Strategic Plan to Mitigate the Impacts of Ship Strikes on Cetacean Populations: 2022-2032

1. INTRODUCTION

Collisions between vessels and cetaceans, known as ship strikes, are an increasing problem on a global scale. As cetacean population sizes increase in some areas and industries such as cruise lines, commercial shipping, oil and gas exploration continue to grow to meet human demand, and the use of pleasure craft continues to expand, an increase in cetacean collision events is occurring. Global interest in this issue is growing as there is an increase in the occurrence of ship strikes, and incidents can affect cetacean populations, human life and property.

While this is clearly an issue for safety at sea and animal welfare, it is difficult to obtain appropriate data to ascertain for which cetacean populations this may be a conservation problem, apart from certain critically endangered populations where even single deaths may threaten population survival.

The International Whaling Commission (IWC) is the primary international body responsible for the conservation and stewardship of large whales, and it is addressing the problem of ship strikes through its Scientific (SC) and Conservation Committees (CC). Reducing ship strikes is a priority for both Committees, and so at IWC57 in 2005 the IWC established a Ship Strike Working Group (SSWG) under the CC. Understanding when, where, how and why vessels collide with cetaceans is important in developing appropriate mitigation to reduce the occurrence of these events. The IWC is focusing efforts on obtaining data to allow a quantitative evaluation of the problem in order to target mitigation efforts. The SSWG, along with a number of partners, has developed a standardised global database of collisions between vessels and whales to collect global data on ship strike events. It is not only a depository for existing information but, an ongoing online facility for collecting new information.

In addition, it should be recognised that several member nations to the IWC have developed national or regional plans to mitigate the impact of ship strikes on cetacean populations, including Australia, several EU member states, and the US. These documents serve as excellent references for approaches specifically designed to address this issue in a given region.

The overall aim of the SSWG is to raise awareness of the need for action on ship strikes at both a national and international level and to promote the development and use of effective tools to tackle the issue. It is envisioned that the SSWG will be developed in to three interrelated components; a Data Manager in the IWC Secretariat; the Working Group (WG) on Ship Strikes under the Conservation Committee (CC) and an Expert Panel to advise both the Data Manager and the WG. In addition, the Data Manager will be advised by the existing Data Review Group on accurate and timely recording of data to the Ship Strikes Database.

The Ship Strikes Strategic Plan describes the direction of activities intended to reduce the threat of ship strikes with cetaceans in the near and distant future. The strategy is based on a collaborative approach - with a strong intent to continue to work with others to complement and add value wherever possible to existing initiatives. Within the IWC context, the WG-Ship Strikes will work to capitalise on links with other work areas, including the work of the Scientific Committee, and with individual initiatives such as Whale Watching, Conservation Management Plans and the Strandings Initiative. Externally, the IWC will seek to maintain strong collaborations with other relevant international organisations, non-governmental organisations, industry and the scientific community

working on shipping research and management, to advance the implementation of the IWCs ship strike strategy, capacity development and the conservation of cetaceans and other taxa.

The IWC's Ship Strike Working Group reports directly to the IWC's Conservation Committee. The Conservation Committee has finalised its own Strategic Plan summarising its proposed activities between 2016 and 2026. This document should be considered supplemental to the Strategic Plan of the IWC's Conservation Committee. References in the Conservation Committee's Strategic Plan to ship strikes have been incorporated into this document, as appropriate.

1.1 Background on the issue

The IWC has identified the need to address the effects of ship strikes on cetacean populations, and especially large whale populations, as a conservation concern worldwide. Most reports of collisions between whales and vessels involve large whales, but all species can be affected (Schoeman *et al*. 2020). Animals can be injured or killed and vessels can sustain damage. Severe and even fatal injuries to passengers have occurred involving traditional and hydrofoil ferries, whale watching vessels and recreational craft. The types of vessels involved in collisions include a great variety of watercraft comprising large ships such as tankers, cargo or cruise ships, whale watching vessels, navy ships, yachts, hydrofoils and others (Laist *et al*., 2001; Jensen and Silber 2004; Panigada *et al.,* 2006; Van Waerebeek et al. 2007; Ritter 2012). Collisions with large vessels often go unnoticed and/or unreported.

Reducing the threat of ship strikes is challenging because factors contributing to ship strikes may differ by species, region, across seasons, collisions may go unnoticed, and the nature of collisions may differ with each instance. Hence assessing the magnitude of the threat is difficult. However, with research, collaboration and co-operation mitigation can be addressed through a series of approaches: technical (detection, e.g. REPCET), regulatory (national and international measures, including reporting, vessel speed, shipping lanes, etc.) and informative/educational (awareness raising and crew training).

The IWC works with the International Maritime Organization (IMO) which developed guidance for reducing the risk of ship strikes with cetaceans in 2009 (MEPC.1/Circ.674). The IMO is currently considering ways to reduce greenhouse gas emissions (GHGs) from shipping which may include reductions in vessel speeds. Speed reductions as part of measures to reduce GHGs would also reduce ship strike risks globally (Leaper, 2019; IWC, 2021). The IMO has recognised that minor routeing changes in high risk areas that shift high volumes of shipping traffic away from critical whale habitat could lead to a substantial reduction in strikes, and was possibly the best mitigation measure (MEPC 69). Limiting vessel speeds in areas of high interactions is also a key element in mitigating adverse impacts on cetacean populations. Such measures require the identification of high risk areas through detailed studies of patterns of whale and vessel distribution and must be enforced to be effective.

Finally, ship strikes can negatively impact endangered cetacean populations, particularly whale populations with numbers in the low hundreds that are at risk of continued declines even if a small number of strikes occur per year. The IWC ship strike strategy contains a multi-stage process for addressing high risk ship strike areas, a number of which have already been identified. Some are at the stage where routeing options can be evaluated. In others, further research is needed to establish patterns of whale distribution to enable risk analyses for different routeing options or alternative risk reduction options, such as speed reductions. In less well-studied regions there are likely additional high risk areas that have not yet been identified.

In 2019, the IWC held a combined workshop with the International Union for Conservation of Nature (IUCN) and the Agreement on the Conservation of Cetaceans in the Black Sea, Mediterranean Sea and

contiguous Atlantic area (ACCOBAMS) to investigate the utility and process of using Important Marine Mammal Areas (IMMAs) to help identify areas of high risk for ship strikes, using the Mediterranean Sea as a test case. Recommendations from this workshop led to a WWF-initiated GIS project to examine the overlap between ship traffic and IMMAs, at a global scale, to identify potential high risk areas (see Minton *et al*. 2012).

The Strategic Plan highlights the need not only for regulatory measures, but ongoing research into technological solutions paired with education to successfully reduce the risks to cetaceans.

1.2 Aim of the Strategic Plan

To provide information and context while developing mitigation measures for ship strikes and priority-setting to promote cetacean conservation by 2032 to achieve a permanent reduction in ship strikes.

1.3 Objectives of the Strategic Plan

In order to achieve the aim of the Strategic Plan, seven objectives have been identified as the key components of the Ship Strikes Strategic Plan. The Strategic Plan identifies a set of medium and long-term high-level actions to be carried out over the lifetime of the Plan and subsequent outcomes. Key partners and collaborators are also identified, as these are vital for the long-term success of the Ship Strikes Strategic Plan. Detailed actions for the first phase (2020-2022) are provided in the workplan.

Objective 1 – Management

Description: This objective includes core actions needed for the coordination and implementation of the Ship Strikes Workplan. This includes the management of the database of collisions between ships and whales with associated collaboration from several IMO members, ACCOBAMS and the Agreement on the Conservation of Small Cetaceans in the Baltic, North East Atlantic, Irish and North Seas (ASCOBANS). The objectives of this database are to contribute to a better understanding of the scale of the problem, of the factors that relate to risk (such as vessel type and speed), to estimate ship strike mortalities for different whale populations, to identify High Risk Areas and to inform mitigation measures.

High Level Actions	Outcomes	Key Partners
• Establish Ship Strikes Expert Panel • Recruit Data Manager • Management of the ship strikes database: global database of collisions between ships and whales • Coordinate with Data Review Panel • Maintain an easily assessable compendium of relevant papers and reports of ship strike issues	• Produce an updated bibliography related to ship strike issues on a two-year schedule. • Publication of routine summary statistics from the Ship Strike Database coupled with specific/directed outreach efforts • Papers for publication that summarise the nature and magnitude of reported large whale–ship strike incidents and that illustrate the efficacy of reduction strategies, as well as possible impacts on whale stocks.	IMO CMS (ACCOBAMS, ASCOBANS) IWC SC

Objective 2 - To reduce mortalities and injuries to large whales as a result of ship strikes

Description: It is important to minimise the impacts of ship strikes particularly when vulnerable populations are involved or ship strikes could adversely impede population growth of large whales. In order to achieve this objective, governments, policy makers and industry require up-to-date information on high-risk ship strike areas and populations to allow them to take action with mitigation measures.

High Level Actions	Outcomes	Key Partners
• Identify at-risk populations, update as necessary • Identify high risk areas, update as necessary • Use the SS Database to assist in identifying at-risk populations and high risk areas • Continued monitoring of measures implemented in identified High Risk areas (see Section 2.1 for list) • Improve the understanding of the relationship between vessel speed and risk of injury, death and damage to the vessel	• Up-to-date information on high-risk areas/populations available for governments and industry to take action with mitigation measures • Data readily available to quantify scale of issue in areas of concern	IWC SC IMO IUCN-IMMAs

Objective 3 - Increase the application of measures that reduce collision probability, such as re-routing and speed reduction/limits on a global scale

Description: Reducing the spatial overlap of both high numbers of whales and high numbers of vessels remains the best means of reducing ship strikes, followed by vessel speed reductions. The IWC Scientific Committee has identified the need for more research into mitigation methods, particularly those involving vessel speed. It has considered a number of studies and approaches since 2009, when MEPC.1/Circ.674 was adopted by the IMO. Many studies considered have confirmed an increased risk of a strike being fatal with increased speed, supporting the use of speed restrictions to reduce risk. Some studies have quantified the speed-risk relationship for specific whale species (Conn and Silber, 2013) and the hydrodynamic forces in relation to speed (Silber *et al*., 2010). Others have evaluated the relative risk reduction that might be achieved by speed restrictions (e.g. Wiley *et al*., 2011). In addition to studies based on collisions, studies based on observations of whales close to vessels have inferred greater collision risk with increased vessel speed (Gende *et al*., 2011; Harris *et al*., 2012).

Examples of successes in reducing whale-ship interactions include the enactment of mandatory 10 knot speed restrictions in Seasonal Management Areas along the Atlantic coast of the United States, where no North Atlantic right whale deaths due to collision have been reported either in, or within 45 NM, of these areas. These results indicate a statistically significant reduction in right whale ship strikes

in these areas, suggesting that the speed limits have been effective (Laist *et al*., 2014). Likewise, since the Ports of Auckland introduced a voluntary protocol on ship strikes in 2013, which includes encouraging ships greater than 70m in length (those least able to avoid a collision and most likely to do more damage) to travel at 10 knots in the Hauraki Gulf, New Zealand, there has been only one known Bryde's whale fatality from ship strike.

We encourage further consideration of the operational aspects of active avoidance; that is, where bridge personnel are actively searching for, and will or are willing to enact avoidance measures (altering course or speed) should a whale be at risk of collision. Simulation models including the visual detection process and ship manoeuvrability characteristics may be useful in this regard (e.g. Clyne and Leaper, 2004).

High Level Actions	Outcomes	Key Partners
• Implementation of measures • Communication of mitigation measures to the IMO • Develop appropriate protocols (Regional) to enable consideration of cetacean distribution and occurrences for proposed new or revised routing schemes or speed restriction. • Continue and expand developing specific guidance for vessels where there may be specific ship strike issues not covered by the IMO's general guidance document (MEPC.1/Circ.674)	• IWC member countries put in place re-routing and/or speed measures where necessary • Paper to IMO MEPC in 2022/23 • Guidance documents produced for specific sectors	IUCN-MMPA TF IMO Regional IGOs/NGOs

Objective 4 - Improve reporting of incidents that do occur to the IWC Ship Strike Database.
Description: This will require increased public and shipping industry awareness of the importance of reporting such incidents to the proper authorities using the standard protocol developed by the IWC's Scientific Committee. To accomplish this goal, it will be necessary for the Secretariat to reach out to local and regional authorities to encourage them to routinely submit ship strike data to the IWC.

High Level Actions	Outcomes	Key Partners
• Systematic outreach to data providers • Review and provision of data (Standard protocol) • Obtain comprehensive and more accurate	Increase reporting from National Progress Reports Promote existing online and paper template for reporting	(1) agencies responsible for producing tide charts, regional charts, and Coast Pilot, (2) agencies responsible for certifying vessel operating licenses,

reporting of ship strike incidents into the Ship Strike Database • Records of ship strikes should be reviewed and added to the database in a reasonable time frame • Improve on the reliability of species identification of ship struck whales • Availability of database • Use of the database • Outreach to other organisations		(3) organisations whose members spend considerable time on or operating marine vessels (e.g. the International Chamber of Shipping, Cruise Line International Association, World Ocean Council, International sailing Association, etc.), (4) organisations responsible for the conduct of vessel operators near and around harbours, and (5) naval academies and merchant marine schools.

Objective 5 - Increase development/use of avoidance technologies and push for their widespread-standardisation where appropriate.

Description: Various modifications to vessel and watercraft operations have been used in an attempt to reduce the threat of ship strikes. Seeking ways to reduce the magnitude of the threat through technological solutions has also been proposed by maritime industries, resource managers, and government agencies. A combination of improved training opportunities or protocols, along with the application of existing technology may provide a means to reduce ship strike interactions, while simultaneously allowing maritime commerce and other activities to proceed with minimal biological and economic impact (Silber *et al*., 2009). Several technologies (e.g. predictive modelling, passive acoustics, and real time information systems) employed together could provide far and nearfield detection capabilities to aid voyage planning, as well as immediate avoidance response (Silber *et al*., 2009).

High Level Actions	Outcomes	Key Partners
• Technological approaches evaluated for efficacy: Infrared Blow Detection (i.e. for smaller vessels that may be able to make avoidance manoeuvres), Auto-detection buoys, Predictive Modelling (cetacean occurrence and distribution might be anticipated using proxies), Passive Acoustics and real time reporting applications.	• Increased use of Whale Alert, REPCET apps and similar to notify mariners about cetacean aggregations and about mitigation measures to increase compliance • Guidance for specific evasive measures	Marine Traffic (AIS) IMO Joint industry/University research Global Shipping Watch

• Avoidance of overlap between whales and ships • Using AIS data • Application of technology		

Objective 6 - Improve collaboration on ship strike issues internationally.
Description: engagement with relevant international organisations should continue to support the implementation of IWC recommendations, the delivery of the strategic plan and to respond to emerging issues.

High Level Actions	**Outcomes**	**Key Partners**
Participate in Regional/International conferences/workshops /meetings	• Increase use of and contributions to the database • Advocacy/outreach efforts to help implement IWC recommendations re: mitigation measures	IMO IUCN (IMMAs) CMS (ACCOBAMS, ASCOBANS) NGOs Arctic Council, UNEP-CEP-SPAW

Objective 7 - Increase public and industry awareness about the issue and measures used to reduce this threat.

Description: Identify and evaluate various training/education programmes to determine which might feasibly expand to other regions or marine resource user groups. Ideally, such training programmes would be incorporated into the curricula of nautical schools where appropriate, and/or made available online. (See also Partner objective 2)

High Level Actions	Outcomes	Key Partners
• Training and education • Specific advice to particular sectors • Public outreach • Use summary statistics from the Ship Strike Database for outreach activities • Review of impact of outreach	• Circulate leaflet on ship strikes for countries to distribute to their maritime networks • Avoidance training curriculum paired with a mobile simulation (e.g. SEAiq *http://seaiq.com/*) be developed that can be tailored based on the species/population of whale at risk and applied to regional areas where pilotage is required, similar to disentanglement training regions.	NGOs

	• Training programmes such as WhaleSENSE/HQWW • Promote guidance • Promote apps	

1.4 Definitions

1.4.1 High Risk Areas

A High Risk Area is defined as the convergence of either areas of high volume of shipping and whales, or high numbers of whales and shipping. Areas of high volumes of shipping include designated shipping lanes, historic shipping routes and port approaches. Areas of high numbers of whales include areas where whales aggregate, whales are known to return in numbers on a regular basis, or critical population areas or habitats (Russell, 2001). As used herein, the term "High Risk Area" is a relative term with no specific threshold assigned to its use.

1.4.2 At risk populations

An at risk population is one in which the population viability is at risk due to ship strikes. Viability may be influenced by a number of single or interacting factors including: the proportion of a population in high risk areas, populations that are prone to ship strikes, for species that swim slowly or remain at surface for long periods of time (sperm whales, humpback whales, bowhead whales and right whales), or for populations that have a small number of reproductively mature females (e.g. western gray whales, eastern North Pacific right whales, Arabian Sea humpbacks and Chile-Peru right whales).

1.4.3 Ship strike

A ship strike is defined as a forceful impact between any part of a watercraft, most commonly the bow or propeller, and a live cetacean, often resulting in death, major injuries or physical trauma. These injuries may not always be externally visible. Strikes may also result in non-fatal serious injuries.

2. STRATEGIES

The IWC Ship Strike Working Group has recommended to the Commission the following strategies be undertaken: (1) create and maintain a global database of collisions between ship strikes and cetaceans, (2) seek ways to reduce the magnitude of this threat through technological solutions, (3) identify High Risk Areas and develop area specific mitigation strategies, (4) identify at risk (e.g. small) populations of large whales and evaluate the extent to which ship strikes are contributing to a lack of recovery, and (5) develop specific advice for the shipping industry regarding mitigation of ship strikes. The Commission has endorsed similar recommendations from the Scientific Committee in the past and approved the previous Ship Strikes Strategic Plan (2010-2020) at its meeting in October 2016. This revised Strategic Plan builds on previous work and recommendations by both the SC and CC.

In addition, the IWC Scientific Committee and the Ship Strike Working Group continue to recommend to the Commission the importance of further knowledge on vessel speed, the risk of death or serious injury to the individual whale, and damage to the vessel. Moreover, two Scientific Committee guiding documents (Ritter and Panigada, 2014; Ritter *et al*., 2014) summarise recommendations to specific shipping sectors.

Further studies, as well as additional analyses of available information, when reviewed by the Scientific Committee or conducted with the assistance of Scientific Committee members, will contribute to the Commission's ability to minimise the impact of ship strikes on cetacean populations.

2.1 Identify High Risk Areas

A High Risk Area is defined in Section 1.4.1. It is important to minimise the impacts of ship strikes particularly when vulnerable populations are involved or ship strikes could adversely impede population growth of large whales. The following areas have been identified as High Risk Areas, where ship strikes are common.

For each location identified, the Ship Strike Working Group should continue to work with the IUCN MMPA Task Force to develop proposals (whilst taking into account the Stages outlined in Table 1) for ship strike risk reduction measures specific to that region.

High risk ship strike areas

Table 1. Stages in identifying high risk areas and developing appropriate mitigation strategies

Stage 1	High risk area of potential concern identified based on overlap of shipping and whale distribution or a high number of reported incidents.
Stage 2	Survey data for whales, AIS data for shipping used to inform risk analysis and local vs international jurisdiction.
Stage 3	Consideration of possible practical options based on risk analysis. Recommendations from IWC Scientific Committee, IWC approaches relevant states to offer information and advice.
Stage 4	Stakeholder workshops to discuss possible mitigation measures and optimise risk reduction with stakeholder interests.
Stage 5	Relevant states consider proposals to IMO or other appropriate management bodies assisted by supporting information from IWC. Voluntary measures by vessel operators or shipping industry organisations may also be implemented.
Stage 6	Measures implemented through IMO or national authorities.
Stage 7	Continued monitoring to evaluate ongoing effectiveness of measures.

Status as of March 2022

Stage (next actions required)	Location	Species of concern	Refs	Notes
Stage 1	Port of Cape Town, South Africa	Southern right whales Humpback whales	IWC Scientific Committee report 2021; SC/68C/SH/14	Ship strike risk analysis to be undertaken.
Stage 2	NE Coast of Sakhalin Island, North Pacific	Western Grey Whales	Weller *et al.*, 2002; Silber *et al*., 2021; IWC Scientific Committee report 2021	Additional analysis, including quantitative assessment required to further clarify the risk. Expected for IWC SC 68D

Stage 3	Canary Islands	Sperm whales	Carrillo and Ritter, 2010; Ritter, 2010; Fais *et al*. 2016	Working group established – update on progress required
	USA, West Coast, California	ENP blue whales	IWC Scientific Committee report 2015; Irvine *et al*. 2014	Further changes to TSS proposed (IMO)
	SW Atlantic. Sub-Antarctic island at 54º15'S 36º45'W	Blue whales Humpback whales	SC/68C/HIM/09	Progressing with relevant authorities and IAATO - considering mitigation measures
Stage 4	Sri Lanka	Blue whales	Priyadarshana *et al*., 2016; Redfern *et al*., 2016; de Vos *et al.,* 2016	Ongoing work from IWC, industry, NGOs and researchers in Sri Lanka
Stage 5	Hellenic Trench, Mediterranean	Sperm whales	Frantzis *et al*., 2014; Frantzis *et al.*, 2015; Frantzis *et al.*, 2019	NAVTEX message plus 2021 recommendations from SC. Voluntary avoidance of high risk areas implemented by some shipping companies.
	Arabian Sea, Port of Duqm, Oman	Humpback whales		10kt speed recommendation
	Antarctic Peninsula	Humpback whales		Areas with 10 knot speed restriction agreed for all IAATO vessels
	Pelagos Sanctuary, Mediterranean	Fin whales	Panigada *et al*., 2006; Panigada *et al*., 2020	Pre-proposal for NW Mediterranean PSSA establishment that would include the Pelagos Agreement Area (Pelagos Sanctuary) Collaboration with Pelagos Agreement

	Balearic Islands, Mediterranean	Fin whales Sperm whales		Pre-proposal for NW Mediterranean PSSA establishment that would include this area
	Eastern Alboran Sea, Mediterranean	Fin whales Sperm whales		Pre-proposal for NW Mediterranean PSSA establishment that would include this area
Stage 6	Panama	Humpback whales	Guzman *et al*., 2013	Measures implemented through IMO
	SW Atlantic Golfo Nuevo, Península Valdés, Argentina	Southern right whales	Rowntree *et al*., 2001 Van Waerebeek *et al*., 2007	A vessel traffic corridor with speed restrictions implemented by the Argentinean Coast Guard since 2008 each year from 1st June to 30th November.
Stage 7	Hauraki Gulf, New Zealand	Bryde's whales	Van Waerebeek *et al*., 2007; Baker *et al*., 2010; Constantine *et al*., 2015 Ebdon *et al.* 2020	Voluntary speed restrictions implemented by Ports of Auckland
	USA, West Coast, California	ENP blue whales		IMO relocation of TSS (Channel Islands) and extension of TSS (approaches to San Francisco) 10kt recommended speed limit (Long Beach and LA)
	Straits of Gibraltar, Mediterranean	Fin whales Sperm whales	de Stephanis and Urquiola, 2006	Recommended seasonal speed restriction in place through IMO - monitoring has demonstrated almost no knowledge nor compliance.

	East coast of USA and Canada	North Atlantic right whale		Seasonal speed restrictions in areas of US east coast since 2008 and in Gulf of St Lawrence, Canada since 2017[1]

Watch list – further work needed to identify specific high risk areas:

- Southern Pacific right whale (CMP)
- Eastern Bering Sea – North Pacific right whale
- Arctic (US and Russian) - Potential threats to bowhead

2.2 Update on efficacy of implemented measures

Continued monitoring in areas where measures have been introduced to reduce ship strikes would be useful to determine efficacy and whether such measures would be useful elsewhere.

Potential areas/species for monitoring, include:

a. Panama humpback whales
b. Arabian Sea humpback whales
c. Eastern North Pacific blue whales
d. Western North Atlantic right whales

2.3 At risk populations

A High Risk Area is defined in Section 1.4.1. Populations of whales in the low hundreds of individuals are at risk of continuing declines even if only a small number of ship strikes occur per year. Therefore, it is important to identify populations that are small, are in decline, or for which human activities result in whale deaths or injuries and to monitor these populations to evaluate the extent to which ship strikes are a threat:

a. Western North Atlantic right whale
b. Eastern North Pacific right whale
c. Chile-Peru right whale
d. Arabian Sea humpback whale
e. Western gray whale
f. Blue whale - Sri Lanka and Arabian Sea
g. Blue whale - Chile
h. Sperm whale - Mediterranean Sea
i. Fin whale - Mediterranean Sea
j. Bryde's whale - Gulf of Mexico
k. Omura's whale - Northwestern Madagascar

[1] https://tc.canada.ca/en/marine-transportation/navigation-marine-conditions/protecting-north-atlantic-right-whales-collisions-vessels-gulf-st-lawrence

l. Sperm whale - Canary Islands region

At a minimum, the Scientific Committee should provide a best estimate of the annual incidence rate of ship strikes for each of these populations and these will be reported to the Commission.

It should be recognised that identifying the cause of death of a stranded whale is often times highly uncertain. Efforts should be made to encourage, wherever possible and practical, the practice of performing necropsies on stranded whales in part to determine the cause of death.

See Annex A for additional details on the populations listed here.

3. LIST OF ANNEXES

Annex A. Identify High Risk Areas supporting material

Annex B. Flow Chart for the Strategic Plan.

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Annex A

Identifying High Risk Areas

1. Sri Lanka - Blue Whales (Priyadarshana *et al*., 2016; Redfern *et al*. 2016; de Vos *et al.,* 2016)

Shipping routes across the northern Indian Ocean converge along the southern tip of Sri Lanka resulting in one of the highest open ocean densities of ship traffic globally. These routes and the lanes associated with the Traffic Separation Scheme (TSS) off Dondra Head overlap with very high numbers of blue whales, concentrations of whale watching activity and coastal fisheries. Results of surveys designed to investigate blue whale distribution in relation to shipping have suggested that shifting the current TSS to the south would substantially reduce the ship strike risk and improve maritime safety (Priyadarshana *et al*., 2016). IWC has been in discussions with the Sri Lanka authorities and shipping interests about possible routing measures and this was discussed at Scientific Committee meeting in Bled in 2016. Status of this population is unknown, but anthropogenic deaths are of great concern due to historic population reduction as a result of whaling. Possible resources to help minimize ship strikes include the development of a distribution model for data poor habitat areas, which could be used to identify key blue whale habitat (Redfern *et al*., 2016).

2. Hauraki Gulf, New Zealand - Bryde's Whales (Van Waerebeek *et al*., 2007; Baker *et al*., 2010, Constantine *et al*., 2015; Ebdon *et al.* 2020)

A year-round population of Bryde's whales inhabits the entrance of the Hauraki Gulf to the Port of Auckland, New Zealand. Since 1996, 85% of all 44 documented Bryde's whale deaths (2.3/per year) have been attributed to ship strikes (Constantine et al. 2015). The local population of Bryde's whales in the Hauraki Gulf is estimated at 159 whales. Whales are broadly distributed throughout the Gulf so re-routing traffic would not lessen the threat of ship strike. The Port of Auckland has issued a protocol for vessels transiting the Hauraki Gulf which includes recommendations for reduced speed to 10 knots.

3. Canary Island - Sperm Whales (Carrillo and Ritter, 2010; Ritter, 2010, Fais *et al*., 2016)

Collisions with sperm whales are of particular concern around the Canary Islands, although a number of other species are also affected. In 2012, a workshop on Maritime Transport and Biodiversity Conservation was held (Tejedor *et al*., 2013). Subsequently, a Working Group for the Prevention of Ship-Strikes was established in 2014, comprising stakeholders from authorities, the shipping industry and researchers, with the IWC fulfilling an advisory role. The PSSA (Particularly Sensitive Sea Area, IMO designation) in the Canary Islands was proposed as a means to facilitate implementation of ship strike mitigation measures. The mandatory reporting system for ships entering the PSSA could be a mechanism for relaying relevant information and guidelines to ships. Such measures might be coordinated through the development of a dedicated regional conservation management plan for sperm whales in the Canary Islands. It should be recognized that High Speed Crossings (HSC) represent a threat to the sustained population of sperm whales in this area, as the ship strike rate currently exceeds the natural reproduction rate of this population (Fais *et al*., 2016).

4. Panama - Humpback Whales (Guzman *et al*., 2013)

The movement of whales in the Gulf of Panama coincides with major commercial maritime routes. A TSS mitigation strategy was implemented in December 2014 and includes a 4-month restriction on

vessel speed (i.e. 10 knots) when the humpback whales are present. Preliminary data shows that TSS compliance is very high and future studies should examine whether compliance has resulted in a reduction of ship strikes.

5. Eastern North Pacific (ENP) Blue Whales

Aggregations of ENP blue whales feed in southern California shipping lanes (Calambokidis *et al*., 2000, 2007; McKenna *et al*., 2015). Recent estimates of the abundance of this population, using both line transect and mark-recapture methods, showed no clear increase in abundance, despite decades of protection from commercial whaling, which ended in 1971 (Barlow 1995, Calambokidis and Barlow 2004, Calambokidis *et al*., 2009). ENP blue whale population estimates range from 2000 to 3000 animals (Calambokidis and Barlow, 2004). A recent study suggested that density dependence is likely the key reason for the observed lack of increase (Monnahan *et al*., 2014). The only known source of juvenile and adult mortality for ENP blue whales is fatal collisions between ships and whales (Carretta *et al*., 2012), although noise and fishery interactions likely also impact the population. Between 1998 and 2007, 21 blue whale deaths (8 confirmed as ship struck animals) were reported along the California coast; 4 of those deaths occurred in the fall of 2007 in the Southern California Bight (Berman-Kowalewski *et al*., 2010). These blue whale strandings were spatially associated with locations of shipping lanes, especially those associated with the Ports of Los Angeles and Long Beach, and were most common in the fall months. Mitigation measures were implemented in 2010. As was the case for the Gulf of Panama, efforts to evaluate the efficacy of these measures should be undertaken.

6. Mediterranean High Risk Areas

6.1 Strait of Gibraltar - Fin and sperm (de Stephanis and Urquiola, 2006)

The Strait of Gibraltar is an area of high vessel traffic, most commonly transited by ferries, fast ferries and cargo ships. A new commercial harbour, built in 2007, has shifted traffic to cross directly through sperm whale feeding grounds. Sperm and fin whales are the most vulnerable cetacean species to ship strikes in this area (de Stepanis and Urquiola, 2006). Details can be found in the report of the Joint ACCOBAMS/Pelagos Workshop on Large Whale Ship Strikes in the Mediterranean Sea.

6.2 Balearic Islands - Fin and sperm whales

The main shipping routes radiating from Ibiza, Mallorca and Menorca towards the Gulf of Lyons, Valencia and Alicante constitute one of the top High Risk Areas for interactions between shipping, and especially fast ferry lines and whales. Studies conducted by Alnitak (e.g. Cañadas *et al*., 1999; Cañadas *et al*., 2000; Cañadas *et al*., 2005) highlight the relevance of the waters around these islands for cetaceans and particularly sperm whales and fin whales. Reports of collisions in all three islands and the intensity of ferry traffic clearly highlight the need for an intensified monitoring effort. Spain has been conducting pilot monitoring studies using AIS data.

6.3 Eastern Alboran Sea - Fin and sperm whales

This area constitutes one the main cetacean hotspots in Europe and the Mediterranean (Cañadas *et al*., 2005). Maritime traffic in this region is also extraordinarily complex and new ferry and fast ferry lines have raised concern over the increased risk of collision with whales. New technological measures to mitigate risk in this area are of special interest given the positive momentum of cooperation between researchers, relevant authorities and the shipping sector as a result of the

reconfiguration of the Traffic Separation Scheme of Cabo de Gata and the Notices to Mariners in the Strait of Gibraltar (Tejedor *et al*., 2008). This task is currently being directed by the Spanish Ministry of the Environment, Rural and maritime Affairs (Fundación Biodiversidad).

6.4 Pelagos Sanctuary – Fin whales (Panigada et al. 2006; Panigada et al., 2020)

From 1972 to 2001, out of 287 fin whale carcasses, 46 individuals (16.0%) were known to have been killed by vessel interactions. The minimum mean annual fatal collision rate increased from 1 to 1.7 whales/year from the 1970s to the 1990s. Fatal strike events (82.2%) were reported in or adjacent to the Pelagos Sanctuary, characterized by high levels of traffic, including High Speed Craft (HSC), and whale concentrations. Among 383 photo-identified whales, 9 (2.4%) had marks that were attributed to a ship impact. Near misses have been reported through an observer scheme on some of the ferries to occur frequently. The high likelihood of unreported fatal strikes combined with other anthropogenic threats suggests an urgent need for a comprehensive, basin-wide conservation strategy, including ship strike mitigation requirements, like real-time monitoring of whale presence and distribution to re-locate ferry routes to areas of lower cetacean density, and reducing ship speed in high cetacean density areas (Panigada *et al*., 2006). (See Joint ACCOBAMS/Pelagos Workshop on Large Whale Ship Strikes in the Mediterranean Sea).

6.5 Island of Crete - Sperm whales (Frantzis et al., 2014; Frantzis et al., 2015; Frantzis et al., 2019)

Localised studies of sperm whales in the Mediterranean suggest that distribution is highly concentrated within limited areas with low densities elsewhere. Long-term studies to the SW of Crete have suggested that this is a consistent area of high concentrations of sperm whales where ship strike mortalities are known to have occurred. The density of shipping also suggests this may be a High Risk Area. This area is suggested as a focus for further investigation to ensure sufficient data are gathered to determine whether minor routing changes to shipping could achieve a significant risk reduction. Although the conservation implications from ship strikes at a population level cannot be determined without further abundance data, studies to determine effective mitigation strategies could allow these to be implemented rapidly if new data on abundance indicated a serious conservation problem.

6.6 Hellenic Trench, Greece - Sperm whales (Frantzis et al., 2014; Frantzis et al., 2015; Frantzis et al., 2019)

Ship strikes are a recognized problem for the Mediterranean sperm whale sub-population which is classified as Endangered by IUCN. The Hellenic Trench southwest of Greece is a known area of high sperm whale density which coincides with major shipping routes. Given the high overlap of sperm whale sightings with shipping tracks, and the high incidence of evidence of ship strikes from stranded sperm whales, IWC has initiated a dialogue with the Greek authorities and regional stakeholders (e.g. ACOBAMS) on possible re-routing measures.

7. NE coast of Sakhalin Island - western gray whale (Weller *et al.*, 2002; Silber *et al*., 2021; IWC Scientific Committee report 2021)

The substantial nearshore industrialisation and shipping congestion throughout the migratory corridor(s) of this population represents a potential threat by increasing the likelihood of ship strikes, especially in China and Japan. Present and planned large-scale offshore gas and oil development in the South China Sea and in close proximity to the only known feeding ground for

western gray whales off northeast Sakhalin Island in the Okhotsk Sea is of particular concern (Weller *et al*., 2002).

8. Arabian Sea - Humpback whale

This is the world's most isolated, smallest, and non-migratory humpback whale population, which, when combined with low population abundance estimates and new anthropogenic threats, raises concern for its survival. Burgeoning anthropogenic threats in the Arabian Sea, including entanglement in fishing gear and ship strikes are known limitations to recovery (Pomilla et al. 2014).

9. Chile-Peru - (Southern Pacific) Right Whale

Collisions with vessels and entanglements in fishing gear are the leading causes of human-induced mortality of southern right whales in the eastern South Pacific. Since 1983, 23 ship strikes have been recorded for southern right whales. However, because ship strikes of right whales can go undetected or unreported, it is likely the number of collisions is greater than documented (IWC, 2001; Galletti-Vernazzani *et al*., 2014).

10. Eastern Bering Sea - North Pacific Right Whale

The current abundance for right whales in the eastern Bering Sea is estimated to be about 30 animals. Because of their rare occurrence and scattered distribution, it is nearly impossible to assess all the threats to this species, but a possible threat includes ship strikes and this threat will increase as more traffic moves through the western Arctic region. East-West vessel traffic and fishing vessels also pose a risk and should be considered (see ABSI, *https://absilcc.org/science/sitepages/FY2013-02.aspx*). In 2010, the US Coast Guard initiated a study on a proposed a potential vessel routing system (referred to as a Port Access Route Study) in the Chukchi Sea, Bering Strait, and Bering Sea. In December 2014, the Coast Guard published a Notice of Study, and a request for comments from the public. Consideration of further steps regarding this proposal is pending (*https://www.federalregister.gov/articles/2014/12/05/2014-28672/port-access-route-study-in-the-chukchi-sea-bering-strait-and-bering-sea#h-8*).

11. Western Arctic (USA and Russian) - Potential Threats to Western Bowhead Whales

With Arctic ice reductions, increased shipping, as well as shifts in habitat ranges of cetaceans, is expected. While ship strikes with cetaceans are not currently an issue for the conservation status of western Arctic bowhead whale population, it may become so for individual whales as vessel traffic increases and migratory habitat changes in response to global warming/loss of sea ice. Therefore, there is a rationale to start monitoring this region.

Annex B

Flow Chart for the Strategic Plan