>The Fisheries Act, 2003 (Regulations 2005)—200,000 TZS fine or 3 month imprisonment</i>	Prohibited	Prohibited	Partial— <i>Export of meat and fins not permitted. Whale shark catch prohibited.</i>
Tanzania (Zanzibar)	Prohibited	Prohibited	Prohibited	Partial— <i>Licences for fin export no longer issued</i>