Annex J

Report of the Sub-Committee on Non-Deliberate Human-Induced Mortality of Cetaceans

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1. INTRODUCTORY ITEMS

1.1 Convenor's opening remarks
Leaper welcomed participants and opened the meeting by highlighting the key areas of work for this sub-committee, bycatch, entanglement and ship strikes. The bycatch work is closely coordinated with the IWC's Bycatch Mitigation Initiative (BMI). The BMI held a two-day workshop on bycatch in the Indian Ocean immediately prior to SC/68A.

1.2 Election of Chair and appointment of Rapporteurs
Leaper and Currey were elected as chairs of the meeting. Hubbell, Mattila, Minton, New and Tarzia, volunteered to be rapporteurs.

1.3 Adoption of Agenda
The Agenda was adopted. Leaper explained that there would also be joint sessions with the Small Cetacean and ASI sub-committees.

1.4 Available documents
The documents available for discussion included: SC/68A/HIM/01-17; Braulik *et al.* (2018); Scheidat *et al.* (2018); FAO (2018); Frantzis *et al.* (2019); FAO (2019); IWC (2018); Díaz-Delgado *et al.* (2018); Peltier *et al.*, 2019a; 2019b); Arregui *et al.* (2019); Hines *et al.* (2018); Roberts *et al.* (2019); Cooke *et al.* (2019); Atkins *et al.* (2013; 2016); and Jiménez *et al.* (2018).

2. BYCATCH AND ENTANGLEMENT

2.1 Progress with the IWC Bycatch Mitigation Initiative
Tarzia presented on the progress of the IWC's Bycatch Mitigation Initiative (BMI) during 2018/19 and its focus out to 2020 and the suggested areas for input from the sub-committee. The BMI undertook a strategic assessment in 2018 to identify the areas of work where it could add most value. The BMI plans to focus in particular on bycatch in small scale/artisanal gillnets, as an area where little coordinated work has been undertaken, and where bycatch rates are likely to be highly significant. The BMI developed a ten-year strategic plan and a two-year costed work plan, both of which can be found on the IWC website: *https://iwc.int/bycatch*. The BMI has six main work areas which include: programme coordination; identification of priority fisheries/cetacean populations for targeted on the ground work; developing and testing mitigation and monitoring solutions; bring about changes in fishing communities towards cetacean bycatch mitigation; raise awareness and capacity within national governments to tackle the issue; raise awareness of cetacean bycatch within RFMOs. Between 2018 and 2020 the BMI will be establishing the programme, developing collaborations and starting up pilot projects (and fundraising for these where relevant), and raising awareness of the programme and its technical advisory capacity with IWC Contracting Governments.

In 2018, the BMI established its Expert Panel, which is made up of a multidisciplinary team of experts, ranging from economists to social scientists, cetacean experts, fisheries managers and gear technologists. The profiles of the Expert Panel can be found on the IWC website: *https://iwc.int/expert-advisory-panel-on-bycatch*. The first face to face meeting of the Expert Panel was held on the 8 May 2019 in Nairobi, prior to the Scientific Committee meeting.

The BMI has worked to engage other international bodies (see Item 2.1.2) to develop collaborations to tackle cetacean bycatch. In addition to holding a regional workshop on Bycatch Mitigation Opportunities in the Western Indian Ocean and Arabian Sea (see Item 2.1.1), the BMI has been working to identify potential pilot projects where novel, multidisciplinary approaches for monitoring, mitigation and fisheries engagement can be applied. The BMI is also working on terms of reference for a review of cetacean sensory ecology, which could potentially inform future experimental work on mitigation measures (e.g. factors that affect a cetacean's ability to detect fishing gear). A number of activities from the BMI work plan identified potential input from the sub-committee. This includes activities in relation to the sensory ecology review, such as suggesting researchers or potential students that could undertake this research and reviewing the draft report in 2020. In relation to pilot projects, sub-committee members could provide updated information on cetacean populations and the bycatch situation once a candidate list of locations has been identified. In relation to the engagement with international bodies, including RFMOs, sub-committee members could identify which meetings are already being attended and review its list of observers so that the BMI can coordinate with others without the risk of duplication. A shared calendar of meetings could be set up by the BMI for this purpose.

The sub-committee discussed the role of the BMI in assisting countries in tackling bycatch issues. Whilst the IWC does not have any mechanism to enforce bycatch mitigation it can help countries through technical advice in implementing technical guidelines (e.g. the FAO's voluntary technical guidelines which are under development) or with RFMO reporting requirements.

2.1.1 Priorities and report from Workshop
Tarzia gave an overview of the Bycatch Mitigation Initiative's first in-person meeting of the BMI Expert Panel on the

8 May; and a regional workshop on 'Bycatch Mitigation Opportunities in the Western Indian Ocean and the Arabian Sea', 8-9 May. The full report and recommendations of the Expert Panel meeting and Workshop Report will be made available as information documents at the Scientific Committee's next meeting. The workshop aimed to: set the scene for cetacean bycatch monitoring and mitigation across the North and Western Indian Ocean region; identify key gaps in knowledge and capacity across the region and the tools needed to fill these; introduce the BMI to Indian Ocean stakeholders; identify locations which could serve as BMI pilot projects; and to start building collaborations at national and international level to tackle bycatch.

A total of 48 participants from 19 countries (including 24 participants from within the Indian Ocean region) and multiple disciplines attended the workshop. Participants included regional representatives from fishing communities, cetacean and bycatch scientists, social scientists, fisheries managers and the BMI Expert Panel. The workshop recognised bycatch as one of the most significant threats to cetacean species and populations in the Indian Ocean region, where large numbers of small-medium-scale gillnet fisheries overlap with areas where vulnerable cetacean species or populations exist. The Indian Ocean is unique in the predominance of gillnets in the tuna fisheries. It was clear that cetacean bycatch is generally very poorly documented in the region and more systematic assessment is critical. There is a need to recognise and address barriers to reporting on bycatch. A mapping exercise identified bycatch hotspots across the region and fisheries which might be candidates for BMI pilot projects. It was recognised that a multi-disciplinary and multi-taxa approach is needed in relation to tackling bycatch; including greater recognition of the socio-economic and cultural aspects of bycatch within this region. The workshop identified a series of recommendations, including specific actions for the BMI.

The sub-committee discussed the importance of considering spatial measures in managing bycatch, in addition to technical solutions, and this was a key part of the rapid risk assessment tools which were presented during the workshop.

The sub-committee thanked Tarzia and Minton and the IWC Secretariat for their efforts in organising the bycatch workshop, which was considered a success. The Indian Ocean has been the subject of concern of the Committee for a number of years, with clear indications of high, but unquantified levels of bycatch in various fisheries. The workshop made significant progress towards more clearly identifying knowledge gaps and actors that can help to address these, as well as opportunities for reducing bycatch through regional and cross-stakeholder collaboration. The workshop involved diverse participants, and it was particularly valuable to have the Kenyan fishermen and other stakeholders from the region involved. The workshop highlighted the diversity of fisheries and challenges involved in cetacean bycatch in the region, and the need to have tailor made solutions. The workshop's recommendations will assist the BMI in its work towards developing a diverse toolbox of solutions with different tools that can each be led by different expert panel members. The sub-committee agreed that the passionate and enthusiastic team involved in the Bycatch Mitigation Initiative will ensure good progress and success in coming years. The workshop report will also provide clarification on the structure and roles of the different parts of the BMI, particularly between its governance body (Standing Working Group) and technical advisory body (the Expert Panel).

2.1.2 Progress on collaboration on bycatch-related issues with other organisations including FAO and IOTC

Tarzia outlined the recent collaboration between the IWC and other international organisations working on bycatch. The IWC Secretariat has continued to engage with the FAO, including through attendance at the FAO's Committee on Fisheries (COFI) meeting in 2018 where the IWC's BMI held a side event on bycatch. COFI requested that the FAO work with the IWC and others in the development of Technical Guidelines, in the form of best practice guidelines, and the IWC Secretariat expects to be invited to the follow up workshop on this in September 2019. The IWC Secretariat has engaged with both the FAO and the Regional Fisheries Management Organisations (RFMOs) through the Regional Secretariat's Network, which has provided opportunities for direct discussion with RFMO secretariats on possible future collaboration. Specific opportunities to collaborate with both the FAO and RFMOs have also been identified through the GEF/FAO Common Oceans Tuna Project and a potential follow on project from 2021.

The IWC has focused its engagement with RFMOs on the IOTC in particular, given the apparent high bycatch levels identified in scientific literature in tuna driftnet fisheries within the region. The IWC Secretariat has been in direct communication with the IOTC Secretariat and a number of potential areas of collaboration have been identified. The recent BMI workshop on Indian Ocean and Arabian Sea Bycatch further strengthened the potential for collaboration with the IOTC.

The BMI has also continued to engage with other international bodies, including CMS, ASCOBAMS and ACCOBAMS, including their joint working group on bycatch. In discussion it was added that the IWC BMI has also agreed to collaborate with WWF, FAO, and CMS on the development of safe handling and release guidelines for small cetaceans found live and entangled in fishing gear. It had been hoped that a draft of these guidelines would be available for review by the IWC SC. However, as they are not yet completed, the IWC Expert Panel on Bycatch will be asked to review these intersessionally, after which they will also be reviewed by the FAO, CMS (including ASCOBANS and ACCOBAMS) and a number of RFMOs, with the intention to produce a publication that is endorsed by, and can be disseminated by all of these bodies.

2.2 Review new methods and estimates of entanglement rates, risks and mortality (large whales)

SC/68A/HIM/02 describes previously undocumented entanglements of minke whales in the inshore waters of Scotland, UK. These results come from a project involving government agencies, scientists, NGOs and the Scottish Creel Fishermen's Federation (SCFF). SCFF is the national trade association for the creel fishing industry which involves static gear fishing for shellfish in coastal waters. Scottish inshore creel fishermen participated in short, semi-structured interviews to gather data on the frequency of entanglements within the last 10 years, and the outcomes of these events. 109 face to face interviews have been completed to date, and 68% of those questioned have reported experiencing at least one marine animal entanglement. Of the 105 separate entanglement incidents involving a range of cetacean and other species reported, 37 have involved minke whales. Thirty of these have been fatal and none have previously been formally recorded, revealing a much higher rate of entanglement for this species than previously documented. All these reports are thus in addition to those in the annual

UK Progress Reports. The reports in this study have also come from interviews representing less than 10% of the creel fishing effort, suggesting that the true entanglement rate is much higher.

Discussion focused on the reliability of information from fisher interviews, particularly in the context of responses being based on memories rather than written logs of entanglements. Leaper said that the interviewers' impression was that fishers generally gave quite honest and accurate information, and in many cases photos were also provided of the entanglement events. Relevant work in South Korea (Song *et al.*, 2010) was discussed, and it was suggested that any follow up work could potentially take a similar approach in examining minke whale entanglement by gear type (gillnet, pot, etc.).

2.2.1 Review report of the Fourth Workshop on Large Whale Entanglement Issues

The Fourth IWC Workshop on Large Whale Entanglement Issues was held in June 2018, shortly after SC/67b. Because of this timing, the report of the workshop was submitted to and endorsed by the Commission at IWC/67 (IWC/67/WKMWI/Rep/01), prior to being reviewed by the SC. Given the death of a Canadian responder (Joe Howlett), while releasing an endangered North Atlantic right whale in 2017, the primary focus of the workshop was operational (e.g. safety). However, the workshop also covered a broad range of topics of potential interest to the SC, including agenda items on data collection, prevention, emerging issues and capacity building. Most of the discussion of better data collection centred on the proposal for an IWC hosted global entanglement database (see Item 2.2.2 of this report below). This meeting provided the first opportunity for the Global Whale Entanglement Response Network (GWERN) to hear about the IWC's new, and related, initiatives on bycatch (BMI) and strandings. The sub-committee expressed interest in working with these efforts where and when appropriate. Canada provided an overview of their management initiatives in the Gulf of St. Lawrence, which had recently seen an increase of NA right whale entanglements in the local crab pot fishery. A representative from Canada's Department of Fisheries and Oceans presented their new efforts to mitigate this increase in lethal entanglements by reducing (unnecessary) rope in the water column, better marking of gear and improving reports and responses (also discussed under Item 2.3 of Annex NH). The workshop noted gaps in response capability in this new high-risk area and the GWERN offered the support of its members where appropriate. The workshop recognised that entangled whales often cross national boundaries, noting that its tri-lateral meeting between GWERN members from Canada, Mexico and the USA (2015, Puerto Vallarta, Mexico) had provided the components for cooperation between range States, including the importance of pre and post event communication. The workshop also noted that entanglements occur outside of national jurisdictions in international waters, including in some rapidly increasing gear types like FADs. The sub-committee remembered that the IWC capacity building program had provided training for the IWC POWER cruise personnel (2015, Shiogama, Japan) which was the first training for a vessel operating on the high seas.

Finally, the workshop heard from several countries where recent trainings had occurred, two of which were trained under the auspices of existing IWC CMPs (Chile and Russia). The situation in Norway stimulated much discussion as most of their entanglement response must be carried out in the dark of the Arctic winter, during the herring seine fishery in the fjords of northern Norway. As convener of GWERN and this workshop, Mattila thanked the dedication and hard work of the GWERN members, both in attendance and in the field.

In discussion, it was noted that several IWC entanglement response trainings have been conducted in regions with existing or proposed CMPs, including the most recent training for Peru and Chile (November 2018, Lima, Peru), and a planned training in June, 2019 for Argentina, Uruguay and Brazil.

2.2.2 Review proposal for global entanglement database

At SC/67b, it was decided that whether to move forward with raising the estimated £20,000 for constructing the entanglement database that was now fully designed, would hinge on presenting the database schema at the next meeting of the GWERN, one month after SC/67b. The summary of that discussion can be found in item 4.3 of the IWC workshop report (IWC/67/WKMWI/Rep/01). While the importance of collecting accurate data, in order to advance two of the primary goals of the GWERN's principles and guidelines, was reiterated, there were a number of concerns raised, many having to do with the amount and complexity of data collection. There was not consensus that the financial investment would provide the desired return.

In discussion, the sub-committee **agreed** that Mattila should request that members of the GWERN collect data using the consensus data form (IWC, 2013) upon which the database was designed, over the next year. This could establish if the data collected would warrant the cost of building the database as designed.

2.3 Mitigation measures for preventing large whale entanglement

FAO (2018) provides the FAO's Report on the 2018 Expert Workshop on Means and Methods for Reducing Marine Mammal Mortality in Fishing and Aquaculture Operations. The report includes a detailed literature review on mitigation measures, a table of mitigation measures, and a decision tree to assist decision makers in choosing pathways to mitigate bycatch. The report includes a number of recommendations including that the FAO develop Technical Guidelines on means and methods for prevention and reduction of marine mammal bycatch, a mechanism for facilitating and monitoring the implementation of any guidelines, and the development of a capacity development programme in implementing the guidelines. The report was endorsed at the 2018 FAO COFI meeting, and the FAO was requested to engage with the IWC, NAMMCO and others in developing the Technical Guidelines which will be in the form of best practice guidelines. A follow up workshop has been scheduled by the FAO for September 2019 and the IWC is expecting to participate.

The sub-committee was pleased to see the IWC engagement with the FAO and **encouraged** this continue. In particular the sub-committee recommended that the IWC Secretariat engage with the FAO, and participate in its upcoming bycatch workshop. The sub-committee also suggested that the current Decision Tree in the FAO report is overly complex (appendix 4 of the FAO report), and might be more useful if it were simplified. A small group (Slooten, Tarzia, Minton, Currey) will work on this intersessionally.

FAO (2019) provides the FAO's overarching guidance on the marking of fishing gear in order identify the fishery and (hopefully) individual owner, in the event that it is abandoned, lost or discarded (ALDFG). Given that the fishing gear commonly removed from entangled whales is frequently in pieces and partially destroyed, it often resembles ALDFG and can therefore be as difficult to trace. Similarly, as non-anchored ALDFG can drift for thousands of kilometres prior to recovery, so too can an entangled whale drag gear for months and thousands of kilometres before removal. Therefore any gear marking that allows ALDFG to be traced will likely assist in the same process for the entangling gear removed from whales. While the FAO guidance is voluntary, the document suggests that complying can help States to meet some related legal obligations (e.g. MARPOL, annex V). It tasks individual States to assess risk, and where appropriate to develop gear marking schemes for identified fisheries. However, given that ALDFG and entangled whales do not recognise national boundaries, the document recommends that neighbouring States and Regions communicate, and hopefully coordinate, their gear marking schemes.

The sub-committee noted this important work by the FAO, and that gear marking was an important step in tackling large whale entanglements in both ghost fishing gear and actively fished gear. This FAO report was also discussed under item 6.1 of Annex K.

2.4 Review new methods and estimates of bycatch rates, risks and mortality (small cetaceans)

SC/68A/HIM/03 presented information on recent developments in European Union legislation on fisheries. In April 2019 the European Parliament plenary voted for Regulation 812/2004 to be repealed and approved the new Technical Measures Regulation (*Regulation on the conservation of fishery resources and the protection of marine ecosystems through technical measures* [2016/0074]). Whilst some improvements have been made, the authors believe that this opportunity to tackle bycatch comprehensively and effectively has been missed. They state, however, that some (more generic) Technical Measures in the new Regulation might also strengthen European bycatch mitigation. Others seem likely to weaken European bycatch mitigation, including that the agreed target thresholds for tackling bycatch of sensitive species remain unclear and that the agreed process for adopting new or updated measures through regionalisation depends on Member States (MS) reaching unanimous agreement through joint recommendations. Furthermore, there is now a requirement for MS to report every three years, rather than annually. Hence, the primary obligation to set standards is now left to individual Member States. Given the current poor track record for bycatch measures implemented by Member States this is of some concern. Recommendations by the authors include that Member States need to implement scientifically robust bycatch monitoring schemes to include mandatory monitoring covering a predetermined percentage of the fleet using independent observers and/or remote electronic monitoring (REM) regardless of vessel size; Fishing licences or permits should be suspended for vessels/fishers that deny access to observers or deployment of REM. Alternatively, vessels/fishers who comply with the obligation might receive a commercial incentive. Also, Member States need to implement measures for enforcement and assessment of effectiveness and compliance. This is the highest priority for those fisheries identified as having a likely population level impact. Hence, while some of the specific details, such as expected precision of bycatch estimates or technical specification of pingers, are missing and will require further scientific input, the measures also provide a legal basis to address cetacean bycatch in other ways, including for example by creating real-time closures and/or restrictions on the use of certain gears. In that sense, it is hoped that the advice and recommendations from the Scientific Committee could assist in the implementation of the legislation by EU Member States.

The sub-committee discussed the potential wider implications of the repealing of Regulation 812/2004 (which dealt with cetacean bycatch) and the incorporation of measures specific to cetaceans in the new Technical Measures Regulation. Whilst the spatial areas that had been identified under 812/2004 for mandatory use of pingers remain identical in the Technical Measures Regulation, the new regulation does not include technical specifications for the pingers. The sub-committee also acknowledged that any use of pingers also needed to be supported by monitoring schemes to ensure that pingers were actually effective. It was highlighted that Norway will be hosting an expert workshop to examine cetacean bycatch rates and the effectiveness of acoustic pingers, which could produce useful information on this topic. The sub-committee discussed the need for a change in perspective at EU level on the potential to work with the fishing industry as partners, rather than solely in a top-down manner with regulations.

Attention: CG

The sub-committee noted the limitations of cetacean bycatch estimates and mitigation programmes across the EU and ***recommended*** *that improved monitoring programmes should be established.*

SC/68A/HIM/12 describes the results of a multi-year study conducted by WWF Pakistan using fishing crew-based observers to collect data on cetacean bycatch in tuna gillnet fisheries operating out of Karachi. The programme was initiated in 2012 when five vessel captains working on four vessels were trained to collect data on both target catch and endangered, threatened and protected (ETP) species bycatch in the fisheries, as a means of helping the fishery to comply with the Indian Ocean Tuna Commission's requirement for 5% observer coverage of the fleet. The programme included an increasing number of captains each year, and involved 85 observers by the 2018 fishing season. Extrapolations from the monitored vessels to the fleet of 700 vessels indicated that cetacean bycatch in the first two years of the project likely involved thousands of individuals, with peaks in bycatch occurring in March-April and between September and December.

From the 2015 fishing season onward, the majority of the fleet switched from setting their drift gillnets at the surface of the water to a placement of nets roughly 2m below the surface, a method chosen by fishers themselves as it results in the catch of larger individual fish. This shift in gear deployment was associated with a statistically significant reduction in cetacean bycatch. The WWF Pakistan team is collaborating with members of the IWC Expert Panel on Bycatch to further analyse the data, and quantify the level of bycatch reduction.

SC/68A/HIM/11 provided a brief summary of recent (2016-19) stranding data in the Bay of Biscay and compared it to the previous years (1990-2015). Peltier *et al.* (2019b) contains an analysis of how mortality areas at sea (inferred from stranding data by using the drift model MOTHY) would match fishing effort distribution aggregated by fishing gear and vessel flag for the multiple stranding events observed in Feb-March 2017. SC/68A/HIM/11 extends this approach to 10 multiple stranding events over the period 2006-15 and the year 2017, with fishing effort data aggregated at the métier level. From 1 December 2018, to 16 April 2019, a total of 1170 cetaceans were reported as stranded along the French Atlantic coasts and 90% were examined through the national stranding scheme. The majority (93%) were identified as common dolphins and in 85% of cases mortality was attributed to bycatch in fishing gear. These figures set a new record for annual total cetacean strandings along the French Atlantic seaboard.

In a GAM modelling exercise (Peltier *et al.*, 2019b), the spatial distribution of mortality areas for stranded bycaught dolphins in February-March 2017 was found to be significantly correlated with fishing effort distribution for French midwater pair trawlers, Spanish otter bottom trawlers and French Danish-seiners. Gillnets and trammel nets were not identified as candidate gears potentially involved in these bycatch-related multiple stranding events, although existing evidence suggests the contrary. In a subsequent step described in SC/68A/HIM/11, the analyses were refined by investigating spatial relationships between fishing effort and mortality areas with fishing effort data split by métier (fishing gear/target species). Twelve métiers were finally retained. Pair trawls targeting either seabass, hake or mackerel were found to be associated with mortality areas in six years; otter trawls for seabass, mackerel, horse mackerel and cuttlefish were involved in 5 years; gillnets and trammel nets targeting hake, monkfish or sole were retained in three years. Although gillnets in general were not identified in the gear/flag analysis for the year 2017 (Peltier *et al.*, 2019a; 2019b), gillnet for hake was selected in the métier analysis for that same year, suggesting that the métier approach would be more discriminating that the gear/flag approach.

At this stage, the work is still in progress; nevertheless several observations can be made. Reverse drift analysis of cetacean carcasses diagnosed as bycaught allows bycatch mortality areas to be mapped. Comparing mortality areas with fishing effort by gear or by métier allows candidate fisheries to be identified. Candidate gears (FAO codes PTM, OTB, GNS, GTR) and target species (CTC, CTL, MNZ, HKE, BSS, MAC, HOM) are diverse. The métiers identified should also be subject to increased observer or Remote Electronic Monitoring programmes. Understanding the high temporal resolution mobility of the common dolphin across its European range would be crucial to predict bycatch risk. The diversity of potentially involved métiers suggests that mitigation options will be complex as they will need to be adapted to each case.

The sub-committee discussed the role of the French national bycatch working group, which is made up of fishing representatives, government, researchers and NGOs and which has been assessing mitigation measures and monitoring approaches in relation to this issue. Some of the fishermen agreed to have observers on board of some of the pair trawlers during the 2018/19 winter season, and pingers were also tested. However the sub-committee acknowledged that efforts thus far have been ineffective, given the large numbers of bycaught animals that continue to wash up as strandings. The efforts of the bycatch working group may have proven ineffectual because it is focused on pair trawlers for sea bass, which is clearly not the only responsible gear or metier in this situation. The sub-committee also discussed the challenges associated with getting observers on board the French fleet, with many vessels refusing to take observers.

In 2017, the Committee noted serious concerns over the large number of stranded common dolphins reported at the beginning of 2017 along the French Atlantic coast. This followed Resolution 5 at the 8th Meeting of Parties to ASCOBANS in 2016 that recognised that common dolphins may have a bycatch which threaten the conservation status of the population.

In 2018, the Committee noted the importance of observer programmes, including electronic monitoring, due to the limitations of stranding information for determining the type of fishing gear implicated in a bycatch event. In addition, the Committee noted that a robust evaluation of the effectiveness of bycatch mitigation measures requires a combination of monitoring measures, including well-designed and effectively implemented observer/electronic monitoring programmes and stranding programmes.

Following the discussion of SC/68A/HIM/11 and Peltier *et al.* (2019b) the sub-committee noted the following.

(a) The level of strandings associated with bycatch had been steadily increasing and already 2019 was the highest on record. This highlights the urgency of the situation and adds to the previous concerns.
(b) The new information had gone some way towards identifying the fisheries and metiers involved but demonstrated a complex situation with potentially multiple different fisheries involving both mobile and static gear contributing to the high levels of bycatch.
(c) The substantial and consistent annual peak in strandings from January-March suggests that the most intense observer effort is required during this period.
(d) Obtaining representative observer coverage had been problematic in the past because vessels could choose whether or not to accept observers
(e) Short periods of 1-3 weeks have been associated with concentrations of strandings which have contributed to more than half of the yearly total counts of stranded common dolphins in 23 of the last 30 winter seasons. This suggests a short period of intense spatial and temporal overlap between dolphin distribution and the fisheries and hence that a 'moving on procedure' in line with the new EU Technical Measures [SC/68A/HIM/03] might be an effective mitigation option.

Attention: CG
Based on this, the sub-committee ***recommended*** *that in order to both identify the fisheries involved, produce reliable estimates of total bycatch and determine the relative contribution from each fishery, a very intensive observer effort is required. The complexity of the situation and highly over-dispersed bycatch rates indicate that 100% coverage with either observers or electronic monitoring may be required.*

The sub-committee also ***recommended*** *that full monitoring coverage either through observers or electronic monitoring would be needed to facilitate compliance with and monitoring of 'moving on' procedures as a mitigation measure.*

The sub-committee noted that further consideration of the area covered by the monitoring and mitigation provisions was needed and ***recommended*** *that this take into account the distribution of estimated bycatch locations identified in SC/68A/HIM/11. It also noted that further work was needed to specify a 'moving on procedure' including to determine the trigger for 'moving on' (e.g. level of bycatch) and the extent of the movement required. The sub-committee agreed that implementing full monitoring coverage that allowed* *any 'moving on' procedure to be evaluated may remove the need for time area closures which would otherwise have to be considered.*

In order to achieve such full coverage by either observers or electronic monitoring, the sub-committee ***recommended*** *that participating in the monitoring programme and agreeing to the mitigation measures be made a condition for fishing in the area during the period January to March through the relevant European Union fisheries management processes.*

ICES (2018) had noted that Good Environmental Status had not been achieved in the Bay of Biscay due to unsustainable bycatch of common dolphin and that bycatch pressure must be addressed adequately in French waters during the next MSFD cycle. The sub-committee ***recommended*** *that the concurrent implementation of both monitoring and mitigation would be required in order to ensure that bycatch was properly assessed and reduced in an appropriate timescale to meet these obligations under the MSFD.*

SC/68A/HIM/10 presented 10 years of systematic bycatch data collected from shark nets in South Africa. Since 2009, detailed investigations of the animals incidentally caught in bather protection nets along the KwaZulu-Natal coast have yielded a valuable dataset to determine whether netmarks are a clear indicator of entanglement in stranded dolphins where cause of death is unclear. The study investigated netmark occurrence on two bycaught dolphin species along the East coast- the Indo-Pacific bottlenose dolphin (*Tursiops aduncus*) and the Indian Ocean humpback dolphin (*Sousa plumbea*). Marine mammal dissection and necropsy reports as well as photographs of 125 animals known to have been caught in bather protection nets between 2010 and 2017 were investigated to determine prevalence of netmarks as well as any correlations with species, sex, age and season. The results showed that only 23% of the investigated dolphins known to have been caught in nets presented signs of netmarks on the skin. There were clear differences between the two species, with only 14% of Sousa showing signs of netmarks, while Tursiops made up well over half of the bycaught animals with netmarks (86%). Furthermore, females were more likely to exhibit netmarks on the skin when compared to males (59% vs 41%). Adults were least likely to exhibit netmarks (31%), with the majority of dolphins being juveniles (69%; juveniles included calves, neonates and subadults). Seasonal differences were also observed, with more netmarks occurring in winter (38%), while summer appeared to have the least number of dolphins with netmarks (10%). This result was of particular interest as it contrasted with the assumption that increased temperature attributed to decay of dolphin carcasses and thus affected netmark occurrence. Netmarks and other injuries are considered to be a clear indication of entanglement. However, the study found that only a small percentage of bycaught animals actually present these signs of entanglement. Thus, other methods, in addition to netmark presence, are required to reliably identify entanglement cases in strandings.

The sub-committee discussed the technical specifications of the shark nets in comparison to fishing nets. The shark nets are multi-filament gillnets, with mesh sizes of 25x25cm, however they are thicker and anchored to the seafloor and so are therefore less flexible than a normal fishing net. It was noted that examining the proportion of animals caught in gillnets that actually show physical evidence of having been caught in nets would be a useful study.

SC/68A/HIM/16 presented information on the Endangered Indian Ocean humpback dolphins *Sousa plumbea* which are bycaught in shark nets in KwaZulu-Natal, South Africa. Shark nets are gillnets set to intentionally lower the population size of sharks to lower the probability of shark attacks. The nets have a large mesh and are made of thick, woven black multifilament twine. Most nets are 200m long by 6m deep and, importantly, they are permanently anchored in the same place. An average of 6.7 humpback dolphins were caught per year in 37km of netting between 1980 and 2009, with a strong spatial bias towards one beach, Richards Bay (Atkins *et al.*, 2013). The shark nets are responsible for a significant portion of the permanent loss of humpback dolphins at Richards Bay and may be affecting the wider population (Atkins *et al.*, 2016). Changing gear from gillnets to baited hooks has resulted in some mitigation of the risk, but 700m of netting remains. A gear substitution ceiling has been reached and further replacements of gillnets with baited hooks are unlikely. A new gillnet deployment is being considered close to Richards Bay; this would potentially impact small and large cetaceans that use the area. Recently, the bycatch problem is being viewed as part of a human-wildlife conflict and stakeholders are being engaged. Further reductions of bycatch may require a wider range of alternatives. A programme to identify and test a greater variety of alternatives to shark nets is needed. The programme should be open and participatory, with input from diverse stakeholders.

The sub-committee discussed the challenges of dealing with public perceptions in relation to shark attack prevention, given that the replacement of nets with baited hooks was perceived to be attracting sharks to beaches and removing a physical barrier between people and sharks. Nets and baited hooks are not the only possible solutions for managing sharks that are approaching beaches, other options include smart buoys (used in Australia) and monitoring with drones. The sub-committee also considered that in the past, shark nets have also been discussed in relation to large whale entanglement. The study area appears to be used regularly by humpback whales during their migration, so this might be another aspect to consider in future work.

The issue of humpback dolphin bycatch in shark nets off South Africa, was also discussed, with recommendations given, under item 2 of Annex M.

Attention: CG

Given that shark nets remain in the same location for extended periods, the sub-committee ***recommended*** *that prior to new shark nets being deployed, data should be gathered on the use of the area by cetaceans and the likely impacts of the nets.*

The sub-committee also ***recommended*** *that more effort should be focused on the process of finding and testing a wider range of alternatives to shark nets in order to increase mitigation efforts to reduce the bycatch of Indian Ocean humpback dolphins*

Seakamela sought to engage the sub-committee on the best possible ways to develop a national programme to monitor and mitigate marine mammal bycatch in South Africa. There are currently 22 recognised commercial fisheries in South Africa as well as over 30,000 non-commercial fishers, 80 of which target line fish (DAFF - Department of Agriculture, 2012). This active sector interacts with marine fauna, sometimes with adverse outcomes. Bycatch mitigation plans are in place for turtles and seabirds; however, marine mammal bycatch remains largely unattended to. While some fisheries, including set lines for rock lobster and octopus, have mitigation measures in place for large whales, a new effort by Depart of Environmental Affairs and Department of Agriculture, Forestry, and Fisheries seeks to build a marine mammal observation program on top of a successful Seabird Observer Programme championed by CapFish (an international marine monitoring and fisheries consulting group). Seakamela requested advice from the sub-committee on the best possible ways to incorporate marine mammal data collection into its continuing seabird bycatch monitoring efforts.

The sub-committee thanked Seakamela for bringing this issue forward, and appreciated the opportunity to advise on the development of this programme. In discussion it was noted that many of the fisheries in question may face challenges analogous to other fisheries that have already developed bycatch monitoring programmes, and South Africa may wish to directly consult with other fisheries experts directly to learn from their experiences. At the regional level, the author was also advised to engage the CCAMLR Secretariat. An in-person meeting in South Africa could also help progress the development of a monitoring programme. The sub-committee agreed the IWC Bycatch Expert Panel was best suited to provide advice on this request and could be approached through the Bycatch Mitigation Initiative co-ordinator. In addition, several experts outside of the Panel, including Currey, expressed interest in supporting development of this national program.

Attention: SC, CG

*The sub-committee **draws attention** to the request of South Africa for advice on development of a national programme to monitor and mitigate marine mammal bycatch in national fisheries and **recommends** the Bycatch Expert Panel provide advice on the development of the national programme.*

SC/68A/HIM/17 and Jiménez *et al.* (2018) provided information on cetacean bycatch in gillnets in Ecuador recorded over 16 years (2001-17) from strandings data. Over this period, 130 carcasses of stranded cetaceans of 18 different species were examined. These included 59 humpback whales (*Megaptera novaeangliae*), 9 pantropical spotted dolphins (*Stenella attenuata*), 8 common dolphins (*Delphinus sp.*), and 54 individuals of 14 other species of dolphins and whales. The cause of death was diagnosed in 54 (38%) of cases, with the most frequent one being entanglement in fishing gear (*n*=43). Confirmed interaction with fishing gear included 18 of 59 (31%) humpback whales, 7 of 9 (78%) spotted dolphins, 4 of 8 (50%) common dolphins, 3 of 6 (50%) dwarf sperm whales. Ten species of cetaceans were demonstrated to have stranded after obvious entanglement with fishing nets. This study demonstrates that the artisanal drift gillnet fishery is the main fishing gear causing mortality for both small and large cetaceans in Ecuadorian waters, with significant bycatch of humpback whales in particular. Fisheries and environmental authorities must be vigilant and enforce existing marine fisheries regulations to proactively mitigate anthropogenic impacts and promote environmental education activities in fishing communities to conserve vulnerable cetacean species in Ecuador's waters.

The sub-committee discussed the high numbers of humpback whales caught, particularly in the context of the potential for animals to become entangled and drag gear as they set off on migration, potentially meaning even higher numbers would eventually die from entanglement. The animals in Ecuador appear to have become entangled in their breeding area and season, and recent increases would appear to be caused by the change in fishing culture to utilise many different drift gillnets in different places both in the coastal and offshore zone. The study was conservative in identifying the animals where death had been caused by entanglement, and only the carcasses where there was strong evidence (e.g. net marks) were counted. Furthermore, only some of the stranded animals were necropsied, given the logistical difficulty in sampling across the whole Ecuadorian coastline.

The sub-committee discussed the potential mitigation option which had been discussed at the BMI Indian Ocean bycatch workshop, in which driftnets were set two meters lower in the water column which reduced bycatch. This could potentially be worth trialling. The potential for this fishery to be a BMI pilot project to explore bycatch mitigation options was brought up, particularly since Ecuador had been highlighted as a priority country for the BMI. In addition, the sub-committee encouraged the IWC's large whale entanglement initiative to work with the authors and the Ecuadorian Government, to provide entanglement response training for this region of Ecuador.

2.4.1 Consideration of 'rapid risk assessment' tools

Hines presented Hines *et al.* (2018) on a toolbox for place-based risk assessment of marine mammal bycatch. Data to document bycatch and the effects of bycatch are often lacking, particularly in developing countries, due to limitations on time, money, and training. A suite of tools for place-based risk assessment of marine mammal bycatch have been developed that makes use of existing data and creates a framework for data acquisition. The tools have open-source processing to guide scientists and managers through a process that results in a spatial risk analysis to support science-policy processes. Users are provided with methods to evaluate existing data, leading to distribution of fishing effort and the use of gear predominant in bycatch occurrences. Bycatch risk assessment methods that consider abundance survey design, spatial characterisation of habitat, bycatch spatial patterns, estimates of analysis uncertainty, protected area design, and the incorporation of socio-cultural dynamics. A range of data from field sites in three Southeast Asian countries (eastern Gulf of Thailand, Sarawak and peninsular Malaysia and southwestern Vietnam) have been collected. The sites have similar coastal cetaceans and sirenians, small-scale and commercial fisheries, and support from either local Universities or management agencies. A fifth field site in NW Sri Lanka, showed how the toolbox could be used for multiple species as a rapid assessment method for assessing and mapping bycatch risk. Using these diverse sites as input has enabled the development of an adaptable and scalable toolkit to support marine mammal conservation and inform fisheries management strategies. These methods will support practitioners to find effective measures to reduce that bycatch to sustainable levels.

Braulik *et al.* (2018) on cetacean rapid risk assessment methodology was introduced. Basic information on cetacean species presence is unknown for tens of thousands of kilometres of coastline, particularly in Africa, Asia and South America, which is a major hurdle to their conservation and management. A survey approach that will generate broad-scale, quantitative, baseline data on cetacean communities and potential threats that can be conducted rapidly and cost-effectively across whole countries, or regions was described. A pilot rapid assessment study in Tanzania was conducted in one year and cost less than $50,000 of field costs, and integrated collection of data on cetaceans from visual, acoustic, and interview surveys with existing information from multiple sources, to provide low resolution data on cetacean community relative abundance, diversity, and threats. Four principal threats were evaluated and compared spatially using a qualitative scale: cetacean mortality in fishing gear (particularly gillnets); cetacean hunting, consumption or use by humans; shipping related collision risk and noise disturbance; and dynamite fishing. The most important area for cetaceans in Tanzania was the Pemba Channel, a deep, high-current waterway between Pemba Island and mainland Africa, whereby far the highest relative cetacean diversity and high relative abundance were recorded, but which is also subject to threats from fishing. This area is now subject to intense cetacean surveys and bycatch mitigation. It has also been proposed as an Important Marine Mammal Area. A rapid assessment approach can be applied in data deficient areas to quickly provide information on cetaceans that can be used by governments and managers for marine spatial planning, management of developments, and to target research activities into the most important locations.

Discussion focused around the ability of this work to identify specific areas for bycatch mitigation. The data generated by the pilot project in Tanzania was able to identify key locations where mitigation trials could take place. However it was stressed that this should be seen as a very useful starting point for further work, rather than an endpoint. Further fine scale work could then help refine information on bycatch and suitability for mitigation trials. In addition, the work had a strong focus on capacity development, training local teams to carry out all the cetacean surveys and interviews.

The sub-committee discussed the relative utility of these assessment tools with regard to the IWC BMI and specifically in relation to their strengths and applicability to identify or inform future affiliated or pilot projects. The two existing assessment tools that were described (Braulik *et al.*, 2018; Hines *et al.*, 2018) are quite different, and yet perhaps complementary. One (Braulik *et al.*, 2018) emphasises a rapid sighting survey technique, with strong engagement and training of local researchers, but its engagement with local fisher communities is also rapid and therefore somewhat transient. The other assessment technique (Hines *et al.*, 2018), does very little, if anything, on the water to collect marine mammal sightings, but instead relies on strong, and potentially long-lasting, engagement with local researchers, fishers and their communities. Therefore the appropriate tool will depend on the goals, and logistical constraints, of a potential study area, but there could be some scope for implementing a combination of both methodologies in a BMI pilot project.

SC/68A/HIM/01 summarises ongoing going work to develop scientific tools, resources and guidelines to help nations comply with the US Marine Mammal Protection Act (MMPA) Import Provisions. In the US, marine mammals are protected by the MMPA, which defines reference points for managing bycatch. The MMPA requires that imported fish and fish products be evaluated with respect to US standards, and regulations to implement that requirement were issued in 2016. The US identifies foreign fisheries that are at risk of having high marine mammal bycatch mortality and categorises them as 'Export Fisheries.' Nations have a five-year grace period, from January 2017 until January 2022, to develop a regulatory program to address their marine mammal bycatch for export fisheries. The University of Washington Ocean Modeling Forum has convened a working group that is conducting four projects to develop tools that are relevant to complying with the rule. The first two projects will address steps in setting and applying bycatch standards: estimating abundance and assessing bycatch rates. The third project will develop an online tool (*https://msiple.shinyapps.io/mammaltool/*) to synthesise data and evaluate potential management strategies. The fourth project will further evaluate the applicability of the Potential Biological Removal method, the primary US bycatch standard.

The sub-committee discussed the US regulations, and that countries importing fish products into the US would be required to show comparable measures to address bycatch. The MMPA Import Provisions rule implements aspects of the Marine Mammal Protection Act that aim to reduce marine mammal bycatch associated with international commercial fishing operations, by requiring nations exporting fish and fish products to the United States to be held to the same standards as US commercial fishing operations.

2.4.2 Consideration of remote electronic monitoring and vessel tracking

Scheidat *et al.* (2018) presented the results of a Remote Electronic Monitoring (REM) project conducted to assess the bycatch of harbour porpoise (*Phocoena phocoena*) in the Dutch commercial bottom-set gillnet fishery. From 1 June 2013 to 31 March 2017 fourteen fishing vessels were equipped with closed-circuit television cameras (CCTV) in combination with sensors to obtain video footage, time and position of net hauls. Video footage was analysed for porpoise bycatch events for 900 fishing days of a total of 8,133 fishing days (11%) consisting of 760 single-walled gillnet (GNS) fishing days (total fishing days 7756; 9.8%) and 140 trammel net (FAO code GTR) fishing days (total fishing days 377; 37.1%). 'Net length km' was used as the fishing effort metric to calculate bycatch rates (porpoises/net length km). Rates were over six times higher for GTR (0.004 porpoises/km) than for GNS (0.0006 porpoises/km). A combined bycatch rate for all net types (0.0011 porpoises/km) was applied to calculate a total bycatch estimate of 88 animals for the study period (95% C.I. 6-170; C.V. 14.54) and an annual average of 23 animals (95% C.I. 2-44). The scale of annual mortality for the Dutch porpoise population was approximated using a precautionary approach, applying the lower 95% C.I. of the best available population estimate and the highest 95% C.I. value of available bycatch estimates, resulting in a maximum annual mortality rate of 0.3%. Other bycatch sources in the Dutch North Sea, such as recreational gillnet fishery or non-Dutch gillnet vessels, were not included. Key recommendations from this work are: (1) monitoring efforts on bycatch rates need to be done regularly; (2) improving REM systems to make them smaller, mobile and cost-efficient should be supported; (3) effort data currently available to estimate bycatch numbers need to be significantly improved; and (4) bycatch data need to be collected in all countries operating fishing fleets in the North Sea. The EU Data Collection Framework could be used to ensure that suitable data is collected in the same way for the North Sea harbour porpoise to estimate a population wide bycatch rate.

The sub-committee focused its discussion around the challenges of convincing the fishing industry to have REM systems onboard, due to perceived privacy issues and reluctance to be recorded. Scheidat explained that this had been extremely challenging at the outset of the project, but that participating fishers were much more willing to participate once additional fishing quota was secured for them in exchange for being part of the study. In the absence of incentives it is possible that fishers may not be as willing to continue being electronically monitored. However the importance of bringing the fishing industry in to participate as partners in the project was recognised as vital for tackling bycatch.

The sub-committee considered the effectiveness of REM systems to capture events where bycaught cetaceans drop out of the net prior to or during hauling. In the study it was not possible to calculate a specific correction factor for porpoise drop-outs from nets due to the low number of bycatches. Other studies have shown that drop-outs can be missed by fishermen and observers as well as by REM observers and it is important to estimate this potential bias when possible.

The discussion also considered the potential for increasing the use of REM systems across the EU, through either the Control Regulation or the Data Collection Framework, and the potential for fishery certification bodies to promote REM. The Marine Stewardship Council (MSC), for example, is considering the applicability of REM in its ongoing MSC standard review. It was noted that a balance would be needed for certification programmes, as REM systems might not be feasible in fisheries in developing countries. However the sub-committee also discussed recent progress in the development of cheaper and more mobile REM systems, with a cheaper prototype already successfully tested on very small vessels. Finally, it was noted that whilst there is a big push for greater monitoring and collection of data in fisheries, care is needed to ensure that the safety of onboard observers is not compromised if their data are used for monitoring or control purposes.

SC/68A/HIM/06 describes a small remote electronic monitoring (REM) system originally developed for use in monitoring fishing operations in the Eastern Pacific and used to monitor marine turtle bycatch. The small, rugged waterproof camera can be pole mounted on any size vessel, can be recharged through use of small solar panels, and uses 3G and/or WiFi networks to transfer GPS track data and video data to a server. Once on the survey, video and track data can be reviewed by an automatic detection system trained to identify the presence of different Endangered, Protected or Threatened (ETP) species in nets or on board. Recent hardware improvements combined with optimised Artificial Intelligence algorithm and improved web platform have increased the detection rates and accuracy of various types of bycatch (average of 85-90%) while reducing dependency on human observers. The Shellcatch system has been applied on over 500 small scale fishing vessels in Latin America, and has been used to produce one peer-reviewed publication demonstrating the system's effectiveness in detecting marine turtle bycatch off the coast of Peru (Bartholomew *et al.*, 2018). The Shellcatch development team is keen to develop further collaborations with researchers in different parts of the world who would be willing to test the system's functionality in different fisheries and settings, and particular its effectiveness in detecting cetacean bycatch.

2.4.3 Hector's and Māui dolphins in New Zealand: consideration of spatial risk assessment of threats.

Discussions on spatial risk assessment of threats to Hector's and Māui dolphins in New Zealand involved joint sessions between the Standing Working Group on Abundance Estimates, Stock Status and International Cruises, the sub-committee on Small Cetaceans and the sub-committee on Non-deliberate Human-induced Mortality of Cetaceans. Participants in these joint discussions are referred to as the 'Working Group' for the purposes of Item 2.4.3.

SC/68A/HIM/05 provided an update on Hector's and Māui dolphins and fisheries. Most sightings of Hector's and Māui dolphins are in waters <100m deep. Gillnet and trawl fisheries have caused substantial population declines, population fragmentation and changes in distribution (Slooten, 2013). Continued bycatch is especially high risk for Māui dolphin (de Jager *et al.*, 2018) and small Hector's dolphin populations. Observer coverage is very low (typically 1-3% for gillnet fisheries). Recent bycatch includes a larger number of catches, and larger number of multiple catches, than would be expected given the catch rate in Roberts *et al.* (2019). For example, five Hector's dolphins in one gillnet and several instances of three Hector's dolphins in one trawl. Insufficient information is available to quantify other potential threats, including pollution, mining and disease (Taylor *et al.*, 2018). A substantial increase in survival rate has been detected for Māui dolphin, and Hector's dolphins at Banks Peninsula, following a partial ban on gillnets and trawling.

The Working Group welcomed the presentation, and suggested the use of VMS data, if available, to determine if there are differences in fisher behaviour when observers are not on board.

Sharp commented that assertions about changing survival rates with the establishment of the marine mammal sanctuary around Banks Peninsula (Gormley *et al.*, 2012) utilised a sight-resight model that treated annual re-sight probability as a random error, and that if inferences about changing survival rates in this period were to be made based upon Gormley *et al.* (2012), then the appropriateness and implications of treating resight probability as a random error should be tested.

Cooke *et al.* (2019) fitted an individual-based model to genetic capture-recapture data from Māui dolphins from biopsies collected during 2001-16 and from some carcasses. Projections of the population into the future were made under various scenarios. The model fits show that the population has almost certainly been declining, but the best-fitting models involve an increasing survival rate and a decreasing rate of decline. If the estimates of fishing-related mortality rate from the risk assessment model of Roberts *et al.* (2019) are treated as a relative index, then the fit to the capture-recapture data is good and the fishing-related (bycatch) mortality is estimated to have decreased, but needs to decrease at least by a further 50% in order to stop the decline and avert the risk of extinction. If the estimates of fishing mortality from Roberts *et al.* (2019) are accepted as absolute rates, then the estimated fishing mortality rate is insufficient to explain the decline, and it is necessary to invoke other sources of mortality, such as toxoplasmosis or some as yet unknown factor. In that case, a reduction of the additional source of mortality by 50% per five years from 2025 would be sufficient to avert extinction, but a reduction of 50% per 10 years starting in 2030 would not quite be enough.

Sharp commented that in Cooke *et al.* (2019) the projection based on assuming fisheries risk was the only threat, and was a relative rather than absolute index, was the only model projection that included a threat intensity that was variable over time, allowing the trajectory to fit an increasing adult survival rate in the time period. This could arise from any combination of multiple threats that are changing over time, including recreational fishing, which was largely eliminated during this time.

Roberts *et al.* (2019) presented a spatially explicit risk assessment of fisheries and non-fishery threats affecting Māui and Hector's dolphins. The risk assessment method estimates encounters between dolphins and threats based on the level of spatial overlap between their mapped distributions. It estimates the probability of death per encounter using fisheries observer data for commercial fisheries or necropsies of beachcast individuals for non-fishery threats, in an integrated Bayesian model. The spatial distribution of the dolphins is strongly predicted by ocean turbidity rather than depth or distance offshore. Updated R_{max} estimates for Māui and Hector's dolphins are higher than estimated previously. Commercial fisheries risk is highest on the East coast of the South Island, concentrated in three areas where high dolphin densities overlap with fishing effort. Commercial setnet risk is much higher than trawl risk despite lower levels of total effort and overlap, reflecting higher catchability. The greatest non-fishery threat to dolphins is toxoplasmosis, but exposure levels vary considerably between subpopulations, of which Māui dolphins have the highest risk. In some subpopulations, estimated toxoplasmosis risk is higher than commercial fisheries risk. However, the toxoplasmosis estimates have high uncertainty, reflecting low sample size and a reliance on untested structural assumptions about the probability of mortality from non-fishery threats. Fisheries risk estimates utilise observer data, so do not rely on similar assumptions.

In light of the many recommendations concerning Māui dolphins that the Scientific Committee has made in the past, the Working Group welcomed the presentation and the potential for new information to inform this issue. The Working Group expressed support for the New Zealand government's use of a spatial risk assessment for Māui and Hector's dolphins, and **agreed** with the principle of estimating encounters between dolphins and lethal threats as a function of their overlap in space. However, given the novel nature and complexity of the approach, and that the document only became available to members of the Committee on the day prior to the opening Plenary of SC/68A (although it had been submitted on 3 May), the Working Group did not have adequate time to rigorously evaluate the specific choices made in designing and implementing the model, including determination of the sensitivity of the conclusions to the choices made. The Working Group therefore recommended that the work be reviewed interssessionally, to confirm the model is sufficiently robust to inform management.

The Working Group **agreed** that the assumption of Māui and Hector's dolphins as equally vulnerable[1] to being bycaught was reasonable in the absence of data indicating otherwise. Clarification was provided on a number of points, including that catchability was calculated in the model by matching the number of dolphin captures recorded by fisheries observers to the estimated overlap between dolphins and observed fishing effort. Scaling from captures to deaths requires the estimation of cryptic mortality (deaths that are unobserved even in the presence of an observer); this multiplier is function of the priors.

At a fundamental level, the calculation of fisheries effort in the model is straightforward, though a number of details do have to be taken into account. This renders the computation of catches (dead animals brought on board of the vessel) and effort for the times when observers are present (often referred to as 'observed catches' and 'observed effort') fully specified in the context of the model. The Working Group highlighted the need to examine a number of topics in greater detail, including the choice of static and dynamic habitat variables, the potential implications of the level and spatial extent of observer coverage, potential biased estimation of vulnerability as a result of having an observer on-board, and the current assumption that vulnerability on observed and unobserved fisheries effort is the same, as well as constant across space and time. Sharp responded that changed fisher behaviour in the presence of an observer would not create bias if the only change was in the location where fishing occurred, but noted that changed fisher behaviour would create bias if the change involved variations in gear deployment that would affect catchability across all locations.

The issue of prior sensitivity was also broached, especially with regards to cryptic mortality. This was a key parameter for scaling up from captures brought on deck to total deaths, and its estimate from the model was completely dependent on the prior, so that a change in prior choice would result in a proportional change in total deaths. The choice of, and sensitivity to, priors was highlighted as a topic in need of further evaluation intersessionally. The Working Group also identified auxiliary data in the form of beachcast individuals and self-reported bycatch from the fisheries that could potentially be used to help inform or validate the Roberts *et al.* (2019) model.

Roberts *et al.* (2019) estimated that at current levels, commercial fisheries risk alone would not be sufficient to produce the observed decline in the Māui dolphin population, suggesting that other threats are also impacting the population. The estimates of Cooke *et al.* (2019) imply that if commercial fisheries-related mortality was the only threat responsible for the population decline, then a further reduction of at least 50% in fisheries mortality would be needed to eliminate the risk of Māui's extinction. Overall, while a number of issues were resolved in the course of discussion, the Working Group **agreed** that the time required to review the model of Roberts *et al.* (2019) and its assumptions, inputs and outputs was greater than could be realistically allocated during SC/68A, especially given that the spatial modelling could not be discussed in any detail due to time constraints.

To provide a more in-depth review, the Working Group **recommended** that an intersessional group be formed whose Terms of Reference would include the preparation of solicited review papers on the information and analysis presented in Roberts *et al.* (2019) on Māui and Hector's life history parameters, the dolphins' spatial distribution, estimates of bycatch rates and vulnerability, toxoplasmosis and the risk model outputs. A panel of independent experts with backgrounds appropriate to these areas would be identified by a Steering Committee. None of the experts would be associated with Roberts *et al.* (2019), Cooke *et al.* (2019) or SC/68A/HIM/05, but would be encouraged to seek additional information as required from relevant scientists to guard against misunderstandings. The Working Group identified a number of specific topics of interest, the details of which can be found in Appendix 3, which may be further refined and prioritised by the Steering Committee. Upon the completion of the review papers, a two-day pre-meeting should be held together with the reviewers and relevant members of the Scientific Committee and New Zealand government. The Working Group noted that financial support would be necessary in order to conduct the recommended scientific review.

The Working Group also acknowledged toxoplasmosis as a recently recognised threat to Māui and Hector's dolphins (Roe *et al.*, 2013), and **recommended** additional research beyond that covered in the Terms of Reference of the intersessional group to better understand the

[1]Within Item 2.4.3, the terms 'vulnerability' and 'catchability' are used as defined in Roberts *et al.* (2019).

implications of this infection. The Working Group identified a link between the review on toxoplasmosis and a focus session on the infection planned for SC/68B, and **recommended** coordination with regards to the selection of the expert reviewer for toxoplasmosis and that individual's participation across both forums.

Attention: SC, S, CG

The Committee ***reiterates*** *last year's recommendations (IWC, 2019), given its continued grave concerns regarding Māui dolphins. The Committee thanks the Contracting Government of New Zealand for bringing forward the spatial risk assessment model for Māui and Hector's dolphins presented in Roberts et al. (2019). However, in order provide a rigorous evaluation of the approach and its outputs, the Committee* ***recommends*** *that an intersessional working group be convened to provide a thorough, independent review of the spatial risk assessment model. The Terms of Reference would include the preparation of solicited review papers on the information and analysis presented in Roberts et al. (2019) on:*

(a) Māui and Hector's dolphins' life history parameters;
(b) Māui and Hector's dolphins' spatial distribution;
(c) estimates of bycatch rates and vulnerability;
(d) toxoplasmosis; and
(e) the risk model outputs.

Five independent experts with backgrounds appropriate to these areas would be identified by a Steering Committee to carry out the review. In order to ensure the independence of the review and its process, in both perception and reality, none of the identified experts or the members of the Steering Committee would be associated with Roberts et al. (2019), Cooke et al. (2019) or SC/68A/HIM/05. The results of the independent reviews would be discussed in a two day pre-meeting to SC/68B. All conclusions would be presented to the Committee in SC/68B for further discussion, and any decisions with regards to existing or future recommendations would be made at that time.

The Committee ***encourages*** *the Contracting Government of New Zealand and the Scientific Committee to consider how to support the independent reviewers and pre-meeting needed to achieve a rigorous review and evaluation of the spatial risk assessment model presented in Roberts et al. (2019).*

The recommendations above are additional to, and do not supplant, the recommendations made by the Committee last year (IWC, 2019) including closures of any fisheries within the range of Māui dolphins that are known to pose a risk of bycatch to dolphins (i.e. set net and trawl fisheries).

Attention: SC, S, CG

The Committee ***recommends*** *that further research be carried out to better understand the source and potential risk of toxoplasmosis, as well as approaches to its mitigation, as it relates to Māui and Hector's dolphins, particularly as toxoplasmosis would compound any threat posed by bycatch.*

2.5 Scientific aspects of mitigation measures for small cetaceans

SC/68A/HIM/04 presented information from preliminary trials of escape devices in anchored stow nets in South Korea. The narrow-ridged finless porpoise (*Neophocaena asiaeorientalis*) is regularly caught in stow nets, particular off the west coast of the Korean peninsula. The National Institute of Fisheries Science of Korea began testing escape devices, based on a jellyfish excluder device. The trials involved a guide net of mesh size of 370mm or 500mm and a hole at the top of the net through which a porpoise might escape. The trials aimed to examine whether this was an effective way to reduce bycatch and whether there was an associated reduction in catch of the target species. Further tests are ongoing.

The sub-committee discussed the possibility of monitoring the interaction between finless porpoises and the escape hatches through underwater video. Whilst this is challenging in murky water, there are examples of technology used in other parts of the world, such as in Mexico (upper Gulf of California) with the vaquita that could be used. This would provide valuable insights, as the study found that even in strong currents the finless porpoise were easily able to locate and use the escape hatches. The sub-committee noted the extremely useful nature of this type of work, given that there is a widespread lack of trialling of novel mitigation solutions.

2.6 Review of information in National Progress reports on bycatch and entanglement

Reports on bycatch and entanglement in National Progress reports were not reviewed but are summarised in Appendix 4.

2.7 Progress on previous recommendations

Progress on recommendations made in 2018 is summarised in Appendix 2.

3. SHIP STRIKES

3.1 Review new methods and estimates of rates of ship strikes, risk of ship strikes and mortality

Peltier *et al.* (2019a) examined stranding data, including photography and necropsy reports with the aim to provide a comprehensive review of confirmed collision records of large whales in France. Since 1972 a national coordinated network collected data and samples on stranded marine mammals along the Metropolitan French coasts. During the period 1972-2017, a total of 51 ship strikes were identified which represents the first identified causes of mortality for large whale in France. Strandings showing evidence of ship strikes have increased since 1972 with seven records during the first decade to reach 22 stranded animals observed between 2005 and 2017. This issue appears particularly critical in the Mediterranean Sea where one in five stranded whales showed evidence of ship strike. This review of collision records highlights the risk of a negative impact of this anthropogenic pressure on the dynamics of whale populations in Europe, suggesting that ship strike rates could not allow achieving the Good Environmental Status of marine mammal populations required by the European Marine Strategy Framework Directive.

The sub-committee welcomed the information from Peltier *et al.* (2019a) and expressed concern for the increasing number of stranded whales linked to ship strikes in several areas off the coast of France. It was noted that the number of stranded individuals will only be a small fraction of the ship strike mortalities, and that modelling the drift of carcasses may be necessary to determine the original location of the ship strike. At present, the sub-committee noted that with the exception of REPCET in the Mediterranean, few measures have been implemented to reduce ship strikes in the affected areas. It was also suggested that other factors such as underwater noise, entanglement or ingestion of marine debris may affect a whale's vulnerability to ship strikes. The author agreed to work with the IWC ship strikes database coordinators to ensure all of the records in the paper were entered in the ship strike database.

3.1.1 Review progress on global database

SC/68A/HIM/14 summarised the 7th term of work undertaken by the IWC ship strike data coordinators between May 2018 and April 2019. In total, 384 reports have been assessed and are now listed as cases in the database, which leaves 118 old reports to be assessed, excluding any new incoming new reports. A number of inquiries about the database were received, and relevant literature was provided, along with general information as well as specific advice. In a number of cases, a folder containing extensive information about IWC's work on ship strikes ('ship strike briefing') was provided to interested parties. An information packet including the ship strike Power Point presentation developed by IWC and German NGO MEER and the IWC guidance documents has been put online as a free download. Contacts with the ACCOBAMS and the Pelagos Sanctuary Executive Secretariats, as well as ASCOBANS, have been maintained to discuss possible synergies in assessing and mitigating ship strikes. There is an ongoing project funded by the Pelagos Agreement on ship strikes in the Pelagos Sanctuary and this will be carried out by a team of international scientists till April 2020. One missing piece is the finalisation of a tool to bulk upload data to the database. Several trials have been conducted and a technical solution seems close. With this option implemented, it will be possible to upload several hundred more reports to the database, stemming from different sources. The coordinators are also currently waiting for US records to be uploaded, in order to integrate them into the data base. A larger number of US cases which were reviewed by the DRG could not be classified because it was assumed that the original records hold greater detail of information on each incident. Without the integration from the US and Australian databases the task of the ship strikes coordinators cannot be fully completed.

In discussion, it was noted that a number of health related factors may increase vulnerability to ship strikes and that data on such factors (e.g. ingestion of marine debris or entanglement injuries) would be useful to collect from carcasses that were diagnosed as having been struck. This type of additional data are not recorded in the database, but each record in the database does identify the level of examination and contact details for any available necropsy report. It was also noted that incidents described in national progress reports may not have been reconciled with the ship strike database, as these incidents have not been actively pursued. The sub-committee recognised the importance of the bulk uploader tool, as the outstanding USA dataset is too large to be entered manually without a considerable investment in time. Aside from the import from countries with large national data sets, all remaining cases will be entered and reviewed. Hence it should be possible to have a fully reviewed database by SC/68b that can be made available for use.

Attention: S

The sub-committee commended Panigada and Ritter for their intersessional work and ***recommended*** *the continuation of the work of the IWC ship strike data coordinators and the Data Review Group to review of historical records.*

The sub-committee ***recommended*** *the Secretariat prioritise development of the bulk upload tools and contact known holders of large data sets to request that the data be shared with the IWC database.*

3.2 Mitigation of ship strikes in high risk areas

SC/68A/HIM/09 describes the distribution of humpback whales and shipping traffic patterns in coastal waters of Peru and notes that measures to organise marine traffic including speed limits, TSSs and ATBAs, have proven to be effective at reducing whale mortality associated to ship strikes in other areas. The sub-committee recognised the potential for ship strikes to impact on cetaceans in Peru's coastal waters. However, none of the authors were available to present the paper and further detail would have helped the sub-committee evaluate the proposed routing options. Hence the sub-committee encouraged the authors to submit additional information to SC/68B. The sub-committee also noted that the Committee has an intersessional correspondence group on vessel routeing which may be able to assist in providing advice on any routing measures that are proposed in the intersessional period.

The sub-committee was also informed about recent measures adopted by the International Association of Antarctica Tour Operators (IAATO) to reduce ship strike risks from Antarctic expedition tourism vessels. IAATO member operators represent the large majority of all tour operators operating in Antarctica, including all commercial SOLAS passenger ship operators. The association has reported nine ship strikes to IWC since 2001. Recognising that increased shipping has the potential to lead to an increase in whale strikes, especially in the whale rich waters of the Gerlache Strait off the Antarctic Peninsula, members of IAATO voted at their annual meeting in Cape Town, South Africa, in May 2019 to adopt mandatory measures to mitigate ship strike risks. IAATO members operate under a mandate to keep the impact of tourism 'less than minor or transitory', an ethos that motivated IAATO efforts to find ship strike risk reduction solutions.

For the 2019-20 season, IAATO Operators are instructed to commit to one of the following:

(1) a 10kn speed restriction within the Geofenced time-area proposed; or
(2) for IAATO Operators who have a whale strike mitigation training program: an extra watchman on the bridge for the sole purpose of being on whale lookout within the Geofenced time-area proposed. Appropriate records of this action must be recorded in the ship's log. The geofenced time/area is as follows:
    - January 1-May 30 in the Gerlache Strait and adjacent waters, in the area between 63.65S and 65.35S, including Dallmann Bay West to 64.2W; and
    - February 1-May 30 in the Marta Passage entering Crystal Sound, 67.8W to 67.0W.

Further, the IAATO secretariat has been tasked with studying the implications of this proposal, including what observer-based whale strike mitigation training programs exist within IAATO member bridge teams, and their expected efficacy, as well as information gaps that limit a more refined and evidence-based whale strike risk mitigation system.

The sub-committee supported the newly adopted mitigation measures, thanked Ted Cheeseman for bringing this information forward, and expressed interest in receiving more information from the evaluations by the IAATO secretariat.

3.2.1 Review progress towards assessing and mitigating ship strikes in previously identified high risk areas

The Canary Islands are identified as an area of high risk for ship strikes in the IWC Strategic Plan to Mitigate the

Impacts of Ship Strikes on Cetacean Populations. This is due to the overlap between cetacean habitats and intense marine traffic in the archipelago, especially fast-moving inter-island ferries, but also other long-distance shipping traffic passing through the islands. The Committee last considered ship strikes in the area in 2015.

SC/68A/HIM/08 noted that inter-island ferry traffic in the waters of the Canary Islands has increased considerably in the last years including normal ferries, fast ferries, and high-speed ferries. According to the Canary Islands Cetacean Stranding Network data, ship collisions have affected a total of 81 cetaceans belonging to 12 species in the last 20 years (7 mysticetes and 74 odontocetes: 5 short finned pilot whales, 10 pigmy sperm whales, 11 beaked whales, 46 sperm whales and 2 small delphinids), 33 of these cases were confirmed by forensic studies. The average per year of ship strikes in this period (1999-2018) was 4.5, 0.37 per month. During the months of January to April of 2019, 4 confirmed cases affecting sperm whales (3) and Bryde's whale (1), and another possible case, affecting a short-finned pilot whale have been reported. This increase in ship strikes (from 0.37 to at least 1 per month) in the Canary Islands is coincidental in time with the introduction of new high-speed ferry routes, raising the concern of the impact of ship strikes on the conservation of sperm whales. Diagnostic methods have improved allowing for ship strikes to be identified even from putrefied carcasses (Arregui *et al.*, 2019; Díaz-Delgado *et al.*, 2018).

The sub-committee thanked Fernandez for this information. It was also noted that the number of stranded carcasses likely did not account for all whales fatally struck by ships, and it was unclear how many other individuals may have been affected.

SC/68A/HIM/15 notes that the species most frequently reported as ship struck around the Canary Islands is the sperm whale and there are indications that current strike mortality could cause population level effects or, in case of high connectivity, render the Canary Islands as an attractive sink habitat for this species. Other species are affected also (see SC/68A/HIM/14). The rate of cetaceans struck by vessels has been abnormally high in the first months of 2019, coinciding with the implementation of new inter-island fast ferry lines. All reports have been based on stranded animals and there have been no direct reports by the two existing ferry operators to date. The recent peak of mortality has raised concern and led to initiatives by the Spanish and Canary Islands Governments, and the industry, to move towards the implementation of mitigation measure that have been proposed for some time by various research groups and NGOs. The authors proposes a set of recommendations to mitigate ship-strike risk from different types of marine traffic (transient, fast inter-island ferries and small-medium boats), including, among others: (i) speed restrictions; (ii) testing of technologies and on-board observers to increase detectability of whales, combined with a strike avoidance protocol; (iii) education of mariners; (iv) of a Ship Strike Prevention Working Group convened by the competent authorities (e.g. a round table where all stakeholders take part to maintain a continuing multilateral dialogue), and (v) that sufficient funding should be available to tackle the issue on the various levels.

In discussion, the sub-committee commended the broad support for further mitigation measures by the relevant stakeholders. Some further commended the conclusions of SC/68A/HIM/15, with its stated goal of transitioning from a 'worrisome hot spot for vessel-whale collisions' to a 'peaceful mutualism between humans and cetaceans'.

Based on new information received during SC/68A, indicating that the situation in the Canary Islands regarding ship strikes continues to be a serious concern (SC/68A/HIM/08, SC/68A/HIM/15), the sub-committee welcomed the initiative of convening a Ship Strike Prevention Working Group to unify efforts by different stakeholders under the guidance of the Canary Island and Spanish Governments, as well as to hold a multi-stakeholder workshop.

Attention: CG, CC, S

The sub-committee draws attention to the high level of ship strikes in the Canary Islands. It therefore re-iterates previous Committee recommendations on the need to immediately implement mitigation measures that will reduce the risk of vessel-whale collisions in the Canary Islands archipelago. The sub-committee ***recommended*** *that mitigation measures should include operational, technological and educational aspects in order to reduce mortalities and injuries to cetaceans as a result of ship strikes, improve reporting of such incidents and increase public and industry awareness.*

In addition, the sub-committee ***recommended*** *that the Secretariat notify Spain and the Canary Islands government of its recent review of new information on ship strikes in the region, its concern over the situation, and willingness to help with information and advice.*

3.2.2 Consideration of methods to identify 'high risk' areas including report of IMMA workshop

SC/68A/HIM/07rev1 reports on a joint IWC-IUCN-ACCOBAMS workshop to evaluate how the data and process used to identify Important Marine Mammal Areas (IMMAs) can assist the IWC to identify areas of high risk for ship strike. The goals and objectives of the workshop were to investigate the utility and process of using IMMAs to help identify areas of high risk for ship strikes, using the Mediterranean Sea as a test case. The IWC defines high risk areas as 'the convergence of either areas of high volume of shipping and whales, or high numbers of whales and shipping'.

The first part of the workshop included a series of presentations on IMMAs and the data and process used to identify them. The IMMA network presently covers three regions: the Mediterranean, the Pacific Islands and the North East Indian Ocean and South East Asian Seas. Two regions are in process: the Extended Southern Ocean and the Western Indian Ocean and Arabian Seas. Two additional regions are funded for 2020: Australia-New Zealand and South East Indian Ocean and the South East Tropical and Temperate Pacific Ocean.

The workshop then provided an overview of the work of the IWC with respect to ship strikes and associated data, and identifying high risk areas, with discussion on the 'Strategic Plan to Mitigate the Impacts of Ship Strikes on Cetacean Populations: 2017-20' and to the work of the IWC to collaborate with other organisations including the International Maritime Organization, the Convention on Migratory Species, including its daughter agreements such as ACCOBAMS and ASCOBANS. The IWC Strategic Plan describes seven stages in identifying high risk areas and developing appropriate mitigation strategies and the IMMA process is nicely linked with these stages.

The workshop then discussed traffic data and agreed that AIS data are very useful to assist with risk analysis for ship strikes and noted that, for all sizeable ships, it is possible to work out where a vessel is, speed, what type, and who owns it. In addition, AIS data can be helpful when engaging with industry.

In-depth discussions were then held on how IMMAs can be used to help identify high risk areas using the IMMAs data already compiled for the Mediterranean, along with AIS shipping data, and expert knowledge of the Mediterranean.

The workshop also considered possible mitigation measures in areas of high risk for ship strikes. It included discussion of both regulatory and voluntary measures, using case studies from New Zealand and the USA. The workshop then discussed opportunities for engagement with other institutions and relevant partners with similar goals or relevant policy processes, including the European Commission, the Convention on Migratory Species, ACCOBAMS and the IMO.

Attention: SC, CC

The sub-committee thanked the participants of the workshop and Panigada for presenting the report. It ***recommended*** *that Panigada become the liaison between the IWC Scientific Committee and Conservation Committee, ACCOBAMS Scientific Committee, the CMS and the IUCN MMPA Task Force on issues related to IMMAs.*

It was also noted that following the workshop, a GIS project to examine the overlap between ship traffic IMMAs has been initiated as a collaboration between WWF's GIS task team and the IMMAs Task Force. This was in direct response to the recommendation at the workshop to undertake an initial analysis of global IMMAs, overlaid with shipping data, to identify potential high-risk areas. The sub-committee welcomed this initiative and looked forward to reviewing the results.

Attention: S

The sub-committee ***draws attention*** *to the recommendations of the Joint IWC-IUCN-ACCOBAMS workshop on the evaluation of data and process used to identify Important Marine Mammal Areas. It therefore* ***recommends****:*

(1) that Important Marine Mammal Areas (IMMAs) represent a systematic and biocentric approach to identifying important habitats, and that as such they can be helpful in identifying potential high-risk areas for ship strikes. In particular, if an IMMA contains a species or population that is vulnerable to ship strikes, and it is transited by significant shipping, the area can be 'flagged' for further investigation and potential mitigation;

(2) that the best overall, current mitigation measures, are to voyage plan to avoid high risk areas or, if they cannot be avoided, restrict speed to 10 knots, which has been shown to be an effective speed to reduce fatal collisions with most large whales;

(3) that the steps identified in SC/68A/HIM/07 are undertaken by the IWC Ship Strikes Working Group and the IWC Scientific Committee as part of a process to identify High Risk Areas for Ship Strikes based on IMMAs;

(4) the IWC Ship Strikes Working Group develop case studies to demonstrate the benefits, anticipated and actual costs of measures introduced to reduce ship strikes and that the IWC Secretariat consider whether an intern could be recruited to support the development of these case studies;

(5) that IMMAs could potentially be used to identify high risk areas for other threats, including combined threats, e.g. bycatch and noise; and

(6) that the IWC Scientific Committee and the IUCN MMPA Task Force review the potential uses of the IWC databases (e.g. historical catch, sightings, strandings etc.) in helping to identify Areas of Interest (AOI) for future surveys, and for the verification of the longevity of IMMAs.

The sub-committee also discussed the workshop conclusions related to ship strike issues in areas of the Mediterranean including the Pelagos Sanctuary and the Hellenic Trench.

Attention: ACCOBAMS

The sub-committee also noted the recommendation by the Committee from SC/67b for continued work to develop and evaluate mitigation measures, such as speed restrictions, that might be associated with the designation of a Particularly Sensitive Sea Area (PSSA) in the Pelagos Sanctuary area. Following on from discussions at the workshop the sub-committee ***encourages*** *the ACCOBAMS Secretariat and ACCOBAMS Parties to further develop the process for the designation of a PSSA at a scale that includes the North West Mediterranean Sea, Slope and Canyon IMMA, plus potentially the Spanish corridor with ship strike mitigation tools such as speed reduction and routing measures as part of Associated Protective Measures.*

Frantzis *et al.* (2019) describes the distribution of shipping traffic and sperm whales in the Hellenic Trench. Sperm whale sighting and density data were combined with specific information on the vessel traffic in the area (e.g., types of vessels, traffic patterns, speed and traffic density), in order to estimate the risk of a whale/ship interaction. Routeing options to significantly reduce ship strike risk by a small offshore shift in shipping routes were identified. The overall collision risk for sperm whales in the study area would be reduced by around 70%, while a maximum of 11 nautical miles would be added to major routes and only around 5 nautical miles for the majority of ships.

It was noted that much of this work had already been reviewed by the Committee leading to a recommendation in 2016 to move forward with Greece, ACCOBAMS and other stakeholders with a routing proposal to IMO. The new data in Frantzis *et al.* (2019) included some new ship strike incidents and analysis of AIS data from 2017. This indicated no significant changes in patterns of shipping traffic from the previous analysis considered by the Committee (Frantzis *et al.*, 2015). This issue had also been discussed in detail at the IMMA workshop (SC/68A/HIM/07).

Attention: G, I

Recognising that ship strikes are a significant threat to the eastern sub-population of sperm whales in the Mediterranean and taking account of the discussions at the workshop in addition to the previous recommendations of the Committee; the sub-committee ***encourages*** *the Greek Ministry of Maritime Affairs and Insular Policy to work with other Greek Ministries (e.g. Ministry of Environment and Energy) and relevant stakeholders including the shipping industry, the European Commission and other countries, NGOs, IGOs and scientists to put in place risk reduction measures in the Hellenic Trench and submit a formal proposal by 2020 to the IMO for approval.*

Table 1

Work plan for bycatch and entanglement.

Topic	Intersessional 2019/20	2020 Annual Meeting
Bycatch Mitigation Initiative	-	Review aspects relevant to Committee and respond to requests for advice
Rates and risks	-	Review new estimates of entanglement rates, risks and mortality
Mitigation	-	Review new information on mitigation
Global disentanglement database	Mattila to trial a data form for disentanglement activities conducted by members of the IWC network at GWERN meeting	Review progress
Collaboration with FAO	Continue collaboration	Continue to review
Rates and risks	-	Review estimates of rates of ship strikes, risk of ship strikes and mortality
FAO bycatch mitigation table	Create decision tree structure from mitigation table	Review decision tree
Observer schemes in South Africa	Work with BMI Expert Panel to provide advice on design of observer schemes	Review advice and consider further if needed

Table 2

Work plan for ship strikes.

Topic	Intersessional 2019/20	2020 Annual Meeting
Mitigation		Review new information on mitigation
Advice on routeing measures related to ship strike risk	Provide advice as required (ship routeing group)	Review advice
Follow up on previous contacts offering IWC assistance regarding high risk areas	Secretariat to maintain contact with Sri Lankan and Greek authorities	Review progress on identified high risk areas in IWC Ship Strike Strategic Plan
Continued co-operation with IMO	Secretariat to maintain dialogue with IMO Secretariat. Attend relevant IMO meetings	Review cooperation
Ship strike database	Continue ongoing data entry into Ship Strike Database and validation of records	Review progress against specific deliverables and timeline
Provision of AIS data	Secretariat to develop MOU with Marine Traffic for provision of data	Consider best way to handle requests for data through the MOU

3.3 Co-operation with other organisations including IMO Secretariat and relevant IMO committees

The main activities of cooperation with IMO are described in SC/68A/03. This includes work on noise and ship strikes. Following up on recommendations form the Committee in 2015 there has been ongoing contact between the Secretariats regarding routing of ship traffic off southern Sri Lanka. The South coast of Sri Lanka is one of the high risk areas for ship strikes identified by the Committee and in the IWC Ship Strikes Strategy. The Secretariat has previously written to the Government of Sri Lanka offering the assistance of the Committee in evaluating alternative routing options to reduce ship strike risk to northern Indian Ocean blue whales. Organisations representing the majority of shipping industry using the current route off the southern tip of Sri Lanka at IMO have also written to the Government of Sri Lanka requesting establishment of an offshore route away from whales, whale watching and coastal fishing vessels.

The HIM Convenor (Leaper) attended a workshop titled ‘National Stakeholder Consultation, Maritime Activities off the Coast of Sri Lanka: the case of the blue whale population near Dondra Hd’ on behalf of IWC. It was held on 5 December 2018 in Colombo and organised jointly by the Sri Lankan Marine Environment Protection Authority (MEPA) and IMO. This provided an opportunity to present the discussions and recommendations of the Committee to Sri Lankan stakeholders and officials.

Attention: S

Noting previous concerns and recommendations regarding the situation for Northern Indian Ocean blue whales and ship strikes off Sri Lanka. The sub-committee ***recommended*** *that the Secretariat should maintain the ongoing dialogue regarding re-routing shipping off southern Sri Lanka with the IMO Secretariat and Sri Lankan officials. It also* ***recommended*** *that Sri Lankan scientists working on blue whales be considered as invited participants for SC/68b.*

Attention: S

The sub-committee ***recommended*** *that the IWC Secretariat continue to cooperate with the IMO Secretariat on the development of new routeing measures and ship strike issues*

3.4 Progress on previous recommendations

Progress on recommendations made in 2018 is summarised in Appendix 2.

4. WORK PLAN

See Tables 1 and 2 above.

5. ADOPTION OF REPORT

The report was adopted at 20:00 on 18 May. Leaper thanked Currey for his work as co-Convenor and Hubbell, Mattila, Minton, New and Tarzia for their excellent work as rapporteurs.

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Taylor, B., Loneragan, M. and Reeves, R. 2018. Appendix 1 – Hector's and Māui Dolphin Threat Management Plan Review, Risk Assessment Workshop, 9-13 July 2018. Panel Recommendations. Report to New Zealand Ministry for Primary Industries and Department of Conservation. 15pp. [Available at: *https://www.doc.govt.nz/globalassets/documents/conservation/native-animals/marine-mammals/maui-tmp/hectors-risk-assessment-workshop-panel-recommendations-appendix-1.pdf*].

Appendix 1

AGENDA

1. Introductory items
   - 1.1 Convenor's opening remarks
   - 1.2 Election of Chair and appointment of Rapporteurs
   - 1.3 Adoption of Agenda
   - 1.4 Available documents
2. Bycatch and entanglement
   - 2.1 Progress with the IWC Bycatch Mitigation Initiative
     - 2.1.1 Priorities and report from workshop
     - 2.1.2 Progress on collaboration on bycatch-related issues with other organisations including FAO and IOTC
   - 2.2 Review new methods and estimates of entanglement rates, risks and mortality (large whales)
     - 2.2.1 Review report of the Fourth Workshop on Large Whale Entanglement Issues
     - 2.2.2 Review proposal for global entanglement database
   - 2.3 Mitigation measures for preventing large whale entanglement
   - 2.4 Review new methods and estimates of bycatch rates, risks and mortality (small cetaceans)
     - 2.4.1 Consideration of 'rapid risk assessment' tools
     - 2.4.2 Consideration of remote electronic monitoring and vessel tracking
   - 2.5 Scientific aspects of mitigation measures for small cetaceans
   - 2.6 Review of information in National Progress reports on bycatch and entanglement
   - 2.7 Progress on previous recommendations
3. Ship strikes
   - 3.1 Review new methods and estimates of rates of ship strikes, risk of ship strikes and mortality
     - 3.1.1 Review progress on global database
   - 3.2 Mitigation of ship strikes in high risk areas
     - 3.2.1 Review progress towards assessing and mitigating ship strikes in previously identified high risk areas
     - 3.2.2 Consideration of methods to identify 'high risk' areas incl. report of IMMA workshop
   - 3.3 Co-operation with other organisations including IMO Secretariat and relevant IMO committees
   - 3.4 Progress on previous recommendations
4. Work plan and budget 2019-20
   - 4.1 Work plan for 2019-20
5. Adoption of Report

Appendix 2

PROGRESS ON PREVIOUS RECOMMENDATIONS FROM 2018 ARISING FROM HIM DISCUSSIONS

Recommendation 1
Attention: C-A, CC
*The Committee **draws the attention** of the Commission to its **serious concern** over the high mortality levels from bycatches in Peru and especially those of the Burmeister's porpoise and dusky dolphin. It **stresses** that action is needed to avoid the same critical situation for Burmeister's porpoise as with the closely related vaquita. In this regard the Committee:*

*(1) **reiterates** its advice (IWC, 2009, p.323) on bycatch monitoring and mitigation in these fisheries;*
*(2) **reiterates** that the Burmeister's porpoise is a potential candidate for a Conservation Management plan;*
*(3) **highlights** opportunities to focus on the bycatch of small cetaceans in Peru through the new IWC Bycatch Mitigation Initiative and **recommends** that they are considered as a potential pilot project; and*
*(4) **offers its assistance** to the Government of Peru; and*
*(5) **requests** that the Commission, through the Secretariat, transmits the Committee's concern and offer of assistance to the Government of Peru.*

The sub-committee noted that the BMI was actively considering the bycatch of small cetaceans in Peru as a pilot project and planned to follow up accordingly with the Government of Peru. The Committee's concern and offer of assistance had not yet been relayed to the Government of Peru but that this would be done by the Secretariat in collaboration with the BMI.

Recommendation 2
Attention: CG-A
*The Committee **draws attention** to the fact that the franciscana remains under strong pressure from human activities, especially bycatch, in Brazilian waters despite fishing net regulations established by the government. The Committee:*

*(1) **advises** that the existing regulation on gillnets, implemented in 2012, is either not being effectively enforced or is not effective in reducing bycatch; and therefore*
*(2) **recommends** the need for this to be investigated further by the Brazilian authorities.*

The sub-committee referred to the discussions in the CMP on franciscana.

Recommendation 3
Attention: CG-A, SC, G
With respect to methods for obtaining bycatch estimates the Committee:

*(1) **agrees** with the recommendations of its intersessional group regarding: (a) uncertainties in bycatch estimates derived from strandings; (b) the use of bycatch estimates derived from strandings; and (c) assessing whether strandings can identify gaps in observer coverage;*
*(2) **notes** the importance of observer programmes, including electronic monitoring, and the limitations of stranding information for determining the type of fishing gear implicated in a bycatch event, or in determining reliable bycatch estimates;*
*(3) **recognises** that in small scale fisheries: (a) observer programmes are particularly complicated, given the small size of vessels; and (b) electronic monitoring may not capture the animals falling from the net during hauling*
*(4) **advises** that a robust evaluation of the effectiveness of bycatch mitigation measures requires a combination of monitoring measures, including well-designed and effectively implemented observer programmes, electronic monitoring and stranding programmes;*
*(5) **advises** that the above advice is relevant to the situation of the franciscana in Brazil; and*
*(6) **agrees** that given the increased use of Remote Electronic Monitoring techniques and the rapid development of camera and associated electronic technology, these techniques should be a focus topic at SC/68A.*

The sub-committee received new information on Remote Electronic Monitoring.

Recommendation 4
Attention: C-R, SC, CC
The Committee discussed the strategic assessment of the Bycatch Mitigation Initiative (BMI) and the role of the Committee. The Committee:

(1) welcomes the progress made thus far under the BMI, including the Strategic Assessment;
(2) thanks Tarzia for the excellent work she has carried out since her appointment as co-ordinator;
(3) agrees to incorporate in its work plan the five work areas listed in its report under Item 13.6.1 and also consideration of 'rapid bycatch and risk assessment' tools;
(4) agrees to the criteria listed in its report under Item 13.6.1 when identifying priority fisheries/sites/species/populations; and
(5) recommends to the Commission that the BMI continues and is supported, including the provision of ongoing support for the BMI coordinator.

The sub-committee had received considerable information about the progress with the BMI, including the Workshop immediately before the meeting.

Recommendation 5
Attention: C-R, S
*The Committee **welcomes** the efforts of the FAO to consider cetacean bycatch and recommends that the IWC Secretariat continues to collaborate with the FAO on this issue.*
The Secretariat had continued to collaborate with FAO.

Recommendation 6
Attention: C-A, CC, SC
With respect to bycatches of cetaceans in the Indian Ocean, the Committee:

(1) reiterates its willingness to collaborate with the IOTC on this issue; and
(2) encourages the Secretariat to continue to work with the IOTC Secretariat.

The sub-committee noted the progress made towards greater collaboration with IOTC and the ongoing efforts following the BMI workshop.

Recommendation 7

Attention: C-R, S

The Committee reiterates the importance of the global ship strikes database to its work. It therefore:

(1) welcomes the work undertaken thus far;
(2) recommends the continuation of this work including: (a) that of the co-ordinators and Data Review Group on the review of historical records; and (b) the Secretariat on upload tools.

The sub-committee noted the progress made on the database, particularly the review of the historical records.

Recommendation 8

Attention: C-A, CC, SC, G

The Committee has continued its work on identifying high risk areas for ship strikes and potential mitigation measures.

In this regard the Committee:

(1) recommends continued work to develop and evaluate mitigation measures, such as speed restrictions, that might be associated with the designation of a Particularly Sensitive Sea Area (PSSA) in the Pelagos Sanctuary area;
(2) reiterates its previous recommendations on the importance of evaluating the efficacy of the REPCET system for reducing the risk of ship strikes;
(3) requests the Commission, via the Secretariat, to remind the authorities in Sri Lanka of its previous offer of assistance from the IWC on this issue;
(4) requests the Commission via the Secretariat, to follow up on previous correspondence on the ship strike risks to sperm whales off Greece;
(5) agrees to support a workshop to evaluate how the data and process used to identify IMMAs can assist the IWC to identify areas of high risk for ship strikes; and
(6) agrees to continue ongoing IWC engagement with the process to identify IMMAs, including consideration of their utility to address other threats.

The sub-committee noted that the IMMA workshop had addressed those recommendations that related to the Mediterranean. There had also been contact with authorities in Sri Lanka through the workshop on the ship strike issue in Colombo in December 2018.

Recommendation 9

Attention: C-R, S

The Scientific Committee reiterates the importance of cooperation with IMO and:

(1) welcomes the ongoing co-operation the Secretariat has maintained with IMO and its Secretariat on ship strike issues, including meetings during IMO MEPC 72; and
(2) recommends that this dialogue continue.

The sub-committee noted the ongoing cooperation between the IWC and IMO Secretariats.

REFERENCE

International Whaling Commission. 2009. Report of the Scientific Committee. Annex L. Report of the sub-committee on small cetaceans. *J. Cetacean Res. Manage. (Suppl.)* 11: 311-333

Appendix 3

PROPOSED PROCESS TO FACILITATE A REVIEW BY THE COMMITTEE OF 'SPATIAL RISK ASSESSMENT OF THREATS TO HECTOR'S AND MĀUI DOLPHINS'

The task requested of the Committee is to review the spatial risk assessment of threats to Hector's and Māui dolphins (Roberts *et al*., 2019) with respect to its use for informing management measures to address anthropogenic threats to Hector's and Māui dolphin.

The Committee welcomed the overall concept of spatial risk assessment and the principle of estimating encounters between dolphins and lethal threats such as fishing as a function of their overlap in space. Hence it is not anticipated that there will need to be further discussion of the overall concept. However, many of the specific choices made in designing and implementing the model may benefit from further scrutiny, including determination of the sensitivity of the conclusions to the choices made.

Roberts *et al*. (2019) presented estimates for:

- updated life history parameters for Hector's and Māui dolphins;
- spatial distributions of Hector's and Māui dolphins, from spatial habitat models;
- spatially resolved commercial fisheries captures and deaths, using updated effort data and fisheries observer data;
- the spatial intensity, and spatial overlap with dolphin subpopulations, of an array of potential threats, including fisheries related mortality and toxoplasmosis, and non-lethal threats such as underwater noise; and
- non-fishery causes of death in different subpopulations, from necropsy information.

Specific topics related to each of these items were identified for the review based on discussions within the Committee. It is anticipated that each of items numbered items 1-5 below could form the subject of short review papers by independent experts with the appropriate background.

SOLICITED REVIEW PAPERS

1. Life history parameters
   1.1 Review the estimates of r_{max} for both subspecies and the possible application of other approaches to this.
2. Spatial distribution of Hector's and Māui dolphins
   2.1 Review aspects of the spatial models, both for the model based on coastal aerial survey data and for the model based on harbour areas using public sightings, with respect to:
      2.1.1 Initial choice of static physical habitat variables
      2.1.2 Initial choice of dynamic habitat variables (sea surface characteristics and prey)
      2.1.3 Selection of dolphin occurrence data for fitting the model
      2.1.4 Model selection and fitting

- 2.1.5 Combination of models for merging coastal and harbour predictions (Māui model only)
- 2.1.6 Model validation and interpretation of results

3. Estimates of bycatch rates and vulnerability of Hector's and Māui dolphins
   - 3.1 Review model parameters and choice of priors for bycatch risk model based on data from fisheries observers including:
     - 3.1.1 Selection of fisheries data for use in model (incl. choice of years)
     - 3.1.2 Selection of bycatch data for use in model
     - 3.1.3 Implications of level and spatial extent of observer coverage
     - 3.1.4 Implications of any bias in bycatch rate as a result of having an observer onboard
     - 3.1.5 Implication of vulnerability/catchability[2] not being constant across space and time
     - 3.1.6 Implication of assumption of Poisson distribution for bycatch compared to observed distribution of single and multiple captures
     - 3.1.7 Sensitivity of estimates of bycatch to choice of priors
   - 3.2 Model diagnostics and goodness of fit
4. Toxoplasmosis
   - 4.1 Review the estimation of spatial toxoplasmosis exposure
     - 4.1.1 Use of hydrological model
     - 4.1.2 Use of human habitation as a proxy for cat density
   - 4.2 Review the use of beachcast necropsies as a means of estimating non-fishery deaths
     - 4.2.1 Potential sources of bias affecting carcass detectability (seasonal/spatial/factors affecting buoyancy)
     - 4.2.2 Implications of other evident patterns or biases for estimation of risk (sex or age bias, seasonal patterns)
     - 4.2.3 Compare toxoplasmosis exposure estimates with numbers of observed carcasses at the subpopulation scale, considering population size
   - 4.3 Identify data or research priorities to improve understanding of toxoplasmosis risk
5. Risk model outputs
   - 5.1 Review model predictions of spatially resolved bycatch compared to known records including beachcast carcasses and fisher-reported catches from vessels without observers
   - 5.2 Compare estimates of commercial fisheries deaths from the spatially explicit model with comparable estimates from simpler models, including uncertainty
   - 5.3 Explore the implications of model estimates for forward population trends
   - 5.4 Explore the potential for, and implications of, backward extrapolation to inform estimation of population trends prior to fisheries closures, including varying assumptions about risk and onset of disease, e.g. toxoplasmosis

REVIEW MEETING

Based on these reviews there would be a pre-meeting to SC/68B to:

(a) evaluate the design and structure of the multi-threat risk assessment model;
(b) evaluate the overall sensitivity to model choices, data selection, uncertainties or potential biases identified in the review papers; and
(c) make recommendations to reduce key uncertainties and improve the utility of the model to inform management decisions.

It is expected that the meeting would be a two-day pre-meeting immediately prior to SC/68B. Participants will include the authors of the review papers, the authors of the work being reviewed, and one or two others if a need for specific expertise was identified.

REFERENCE

Roberts, J.O., Webber, D.N., Goetz, K.T., Edwards, C.T.T., Roe, W.D. and Doonan, I.J. 2019. Spatial risk assessment of threats to Hector's and Māui dolphins (*Cephalorhynchus hectori*). Fisheries New Zealand, Wellington, New Zealand. 169pp.

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[2]Vulnerability and catchability are used here as defined in Roberts *et al.* (2019).

Appendix 4

BYCATCH AND SHIP STRIKES OF LARGE WHALES REPORTED IN THE PROGRESS REPORT DATABASE, 2019

Complied by Marion Hughes, IWC Secretariat

Bycatch

Species	Local area	Local area (long/lat)	Unknown: Dead	Unknown: seriously injured	Targeted species	Gear	How observed	Comments
Australia								
Humpback whale	-	-25.62172; 152.94166	1	0	-	-	-	Source of gear not reported
Humpback whale	North Head, Sydney	-33°53' 28.131; 151°17' 13.53	0	1	Fish	[FIX] TRAPS	Public	Line attached to a fish trap entangled around head and tail. Partial disentanglement established. NPWS Elements database record: MAR20181863

Species	Large Area	Local area	Year	Individuals*	Targeted species	Gear type
Humpback whale	Indian Ocean	Hamelin Bay	2018	1	-	[NK]
Southern right whale	Indian Ocean	Esperance	2018	1	-	[NK]
Humpback whale	Indian Ocean	Rottnest Island	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Lancelin	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Yardi Creek	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Leeman	2018	1	-	[NK]
Humpback whale	Indian Ocean	Flinders Bay	2018	1	-	[NK]
Humpback whale	Indian Ocean	200 n.miles NW of Broome	2018	1	-	[NK]
Humpback whale	Indian Ocean	Mangrrove Bay	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Lancelin	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Exmouth	2018	1	-	[NK]
Humpback whale	Indian Ocean	Dongara	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Abrolhos Islands	2018	1	-	[FPO]
Southern right whale	Southern Ocean	Esperance	2018	1	-	[NK]
Humpback whale	Indian Ocean	Mandurah	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Mandurah	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Wydup Rocks	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Bundegi	2018	1	-	[FPO]
Humpback whale	Indian Ocean	Fremantle	2018	1	-	[NK]
Humpback whale	Pacific Ocean - Coral Sea	-	2018	6	White, bull, tiger sharks	[NSC]
Humpback whale	Pacific Ocean - Coral Sea	-	2018	1	-	[FPO]
Unidentified large whale	Pacific Ocean - Coral Sea	-	2018	1	-	
Humpback whale	Pacific Ocean - Coral Sea	-	2018	1	-	
Humpback whale	Pacific Ocean - Tasman Sea	Cudgen Creek mouth, Kingscliff, NSW	2018	1	-	[LX]
Humpback whale	Pacific Ocean - Tasman Sea	Cape Solander, Kurnell, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Port Stephens, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	North Head, Sydney, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Crescent Head, NSW	2018	1	-	[FIX]; [FPO]
Humpback whale	Pacific Ocean - Tasman Sea	Point Plomer, Crescent Head, NSW	2018	1	-	[FIX]; [FPO]
Humpback whale	Pacific Ocean - Tasman Sea	Forster, NSW	2018	1	Lobster	[FPO]

Cont.

Species	Large Area	Local area	Year	Individuals*	Targeted species	Gear type
Australia cont.						
Humpback whale	Pacific Ocean - Tasman Sea	Tacking Point, Port Macquarie, NSW	2018	1	-	[FIX]; [FPO]
Humpback whale	Pacific Ocean - Tasman Sea	Ballina Lighthouse Beach, NSW	2018	2	Sharks	[LX]
Humpback whale	Pacific Ocean - Tasman Sea	East Montague Island Nature Reserve, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Mistral Point, Maroubra, Sydney, NSW	2018	1	Lobster	[FPO]
Humpback whale	Pacific Ocean - Tasman Sea	Coffs Harbour, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Dalmeny Lookout, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Crescent Head, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Boambee Headland, Sawtell, NSW	2018	1	Sharks	[NSC]
Humpback whale	Pacific Ocean - Tasman Sea	Malabar Headland, Sydney, NSW	2018	2	-	[MIS]
Humpback whale	Pacific Ocean - Tasman Sea	Between Black Head and Forster, NSW	2018	1	-	[MIS]
Humpback whale	Pacific Ocean - South	-	2018	3	-	[LL]
Humpback whale	Southern Ocean	-	2018	1	-	[MIS]
Southern right whale	Southern Ocean - Bass Strait	Bridgewater Bay – Portland	2018	1	Southern rock lobster	[FPO]
Southern right whale	Southern Ocean - Bass Strait	Apollo Bay	2018	1	Southern rock lobster	[FPO]

Species	ID	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Unknown: Dead	Gear	How observed	Contacts	Comments
Denmark											
Humpback whale	PR/R/14030	2018	2019	Arctic Ocean - Davis Strait	Sarfannguit near Sisimiut	-	1	[FPN]	Fisherman	PR/C/698 | Ministry of Fisheries and Hunting, Government of Greenland (*apn@nanoq.gl*)	Humpback whale unknown sex, Sarfannguit near Sisimiut, West Greenland (unknown length) entangled in fishing gear from pond net, dead, 06/18.
Humpback whale	PR/R/14033	2018	2019	Arctic Ocean - Davis Strait	Oqaq near Kitsissuarsuit, West Greenland	-	1	[NK]	Fisherman	As above	Humpback whale unknown sex, Oqaq near Kitsissuarsuit, West Greenland (unknown length) entangled in rope with buoy attached, euthanised, 07/18.
Humpback whale	-	2018	-	Arctic Ocean – Davis Strait	Akulliit near Qasigiannguit, West Greenland	-	1	[FPN]	-	As above	Stationery uncovered pound nets.
Humpback whale	PR/R/14039	2018	2019	Arctic Ocean - Denmark Strait	Sermiligaaq, Tasiilaq, East Greenland	-	1	[GN]	Fisherman	As above	Humpback whale unknown sex, Sermiligaaq, Tasiilaq, East Greenland (unknown length) observed swimming entangled in fishing gear, gillnets, euthanised, 10/18.
Common minke whale	PR/R/14042	2018	2019	Arctic Ocean - Denmark Strait	-	B grd. min. 65 04; L grd. min. 32 41	1	[TBN]	Fisherman	As above	Minke whale unknown sex, offshore East Greenland, (8m) caught in pelagic trawler gear fishing for mackerel, dead, 08/18.

Species	ID	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Males: Dead	Females: Dead	Unknown: Dead	Gear	How observed	Contacts
Japan												
Common minke whale	PR/R/12037	2018	2019	Pacific Ocean - North	Hokkaido Prefecture	-	1	4	1	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12039	2018	2019	Pacific Ocean - North	Aomori Prefecture	-	1	3	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12041	2018	2019	Pacific Ocean - North	Iwate Prefecture	-	0	9	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12043	2018	2019	Pacific Ocean - North	Miyagi Prefecture	-	4	5	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12045	2018	2019	Pacific Ocean - North	Chiba Prefecture	-	1	0	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12047	2018	2019	Pacific Ocean - North	Niigata Prefecture	Sea of Japan	0	1	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12049	2018	2019	Pacific Ocean - North	Toyama Prefecture	Sea of Japan	2	4	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12053	2018	2019	Pacific Ocean - North	Ishikawa Prefecture	Sea of Japan	3	9	1	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12055	2018	2019	Pacific Ocean - North	Shizuoka Prefecture	-	0	0	2	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12057	2018	2019	Pacific Ocean - North	Kyoto Prefecture	Sea of Japan	0	3	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12059	2018	2019	Pacific Ocean - North	Hyogo Prefecture	-	0	0	3	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12063	2018	2019	Pacific Ocean - North	Wakayama Prefecture	-	0	1	1	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12065	2018	2019	Pacific Ocean - North	Shimane Prefecture	Sea of Japan	3	2	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12067	2018	2019	Pacific Ocean - North	Yamaguchi Prefecture	-	0	1	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12069	2018	2019	Pacific Ocean - North	Kochi Prefecture	-	0	5	2	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12071	2018	2019	Pacific Ocean - North	Nagasaki Prefecture	-	4	4	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12073	2018	2019	Pacific Ocean - North	Miyazaki Prefecture	-	1	0	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12075	2018	2019	Pacific Ocean - North	Kagoshima Prefecture	-	0	5	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Humpback whale	PR/R/12077	2018	2019	Pacific Ocean - North	Chiba Prefecture	-	0	0	2	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Humpback whale	PR/R/12079	2018	2019	Pacific Ocean - North	Kagoshima Prefecture	-	0	0	1	[FPN] TRAPS	Fisherman	-
North Pacific right whale	PR/R/12081	2018	2019	Pacific Ocean - North	Shizuoka Prefecture	-	1	0	0	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ
Common minke whale	PR/R/12152	2018	2019	Pacific Ocean - North	Oita Prefecture	-	0	0	1	[FPN] TRAPS	Fisherman	PR/C/243 | FAJ

Species	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Males: Dead	Females: Dead	Unknown: Dead	Gear	How observed	Contacts
Korea, Republic of											
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.90, 129.7167	1	0	0	[FPO] TRAPS	Observer/inspector	PR/C/652 | H.W. Kim (*forestu2@gmail.com*)
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.4817, 129.3170	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.4798, 128.4521	0	0	1	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.4667, 130.0000	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.4333, 129.3500	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.4833, 130.0667	0	1	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.3003, 129.5650	0	0	1	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	37.0667, 129.6333	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.7346, 129.0529	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.4083, 129.6733	0	1	0	[GN]	Observer/inspector	A above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.3833, 130.0833	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.4103, 129.6725	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.5882, 129.2587	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.3342, 129.4037	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.0847, 129.5380	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.8265, 129.4877	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.1123, 128.7679	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.2083, 130.1217	1	0	0	[FPO] TRAPS	-	As above

Cont.

Species	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Males: Dead	Females: Dead	Unknown: Dead	Gear	How observed	Contacts
Korea cont.											
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.4083, 130.0700	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.3022, 129.3342	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.0892, 129.5594	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.0837, 128.7837	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.9021, 128.9195	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.5213, 129.7918	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.6317, 129.4248	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.2050, 129.8250	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.4433, 128.5453	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.4500, 129.2167	0	1	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.3567, 129.8333	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.0152, 128.8478	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.0333, 129.5833	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.3077, 129.5763	0	0	1	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.6253, 129.4262	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.0833, 129.6000	0	0	1	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Busan	35.3000, 130.0333	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.3688, 129.4903	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - East China Sea	Gyeongsangbuk-do	35.3333, 130.3000	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.2062, 129.4687	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.8383, 129.4575	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.6253, 129.4262	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.2298, 129.5381	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - East China Sea	Jeollanam-do	34.4367, 127.6837	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.1750, 129.5250	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.0535, 129.5088	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Yellow Sea	Chungcheongnam-do	36.2411, 124.6755	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.3862, 129.4242	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.2722, 129.4580	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Busan	35.1000, 129.4000	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - East China Sea	Jeollanam-do	34.1024, 126.4203	0	1	0	[FSN] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.2570, 129.4078	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Yellow Sea	Jeollabuk-do	36.1053, 125.8723	0	1	0	[FSN] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.3252, 129.2699	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	37.2587, 129.3385	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.6167, 130.7500	1	0	0	[GN]	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - East China Sea	Jeollanam-do	34.4367, 127.6847	1	0	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.1167, 130,000	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.3427, 129.4053	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	37.0517, 129.4217	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.1564, 129.4244	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.2036, 129.5507	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.3000, 130.1167	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.2500, 128.5833	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.1033, 129.8217	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.1525, 129.6888	0	1	0	[FPO] TRAPS	Observer/inspector	As above

Cont.

Species	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Males: Dead	Females: Dead	Unknown: Dead	Gear	How observed	Contacts
Korea, cont.											
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.2590, 129.9500	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.1000, 129.7167	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.2313, 129.6380	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.9500, 129.5167	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - East China Sea	Jeollanam-do	34.4868, 127.8246	0	1	0	[FIX] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.1667, 129.9167	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.1333, 129.9000	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.1167, 129.8050	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangnam-do	35.1333, 129.9167	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	36.5097, 129.7267	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.1500, 129.7500	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Busan	35.1000, 129.7867	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.3767, 129.6380	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Busan	35.1870, 129.6200	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Yellow Sea	Chungcheongnam-do	36.7167, 125.7167	0	1	0	[FSN] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gyeongsangbuk-do	35.3084, 130.2052	0	1	0	[FPO] TRAPS	Observer/inspector	As above
Common minke whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Gangwon-do	38.0515, 128.8031	1	0	0	[FPO] TRAPS	Observer/inspector	As above
Humpback whale	2018	2019	Pacific Ocean - Sea of Japan/East Sea	Ulsan	35.4867, 129.6040	0	1	0	[FPO] TRAPS	Observer/inspector	As above

Species	ID	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Unknown: Dead	Targeted species	Gear	How observed	Contacts	Comments
New Zealand												
Common minke whale	-	2018	-	Pacific Ocean - South	-	-	1	Swordfish	[LLD]	-	-	-
Humpback whale	-	2018	-	Pacific Ocean - NZ	Coromandel	-	1	Crayfish/rock lobster	[FPO]	-	-	-
Humpback whale	-	2018	-	Pacific Ocean - NZ	Bay of Islands	-	1	Crayfish/rock lobster	[FPO]	-	-	-
Unidentified large baleen whale	PR/R/13138	2018	2019	Pacific Ocean - South	Chatham Rise	-	1	-	-	Fisherman	PR/C/895 | Fisheries New Zealand	No detailed information, 02/11/18
Unidentified large whale	PR/R/13141	2018	2019	Pacific Ocean - South	-	-50.888333, 166.765	1	Arrow squid	[TM] MID-WATER TRAWLS	Observer or inspector	As above	Skull bones only, 05/04/18
Unidentified large baleen whale	PR/R/13144	2018	2019	Pacific Ocean - NZ	Marlborough Sounds	40.9164, 173.9845	1	Mussels	[MIS]	Fisherman	PR/C/537 | H. Hendriks (*hhendriks@doc.govt.nz*)	Mussel farmers reported to DOC who attended. Unsure if whale became entangled alive or already dead, 22/01/18.

Species	ID	Data year	Year submitted	Large Area	Local area (long/lat)	Females: Seriously Injured	Targeted species	Gear	How observed	Contacts	Reference	Comments
UK												
Common minke whale	PR/R/14217	2018	2019	Atlantic Ocean - North	57.54694444,-4.070555556	1	Unknown or N/A	[NK]	Scientist	PR/C/248 | A. Brownlow (*andrew.brownlow@sac.co.uk*)	PR/B/792 | Deaville, R. (compiler). *CSIP Annual Report to UK Government for 2018*. Unpublished.	Diagnosed as entanglement from necropsy within UK strandings programme.

Species	Large Area	Local area	Local area (long/lat)	Unknown: Dead	Unknown: Seriously Injured	Targeted species	Gear	How observed	Reference	Comments
USA										
Fin whale	Atlantic Ocean - North	-	-	0	0	-	[NK]	-	PR/B/749 | Henry, A.G., Cole, T.V.N., Hall, L, Ledwell, W., Morin, D. and Reid, A. 2019. Mortality and serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast and Atlantic Canadian Provinces, 2012-2016. *Northeast Fish. Sci. Cent. Ref. Doc*. 19-31. Unpublished.	
Humpback whale	Atlantic Ocean - North	-	-	3	2	-	-	-	As above	Includes Canadian data.
North Atlantic right whale	Atlantic Ocean - North	-	-	0	6	-	-	-	As above	Includes Canadian data.
Common minke whale	Atlantic Ocean - North	-	-	2	1	-	-	-	As above	The Unknown: SI and the Unknown: Unknown were sighted in Canadian waters.

Ship strikes

Species	ID	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Individuals: Dead	Individuals: Seriously Injured	Submitted to IWC or National Ship Strike Database	Contacts	Comments
Australia											
Humpback whale	PR/R/12396	2018	2019	Indian Ocean	Exmouth - Ningaloo Marine Park	-	0	1	Unknown	PR/C/650 | Cameron Craigie (*cameron.craigie@dpaw.wa.gov.au*)	Serious multiple propeller cuts by large vessel.
Humpback whale	PR/R/12402	2018	2019	Indian Ocean	Exmouth Gulf	-	0	0	Unknown	As above	Female with calf struck by vessel.
Humpback whale	PR/R/12793	2018	2019	Pacific Ocean - Coral Sea	Great Sandy Strait	-25.792; 153.037	1	0	Yes	PR/C/832 | StrandNet (*strand.data@des.qld.gov.au*)	-

Species	ID	Data year	Year submitted	Large Area	Local area	Local taxonomy	Local area (long/lat)	Individuals: Dead	Individuals: Seriously Injured	Submitted to IWC or National Ship Strike Database	Comments
Spain											
Fin whale	PR/R/ 11066	2018	2019	Atlantic Ocean - North	Punta Cabalo - Illa de Arousa	-	42,5732111111111, - 888433333333333	-	1	Unknown or N/A	PR/B/743 | Convenio de Colaboración Entre a Consellería de Medio Ambiente e Ordenación do Territorio da Xunta de Galicia e a Asociación 'Coordinadora Para o Estudo dos Mamíferos Mariños-Cemma', Para a Asistencia, Recup-eración e Estudo dos Réptiles (Tartarugas) e Mamíferos Mariños Varados no Litoral da Comunidade Autónoma de Galicia. 2018. Consellería de Mbeio Ambiente, Territorio e Vivenda + CEMMA. Unpublished. Possible vessel strike, dead individual taken to fishing port.
Sperm whale	PR/R/ 12771	2019	2019	Atlantic Ocean - North	Oriental Canary Islands, Gran Canaria	Cachalote	27.98788, -15.37416	1	0	No	Passive stranding, the animal died recently, juvenile-subadult and sexually mature male, 910cm total length, abundant stomach content, so far *Histioteuthis* sp., *Haliphron atlanticus*, *Galiteuthis* sp., *Taonius* sp., *Pholidoteuthis boschmai*, *Chiroteuthis* sp. and *Octopoteuthis* sp. specimens have been identified. Several clean and deep cuts produced accurately by a high-speed boat, since there is no other situation or scene that ends with these dissections and mutilations so forthright. One of the cuts located in the middle of the caudal peduncle reaching almost to section completely, another lighter cut in the belly and complete mutilation of the mandibles at the beginning of the mandible ramus.
Sperm whale	PR/R/ 12777	2019	2019	Atlantic Ocean - North	Oriental Canary Islands, Gran Canaria	Cachalote	28.00592, -15.37313	1	0	No	Floating stranding, the animal died recently, juvenile and sexually immature female, 797cm total length, abundant and fresh stomach content, mainly cephalopods, some of them partially entire, and scarce fishes remains. Deep cut 40cm long, W-shaped, dorsally behind the head that produced a massive hemorrhage, produced by a boat. A small bleeding cut was also observed in the left lobe next to the caudal notch.

Species	ID	Data year	Year submitted	Large Area	Local area	Local taxonomy	Local area (long/lat)	Individuals: Dead	Individuals: Seriously Injured	Submitted to IWC or National Ship Strike Database	Comments
Spain cont.											
Bryde's whale	PR/R/ 12780	2019	2019	Atlantic Ocean - North	Oriental Canary Islands, Fuerteventura	Rorcual tropical	28.07100, -14.50693	1	0	No	Passive stranding, sexually immature male, 1050cm total length. Stomach full of little fishes. Traumatic cut, 175cm long and 220cm wide, in the lateral region between the dorsal fin and right pectoral fin.
Sperm whale	PR/R/ 13214	2018	2019	Atlantic Ocean - Mediterranean Sea	Golfo de Vera	-	37.419702, 1.003755	1	0	No	Juvenile male, 6,40m and 2,280kg.
Fin whale	PR/R/ 13550	2018	2019	Atlantic Ocean - Mediterranean Sea	Golfo de Valencia	-	39.64377, -0.19775	1	0	No	Found in a bow bulb, not known if it was the cause of death.
Pygmy sperm whale	PR/R/ 14055	2018	2019	Atlantic Ocean - North	Canary Islands	-	-	1	0	Unknown	-

Species	ID	Data year	Year submitted	Large Area	Local area	Local area (long/lat)	Males: Dead	Individuals: Seriously Injured	Submitted to IWC or National Ship Strike Database	Contacts	References	Comments
UK												
Common minke whale	PR/R/ 14211	2018	2019	Atlantic Ocean - North	-	56.21166667, -2.936666667	-	1	Unknown or N/A	PR/C/248 | A. Brownlow (*andrew.brownlow@sac.co.uk*)	PR/B/792. Deaville, R. (compiler). CSIP Annual Report to UK Government for 2018. Unpublished.	Blunt force trauma to the right side of the head, leading to intracranial bleed.

Species	ID	Data year	Year submitted	Large Area	Individuals: Dead	Individuals: Seriously Injured	Submitted to IWC or National Ship Strike Database	Contacts	References
USA									
Humpback whale	PR/R/ 11825	2016	2019	Atlantic Ocean - North	5	2	Unknown	PR/C/836 | Allison Henry (*allison.henry@noaa.gov*)	PR/B/749. Henry, A.G., Cole, T.V.N., Hall, L., Ledwell, W., Morin, D. and Reid, A. In review. Mortality and serious injury determinations for baleen whale stocks along the Gulf of Mexico, United States East Coast and Atlantic Canadian Provinces, 2012-2016. *Northeast Fish. Sci. Cent. Ref. Doc.* Unpublished.
North Atlantic right whale	PR/R/ 11828	2016	2019	Atlantic Ocean - North	1	0	Unknown	As above	As above
Sei whale	PR/R /11831	2016	2019	Atlantic Ocean - North	1	0	Unknown	As above	As above

FAO Gear Codes used in these tables

[FIX] TRAPS - Traps (not specified)
[FPN] TRAPS - Stationary uncovered pounds nets
[FPO] TRAPS - Pots
[FSN] TRAPS - Stow nets
[GN] GILLNETS AND ENTANGLING GEAR - Gillnets (not specified)
[LX] HOOKS AND LINES - Hooks and lines (not specified)
[MIS] MISCELLANEOUS GEAR
[NK] GEAR NOT KNOWN OR NOT SPECIFIED
[NSC] SHARK CONTROL NETS
[TBN] TRAWLS - Pair trawls
[TM] MIDWATER TRAWLS - Midwater trawls (not specified)